DESIGN BRANCH
SAVE

Central Utah Project
Bonneville Unit

Diamond Fork System

FINAL SUPPLEMENT TO THE
FINAL ENVIRONMENTAL IMPACT STATEMENT

UNITED STATES
DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

FINAL SUPPLEMENT TO THE

FINAL ENVIRONMENTAL IMPACT STATEMENT

DIAMOND FORK SYSTEM

BONNEVILLE UNIT, CENTRAL UTAH PROJECT

Prepared by:

U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Region

This document describes the environmental impacts of the Diamond Fork System of the Bonneville Unit, Central Utah Project. The document is the National Environmental Policy Act compliance document for section 404 permits under the Clean Water Act (Public Law 95-217), and complies with Executive Order 11988, Floodplains Management; and Executive Order 11900, Protection of Wetlands.

This supplement describes the environmental impacts of reducing the size of the Diamond Fork Power System plan since publication of the Final Enviromental Statement (INT-FES 84-30). Changes in market conditions make the FES plan no longer practical. The recommended plan presented in the final supplement provides 56.5 megawatts of installed generating capacity compared to 166.2 in the FES. Approximately 10.5 megawatts would be needed to meet requirements of the Bonneville Unit. The remaining capacity would require non-Federal financing. Facilities added to the recommended plan since the FES include Sixth Water Aqueduct and Last Chance Powerplant. Facilities deleted since the FES plan include Syar Powerplant and Dam, Corona Aqueduct, Sixth Water Powerplant and Dam, and Dyne Aqueduct and Powerplant.

For further information on the processing or content of this document, please contact the Regional Environmental Officer, Bureau of Reclamation, 125 South State Street, P.O. Box 11568, Salt Lake City, Utah 84147, or call commercial (801) 524-5580 or FTS 588-5580.

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SUMMARY

General

The Diamond Fork System would be an essential component of the interrelated systems of the Central Utah Project's Bonneville Unit. Construction of the Bonneville Unit began in 1967 and is nearly 53 percent complete, based on costs expended to date as a percent of the total estimated cost. The Central Utah Project is a major development project designed to provide water for the agricultural, municipal, and industrial needs of 12 counties in northern and central Utah. The project would also provide benefits for flood control and recreation, fishery enhancement, and mitigation of wildlife losses.

The Diamond Fork System, in north-central Utah, would effect a transbasin diversion of water from the Uinta Basin of the Upper Colorado River Basin to the Bonneville Basin of the Great Basin. The transbasin diversion would provide water for the Municipal and Industrial System of the Bonneville Unit for municipal and industrial uses and for supplemental irrigation service in the Spanish Fork area of south Utah County. Water would also be provided for the Irrigation and Drainage (I&D) System of the Bonneville Unit. The transbasin diversion would descend from the enlarged Strawberry Reservoir in the Uinta Basin to the confluence of Diamond Fork and the Spanish Fork River in the Bonneville Basin through a system of tunnels, pipelines, and a powerplant.

Since filing of the 1984 Final Environmental Impact Statement (FES) on the Diamond Fork Power System (INT-FES 84-30), conditions have changed so that the recommended plan evaluated in the FES is no longer practical and, therefore, has been reduced in size. This supplement presents an analysis of impacts expected to result from a recommended plan and two alternatives for the downsized system where the impacts would be different from the 1984 FES plan.

The recommended plan for the system would facilitate the transbasin diversion of an annual average of 101,900 acre-feet of Bonneville Unit water and 61,500 acre-feet[1] of Strawberry Valley Project water from the Uinta Basin to the Bonneville Basin. Additionally, the system would provide recreation and fishery benefits, hydroelectric generation, wildlife mitigation measures, and flood and water quality control. The developed water would fulfill the Instream Flow Agreement of 1980, which provided for the compensation of up to 50 percent of the fishery impact on project streams in the Uinta Basin, while meeting the project objectives of supplying immediate and projected needs for a rapidly growing population along the Wasatch Front.

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[1] Based on project operation studies only. Actual entitlement is currently being negotiated.

Most of the system would be in Utah County, but a small portion at the upper end would be in Wasatch County. The system would be constructed in the Diamond Fork and Sixth Water drainages in the Uinta National Forest of the Wasatch Mountain range. Sixth Water is a tributary of Diamond Fork, which is a tributary of the Spanish Fork River. Elevations of project features would range from about 7600 to 5000 feet.

Alternatives

Three alternatives for the Diamond Fork System are presented in this supplement. The recommended plan and alternative A would deliver water to both the Municipal and Industrial (M&I) and I&D Systems, but would require additional NEPA compliance to cover construction of the I&D System. Alternative C corresponds with the No Action Alternative for the I&D System. The recommended plan and alternative C provide for a reduced transbasin diversion of water from the Uinta Basin to the Bonneville Basin to satisfy the requirements of the 1980 Instream Flow Agreement for Uinta Basin streams. Alternative A provides for a larger transbasin diversion and assumes that the Instream Flow Agreement would be satisfied by other means. All three alternatives would provide water for supplemental service irrigation in the Spanish Fork area and would include recreation, flood control, and fish and wildlife mitigation and enhancement measures. Power for project pumping would also be developed and potential would exist for further non-Federal development of power. Summary data for the major facilities and the plan recommended in the 1984 FES are shown in summary table 1.

With the recommended plan, the system would receive water from Strawberry Reservoir through Syar Tunnel. From the tunnel outlet, water would enter Sixth Water Aqueduct, which would include Sixth Water Pipeline, Sixth Water Shaft, and Sixth Water Tunnel. Water from the aqueduct would be discharged into Sixth Water Creek through Last Chance Powerplant and then enter Monks Hollow Reservoir. Water from Monks Hollow Reservoir would enter the proposed Diamond Fork Pipeline and be conveyed to the I&D System, as discussed in the 1984 FES. Flows not conveyed in the pipeline would enter the Diamond Fork stream channel below Monks Hollow Dam and subsequently the Spanish Fork River. Water for irrigation of supplemental service lands in the Spanish Fork area would be diverted from the river by existing Strawberry Valley Project facilities.

Monks Hollow and Diamond Fork Powerplants and an enlarged Last Chance Powerplant could be constructed if non-Federal financing is obtained. The recommended plan would provide 10.5 MW of generating capacity to meet project pumping requirements of the Bonneville Unit. Up to 46 MW of additional capacity could be added with sufficient non-Federal financing (see summary tables 1 and 2).

Summary Table 1.--Summary data for Diamond Fork System

	1984 FES Plan	Recommended plan	Alternative A	Alternative C
Syar Tunnel				
Length (miles)	6.5	5.7	5.7	5.7
Diameter (feet)	8.25	8.5	8.5	8.5
Capacity (cfs)	600	600	600	600
Syar Penstock				
Length (miles)	0.2			
Diameter (feet)	8.5			
Capacity (cfs)	600			
Syar Powerplant				
Capacity (MW)	12.6			
Syar Dam				
Height (feet)	88			
Material volume (cubic yards)	810,000			
Syar Reservoir				
Capacity (acre-feet)	910			
Normal surface area (acres)	31			
Corona Aqueduct				
Length (miles)	0.9			
Diameter (feet)	10.0-11.75			
Capacity (cfs)	1,300			
Sixth Water Penstock				
Length (miles)	0.3			
Diameter (feet)	7.5			
Capacity (cfs)	1,300			
Sixth Water Powerplant				
Capacity (MW)	74.1			
Sixth Water Dam				
Height (feet)	135			
Material volume (cubic yards)	510,000			
Sixth Water Reservoir				
Capacity (acre-feet)	560			
Normal surface area (acres)	19			
Dyne Aqueduct				
Length (miles)	2.6			
Diameter (feet)	10.75-11.5			
Capacity (cfs)	1,250			
Dyne Penstock				
Length (miles)	0.5			
Diameter (feet)	7.75			
Capacity (cfs)	1,250			
Dyne Powerplant				
Capacity (MW)	67.7			
Sixth Water Aqueduct				
Sixth Water Pipeline				
Length (miles)		0.8		
Diameter (feet)		8.0		
Capacity (cfs)		600		
Sixth Water Shaft				
Depth (feet)		575		
Diameter (feet)		8.5		
Capacity (cfs)		600		

Summary Table 1 (continued).--Summary data for Diamond Fork System

	1984 FES Plan	Recommended plan	Alternative A	Alternative C
Sixth Water Tunnel				
Length (miles)		0.6		
Diameter (feet)		8.5		
Capacity (cfs)		600		
Fifth Water Aqueduct				
Rays Valley Pipeline				
Length (miles)			0.9	0.9
Diameter (feet)			7.0	7.0
Capacity (cfs)			600	600
Fifth Water Tunnel				
Length (miles)			1.1	1.1
Diameter (feet)			8.5	8.5
Capacity (cfs)			600	600
Fifth Water Pipeline				
Length (miles)			0.5	0.5
Diameter (feet)			7.0	7.0
Capacity (cfs)			600	600
Fifth Water Penstock				
Length (miles)			0.5	0.5
Diameter (feet)			6.0	6.0
Capacity (cfs)			600	600
Last Chance Powerplant				
Capacity (MW)		[1]48.0	[2]60.0	[3]60.0
Monks Hollow Dam				
Height (feet)	250	258	258	
Material volume (cubic yards)	150,000	150,000	150,000	
Monks Hollow Reservoir				
Capacity (acre-feet)	31,400	33,100	33,100	
Normal surface area (acres)	343	352	352	
Monks Hollow Powerplant				
Capacity (MW)	[4]5.0	2.5	[4]2.5	
Three Forks Dam				
Height (feet)				60.0
Material volume (cubic yards)				65,000
Three Forks Reservoir				
Capacity (acre-feet)				430
Normal surface area (acres)				14
Diamond Fork Pipeline				
Length (miles)	6.9	7.2	7.2	9.9
Diameter (feet)	9.0	8.0	8.0	7.0
Capacity (cfs)	450	510	510	350
Diamond Fork Powerplant				
Capacity (MW)	[4]6.8	[4]6.0	[2,4]6.0	10.0

[1] 10.5 MW of power for project pumping. The remaining capacity would be for non-Federal development.
[2] 18 MW for project pumping.
[3] 3 MW for project pumping.
[4] Non-Federal power development.

Summary Table 2.--Comparison of environmental impacts for the Diamond Fork System alternatives[1]

Environmental category	Future without condition	1984 Final Environmental statement plan	Recommended plan	Alternative A	Alternative C	Fifth water pumped storage alternative	Sixth water pumped storage alternative	1964 DPR alternative	No power alternative
Fish standing crop									
Streams (wild trout)	[2,3]12.8	[3,5]5.7	[3]+9.7	[3]+8.7	[3]+16.8	[4]+2,353	[4]+2,321	[4]-683	[4]+2,066
Monks Hollow Reservoir	NA	[6]+17	[6]+17	[6]+17	NA	+2,048	+837	+1,337	0
Vegetation (acres)									
Permanent	93,500	-545	-438	-447	-98	-1,021	-546	-855	-19
Temporary	93,500	-280	-132	-155	-156	-411	-297	-327	-204
Wildlife indicator species (AAHU)[7]									
Mule deer	71,995	-45	- 66	-105	-156	+50	-10	+24	+17
Bobcat	17,556	+150	+ 90	+127	+158	+221	+99	+131	+33
Golden eagle	51,425	+59	+143	+235	+358	-213	-169	-292	+34
Cooper's hawk	2,365	-14	-15	-16	-12	-14	-14	-12	-8
Beaver	110	-2	-12	-8	-3	-1	-1	+14	-3
Wildlife mitigation required--									
land acquisition (acres)[6]	NA	4,000	2,640	3,230	2,760	4,443	2,455	3,748	612
Endangered species[9]	0	0	0	0	0	0	0	0	0
Water quality									
Streams[10]									
Temperature (°C)[11]	17 to 21	9 to 20	9 to 20	9 to 20	7 to 11	-4 to +2	-8 to +3	-9 to +2	-10 to +2
Dissolved oxygen (ppm)[12]	8	4 to 10	4 to 10	4 to 10	6 to 10	-4 to 0	-4 to 0	-4 to 0	-8 to 0
Turbidity[11]	-	++	+	+	+	++	++	-	+
Monks Hollow Reservoir temperature (°C)	NA	9 to 15	9 to 15	9 to 15	NA	13-17	9-15	NA	NA
Monks Hollow Reservoir fluctuations (acres)									
Minimum	NA	240	142	142	NA	300	300	NA	NA
Maximum	NA	343	352	352	NA	343	343	NA	NA
Average	NA	302	306	306	NA			NA	NA
Cultural resources[15]	0	0	0	0	0	0	0	0	0
Social									
Jobs	[16,19]100,409	[16]4,310	[16]1,656	[16]1,656	[16]1,167	[17]33,285	[17]22,320	[17]10,580	[17]5,230
Population[18]	[19]296,800	1,905	513	513	348	3,850	3,430	1,750	865
Agricultural crop production[20]									
Alfalfa (tons)	115,000	NA	+21,000	+21,000	+21,000	NA	NA	NA	NA
Barley (bushels)	1,579,000	NA	+296,000	+296,000	+296,000	NA	NA	NA	NA
Corn silage (tons)	62,000	NA	+12,000	+12,000	+12,000	NA	NA	NA	NA
Corn grain (bushels)	462,000	NA	+87,000	+87,000	+87,000	NA	NA	NA	NA
Fruit (bushels)	2,326,000	NA	+436,000	+436,000	+436,000	NA	NA	NA	NA
AUM's[21]	12,115	-570	-570	-570	-110	-1,050	-550	-820	-110

Summary Table 2 (continued).--Comparison of environmental impacts for the Diamond Fork System alternatives[1]--continued

Environmental category	Future without condition	1984 Final Environmental	Recommended plan	Alternative A	Alternative C	Fifth Water Pumped Storage	Sixth Water Pumped Storage	1964 DPR Alternative	No Power alternative
Management cost to permittees ($)	53,000	46,800	49,100	49,100	49,100	+26,000	+20,000	+14,000	0
Esthetics[22]		25,411	25,411	25,411	19,525	22,135	25,411	29,240	19,525
Recreation (RD)[23]	460,895	+60,400	+60,400	+60,400	+60,400	+100,400	+60,400		+60,400
Power generated (MW)	0	166.2	[24]56.5	[24]68.5	[24]70	1,182.4	422.6	133.5	0

[1] Impacts represent changes from the future without condition. Where this condition is not quantified, impacts shown are absolute values.

[2] Reflects 1986 analysis of future without condition. 1984 FES stated a baseline standing crop of 2,184 pounds per year (lbs/year).

[3] Measured in pounds per acre.

[4] Measured in pounds per year.

[5] This value stated as 2,321 total pounds in the 1984 FES.

[6] Only total pounds were given in the 1984 FES.

[7] AAHU (average annual habitat units) is a combined measure of quantity and quality of habitat. The net gain or loss is compared to the onsite mitigation plan. The net gain or loss with the offsite mitigation plan would be similar.

[8] Onsite mitigation requirement. The offsite mitigation equivalent is 6,000 acres for the 1984 FES plan, 4,100 acres for the recommended plan, 4,945 acres for alternative A, and 4,280 acres for alternative C. Offsite equivalents were not analyzed for the other alternatives presented in the 1984 FES.

[9] Not affected by any project alternative.

[10] Diamond Fork immediately below Monks Hollow Reservoir.

[11] Average maximum temperature in August.

[12] Average of spot measurements taken throughout the year.

[13] ++ indicates a significant decrease in turbidity, + indicates a slight decrease in turbidity, and a - indicates a slight increase in turbidity.

[14] Temperature ranges given are maximum predicted to occur when cold water is withdrawn from Strawberry Reservoir. When warm water is withdrawn, expected temperature ranges would be 17 to 20 °C (maximum in August).

[15] Based on surveys covering 90 percent of the project area, no significant sites would be impacted. Should significant sites be found during completion of the inventory, mitigation would reduce the net impact.

[16] Total number of direct and indirect work years from project construction.

[17] Total number of direct and indirect jobs from project construction.

[18] Population influx during peak construction year.

[19] Source: State of Utah, Office of Planning and Budget, 1986.

[20] Agricultural development was not included in the 1984 FES plan, nor is it a feature of the minimum power development alternative. Therefore, no values are given.

[21] Animal Unit Months.

[22] Numerical ratings prepared by the Forest Service for a relative comparison of effects.

[23] Recreation day (net annual use and increase expected in 1995).

[24] Includes non-Federal power development.

A switchyard would be built at each powerplant and one substation would be required. A 138-kilovolt (kV) transmission line would connect the Last Chance Switchyard with the substation. About 18.2 miles of new roads would be constructed and about 11.9 miles of existing roads would be improved to facilitate construction and operation of the system. Recreation facilities and fishery measures would remain virtually the same as described in the 1984 FES. Mitigation for big game and other wildlife habitat would consist of habitat management of up to 6,000 acres of Federal and private lands in Utah, Wasatch, and Duchesne Counties. Habitat improvements would be accomplished on specified areas to improve their value for wildlife. The private lands for mitigation would be acquired through fee title purchase from willing sellers.

Alternative A would be essentially the same as the recommended plan except Fifth Water Aqueduct would convey water from Syar Tunnel to Sixth Water Creek instead of Sixth Water Aqueduct. Alternative A would provide for a larger transbasin diversion of water and 18 MW of generating capacity for project pumping requirements and up to 50.5 MW of additional capacity for non-Federal development.

Alternative C would be the same as alternative A with the following exceptions: Monks Hollow Dam and Powerplant would be deleted from the plan and a small diversion and regulating dam would be constructed at Three Forks about 10 miles upstream from the confluence of Diamond Fork and the Spanish Fork River; Diamond Fork Pipeline would extend upstream an additional 2.7 miles to Three Forks Dam, and would have a capacity of 350 cfs; and about 3 MW of generating capacity for Bonneville Unit project pumping requirements could be provided, but an additional 67 MW could be provided with non-Federal financing. Monks Hollow Powerplant would not be developed without non-Federal participation.

Summary of Environmental Impacts

Summary table 2 shows a comparison of net environmental impacts which would result from implementation of the recommended plan, alternatives A and C, the 1984 FES plan, and four additional alternatives which were also presented in the 1984 FES. The impacts are compared to a future without project condition, which assumes no further Federal development of the Bonneville Unit. Impacts of the recommended plan and alternative A on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be identified in a draft environmental statement on the I&D System.

Temporary and permanent impacts on topography and scenery would remain the same as in the FES.

Permanent losses of vegetation would total 438 acres for the recommended plan, 447 acres for alternative A, and 98 acres for

alternative C, compared to permanent losses of 545 acres in the 1984 FES plan. Temporary losses would total 132 acres for the recommended plan, 155 acres for alternative A, and 156 acres for alternative C, compared to 280 acres in the FES plan.

With the recommended plan and alternative A, the construction of Monks Hollow Reservoir would inundate flood plains and cause the loss of 45 and 44 acres of existing stream and associated riparian vegetation, respectively, compared to 46 acres in the 1984 FES plan. With alternative C, losses would be considerably less at 23 acres. Temporary disturbances would be 14 acres for the recommended plan and alternative A, 18 acres for alternative C, and 28 acres for the 1984 FES plan. Net negative impacts to beaver and deer with mitigation would be greater with the recommended plan and two alternatives when compared to the FES plan, but benefits to golden eagles would be greater.

Maximum streamflows in Sixth Water Creek between Last Chance Powerplant and Monks Hollow Reservoir would be significantly greater than in the 1984 FES plan for the recommended plan and alternatives A and C. With the recommended plan and alternative A, flows below Monks Hollow Dam would be the same as in the FES plan in Diamond Fork and slightly less in the Spanish Fork River.

With alternative C, flows of Beer Creek would be greater than at present during the irrigation season. Utah Lake fluctuations would be nearly equal to those which have occurred historically. If adequate water is available, the lake could be reregulated to maintain a minimum water surface higher than historical minimum levels and a maximum water surface lower than historically.

Jordan River flows would not be significantly affected by alternative C.

Although operation of the recommended plan and two alternatives would not significantly alter water quality in Strawberry Reservoir, differences in reservoir operation and water levels would alter the relative volumes of reservoir water above and below the thermocline[2] and associated water temperatures, dissolved oxygen levels, and nutrient levels. Water entering Monks Hollow Reservoir with the recommended plan and alternative A would be similar in temperature and nutrients to the water released from Strawberry Reservoir. Monks Hollow Reservoir would have relatively high nutrient loadings and would be classified as

[2] A place, in relation to a lake's depth, where an abrupt, obvious temperature change occurs between the upper warm portion of a lake and the lower cold portion.

eutrophic[3]. Water quality conditions in both reservoirs and in the Diamond Fork/Spanish Fork River System are expected to be very similar to those described in the 1984 FES. For alternative C, total dissolved solids in Utah Lake would average about 1,030 mg/L, less than historical and "future without project" conditions.

Stream fisheries would be considerably improved as in the 1984 FES plan. However, fisherman use would be slightly less for the recommended plan and alternative A. For alternative C, fisherman use would show a significant increase. The Monks Hollow Reservoir fishery would be similar to the FES plan. Wildlife impacts would be generally less than in the FES plan, although impacts on beaver would be greater.

Project impacts on endangered species, insect pests and vectors, air quality, geology and seismicity, and cultural resources would be the same as in the 1984 FES plan.

Social and economic impacts would be generally less than in the 1984 FES plan. Population influx in the peak year of construction is estimated at 513 for the recommended plan and alternative A and 348 for alternative C, compared to about 1,905 in the FES plan. Employment created would amount to about 1,300 work-years for the recommended plan and alternative A and 916 work-years for alternative C, significantly less than the 3,610 work-years in the FES plan. Impacts on housing and education also would be considerably less.

Agricultural development was not discussed in the 1984 FES, since irrigation was not a project purpose at that time. Agricultural irrigation was added as a purpose for the Diamond Fork System because supplemental irrigation water could be delivered to the Spanish Fork area without construction of additional conveyance facilities. Annual gross agricultural production would be increased by about $7.1 million and net farm income would ultimately increase by $1.8 million. Crop production (mostly livestock products, fruit, and grazing pasture) would increase significantly.

Impacts on grazing and recreation and tourism would be the same as in the 1984 FES plan.

Transmission facilities would have fewer impacts than in the 1984 FES plan. With the recommended plan, about 4.0 miles of transmission line would be visible from roads, compared to 4.7 in the FES. About 61 acres would be cleared for transmission line rights of way, 9 acres fewer than in the FES. Less than 19 acres would be cleared for switchyards and substation, compared to 27 acres in the FES. Transmission lines would span five streams, one less than in the FES. Impacts from alternative C would be less than from the recommended plan or alternative A.

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[3] Rich in dissolved nutrients such as phosphorous.

CONTENTS

TABLES

TABLES (continued)

MAPS AND FIGURES

CHAPTER I
PURPOSE AND NEED

Purpose of the Supplement to the Environmental Impact Statement

This supplement presents and analyzes changes made in the plan for the Diamond Fork System of the Bonneville Unit of the Central Utah Project. A Final Environmental Impact Statement (FES) for the Diamond Fork Power System, INT FES 84-30, was filed with the Environmental Protection Agency and made available to the public on October 4, 1984 [1]. Since that time, however, conditions have changed so that the recommended plan evaluated in the FES is no longer practical and has been reduced in size. Because of the reduced emphasis on power development, the system has been renamed the Diamond Fork System. This document presents an analysis of impacts expected to result from a recommended plan and two alternatives for the downsized system where the impacts would be different from the FES plan.

This supplement has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190) and current guidelines established by the Department of the Interior and the Bureau of Reclamation (Reclamation). Where applicable, this supplement is intended to meet requirements for a public involvement summary report. This supplement also is intended to serve environmental review requirements in compliance with Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.

The 1984 FES for the system discussed the impacts of discharging dredge and fill material into navigable waters at project construction sites and measures which would be employed to control or limit water pollution from these discharges. This information has been updated to include impacts and measures associated with the recommended plan and alternatives discussed in this supplement. The FES and this supplement are intended to pursue an exemption from obtaining permits to discharge dredge and fill material under Section 404 of Public Law 95-217 through procedures described in Section 404(r) of that law. An updated evaluation, prepared in accordance with Section 404(b)(1) of Public Law 95-217, is presented in attachment 1. Reclamation will submit the supplement to Congress prior to construction funding.

Purpose of the Diamond Fork System

The purpose of the Diamond Fork System is to effect a transbasin diversion of water from the Uinta Basin of the Upper Colorado

River Basin to the Bonneville Basin of the Great Basin. The transbasin diversion would provide water to the Municipal and Industrial (M&I) System of the Bonneville Unit for municipal and industrial uses and for irrigation. Water from the system also would be delivered for supplemental irrigation service in the Spanish Fork area of south Utah County, a change from the 1984 FES. The Diamond Fork System would provide water to the Irrigation and Drainage (I&D) System of the Bonneville Unit. Power for I&D System pumping would also be provided by using the potential of falling water to generate electricity. The potential also would exist for further hydroelectric development to be financed by non-Federal entities.

Interrelationships

Strawberry Valley Project

The Strawberry Valley Project is a forerunner of the Central Utah Project. Principal features of the project related to the Diamond Fork System include Strawberry Reservoir and Tunnel. The reservoir stores flows of the Strawberry River, a tributary of the Duchesne River in the Uinta Basin, and many smaller streams. The tunnel serves as an outlet for the reservoir and conveys water through the Wasatch Mountains to Sixth Water Creek, Diamond Fork, and the Spanish Fork River for delivery to the Bonneville Basin. Strawberry Project water and Spanish Fork River water presently are diverted from the Spanish Fork River to the Strawberry Power Canal and then to the High Line Canal and Mapleton Lateral near the mouth of Spanish Fork Canyon. Approximately 47,880 acres in the system area are served by the project.

Bonneville Unit

As discussed in the 1984 FES, the Bonneville Unit involves a transbasin diversion of water from the Uinta Basin to the Bonneville Basin. The unit includes facilities to collect water from streams of the Duchesne River system in the Uinta Basin, to store and regulate the collected water, and to release it as needed through a tunnel to the Bonneville Basin and deliver it to areas of use. Other collection and storage works in the Uinta Basin would expand usable water supplies in that basin. Project facilities in the Bonneville Basin would provide for storage and distribution of the water imported from the Uinta Basin, for further development of local water resources, and for facilitating water exchanges and water quality control that would allow the most beneficial use.

The Bonneville Unit includes six systems which are completed, under construction, or in the advanced planning stage. These

systems are designed for interrelated operation to provide maximum efficiency. However, the Diamond Fork System would not depend on construction of the I&D System to obtain its projected benefits because a conveyance system in Diamond Fork Canyon would still be needed to convey water for the M&I System. Additional interrelationships between the Diamond Fork System and the I&D System are discussed in chapter II.

The original Bonneville Unit Plan, as presented in the 1973 programmatic Final Environmental Statement for the unit, provided a total of 6,500 acre-feet of water for fishery releases. This would have resulted in an approximate 73 percent reduction in adult trout habitat in the affected Uinta Basin streams.

In February 1980, a formal interagency Instream Flow Agreement was consummated with the goal of providing 44,400 acre-feet of water annually to preserve 50 percent of the historic adult trout habitat in streams impacted by the Starvation and Strawberry Collection Systems [2]. Under terms of the agreement, 37,900 acre-feet of water in addition to the 6,500 acre-feet to be developed by the Bonneville Unit would be cooperatively developed by the Central Utah Water Conservancy District, the State of Utah, the Forest Service, and the Fish and Wildlife Service. The Central Utah Water Conservancy District originally agreed to provide 15,800 acre-feet of the total, while the other cooperating agencies were to study alternative plans to provide the remaining 22,100 acre-feet. Current planning provides for leaving the entire 44,400 acre-feet of fishery water in the Uinta Basin for release to the affected Collection System streams and reducing the project water supply accordingly. This provision has been incorporated into the recommended plan.

The remaining 50 percent compensation of stream fishery habitat losses for Collection System streams was addressed in a final Aquatic Mitigation Plan completed in December 1988 [3]. Full implementation of this plan would provide 34,090 angler days of fisherman use, which is the economic basis for the mitigation, representing 50 percent of the requirement on non-Indian lands. The following items are included in the plan:

1. The Strawberry exchange plan is the highest priority aquatic-mitigation measure. This plan would restore natural flows to several streams in the upper Strawberry River drainage. Resulting fishery enhancement would provide about 10,000 angler days.

2. Acquisition of angler access to affected streams and preservation of habitat are essential before fisherman-use benefits can be realized. Acquisition of access along specific segments of four major Collection System streams is being

implemented by Reclamation as land and funding become available and would provide about 12,500 angler days annually.

3. Development of instream fish habitat would help maintain or enhance habitat at the reduced levels of streamflows under project operation. Potential measures include those that would stabilize streambanks and riparian zones, improve water quality, improve water velocity, decrease stream width, increase fish cover, and improve pool-riffle ratios. Habitat improvement on selected streams based upon detailed plans and designs is currently being implemented through an interagency agreement between Reclamation and the Forest Service. Full implementation of these measures would produce about 9,790 angler days.

4. The trout-egg-taking station on the Strawberry River is operated by the Utah Division of Wildlife Resources as a source of cutthroat trout eggs for the State's hatchery system and would be flooded by the enlarged Strawberry Reservoir. As a mitigation measure, a new facility upstream was completed in 1988. This facility would provide about 5 percent (1,800 angler days) of the stream fishery mitigation needs for the collection system.

Participating Entities

Several agencies were involved in the original planning of the system and have aided in evaluating changes to the system since publication of the FES. Western Area Power Administration (Western) and the Forest Service are cooperating agencies in the preparation of this supplement. The Fish and Wildlife Service, Utah Division of Water Resources, and the Corps of Engineers also participated.

Western identified specific transmission facilities required to connect Diamond Fork System powerplants to the existing Colorado River Storage Project (CRSP) interconnected transmission system. Western will be responsible for switchyard and transmission line construction and for marketing power produced by the system in excess of Bonneville Unit needs.

Coordination with the Forest Service during the plan formulation process ensured that land use requirements have been considered during the formulation of the recommended plan and the two alternatives.

The Fish and Wildlife Service (FWS) and the Utah Division of Wildlife Resources (UDWR) have been involved in plan formulation and selection to ensure protection of fish and wildlife resources within the project area. The FWS also provided significant input regarding the June sucker, a fish listed as an endangered species. The FWS's recommendations for fish and wildlife mitigation are listed in attachment 2.

The Corps of Engineers and the Environmental Protection Agency were both consulted during the preparation of the 404(r) exemption evaluation, and their recommendations were incorporated into the evaluation.

On January 19, 1984, an extensive public review of the Bonneville Unit was initiated by Scott M. Matheson, then Governor of Utah, and the Bureau of Reclamation. The review assessed the most effective way for Utah to use its allotted share of Upper Colorado River water. Findings of the review were published in December 1984 [4]. The State, in its review, strongly endorsed a scaled-down version of the Diamond Fork System.

Location and Setting

As stated in the 1984 FES, the Diamond Fork System would be located mainly in Diamond Fork Canyon in the Bonneville Basin, but a small portion would be in the Uinta Basin (see following figure). The system setting remains the same as described in the FES, except for the addition of the Spanish Fork River, which is discussed below.

The Spanish Fork River and Diamond Fork, a tributary, are the principal streams in the area. The river originates high in the Wasatch Mountains and flows generally northwest to Utah Lake. About 20 miles above its mouth, the river is joined by Diamond Fork. About 10 miles above the confluence with the Spanish Fork River, Diamond Fork is joined from the northeast by Sixth Water Creek. Natural streamflows in the area are highest in the spring and lowest in late fall or winter. The water quality of the streams is generally good, except for periodically high turbidity and sediment levels. The Spanish Fork River is located mainly in a narrow, steep-walled canyon but enters the broad, gently-sloping Utah Valley about 6 miles above its mouth. Diamond Fork and Sixth Water Creek are in narrow, steep-walled canyons, although Diamond Fork Canyon becomes gradually wider at Monks Hollow, about 8 miles above the Spanish Fork River confluence. Presently irrigated lands of the Strawberry Valley Project, which would receive supplemental irrigation service, are located in the Spanish Fork area along the Spanish Fork River between the Wasatch Mountains and Utah Lake.

The climate and vegetation in the area vary considerably. The Diamond Fork Canyon area is generally mild in summer but cold in winter. Temperatures have ranged from -50 to 89 °F (-46 to 32 °C), and precipitation averages about 21 inches annually, mostly in the form of snow. Vegetation is dominated by mountain brush species, and Utah juniper is abundant in the eastern portion of the area. The Spanish Fork area is warm in summer and winters are not severe, although periods of extreme cold do occur. Temperatures have ranged from -19 to 108 °F (-28 to

42 °C). Average annual precipitation is about 18 inches. Snowfall is about 55 inches annually. Vegetation in the Spanish Fork area is dominated by irrigated agriculture. Natural vegetation is mostly mountain brush species along mountain foothills to the east and desert shrub species to the west. A variety of wetland vegetation exists near Utah Lake.

Trout fisheries occur in the upper Spanish Fork River, in Diamond Fork, and in Sixth Water Creek. Representative wildlife in the Diamond Fork Canyon area consist of mule deer, elk, cougar, bobcat, coyote, badger, striped skunk, mink, beaver, ruffed and blue grouse, mourning dove, American robin, black-capped chickadee, the golden eagle, Cooper's hawk, redtailed hawk, porcupine, cottontail rabbit, Uinta ground squirrel, pocket gopher, deer mouse, tiger salamander, western chorus frog, sagebrush lizard, and Great Basin rattlesnake. In the Spanish Fork area, wildlife species are those adapted to habitats found on or adjacent to agricultural lands. Common small mammals include mice, gophers, skunks, and muskrats. A variety of small birds such as the meadow lark, starling, blackbirds, sparrows, and crow are also found. Upland game animals are represented by the ring-necked pheasant, mourning dove, and cottontail rabbit. Various species of snakes, toads, frogs, and lizards are also common to the area. Waterfowl which feed on the agricultural lands include the Canada goose and several species of ducks. Shore and wading birds which inhabit the adjacent wetlands include species such as the black-necked stilt, American avocet, sandpiper, egret, heron, and white-faced ibis.

The population of Utah County in 1980 was 218,106 persons, which was nearly 15 percent of the State's population. From 1950 to 1980, Utah County's population increased by an average of 3.3 percent annually, as compared to 2.5 percent for the State. The economic climate of Utah County paralleled population trends and showed increases in both per capita personal income as well as all employment sectors, except for an annual decrease of less than 1.0 percent for agriculture.

The population of the area affected by the system (35,572 people in the 1980 census) is restricted to the towns of Spanish Fork, Springville, Salem, Payson, Mapleton, Elk Ridge, and Woodland Hills and surrounding areas. Several farms and ranches in the lower Diamond Fork area have temporary residents in the summer but no permanent residents.

Need for Action

Problems and needs of the Diamond Fork area were identified by Reclamation planning teams, aided by public involvement activities such as public meetings, tours of the project area, and newsletters. The only significant concerns and needs which

emerged since publication of the FES are related to electrical energy requirements, as discussed below. Because irrigation of lands in the Spanish Fork area has been included as a project purpose, irrigation needs in that area are also discussed.

Approximately 3 megawatts (MW) of installed generating capacity are needed for pumping irrigation water under the M&I System. An additional 7.5 to 15 MW would be needed for the I&D System. These needs will be federally financed and repaid as a Bonneville Unit cost. An additional 50.5 to 58 MW not required for project pumping potentially could be developed with non-Federal financing.

Reclamation believes that a willingness by non-Federal entities to finance nonproject power will accurately measure the need for additional power as well as its marketability.

The major irrigation need in the Diamond Fork System area is for supplemental service to about 47,880 acres of presently irrigated lands in the Spanish Fork area. Agricultural production is limited by shortages in the late season, which average about 20 percent of the diversion demand. Additional water supplies would help stabilize existing agricultural production.

CHAPTER II
ALTERNATIVES

As stated in chapter I, the recommended plan presented in the 1984 Diamond Fork Power System FES has been reduced in size because of a lack of non-Federal financing, and irrigation of supplemental service lands has been added as a project purpose. The draft supplement to the FES presented three downsized alternatives. Alternative A would have the capability to convey the full transbasin diversion to the Bonneville Basin but would require a costly pumpback facility to fulfill the Instream Flow Agreement of 1980. Alternatives B and C would include a reduced transbasin diversion while fulfilling the Instream Flow Agreement without the aforementioned pumpback system. Alternative B is presented as the recommended plan in this final supplement. This alternative was selected because it is the most environmentally acceptable alternative consistent with project plans for the I&D System.

In the draft supplement, alternatives A, B, and C included Fifth Water Aqueduct for conveying water from Syar Tunnel to Sixth Water Creek. The draft also included two options to the aqueduct: option 1 with a pipeline, vertical shaft, and tunnel located on a slightly different alignment, and option 2 with pipeline, shaft, and tunnel which would enter Sixth Water Creek about 1.5 miles upstream of the Fifth Water Aqueduct. Option 2 was selected for inclusion in the recommended plan instead of the Fifth Water Aqueduct presented in the supplement because of reduced overall environmental impacts, reduced project costs, and the possibility of a shorter construction schedule.

The recommended plan and alternative A assume full development of the Bonneville Unit as presently planned (including the I&D System). Alternative C corresponds with the No Action Alternative for the I&D System. For the recommended plan and alternative A, this supplement identifies impacts which are expected to result from the Diamond Fork System in areas where such impacts would not overlap with I&D System impacts. As in the FES, impacts to Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River are not identified because impacts in these areas would result from both the Diamond Fork System and the I&D System. Impacts in these areas will be identified in the environmental statement for the I&D System. For alternative C, all known impacts are identified, including those in Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River.

The recommended plan includes Syar Tunnel, Sixth Water Aqueduct, and the Diamond Fork Pipeline as major features. Alternatives A and C include Syar Tunnel, Fifth Water Aqueduct, and Diamond Fork Pipeline. The recommended plan and alternative A also would include Last Chance Powerplant and Monks Hollow Dam, and alternative C would include a small dam at Three Forks. Facilities deleted from the alternatives include Syar Powerplant,

Syar Dam, Corona Aqueduct, Sixth Water Powerplant, Sixth Water Dam, Dyne Aqueduct, and Dyne Powerplant.

A 2.5-MW Monks Hollow Powerplant and a 6.0-MW Diamond Fork Powerplant on the Diamond Fork Pipeline are part of the recommended plan and alternative A. These facilities would be built only with non-Federal financing, however, and the schedule for construction is not certain. Alternative C provides for a 10-MW Diamond Fork Powerplant which also would only be built with non-Federal funding. The downsized recommended plan and alternatives would provide from 56.5 to 70 MW of installed generating capacity compared to the 166.2 MW considered in the FES. From 3 to 18 MW of this capacity would be required to meet pumping requirements of the Bonneville Unit, depending on whether or not the I&D System is constructed and the size of the transbasin diversion. The pumping requirements would be provided by a portion of the Last Chance Powerplant. Non-Federal financing would be required for the remaining capacity of the Last Chance Powerplant.

The water supply data presented herein represent simulated studies for the 1930-73 period and reflect 1988 project plans. The water supply will vary with hydrologic conditions and is expected to change as refinements take place in the project plan and operations. In particular, the diversion to the Strawberry Valley Project is under negotiation and will likely average 61,500 acre-feet based on pre-Bonneville Unit analysis.

Recommended Plan

Plan Accomplishments and Concept

The recommended plan was formulated to fulfill the Instream Flow Agreement of 1980 while meeting the requirements of the M&I System and the supplemental service land in the Spanish Fork area. With the recommended plan, 44,400 acre-feet of Bonneville Unit water would be provided for instream fishery flows within the Uinta Basin streams from which the water for the transbasin diversion would be collected. This amount is considerably larger than the 6,500 acre-feet included in the 1984 FES plan.

As in the 1984 FES plan, the Diamond Fork System would receive water from Strawberry Reservoir through the proposed Syar Tunnel (see the following map and elevation profile). From the tunnel outlet, the water would enter the Sixth Water Aqueduct which would include Sixth Water Pipeline, Sixth Water Shaft, and Sixth Water Tunnel. Water from the aqueduct would be discharged into Sixth Water Creek through Last Chance Powerplant (to be located near the site of Sixth Water Powerplant in the 1984 FES) and subsequently enter the proposed Monks Hollow Reservoir. From the reservoir, a portion of the water would enter the proposed Diamond Fork Pipeline and be conveyed to a proposed bifurcation

SPRINGVILLE
MAPLETON
T7S
T8S
T3S
T4S
Strawberry Tunnel
STRAWBERRY RESERVOIR ENLARGEMENT
R3E
R4E
R5E
R6E
R12W
R11W
T4S
T5S
T8S
T9S
T10S
UP&L 345KV Spanish Fork Substation
SPANISH FORK RIVER
DIAMOND FORK PIPELINE
DIAMOND FORK POWERPLANT & SWITCHYARD (requires non-federal financing)
UP&L 46KV
UP&L 345KV
SOLDIER CREEK
Spanish Fork-Huntington
Camp Williams-Emery
Carbon-Hale UP&L 138KV
PROPOSED TANK HOLLOW SUBSTATION
MONKS HOLLOW POWERPLANT & SWITCHYARD (requires non-federal financing)
MONKS HOLLOW RESERVOIR
PROPOSED 13.8 KV TRANSMISSION LINE
LAST CHANCE POWERPLANT & SWITCHYARD
PROPOSED 138 KV TRANSMISSION LINE
SIXTH WATER PIPELINE
SYAR TUNNEL
SIXTH WATER SHAFT
SIXTH WATER TUNNEL
SHEEP CREEK RAYS VALLEY ROAD
Little Diamond Creek
DIAMOND CREEK
Cottonwood Canyon
Sheep Creek
Horse Creek
Squaw Creek
Indian Creek
Chipman Creek
Sixth Water Creek
Fifth Water Creek
Fourth Water Creek
Third Water Creek
Second Water Creek
First Water Creek
UTAH
WASATCH
CO.
CO.
N.
PROJECT AREA
SALT LAKE CITY
PROVO
VERNAL
ST. GEORGE
COLORADO RIVER
LOCATION MAP

EXPLANATION

- Proposed & Existing Tunnels
- Proposed & Existing Transmission Lines
- Proposed Powerplants
- Proposed & Existing Access Roads
- Roads to be Upgraded
- Proposed Reservoirs
- Proposed Pipeline

4000 0 4000 8000 12000
SCALE OF FEET

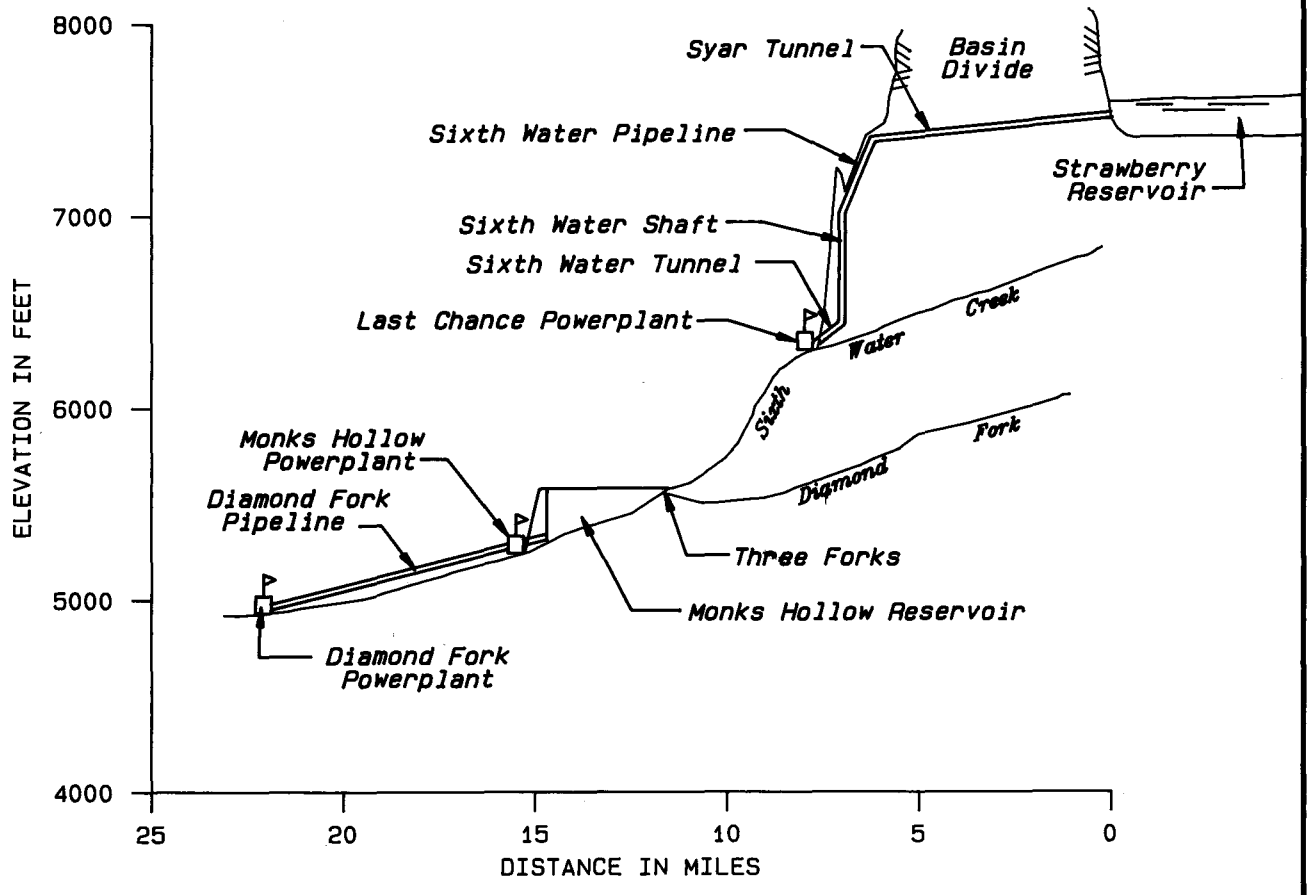
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL UTAH PROJECT
BONNEVILLE UNIT — UTAH

DIAMOND FORK SYSTEM

RECOMMENDED PLAN

66-400-1620

RECOMMENDED PLAN
ELEVATION PROFILE



66-418-7820

near the confluence of Diamond Fork and the Spanish Fork River. The pipeline would provide considerable enhancement of the Diamond Fork fishery. At the bifurcation, part of the water would enter the I&D System and the remainder would enter the Spanish Fork River. Monks Hollow Reservoir releases not conveyed in the Diamond Fork Pipeline would enter the Diamond Fork stream channel below Monks Hollow Dam and subsequently, the Spanish Fork River. The water for irrigation of the Spanish Fork supplemental service lands would be diverted from the river by existing Strawberry Valley Project facilities.

Hydroelectric power could be generated at three proposed flowthrough plants--Last Chance at the terminus of Sixth Water Aqueduct, Monks Hollow at Monks Hollow Dam, and Diamond Fork at the terminus of Diamond Fork Pipeline. A portion of the Last Chance plant would be developed as part of the project, while Monks Hollow, Diamond Fork, and the remainder of Last Chance would be developed only if non-Federal participation becomes available.

Each powerplant constructed would require a switchyard, and a substation would be required in Spanish Fork Canyon near the mouth of Tank Hollow where the powerplants would be connected to the Colorado River Storage Project (CRSP) interconnected transmission system. New transmission lines would be required between the powerplants and the substation.

As part of the system, one new road has been constructed, others would be constructed, and some existing roads would be improved or replaced to facilitate construction and operation. Facilities for operation and maintenance would be located at Last Chance Powerplant. Recreation, fish, and wildlife measures would be similar to the 1984 FES.

If non-Federal financing is obtained, potential average annual energy production would be 219,000 megawatt-hours (MWh).

Project Facilities and Measures

Syar Tunnel.--Syar Tunnel, about 5.7 miles long, will be a pressure-type tunnel, 8.5 feet in diameter, with a capacity of 600 cubic feet per second (cfs). A 50-cfs valve will be installed in the tunnel to divert flows to the existing Strawberry Tunnel to provide the capability of maintaining or enhancing the fishery in Sixth Water Creek. Concrete aggregates in sufficient quantities for lining the tunnel are located in three commercial gravel pits 32 miles from the tunnel near the mouth of Spanish Fork Canyon. Excavated material from the tunnel will be deposited 1,500 feet south of the outlet. About 10 acres will be required to dispose of the 175,000 cubic yards of material. Topsoil will be removed from the disposal area and

subsequently placed over the material excavated from the tunnel. The area will be contoured and reseeded to blend in with the surrounding landscape. Physical data for the tunnel and other system facilities are shown in table 1.

A construction contract for Syar Tunnel was awarded on August 22, 1988. NEPA compliance for the tunnel was accomplished in the 1984 FES.

Sixth Water Aqueduct.--Sixth Water Aqueduct would be located in the vicinity of Rays Valley and Fifth Water Ridge (see the following map). The aqueduct would consist of Sixth Water Pipeline, Sixth Water Shaft, and Sixth Water Tunnel. Physical data for the aqueduct are shown in table 1.

Construction materials for the pipeline, shaft, and tunnel would either come from the Monks Hollow Reservoir area or from the commercial sites in Spanish Fork Canyon listed for Syar Tunnel. Excavated materials for Sixth Water Pipeline and Sixth Water Shaft would be deposited at the Syar Tunnel disposal area. Materials excavated from Sixth Water Tunnel would be disposed of near the tunnel outlet portal along Sixth Water Creek. The materials would be covered with topsoil and reseeded as necessary to prevent erosion.

Last Chance Powerplant.--The Last Chance Powerplant would utilize a head of about 1,225 feet between Strawberry Tunnel and the plant to generate 186,000 MWh of energy annually. If non-Federal financing is not obtained, the powerplant would include a 15,000-horsepower turbine with a 130-cfs discharge capacity and a 10,500-kilowatt (kW) generator. Bypass valves and stilling basins would provide for the full discharge capacity from the Sixth Water Aqueduct. If non-Federal financing is obtained, the powerplant capacity could be increased to a total of 48 MW. Last Chance Powerplant would be remotely controlled from the CRSP Operations Center at Page, Arizona, or from another location designated by non-Federal participants.

Monks Hollow Dam and Reservoir.--Monks Hollow Dam would be a double curvature-arch concrete structure, 258 feet high, with a crest length of 925 feet and a crest width of 13 feet. Two separate outlet works would be provided for the dam. One would discharge water through a pressure control structure or Monks Hollow Powerplant (if built with non-Federal funds) and then into the Diamond Fork Pipeline. This outlet would have a capacity of 510 cfs. The other would discharge directly into the Diamond Fork stream channel and would have a capacity of 370 cfs. An overflow spillway located on the left abutment would be designed to pass the probable maximum flood, which would have a

Table 1.--Summary data for powerplant and conveyance works, recommended plan.

Facility	Length (miles)	Diameter (feet)	Capacity (cfs)	Capacity (MW)
Syar Tunnel	5.7	8.5	600	
Sixth Water Aqueduct				
Sixth Water Pipeline	.8	8.0	600	
Sixth Water Shaft	[1]575	8.5	600	
Sixth Water Tunnel	.6	8.5	600	
Last Chance Powerplant				[2]48
Monks Hollow Powerplant				[3]2.5
Diamond Fork Pipeline	7.2	8.0	510	
Diamond Fork Powerplant				[3]6.0

[1] Depth of shaft (feet).
[2] 10.5 MW of Federal power for project pumping and 37.5 MW to be financed by non-Federal entities.
[3] To be financed by non-Federal entities.

peak inflow of 78,100 cfs and a volume of 32,500 acre-feet. Concrete aggregate for the dam would most likely be obtained from the reservoir basin. However, the three commercial gravel pits located near the mouth of Spanish Fork Canyon would provide the materials for Syar Tunnel and have been approved as sources for concrete aggregate. Aggregate from these pits could also be used for the dam. All new borrow sites would be developed in cooperation with the Forest Service.

Monks Hollow Reservoir would have a total capacity of 33,100 acre-feet. The reservoir would not fluctuate greatly on a daily basis but would fluctuate a maximum of about 110 feet on a seasonal basis. Physical data for the dam and reservoir are summarized in table 2.

Table 2.--Summary data for Monks Hollow Dam and Reservoir, recommended plan.

Dam	
Height (feet)	258
Material volume (cubic yards)	150,000
Reservoir capacity (acre-feet)	
Active capacity	26,700
Inactive and dead	6,400
Total	33,100
Flood surcharge capacity	8,050
Surface area at normal water surface elevation 5,555 feet (acres)	352
Surface area at minimum water surface elevation 5,445 feet (acres)	142

Monks Hollow Powerplant.--The 2.5-MW Monks Hollow Powerplant, if constructed with non-Federal financing, would be located at the base of Monks Hollow Dam and would generate 12,140 MWh of energy annually using the water released from Monks Hollow Reservoir to meet downstream irrigation and municipal and industrial needs in the Bonneville Basin. The plant would include a 3,500-horsepower turbine and a 2,500-kW generator. The unit would have a design head of 150 feet and a discharge capacity of 230 cfs. The plant would be remotely controlled from the CRSP Operations Center at Page, Arizona, or from another remotely located control center, as may be determined by non-Federal participants. A steel penstock would deliver water to the powerplant through the base of the dam. As previously discussed, the penstock would be part of the Diamond Fork Pipeline outlet works constructed for the dam. The penstock would have a diameter of approximately 5.5 feet, a capacity of 510 cfs, and a length of about 320 feet. All flows would pass through either a pressure control structure or the powerplant turbine. Peak summer releases in excess of 230 cfs would bypass the powerplant turbine. After passing through the Monks Hollow Powerplant or the pressure control structure, water would discharge directly into the Diamond Fork Pipeline. If Monks Hollow Powerplant were not built, only the pressure control structure would be required at the powerplant site. The structure would contain valves, a surge tank, and an overflow to regulate the pressure in the Diamond Fork Pipeline.

Diamond Fork Pipeline and Powerplant.--The Diamond Fork Pipeline would convey water to the mouth of Diamond Fork outside of the stream channel, thus reducing erosion and providing considerable enhancement to the fishery in Diamond Fork. The pipeline would also convey water under pressure to the aqueduct system of the I&D System and could also serve as the penstock for the potential Diamond Fork Powerplant. The buried pipeline would have a diameter of 8.0 feet and a capacity of 510 cfs. This capacity is higher than the 450 cfs indicated in the 1984 FES because of changes in the configuration of the I&D System (purchasing Utah Lake water, deleting industrial water, and other plan revisions). The pipeline would have a length of 7.2 miles.

A bifurcation to be located at the confluence of Diamond Fork and the Spanish Fork River would divert excess pipeline flows to the river just above the confluence and the remainder to the I&D System. Water would be discharged into the Spanish Fork River through Diamond Fork Powerplant or a bypass valve. Construction materials for the pipeline could be obtained from existing operations at the mouth of Spanish Fork Canyon, about 6 miles from the downstream end of the pipeline. Other sources are located 10 miles up Spanish Fork Canyon at the mouth of Sheep Creek Canyon. Commercial gravel pits would be the same as those listed for Syar Tunnel. Disposal sites for waste material would

be selected along the alignment in cooperation with landowners and the Forest Service.

The 6.0-MW Diamond Fork Powerplant, if constructed by non-Federal interests, would generate an average of about 20,960 MWh of energy annually. The plant would use the head of 300 feet between its location and Monks Hollow Powerplant. The Diamond Fork Powerplant would include an 8,200-horsepower turbine, with a 300-foot design head and 290-cfs discharge capacity, and a 6,000-kW generator. The plant would be remotely controlled.

Switchyards, Substations, and Transmission Lines.--Switchyards, substations, and transmission lines for the Diamond Fork System would be constructed and operated by Western Area Power Administration (Western) with one exception: Reclamation may build the transmission line from Last Chance Powerplant to Monks Hollow Powerplant. The Last Chance Switchyard would include a 13.8/138-kilovolt (kV), three-phase transformer, a 138-kV line bay, and a 13.8-kV bus tie bay. The size of the switchyard would be approximately 100 feet by 200 feet.

Monks Hollow Switchyard would contain a 6.6/13.8-kV, three-phase transformer and a 13.8-kV bus tie bay. The Diamond Fork Switchyard would be the same as described in the 1984 FES. These switchyards would be built only if non-Federal funding were provided for the Monks Hollow and Diamond Fork Powerplants.

An overhead alternating current transmission system would be required. A 6.1-mile, 13.8-kV line would be required to connect Monks Hollow Switchyard to Last Chance Switchyard. A 10-mile, 138-kV line would connect Last Chance Switchyard to the CRSP interconnected transmission system at the proposed Tank Hollow Substation. The line for the Diamond Fork Powerplant would be the same as in the 1984 FES.

The 138-kV line would probably be supported on wood-pole structures although steel-pole structures could be used. This line would be federally financed. The 46-kV and 13.8-kV lines would be as discussed in the FES except that they would be built only if non-Federal financing were provided for the associated powerplants.

Based on an existing contractual agreement with Utah Power & Light Company (UP&L) for wheeling Diamond Fork power, the Tank Hollow Substation would tie into UP&L's two existing 138-kV lines (Carbon to Hale). This tie would result in a substation approximately 135 feet by 225 feet in size.

A temporary construction powerline might be built from Spanish Fork Canyon to Syar Tunnel outlet portal, as described in the FES. The contractor would have the option of constructing this

line or providing onsite generating equipment. At the contractor's option, a temporary line could also be built from the mouth of Diamond Fork to Monks Hollow Dam. This 8-mile line would also be removed and the landscape restored upon completion of construction.

Roads.--About 18.6 miles of new roads would be constructed and about 11.5 miles of existing roads would be improved to facilitate construction and operation of the Diamond Fork System. About 0.6 mile of the new roads would be located on private land and the remaining 18.0 miles would be on Forest Service land.

The newly constructed, 15-mile-long Sheep Creek-Rays Valley Road provides access to Rays Valley from U.S. Highway 6 at the mouth of Sheep Creek in Spanish Fork Canyon. A new road, 0.9 mile long, would be constructed beginning at the end of the Sheep Creek-Rays Valley Road to provide access to the Syar Tunnel portal. About 2.0 miles of Rays Valley Road, from the end of the new Sheep Creek-Rays Valley Road to the turnoff to the Last Chance Powerplant site, would be improved as would the road from the turnoff to the powerplant, also 2.0 miles. Additionally, about 0.4 mile of new road would be constructed from Rays Valley road to the Sixth Water Shaft.

About 7.5 miles of the existing Diamond Fork Road would be improved, as discussed in the FES.

The access road to Monks Hollow Dam and the proposed day-use area at Monks Hollow Reservoir would be 2.3 miles long, 1 mile shorter than in the 1984 FES.

The new access roads would be 20-foot-wide, mostly asphalt-surfaced roads built to Reclamation standards.

Operating Facilities and Project Administration.--Operating facilities and project administration would be the same as presented in the FES, with two exceptions. The Central Utah Water Conservancy District (CUWCD) with Reclamation oversight would operate the project water conveyance facilities and Monks Hollow Reservoir and would be responsible for snow removal. Power facilities could be operated by Federal or non-Federal entities. The Last Chance Powerplant would serve as the central control facility for operation and maintenance of project facilities rather than Sixth Water Powerplant. The powerplant would be remotely controlled from the CRSP Operations Center at Page, Arizona, or from another location designated by non-Federal participants. A communications system would be provided between the powerplant and the control center. In addition, facilities for a small number of operation and maintenance personnel would be provided at the plant.

Recreation Facilities.--Recreation facilities for the system were planned by the Forest Service in cooperation with Reclamation and are the same as presented in the FES with one exception. Picnic facilities at the Monks Hollow Recreation Area would consist of 20 tables with shelters and 2 group shelters, rather than the 25 tables presented in the FES.

Fishery Measures.--Fishery mitigation measures for the system are the same as discussed in the FES with these exceptions: (1) the Diamond Fork Pipeline has been increased in capacity from 450 to 510 cfs. The larger pipeline would carry more water to prevent peak flows in the Diamond Fork stream channel from exceeding historical levels, (2) Sixth Water Dam is no longer part of the plan and, thus, there would be no need for a minimum flow below that structure, and (3) fisherman access would need to be assured for only 2 miles of lower Diamond Fork rather than the 5 miles described in the FES because 3 miles of the stream have been incorporated into the Uinta National Forest. These measures would mitigate losses caused by construction of the system and would also provide considerable enhancement to the Diamond Fork fishery over existing conditions.

Wildlife Measures.--Wildlife mitigation measures for the recommended plan were cooperatively revised through the interagency team process as described in the 1984 FES. The team developed two mitigation options utilizing the same methodology and priorities described in the 1984 FES. The options examined by the team include an offsite and an onsite mitigation option.

Wildlife mitigation measures common to both options are as follows:

1. Minimize disturbance to vegetation and landscape by confining construction activities to specific areas actually needed for project purposes.

2. Rehabilitate temporarily disturbed landscapes to the best possible condition to restore maximum wildlife habitat values.

3. Protect important wildlife use areas, particularly for bobcat, golden eagle, and mule deer, from unnecessary disturbances. Specific measures include:

    a. Reducing stress on nesting golden eagles during the breeding cycle by avoiding heavy construction activities within 0.6 mile of any active nesting site. Areas of intensive human use such as

construction camps, processing facilities, and equipment yards would be located a minimum of 1 mile from any active nesting site.

b. Designing power transmission lines and towers to prevent electrocution of eagles and placing the lines and towers in such locations to minimize exposure of perched eagles and other raptors to indiscriminate shooting by undisciplined individuals.

c. Protecting rocky cliff areas immediately north of Monks Hollow, which are important in providing preferred denning and hunting habitat for bobcat, from unnecessary habitat destruction or alteration.

d. Restricting public access (especially snowmobiles) during the winter period (from December through mid-April) to project roads on severe winter range for mule deer. This would be done in accordance with the current Uinta National Forest travel plan.

e. Controlling excessive construction activities and noise in deer wintering areas whenever possible.

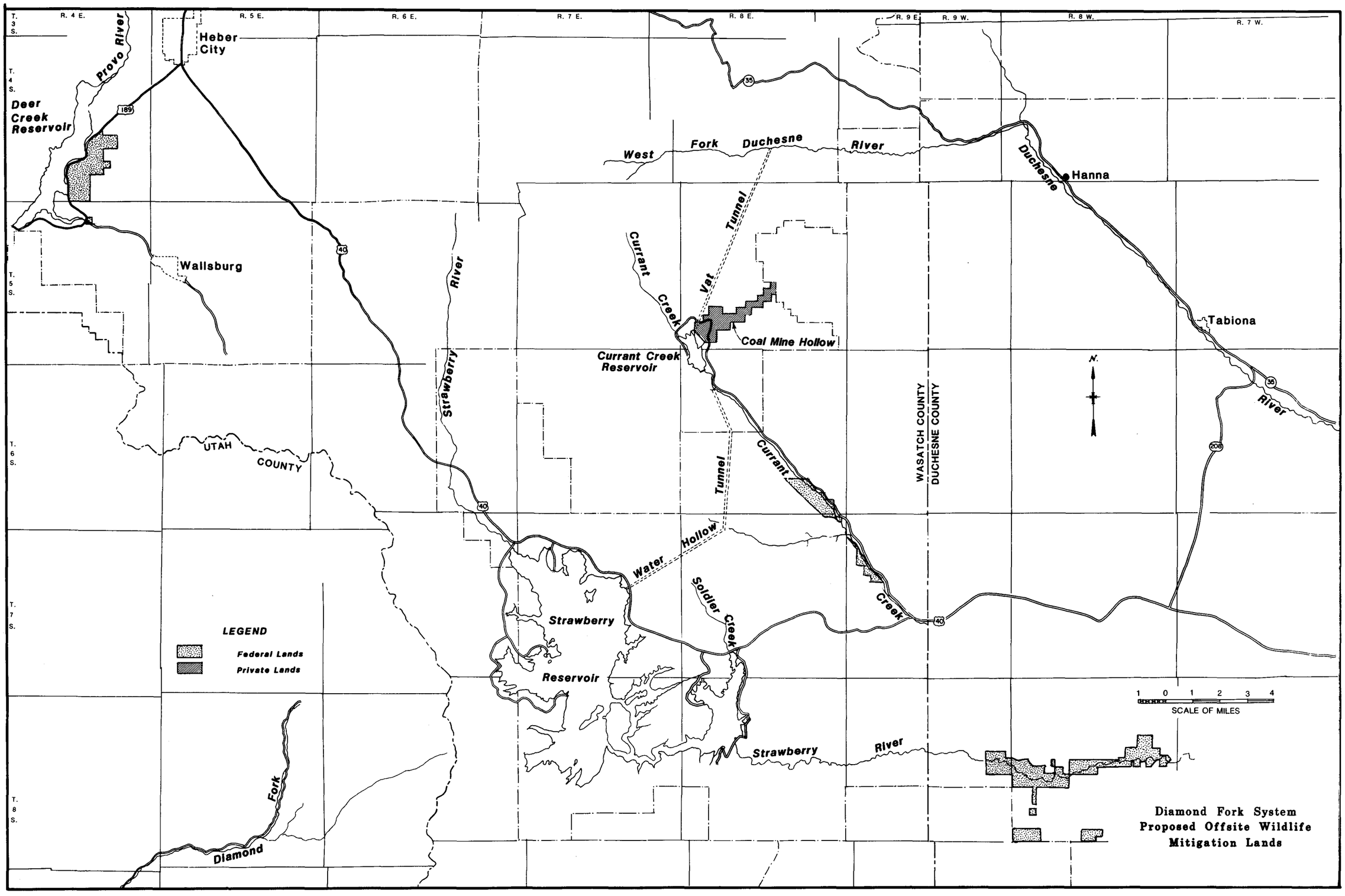
f. Avoiding construction impacts in riparian zones to the extent possible and reestablishing riparian habitat where construction activities occurred.

g. Scheduling major operation and maintenance activities to avoid golden eagle breeding and nesting periods and big game winter use.

4. Use helicopter construction methods to construct power transmission facilities in locations not accessible by existing roads and trails. This would include spanning canyons with transmission lines whenever possible to avoid impacts to vulnerable riparian habitats.

Offsite Option.--This is Reclamation's preferred option. It differs from both the mitigation program described in the 1984 FES and the onsite option in that it provides compensation measures primarily in areas remote from the project activity. The offsite option considers the acquisition, protection, and management of up to 572 acres of additional private lands as well as habitat improvements and/or management of up to 5,428 acres of Federal lands administered by Reclamation and the Forest Service. Of the 6,000 acres under consideration, about 4,100 acres would be required to fully mitigate project impacts resulting from the recommended plan. All of the lands are located in Utah, Wasatch, and Duchesne Counties (see the following map). This plan has

5428
+572
6000 ac.


R. 4 E.
R. 5 E.
R. 6 E.
R. 7 E.
R. 8 E.
R. 9 E.
R. 9 W.
R. 8 W.
R. 7 W.
T. 3 S.
T. 4 S.
T. 5 S.
T. 6 S.
T. 7 S.
T. 8 S.
Provo River
Heber City
Deer Creek Reservoir
189
Wallsburg
40
UTAH COUNTY
Strawberry River
West Fork Duchesne River
35
Duchesne
Hanna
Tabiona
Currant Creek
Vat Tunnel
Coal Mine Hollow
Currant Creek Reservoir
Tunnel
Currant Creek
WASATCH COUNTY
DUCHESNE COUNTY
N.
208
Water Hollow
Soldier Creek
Strawberry Reservoir
Strawberry River
Fork
Diamond
LEGEND
Federal Lands
Private Lands
1 0 1 2 3 4
SCALE OF MILES
Diamond Fork System
Proposed Offsite Wildlife
Mitigation Lands

been agreed to by the Fish and Wildlife Service, the Forest Service, and the Utah Division of Wildlife Resources as part of a negotiated mitigation plan for the Strawberry Collection System, Municipal and Industrial System, and Diamond Fork System [3].

Most of the lands involved became available as excess Federal lands already under consideration or purchased for angler access and wetland mitigation for other Bonneville Unit Systems. The offsite lands exhibit similar vegetative types, habitats, and wildlife populations as the onsite lands, and all of these factors were taken into account. The value of the lands as mule deer habitat was used as the means to compare their mitigative value with the onsite mitigation lands.

About 80 percent of the lands involved in the offsite option are important mule deer winter ranges. The other 20 percent are spring, summer, and fall ranges. Table 3 lists each land parcel under consideration, its location, ownership, actual acreage, and acreage of mitigation equivalents (as compared to the onsite option). The requirement of 4,100 acres for the offsite plan would provide about 2,720 acres of equivalent onsite mitigation compared to about 2,640 acres for the onsite plan.

Table 3.--Offsite wildlife mitigation option.

Land parcel	Location (county)	Current ownership	Proposed management agency[1]	Actual acreage	Mitigation equivalent acreage[2]
Coal Mine Hollow	Wasatch	Private	FS	572	242
Currant Creek[3]	Wasatch	UDWR		595	252
Strawberry River[3]	Duchesne	Federal	UDWR	2,595	1,832
Deer Creek[4]	Wasatch	Federal	UDWR	1,030	509
Diamond Fork (Parcel D)[3]	Utah	Federal	FS	591	533
Diamond Fork (Parcel R)	Utah	Federal	FS	617	610
Total				6,000	3,978

[1] FS = Forest Service, UDWR = Utah Division of Wildlife Resources.

[2] The mitigation equivalent is the number of acres of the onsite plan that is equivalent in wildlife mitigative value to each land parcel in the offsite plan.

[3] Lands previously acquired from private owners.

[4] Provo River Project lands.

Reclamation would prepare and obtain approvals on a general mitigation plan. Transfer of lands to managing agencies would be subject to the general plan. Detailed management and habitat

improvement plans for each land parcel would be cooperatively formulated by Reclamation, the Fish and Wildlife Service, the Forest Service, and the Utah Division of Wildlife Resources. The Forest Service would manage all wildlife mitigation lands within the national forest boundary. The Utah Division of Wildlife Resources would manage all other lands. Management practices would be the same as presented in the FES, with the addition of noxious weed control.

Onsite Option.--The onsite option for wildlife is essentially the same as the mitigation program described in the 1984 FES for the Sixth Water Flow Through Plan except that about 2,640 acres would be required, about 1,360 acres fewer than in the FES. The reduced requirement is a result of fewer impacts on terrestrial wildlife and their habitats with the recommended plan. The onsite option would include the same land parcels as designated in the FES. Parcel D is common to both mitigation options and has already been acquired as partial mitigation for impacts of the Sheep Creek-Rays Valley Road. Habitat improvement and management plans would be the same as described in the FES. All mitigation lands acquired under this option would be within the boundaries of the Uinta National Forest and would be managed by the Forest Service. The onsite mitigation option is used as a basis for determining the net impacts on terrestrial wildlife for all alternatives since each has similar habitat types and wildlife populations.

Evaluation of Wildlife Mitigation Options.--Either the offsite or the onsite mitigation option would compensate fully for losses of all indicator species (mule deer, golden eagle, bobcat, Cooper's hawk, and beaver) as well as other affected wildlife species and their habitats resulting from construction and operation of the recommended plan. The mitigative values of either plan would be similar, as agreed to by the cooperating agencies. The onsite option would require fewer total acres than the offsite option because losses would be mitigated in place with more intensive habitat improvements. The offsite option would mostly involve habitat protection and management with little attempt at direct improvement. This is because the onsite lands have the best potential for improvement through range rehabilitation, whereas the offsite lands have only limited potential because of rough topography and little opportunity for direct vegetative manipulations.

Reclamation prefers the offsite mitigation option because about 90 percent of the lands under consideration are already in Federal ownership (and most of these are under Reclamation jurisdiction) and can easily be transferred to the appropriate management agency with the least impact to the taxpayer and private landowner. Purchase of additional private land under the

onsite option would unnecessarily convert about 500 acres (or more) of private land to Federal ownership. Another reason for Reclamation's preference is the fact that the offsite lands are part of the negotiated mitigation package which also includes fish and wildlife mitigation measures for other systems of the Bonneville Unit. These lands are in large blocks adjacent to other public lands already managed for wildlife purposes. Management of all these lands together would allow for more efficient wildlife conservation and enhancement practices.

Project Operation

Approximately 183,400 acre-feet of water annually would be available in Strawberry Reservoir for Bonneville Unit and Strawberry Valley Project use. After allowing for evaporation losses of 27,300 acre-feet and a decrease in storage of about 7,550 acre-feet, 163,400 acre-feet[1] would be diverted to the Bonneville Basin through Syar Tunnel and 250 acre-feet would be available in Strawberry Reservoir for municipal uses. The average annual diversion to the Bonneville Basin would consist of 101,900 acre-feet of project water developed in the Uinta Basin and 61,500 acre-feet[2] of Strawberry Project water.

In addition to the water released through Syar Tunnel, 2,800 acre-feet of Diamond Fork flows tributary to Spanish Fork River would be utilized for project purposes through the Spanish Fork River exchange. The exchange water, normally tributary to Utah Lake, would be replaced from project water in Utah Lake. After small evaporation losses (800 acre-feet) from Monks Hollow Reservoir, the 163,400 acre-feet from Syar Tunnel and the 2,800 acre-feet from the Spanish Fork River exchange would be released from the reservoir to the Diamond Fork Pipeline (135,600 acre-feet) and to the Diamond Fork stream channel (29,800 acre-feet) and, subsequently, to the Spanish Fork River. The release to the Diamond Fork channel would range from a maximum of 61,300 acre-feet to a minimum of 10,000 acre-feet. The pipeline flow would be divided at the mouth of Diamond Fork Canyon with 58,400 acre-feet entering the I&D System and 77,200 acre-feet discharging to the Spanish Fork River. The discharge to the Spanish Fork River would range from a maximum of 125,100 acre-feet to a minimum of 20,000 acre-feet. An annual average of 107,000 acre-feet of project water would enter the river from Diamond Fork. An average of 13,200 acre-feet of the project water discharged into the river would be diverted for

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[1] Because of the refinements in irrigation demands, releases from Strawberry Reservoir for the period of study are slightly different than in the FES.

[2] This amount is currently being negotiated with the Strawberry Water Users Association.

irrigation for the 47,880 acres of presently irrigated lands in the Spanish Fork area. The remaining project water released to Spanish Fork River would enter Utah Lake for use by the M&I and I&D Systems. In addition to the 13,200 acre-feet released from Strawberry Reservoir, 3,000 acre-feet would be integrated into the Spanish Fork supplemental supply from existing ground water development. Approximately 1,600 acre-feet of return flow would be reused in the Beer Creek area, and 1,000 acre-feet of ground water would be purchased. The total project supply to the Spanish Fork area would be 18,800 acre-feet. The annual releases from Strawberry Reservoir through the Syar Tunnel and Diamond Fork System would vary from about 284,200 acre-feet to about 67,500 acre-feet, with an average of 163,400 acre-feet (based on 1930-73 records). Operation of the system would vary primarily as the releases vary from season to season and year to year.

Other Planning Considerations

Actions Required to Implement the Plan.--Several water quality permits must be obtained prior to construction of the Diamond Fork System. The Clean Water Act of 1977 (Public Law 95-217) requires that section 402 permits be obtained from Utah Department of Health through authority granted by the Environmental Protection Agency for the discharge of any wastewater or process water. These permits must be obtained for several features of the system. In accordance with section 404 of Public Law 95-217, either (1) permits must be obtained from the Corps of Engineers to discharge dredge-and-fill material below the normal high water level of streams and other water bodies or (2) exemption must be obtained under section 404(r). As stated in chapter I, Reclamation intends to obtain the exemption by pursuing the course of action provided by section 404(r) (see attachment 1).

Consultation with the Fish and Wildlife Service under Section 7 of the Endangered Species Act was carried out previously in conjunction with the 1984 FES for the system. At that time, Reclamation and the FWS both concurred that the system would have no effect on threatened or endangered species. The downsized system would reduce overall impacts on fish and wildlife and their habitats from those described in the FES; therefore, Reclamation has concluded and the Fish and Wildlife Service has agreed that the determination of no effect on endangered species is still valid and no further consultation is necessary. Consultation under the Fish and Wildlife Coordination Act for fish and wildlife mitigation measures under the downsized system is underway, and a draft report containing recommendations has been submitted to Reclamation. The recommendations and Reclamation's responses are shown in attachment 2.

Relocations.--About 742 acres under multiple ownership remain to be acquired. Approximately 3,781 acres have already been acquired and will be managed for wildlife mitigation. Some of these areas would also be improved. An additional 1,647 acres of Federal land would be improved and managed for wildlife mitigation. Two or three seasonal single-family dwellings and other improvements are located on the land proposed for acquisition. These dwellings are not occupied during the winter, nor are they the primary residence of the owners or summer occupants; therefore, no individuals or families would be relocated. The other improvements include barns and outbuildings. Some improvements may need to be purchased and removed by a clearing contractor or sold back to the original owners for salvage.

All relocation assistance would be accomplished under provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), as amended by the Uniform Relocation Act Amendments of 1987. The primary assistance provided by Reclamation would be payments for the removal of any personal property from the acquired land.

Acquisition of Land for Project Features.--About 8,655 acres of land would be required for project features, wildlife mitigation, and material source areas. The amounts of land by present ownership or administration and proposed project use are shown in table 4.

The acquisition of private lands required for wildlife mitigation would be pursued through fee title from willing sellers.

National forest lands would be administered by the Forest Service. All other lands would be administered by the Utah Division of Wildlife Resources. All wildlife lands would be managed under authority of an approved management plan and a cooperative agreement with Reclamation. Management agencies would be the Utah Division of Wildlife Resources and/or the Forest Service (see table 3).

Construction Activities and Schedule.--The major facilities of the Diamond Fork System, including the transmission lines, would be constructed over a period of about 7 years. During its peak year, the project would provide direct employment for about 952 private and government employees, based on a 7-month construction period during each year of construction.

Alternative A

Alternative A is similar to the recommended plan but the transbasin diversion would be increased. This alternative

Table 4.--Lands for project features, (unit-acres)

Project feature/type of acquisition	Ownership or administration Private	Federal	Total
Syar Tunnel			
Reclamation withdrawal		53	
Sixth Water Pipeline			
Reclamation withdrawal		19	
Sixth Water Tunnel			
Reclamation withdrawal		4	
Last Chance Powerplant and Switchyard			
Reclamation withdrawal		10	
Monks Hollow Dam, Reservoir, Powerplant and Switchyard			
Reclamation withdrawal		1,500	1,500
Diamond Fork Pipeline			
Reclamation withdrawal		119	
Fee title	125		
Diamond Fork Powerplant and Switchyard			
Fee title	10		
Transmission lines			
Forest Service land use authorization		175	
Tank Hollow Substation			
Fee title	10		
Access roads			
Forest Service land use authorization		310	310
Fee title	10		10
Wildlife mitigation and improvement			
Fee title	572	[1] 5,428	6,000
Developed recreation sites		25	25
Material source areas		270	270
Fee title	15		15
Total	742	7,913	8,655

[1] Includes 617 acres of land acquired by the Forest Service by exchange, 1,030 acres of Provo River Project lands, and 3,781 acres of lands acquired for Bonneville Unit mitigation measures. Wildlife habitat improvements would be made on these lands.

assumes full development of the Bonneville Unit and would provide water and power for the M&I and I&D Systems. Supplemental water would also be delivered to the Spanish Fork area. With alternative A and the 1984 FES plan, 6,500 acre-feet of divertable water would be bypassed to the Uinta Basin tributaries for fishery purposes, 37,900 acre-feet less than with the recommended plan.

Project features and measures for alternative A would be similar to the recommended plan except Fifth Water Aqueduct would replace Sixth Water Aqueduct (see map and elevation profile following this page). The Fifth Water Aqueduct would consist of Rays Valley Pipeline, Fifth Water Tunnel, and Fifth Water Pipeline and Penstock, all of which would be located in the vicinity of Rays Valley and Fifth Water Ridge. Physical data for the aqueduct are shown in table 5.

Table 5.--Summary data for powerplant and conveyance works, alternative A.

Facility	Length (miles)	Diameter (feet)	Capacity (cfs)	Capacity (MW)
Syar Tunnel	5.7	8.5	600	
Fifth Water Aqueduct				
Rays Valley Pipeline	.9	7.0	600	
Fifth Water Tunnel	1.1	8.5	600	
Fifth Water Pipeline	.5	7.0	600	
Fifth Water Penstock	.5	6.0	600	
Last Chance Powerplant				[1]60
Monks Hollow Powerplant				[2]2.5
Diamond Fork Pipeline	7.2	8.0	510	
Diamond Fork Powerplant				[2]6.0

[1] 18 MW of Federal power for project pumping and 42 MW to be financed by non-Federal entities.

[2] To be financed by non-Federal entities.

About 23.4 miles of new roads would be constructed and about 7.5 miles of existing roads would be improved with alternative A. The roads would be the same as in the recommended plan with the following exceptions. A new 1.5-mile road would provide access to the outlet portal of Fifth Water Tunnel. The road would extend along Fifth Water drainage approximately 1 mile and then turn north about 0.5 mile to the outlet portal. A new 3.7-mile road would provide access to Last Chance Powerplant down Fifth Water Ridge. The road from the end of the Sheep Creek-Rays Valley Road to provide access to the Syar Tunnel portal would not be constructed. The Rays Valley Road from the end of the Sheep Creek-Rays Valley Road to the turnoff to the Last Chance Powerplant site would not be improved, nor would improvements be made to the road from the turnoff to the powerplant site or the road from Rays Valley Road to the Sixth Water Shaft.

Fishery and recreation measures would be the same as for the recommended plan. Wildlife measures would be the same as described for the recommended plan but with a higher acreage requirement. For the preferred offsite option, about 4,945 acres of mitigation would be required compared to about 3,230 acres for the onsite plan, increases of 845 acres and 590 acres, respectively, from the recommended plan.

Approximately 221,300 acre-feet of water annually (37,900 acre-feet more than with the recommended plan) would be available in Strawberry Reservoir for Bonneville Unit and Strawberry Valley Project use. After allowing for evaporation losses of 27,600 acre-feet and a decrease in storage of about 5,750 acre-feet, 199,200 acre-feet would be diverted to the Bonneville Basin through Syar Tunnel and 250 acre-feet would be available in Strawberry Reservoir for municipal uses. The average annual diversion to the Bonneville Basin would consist of 137,700 acre-feet of project water developed in the Uinta Basin and 61,500 acre-feet of Strawberry Project water. In addition to the water released through Syar Tunnel, 2,800 acre-feet of Diamond Fork flows tributary to Spanish Fork River would be utilized for project purposes through the Spanish Fork River exchange. The exchange water, which is normally tributary to Utah Lake, would be replaced from project water in Utah Lake.

After small evaporation losses (800 acre-feet) from Monks Hollow Reservoir, the 199,200 acre-feet from Syar Tunnel and the 2,800 acre-feet from the Spanish Fork River exchange would be released from the reservoir to the Diamond Fork Pipeline (165,500 acre-feet) and to the Diamond Fork stream channel (35,700 acre-feet) and, subsequently, to the Spanish Fork River. The release to the Diamond Fork channel would range from a maximum of 74,100 acre-feet to a minimum of 10,000 acre-feet. The pipeline flow would be divided at the mouth of Diamond Fork Canyon with 77,900 acre-feet entering the I&D System and 87,600 acre-feet discharging to the Spanish Fork River. The discharge to the Spanish Fork River would range from a maximum of 140,200 acre-feet to a minimum of 26,100 acre-feet. An annual average of 123,300 acre-feet of project water would enter the river from Diamond Fork. An average of 13,200 acre-feet of the project water discharged into the river would be diverted for supplemental irrigation for the 47,880 acres of presently irrigated lands in the Spanish Fork area. The remaining project water released to Spanish Fork River would enter Utah Lake for use by the M&I and I&D Systems. In addition to the 13,200 acre-feet released from Strawberry Reservoir, 3,000 acre-feet would be integrated into the Spanish Fork supplemental supply from existing ground-water development. Approximately 1,600 acre-feet of return flow would be reused in the Beer Creek area, and 1,000 acre-feet of ground water would be purchased. The total project supply to the Spanish Fork area would be 18,800 acre-feet. The annual releases from Strawberry Reservoir through the Syar Tunnel and Diamond Fork System would vary from about 316,100 acre-feet to about 89,600 acre-feet, with an average of 199,200 acre-feet (based on 1930-73 records). Operation of the system would vary primarily as the releases vary from season to season and year to year.

Potential generating capacity available for development through non-Federal financing would be 68.5 MW. However, average annual energy production would be increased by 27 percent to 278,600 MWh.

SPRINGVILLE

MAPLETON

T7S
T8S

R3E
R4E

R4E
R5E

R5E
R6E

T3S
T4S

Strawberry Tunnel

STRAWBERRY RESERVOIR ENLARGEMENT

SYAR TUNNEL

UP&L 345KV Spanish Fork Substation

LAST CHANCE POWERPLANT & SWITCHYARD

FIFTH WATER PIPELINE & PENSTOCK

RAYS VALLEY PIPELINE

FIFTH WATER TUNNEL

MONKS HOLLOW POWERPLANT & SWITCHYARD
(requires non-federal financing)

PROPOSED 13.8 KV TRANSMISSION LINE

MONKS HOLLOW RESERVOIR

DIAMOND FORK PIPELINE

DIAMOND FORK POWERPLANT & SWITCHYARD
(requires non-federal financing)

UP&L 46KV

UP&L 345 KV

Spanish Fork-Huntington

Camp Williams-Emery

PROPOSED 138 KV TRANSMISSION LINE

SHEEP CREEK RAYS VALLEY ROAD

Carbon-Hale UP&L 138KV

PROPOSED TANK HOLLOW SUBSTATION

SPANISH FORK RIVER

DIAMOND CREEK

SOLDIER CREEK

Little Diamond Creek

Cottonwood Canyon

Sheep Creek

Horse Creek

Squaw Creek

Indian Creek

Chipman Creek

Water Creek

Fifth Water Creek

Fourth Water Creek

Third Water Creek

Second Water Creek

First Water Creek

UTAH CO. WASATCH CO.

T4S
T5S

T8S
T9S

T9S
T10S

R12W
R11W

PROJECT AREA

LOCATION MAP

SALT LAKE CITY
VERNAL
PROVO
ST. GEORGE
COLORADO RIVER
GREEN RIVER

EXPLANATION

- Proposed & Existing Tunnels
- Proposed & Existing Transmission Lines
- Proposed Powerplants
- Proposed & Existing Access Roads
- Roads to be Upgraded
- Proposed Reservoirs
- Proposed Pipeline

4000 0 4000 8000 12000
SCALE OF FEET

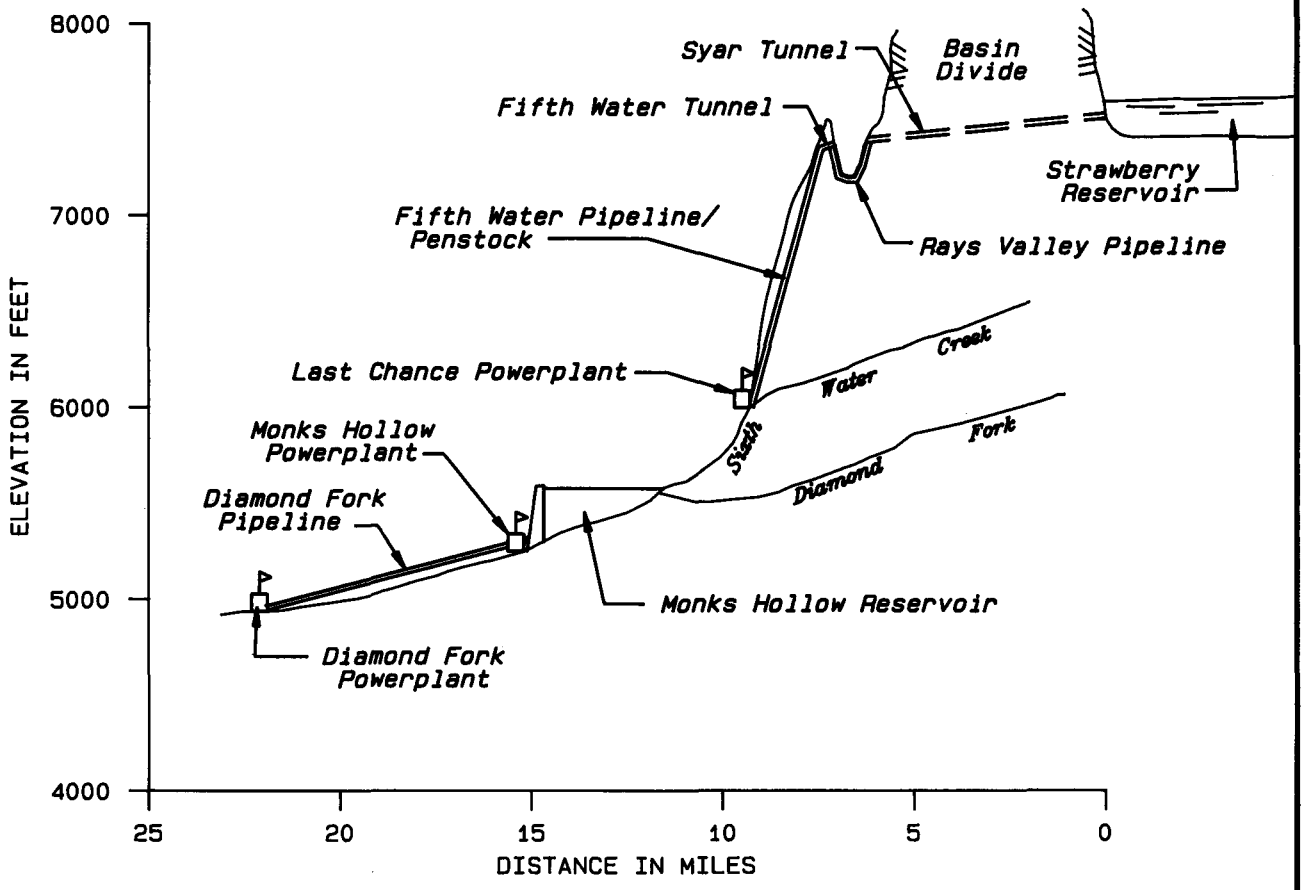
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL UTAH PROJECT
BONNEVILLE UNIT — UTAH

DIAMOND FORK SYSTEM

ALTERNATIVE A

66-400-1584

ALTERNATIVE A
ELEVATION PROFILE



66-418-7827

Alternative C

Alternative C corresponds with the I&D System No Action Alternative and would be viable only if the I&D System were not built. This alternative would provide for the transbasin diversion of water from the Colorado River Basin to the Bonneville Basin and would provide 3 MW of power for project pumping. The alternative would also allow non-Federal financing of an additional 67 MW of power and would satisfy requirements of the 1980 Instream Flow Agreement by reducing the transbasin diversion. Project features for this alternative are shown on the following map and elevation profile, and summary data are presented in table 5a. Project features and measures, including fish, wildlife, and recreation, would be the same as for alternative A, except as noted below.

Monks Hollow Dam and Powerplant would be deleted from the plan. Monks Hollow Switchyard and the transmission line from the switchyard to Last Chance Switchyard also would be deleted. The 13.8-kV bus tie bay would be deleted from Last Chance Switchyard.

A small diversion and regulating dam would be constructed at Three Forks, approximately 10 miles upstream from the confluence of Diamond Fork and the Spanish Fork River. Three Forks Dam would be a roller-compacted concrete structure 60 feet high, with a crest length of 275 feet. Approximately 65,000 yards of concrete would be used in the dam. The entire crest of the dam would serve as a spillway to safely pass anticipated floods. Two outlet works would be provided. An outlet to the intake for the Diamond Fork Pipeline, described below, would have a capacity of 350 cfs. The second outlet, to the Diamond Fork stream channel, would have a capacity of 250 cfs.

Three Forks Reservoir would have a total capacity of 430 acre-feet consisting of 300 acre-feet of active capacity and 130 acre-feet of dead storage for sediment accumulation. At normal water surface elevation, 5582 feet, the reservoir would have a surface area of 14 acres. The reservoir could fluctuate 27 feet on a daily basis to regulate daily peak releases from Last Chance Powerplant. The reservoir would have a surface area of 8 acres at minimum pool. Most of the sediment load would be flushed through the reservoir (about 3 percent trap efficiency); however, occasional removal of some bedload material might be required to maintain proper operation.

Roads would be the same as for alternative A except that an additional 2.7 miles of the Diamond Fork road would be upgraded between Monks Hollow Damsite and Three Forks Dam. Without non-Federal financing, Last Chance Powerplant would be built to a capacity of 3 MW. However, the full capacity of 60 MW could be constructed with non-Federal financing. Diamond Fork Powerplant could be constructed to a capacity of about 10 MW with non-Federal financing, but would not be built unless non-Federal participation is involved. Total potential generating capacity

Table 5a.--Summary data for powerplant and conveyance works, alternative C.

Facility	Length (miles)	Diameter (feet)	Height (feet)	Capacity			Surface area (acres)		Material volume (cubic yards)
				cfs	MW	Acre-feet	Normal	Minimum	
Syar Tunnel	5.7	8.5		600					
Fifth Water Aqueduct									
Rays Valley Pipeline	.9	7.0		600					
Fifth Water Tunnel	1.1	8.5		600					
Fifth Water Pipeline	.5	7.0		600					
Fifth Water Penstock	.5	6.0		600					
Last Chance Powerplant					[1]60				
Three Forks Dam			60						65,000
Three Forks Reservoir						430	14	8	
Diamond Fork Pipeline	9.9	7.0		350					
Diamond Fork Powerplant					[2]10.0				

[1] 3 MW of power for project pumping and 57 MW for non-Federal power development.

[2] Non-Federal power to be financed by non-Federal entities. The Diamond Fork Pipeline would extend upstream an additional 2.7 miles to Three Forks Dam. The pipeline would have a diameter of 7.0 feet and a capacity of 350 cfs to accommodate the transbasin diversion.

SPRINGVILLE

MAPLETON

T7S
T8S

R3E
R4E

R4E
R5E

R5E
R6E

T3S
T4S

T4S
T5S

T8S
T9S

T9S
T10S

R12W
R11W

UTAH
WASATCH
CO.
CO.

N.

Strawberry Tunnel

STRAWBERRY RESERVOIR ENLARGEMENT

SYAR TUNNEL

Horse Creek

Squaw Creek

Indian Creek

Chipman Creek

Rays Valley Creek

Fifth Water Creek

Fourth Water Creek

Third Water Creek

Second Water Creek

First Water Creek

Sheep Creek

Little Diamond Creek

Diamond Creek

Cottonwood Canyon

Spanish Fork River

Soldier Creek

FIFTH WATER PIPELINE & PENSTOCK

RAYS VALLEY PIPELINE

FIFTH WATER TUNNEL

LAST CHANCE POWERPLANT & SWITCHYARD

THREE FORKS DAM & RESERVOIR

DIAMOND FORK PIPELINE

PROPOSED 138 KV TRANSMISSION LINE

DIAMOND FORK POWERPLANT & SWITCHYARD
(requires non-federal financing)

SHEEP CREEK RAYS VALLEY ROAD

UP&L 345KV
Spanish Fork
Substation

UP&L 46KV

UP&L 345 KV

Spanish Fork-Huntington

Camp Williams-Emery

Carbon-Hale
UP&L 138 KV

PROPOSED TANK HOLLOW SUBSTATION

PROJECT AREA

LOCATION MAP

SALT LAKE CITY
PROVO
VERNAL
ST. GEORGE
COLORADO RIVER

EXPLANATION

- Proposed & Existing Tunnels
- Proposed & Existing Transmission Lines
- Proposed Powerplants
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- Roads to be Upgraded
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- Proposed Pipeline

4000 0 4000 8000 12000
SCALE OF FEET

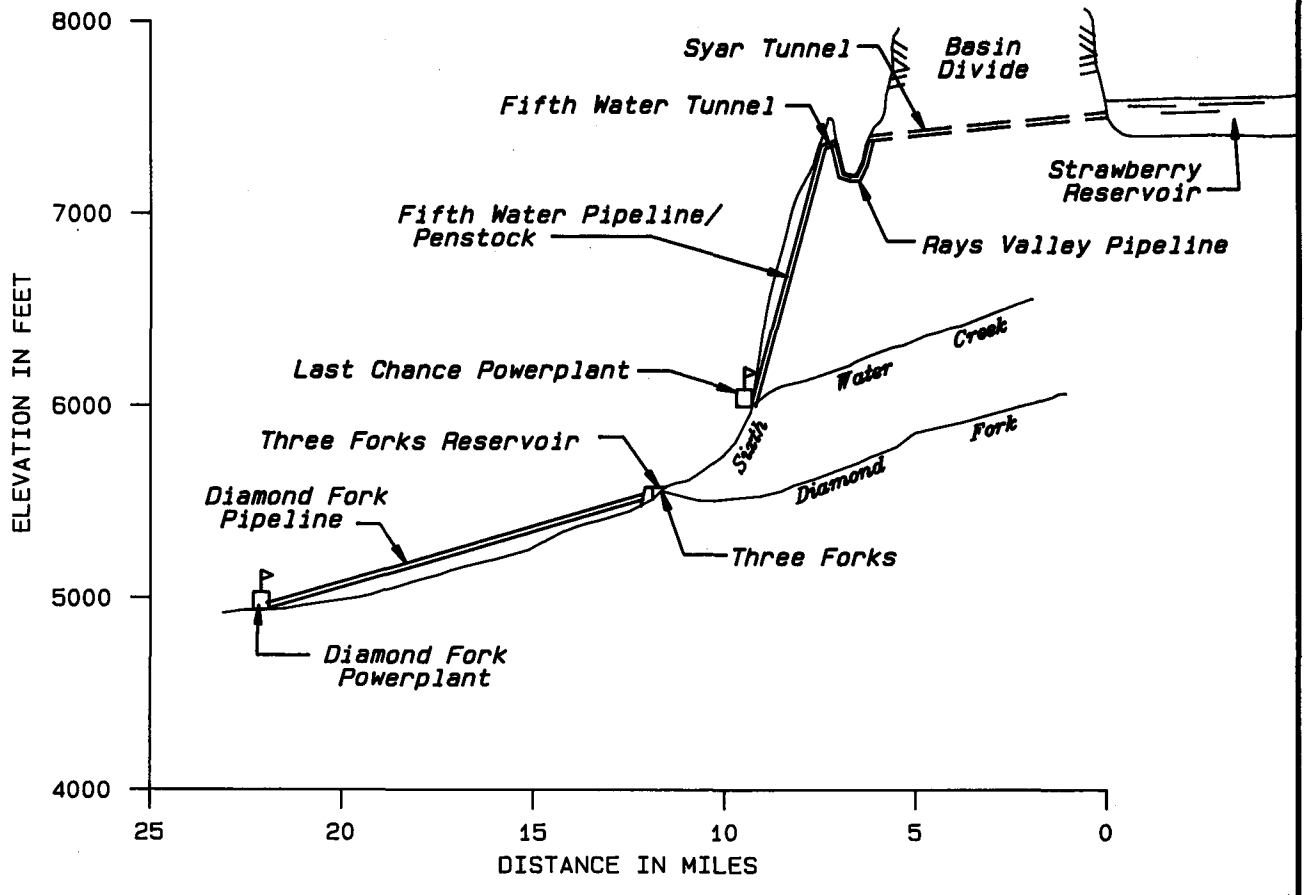
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL UTAH PROJECT
BONNEVILLE UNIT — UTAH

DIAMOND FORK SYSTEM

ALTERNATIVE C

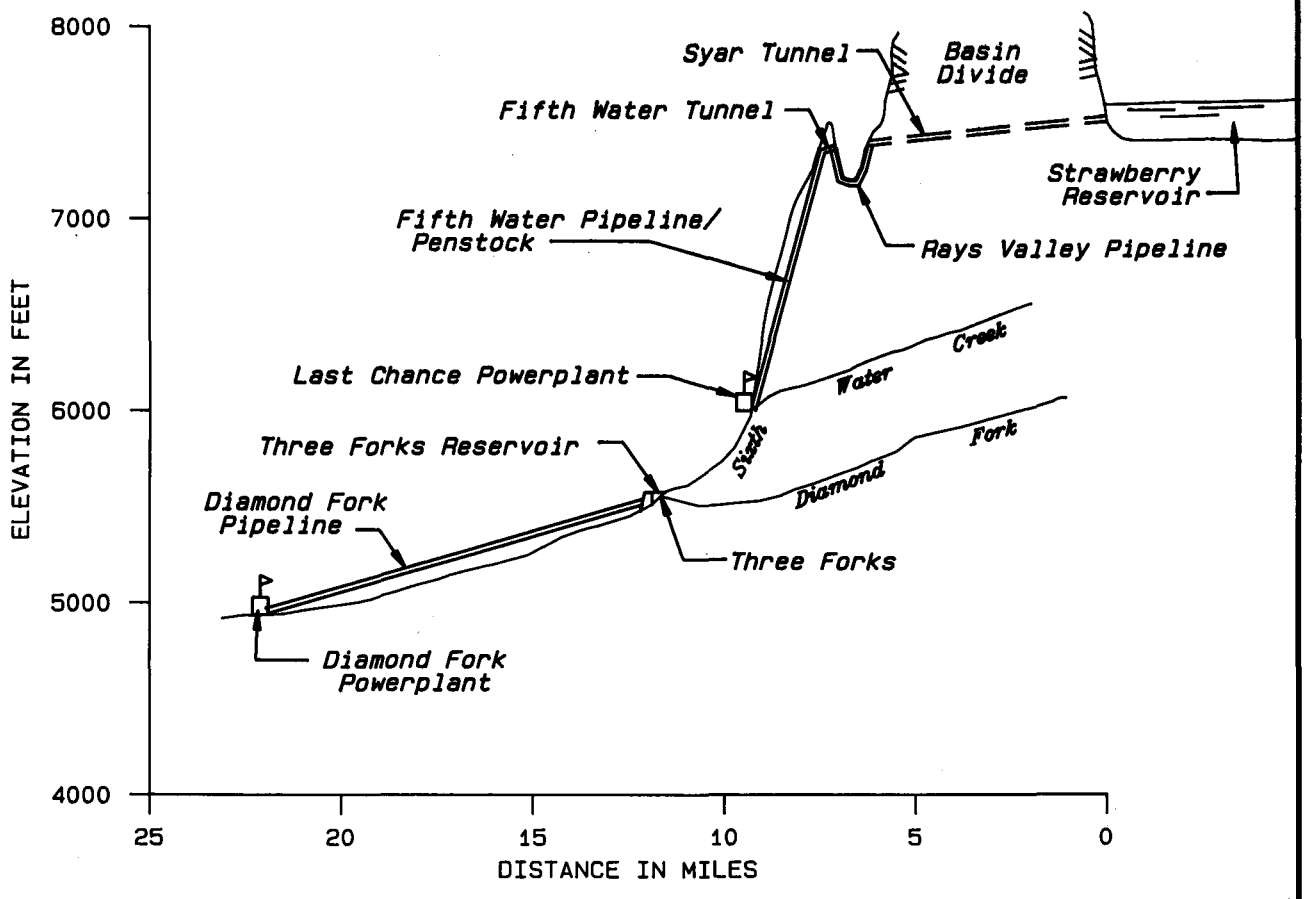
66-400-1585

ALTERNATIVE C
ELEVATION PROFILE



66-418-7821

ALTERNATIVE C
ELEVATION PROFILE



66-418-7821

would be higher than with the recommended plan, and total energy produced would be increased 13 percent to 247,000 MWh. This increase in energy potential is attributed to the increased transbasin diversion through the Diamond Fork System.

Fishery measures would be the same as for the recommended plan and alternative A, except that additional fish would be stocked in Diamond Fork to accommodate angler use in the stream section which would have been inundated by Monks Hollow Reservoir in those alternatives.

Wildlife measures for alternative C would be the same as described for the recommended plan but with a slightly higher acreage requirement. For the preferred offsite option, about 4,280 acres of mitigation would be required compared to about 2,760 acres for the onsite plan, increases of 180 acres and 120 acres, respectively, from the recommended plan.

Approximately 183,300 acre-feet of water annually would be available in Strawberry Reservoir for Bonneville Unit and Strawberry Valley Project use. After allowing for evaporation losses of 29,300 acre-feet and a decrease in storage of about 4,550 acre-feet, 158,300 acre-feet would be diverted to the Bonneville Basin through Syar Tunnel and 250 acre-feet would be available in Strawberry Reservoir for municipal uses. The average annual diversion to the Bonneville Basin would consist of 96,800 acre-feet of project water developed in the Uinta Basin and 61,500 acre-feet of Strawberry Valley Project water.

96800 - CUP
[14,700] - [82,100] - UI LK

The 158,300 acre-feet released from Syar Tunnel would be diverted into the Diamond Fork Pipeline (112,000 acre-feet) and to the Diamond Fork stream channel (46,300 acre-feet) and, subsequently, to the Spanish Fork River. The release to the Diamond Fork channel would range from a maximum of 79,800 acre-feet to a minimum of 11,800 acre-feet. An annual average of 158,300 acre-feet of project water would enter the river from Diamond Fork. An average of 14,700 acre-feet of the project water discharged into the river would be diverted for supplemental irrigation for the 47,880 acres of presently irrigated lands in the Spanish Fork area. The remaining project water released to Spanish Fork River would enter Utah Lake for use by the M&I System. In addition to the 14,700 acre-feet released from Strawberry Reservoir, 3,000 acre-feet would be integrated into the Spanish Fork supplemental supply from existing ground water development. Approximately 1,600 acre-feet of return flow would be reused in the Beer Creek area, and 1,000 acre-feet of ground water would be exchanged from Utah Lake. The total project supply to the Spanish Fork area would be 20,300 acre-feet. The annual releases from Strawberry Reservoir through the Syar Tunnel and Diamond Fork System would vary from about 225,500 acre-feet to about 73,800 acre-feet, with an average of 158,300 acre-feet (based on 1930-73 records). Operation of the system would vary primarily as the releases vary from season to season and year to year.

158,300
[96800] - CUP
[61,500] - SVP

158,300
[112,000] - pipe
[46,300] - DF channel

As stated above, an annual average of 158,300 acre-feet of water would enter the Spanish Fork River from Diamond Fork. Approximately 76,200 acre-feet would be diverted from the river for irrigation in the Spanish Fork area and the remaining 82,100 acre-feet would enter Utah Lake. The water for the Spanish Fork area would consist of 61,500 acre-feet of Strawberry Valley Project water and 14,700 acre-feet of Bonneville Unit water from Strawberry Reservoir.

An annual average of 108,200 acre-feet of Bonneville Unit water would be available from Utah Lake. This water would consist of project releases to the Spanish Fork River (82,100 acre-feet), project return flows (17,900 acre-feet), an evaporation increase of 1,900 acre-feet, decreased spills from the lake to the Jordan River of 9,800 acre-feet, and a 300-acre-foot decrease in lake storage. The return flows would include 13,000 acre-feet from municipal use in north Utah County and 4,900 acre-feet from irrigation in the Spanish Fork area.

A large portion of the Utah Lake water (98,500 acre-feet) would be made available to Jordanelle Reservoir of the M&I System through the Provo River exchange, which would be accomplished by storing Provo River flows now entering the lake in the reservoir and using lake water to serve areas presently served by the river flows. Other uses of Bonneville Unit water in the lake would include 1,000 acre-feet for the Spanish Fork area. Under the Bonneville Unit, operation of the lake would be coordinated with operation of Strawberry and Jordanelle Reservoirs. The project would operate "through" the lake without affecting lake volume or elevations by a replacement of lake water used for project purposes from upstream project facilities and/or project return flows on an acre-foot per acre-foot basis. Saved lake evaporation would be minimal since lake elevations follow a natural pattern. However, during wet periods when the lake is projected to spill to the Jordan River, no project releases would be made to the lake and high flows of the Provo River would be stored at Jordanelle Reservoir without replacement. This would benefit lands surrounding the lake during times of flooding. Whenever possible during dry years, the lake could be stabilized and would not be drawn lower than 9.3 feet below compromise elevation if adequate project water is available.

An annual average of 8,700 acre-feet of Utah Lake water would be used to accomplish the Indian Ford exchange[3]. The exchange would provide most of the water supply to enable the release of water from Jordanelle Reservoir to the Provo River to mitigate fishery losses which would otherwise occur on the lower reach of the river with Bonneville Unit development. To compensate irrigators presently using this water, Utah Lake water would be released to the Jordan River and pumped to the Provo Reservoir Canal by the Indian Ford Pumping Plant[4].

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[3] Formerly referred to as the Jacob-Welby Exchange.
[4] Formerly referred to as the Jacob-Welby Pumping Plant.

Comparative Analysis of Alternatives

Basis of Impact Analysis

To provide a meaningful evaluation of the alternatives, impacts expected to result from each have been compared to conditions expected in the future without additional Federal development of the Bonneville Unit. This future without condition was developed by inventorying existing conditions and projecting expected changes into the future, as explained in the 1984 FES.

Comparative Analysis of Features

The major features of the recommended plan are presented in tables 1 and 2, the features of alternative A are shown in table 5, and features of alternative C are shown in table 5a. The feature sizes are based on appraisal-level designs. As designs for the recommended plan are refined, the sizes and capacities of the features may change somewhat, but the basic configurations and locations should remain the same.

Comparative Analysis of Impacts

A summary comparison of the impacts expected from the 1984 FES plan, the recommended plan, and alternatives A and C are presented in table 6, and more detail is given in chapter III. The table presents net impacts resulting from implementation of all recommended mitigation and enhancement measures. Other alternatives presented in the 1984 FES are also presented for comparative purposes.

Alternative Studied but Eliminated from Further Consideration

In developing the plan for the downsized development of the Diamond Fork System, Reclamation studied an alternative which included rehabilitation of the existing Strawberry Tunnel instead of Syar Tunnel. Cost/benefit studies were performed for the plan and a comparison was made with the plan which included Syar Tunnel. Results of the evaluation indicated that the cost of the project using the existing tunnel and the cost using the new Syar Tunnel were approximately equal due to rehabilitation that would be required on the old tunnel and additional facilities that would be required to connect the tunnel to the system.

At its December 12, 1985, board meeting, the Central Utah Water Conservancy District passed a resolution urging Reclamation to proceed with construction of the Diamond Fork System plan which included Syar Tunnel. This resolution was based on a belief that a new tunnel, designed and constructed using state-of-the-art techniques, would be more reliable than the rehabilitated

Table 6.--Comparison of environmental impacts for the Diamond Fork System alternatives[1]

Environmental category	Future without condition	1984 Final Environmental statement plan	Recommended plan	Alternative A	Alternative C	Fifth water pumped storage alternative	Sixth water pumped storage alternative	1964 DPR alternative	No power alternative
Fish standing crop									
Streams (wild trout)	[2,3]12.8	[3,5]5.7	[3]+9.7	[3]+8.7	[3]+16.8	[4]+2,353	[4]+2,321	[4]-683	[4]+2,066
Monks Hollow Reservoir	NA	[6]+17	[6]+17	[6]+17	NA	+2,048	+837	+1,337	0
Vegetation (acres)									
Permanent	93,500	-545	-438	-447	-98	-1,021	-546	-855	-19
Temporary	93,500	-280	-132	-155	-156	-411	-297	-327	-204
Wildlife indicator species (AAHU)[7]									
Mule deer	71,995	-45	- 66	-105	-156	+50	-10	+24	+17
Bobcat	17,556	+150	+ 90	+127	+158	+221	+99	+131	+33
Golden eagle	51,425	+59	+143	+235	+358	-213	-169	-292	+34
Cooper's hawk	2,365	-14	-15	-16	-12	-14	-14	-12	-8
Beaver	110	-2	-12	-8	-3	-1	-1	+14	-3
Wildlife mitigation required-- land acquisition (acres)[8]	NA	4,000	2,640	3,230	2,760	4,443	2,455	3,748	612
Endangered species[9]	0	0	0	0	0	0	0	0	0
Water quality									
Streams[10]									
Temperature (°C)[11]	17 to 21	9 to 20	9 to 20	9 to 20	7 to 11	-4 to +2	-8 to +3	-9 to +2	-10 to +2
Dissolved oxygen (ppm)[12]	8	4 to 10	4 to 10	4 to 10	6 to 10	-4 to 0	-4 to 0	-4 to 0	-8 to 0
Turbidity[11]	-	++	+	+	+	++	++	-	+
Monks Hollow Reservoir temperature (°C)	NA	9 to 15	9 to 15	9 to 15	NA	13-17	9-15	NA	NA
Monks Hollow Reservoir fluctuations (acres)									
Minimum	NA	240	142	142	NA	300	300	NA	NA
Maximum	NA	343	352	352	NA	343	343	NA	NA
Average	NA	302	306	306	NA			NA	NA
Cultural resources[13]	0	0	0	0	0	0	0	0	0
Social									
Jobs	[14,15]100,409	[14]4,310	[14]1,656	[14]1,656	[14]1,167	[17]33,285	[17]22,320	[17]10,580	[17]5,230
Population[16]	[15]296,800	1,905	513	513	348	3,850	3,430	1,750	865
Agricultural crop production[20]									
Alfalfa (tons)	115,000	NA	+21,000	+21,000	+21,000	NA	NA	NA	NA
Barley (bushels)	1,579,000	NA	+296,000	+296,000	+296,000	NA	NA	NA	NA
Corn silage (tons)	62,000	NA	+12,000	+12,000	+12,000	NA	NA	NA	NA
Corn grain (bushels)	462,000	NA	+87,000	+87,000	+87,000	NA	NA	NA	NA
Fruit (bushels)	2,326,000	NA	+436,000	+436,000	+436,000	NA	NA	NA	NA
AUM's[21]	12,115	-570	-570	-570	-110	-1,050	-550	-820	-110

Table 6 (continued).—Comparison of environmental impacts for the Diamond Fork System alternatives[1]—continued

Environmental category	Future without condition	1984 Final Environmental	Recommended plan	Alternative A	Alternative C	Fifth Water Pumped Storage	Sixth Water Pumped Storage	1964 DPR Alternative	No Power alternative
Management cost to permittees ($)	53,000	46,800	49,100	49,100	49,100	+26,000	+20,000	+14,000	0
Esthetics[22]		25,411	25,411	25,411	19,525	22,135	25,411	29,240	19,525
Recreation (RD)[23]	460,895	+60,400	+60,400	+60,400	+60,400	+100,400	+60,400		+60,400
Power generated (MW)	0	166.2	[24]56.5	[24]68.5	[24]70	1,182.4	422.6	133.5	0

[1] Impacts represent changes from the future without condition. Where this condition is not quantified, impacts shown are absolute values.

[2] Reflects 1986 analysis of future without condition. 1984 FES stated a baseline standing crop of 2,184 pounds per year (lbs/year).

[3] Measured in pounds per acre.

[4] Measured in pounds per year.

[5] This value stated as 2,321 total pounds in the 1984 FES.

[6] Only total pounds were given in the 1984 FES.

[7] AAHU (average annual habitat units) is a combined measure of quantity and quality of habitat. The net gain or loss is compared to the onsite mitigation plan. The net gain or loss with the offsite mitigation plan would be similar.

[8] Onsite mitigation requirement. The offsite mitigation equivalent is 6,000 acres for the 1984 FES plan, 4,100 acres for the recommended plan, 4,945 acres for alternative A, and 4,280 acres for alternative C. Offsite equivalents were not analyzed for the other alternatives presented in the 1984 FES.

[9] Not affected by any project alternative.

[10] Diamond Fork immediately below Monks Hollow Reservoir.

[11] Average maximum temperature in August.

[12] Average of spot measurements taken throughout the year.

[13] ++ indicates a significant decrease in turbidity, + indicates a slight decrease in turbidity, and a - indicates a slight increase in turbidity.

[14] Temperature ranges given are maximum predicted to occur when cold water is withdrawn from Strawberry Reservoir. When warm water is withdrawn, expected temperature ranges would be 17 to 20 °C (maximum in August).

[15] Based on surveys covering 90 percent of the project area, no significant sites would be impacted. Should significant sites be found during completion of the inventory, mitigation would reduce the net impact.

[16] Total number of direct and indirect work years from project construction.

[17] Total number of direct and indirect jobs from project construction.

[18] Population influx during peak construction year.

[19] Source: State of Utah, Office of Planning and Budget, 1986.

[20] Agricultural development was not included in the 1984 FES plan, nor is it a feature of the minimum power development alternative. Therefore, no values are given.

[21] Animal Unit Months.

[22] Numerical ratings prepared by the Forest Service for a relative comparison of effects.

[23] Recreation day (net annual use and increase expected in 1995).

[24] Includes non-Federal power development.

75-year-old tunnel. The Strawberry Water Users Association also supported the Central Utah Water Conservancy District resolution. Based on the equal cost and the Central Utah Water Conservancy District resolution, Reclamation dropped from further consideration plans which included rehabilitation of the Strawberry Tunnel.

CHAPTER III
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter discusses the affected environment and environmental consequences only where they are different from the 1984 FES or where new information provides a better understanding of the area. Therefore, a discussion of existing conditions is not included for most parameters since these conditions are the same as in the FES.

Overall, impacts anticipated from the recommended plan and alternatives A and C are less than from the 1984 FES plan. Inclusion of the Spanish Fork area supplemental service lands would result in minimal impacts in the project area; only water supply and agricultural production would be affected. Reduction of the transbasin diversion, as discussed in the recommended plan, would primarily impact water supply, water quality, and fisheries. The impacts associated with the recommended plan and alternatives A and C are discussed below. Also presented are the impacts that could be expected with no further Federal development of the Bonneville Unit, referred to as the "future without condition."

Topography and Scenery

Project impacts on the Diamond Fork scenery were evaluated in the 1984 FES using the rating system listed in the U.S. Department of Agriculture's National Forest Landscape Management, Volume 2. Affected project features or landscape modifications were analyzed to determine the net change in visual rating from existing conditions. An adverse rating of 25,411 was given the 1984 FES plan, and this rating also applies to the recommended plan and alternative A. Alternative C would have the least impact with an adverse rating of 19,525.

All areas excavated or denuded of vegetation would be rehabilitated in consultation with affected landowners. All visual mitigation would be coordinated with the Forest Service and landowners as needed.

Vegetation

Vegetative types in the Diamond Fork area are the same as described in the 1984 FES. In the Spanish Fork supplemental service area, vegetation consists of crops such as corn, alfalfa, small grains, pastureland, and fruit orchards. All project alternatives would result in increased production of farm products on these lands, but vegetative changes would be insignificant.

Recommended Plan

Permanent losses of vegetation caused by the recommended plan would total 438 acres (see table 7), including 45 acres (10 percent) of riparian habitat. Most of the loss would be attributable to inundation by Monks Hollow Reservoir and construction of new access roads. Temporary losses of 132 acres would primarily be the result of construction of the Sixth Water Aqueduct, Diamond Fork Pipeline, power transmission lines, and the development of material source areas. Permanent losses of vegetation would be reduced by 107 acres and temporary losses by 148 acres from the 1984 FES plan (table 7).

Alternative A

Permanent losses of vegetation caused by alternative A would total 447 acres (see table 7), slightly more than with the recommended plan. Temporary losses of 155 acres would occur, considerably more than with the recommended plan.

Alternative C

Permanent vegetation losses of about 98 acres would occur with alternative C (table 7). With no Monks Hollow Reservoir, the losses would be about 340 acres fewer than the recommended plan. Temporary losses would be 156 acres, or 24 acres greater than the recommended plan, because of a longer Diamond Fork Pipeline.

Flood Plains and Wetlands

Existing Conditions

Flood plains are not extensive within the Diamond Fork area. Most of the streams affected by the project are located in narrow, constricted canyons with high gradient streambeds. Flood waters flowing under these conditions are physically confined and unable to spread out.

Insofar as wetlands may include "those areas that are frequently inundated by surface or ground water and normally support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth or reproduction," all intermittent and perennial streams within the area of the proposed project may be classified as such. The perennial streams contain a wide variety of aquatic macro-invertebrates as well as a valuable stream fishery resource.

Table 7.--Acres of vegetation temporarily[1] or permanently[2] lost.

Vegetation type/ duration of loss	Future without condition acreage	Acreage loss: Alternative: Recommended plan	A	C	1984 Final Environmental Statement plan
Sagebrush	8,600				
Temporary		14	18	18	18
Permanent		60	60	+1	62
Reseeded	8,900				
Temporary		9	13	13	75
Permanent		73	76	18	108
Mountain brush	51,500				
Temporary		59	71	69	98
Permanent		147	151	36	199
Pinyon-juniper	19,700				
Temporary		4	5	4	26
Permanent		108	111	17	125
Agriculture	500				
Temporary		31	33	33	33
Permanent		5	5	5	5
Riparian	500				
Temporary		14	14	18	28
Permanent		45	44	23	46
Aspen-conifer	3,800				
Temporary		1	1	1	2
Permanent		0	0	0	0
Total	93,500				
Temporary		132	155	156	280
Permanent		438	447	98	545

[1] Temporary losses include those vegetated areas where disturbance would occur during project construction, after which the land surface would be rehabilitated and revegetated to the extent possible. It is assumed that with proper rehabilitation these areas would regain 75 percent or more of their wildlife habitat value.

[2] Permanent losses include those vegetated areas where permanent project surface features would be placed.

The riparian woodland community[1], which is the only vegetation type having wetland value in the Diamond Fork area, occurs infrequently (0.5 percent of the area) and is associated with canyon bottoms in conjunction with permanent streams and seeps. Within the riparian community are scattered small sites of emergent wetlands characterized by growth of sedges, rushes, willows, and grasses. These areas have value far beyond their frequency of occurrence and provide a diversity of habitat for birds, furbearers, other small mammals, and big game. The specific habitat unit values of the riparian habitat and associated emergent wetlands to wildlife species have been incorporated into the wildlife analysis.

In the Spanish Fork area, various wetland types are found within and adjacent to the agricultural lands. None of the project alternatives would have adverse impacts on wetlands in this area. The use of more irrigation water could help sustain irrigation-dependent wetlands through the dry season.

Environmental Impacts

Recommended Plan.--The construction of Monks Hollow Reservoir would inundate flood plains and, along with construction of other project features, would result in a loss of 45 acres of existing stream and associated riparian vegetation (including less than 1 acre of emergent wetlands). This total loss is 1 acre less than in the 1984 FES plan because of the elimination of Sixth Water Reservoir. Monks Hollow Reservoir would provide 352 acres of aquatic habitat in exchange, 41 acres fewer than in the FES plan. In addition, 14 acres of riparian vegetation would be temporarily disturbed (including about 5 acres of emergent wetlands) as a result of construction of the Diamond Fork Pipeline, the same as in the FES plan.

Executive Orders 11988 (Floodplains Management) and 11990 (Protection of Wetlands) were written with the intent of discouraging development in flood plains, thus minimizing flood damages and preserving the natural value of wetlands. The executive orders require that development sites and alternatives be evaluated with respect to flood plain and wetland impacts. This report, in conjunction with the 1984 FES and the 1973 Bonneville Unit FES, has evaluated several dam and reservoir sites and alternative plans for the system. The alternatives

[1] Wooded riparian habitat is sustained by a high ground water table along stream bottoms and, as such, could be classified as "palustrine, broad-leaved, deciduous-forested wetlands" (Fish and Wildlife Service, 1979) [6].

evaluated in this document would have less total impact on acres of flood plain and riparian habitat than the 1984 and 1973 recommended plans.

Project facilities would be built for the purposes of water conveyance and power production. However, floods in the streams would, for the most part, be controlled, and the potential for flooding would be reduced. In addition, Monks Hollow Reservoir would be operated for flood control on a forecast basis.

The beaver is the best representative of the wetland value associated with the riparian woodland vegetative community. The net change in habitat values with implementation of the recommended mitigation option would be -12 average annual habitat units (AAHU)--a loss of 14 percent--for the recommended plan. The recommended and alternative mitigation options both include acquisition, management, and improvement of riparian habitats. This loss is greater than the -8 AAHU for the 1984 FES plan. A more detailed description of AAHU's is found under Wildlife in this chapter. The loss of streambed and associated macroinvertebrate communities (benthos) would be relatively small (8 acres). Although impacts on beaver would be greater than in the FES plan due to increased flows in lower Sixth Water Creek, the reduction of the high flows in Diamond Fork along with planned stream rehabilitation measures would help preserve and enhance the remaining flood plain and riparian wetland values. Maximum effort would be made to restore the temporarily disturbed areas to as near natural conditions as possible.

The transmission lines and switchyards may have some impacts on flood plains and wetlands, depending on designs. Flood plains and wetlands would be avoided wherever possible by spanning narrow canyons. If project transmission facilities are designed to be constructed in a flood plain or wetland, a flood plains/wetlands assessment would be prepared which would recommend appropriate mitigation measures.

Table 8 shows permanent impacts on flood plain and wetland values for each alternative and the 1984 FES plan.

Because of the 110-foot seasonal fluctuation and steep slopes of Monks Hollow Reservoir, the shoreline would be mostly barren and would not promote establishment of wetland vegetation. Limited use of the reservoir by waterfowl, shore birds, and furbearers would occur.

Alternative A.--Alternative A would reduce the loss of wooded riparian habitat by 1 acre from the recommended plan. Impacts on stream and reservoir habitats would be the same as with the

Table 8.--Permanent impacts on flood plains and wetlands.

Alternative	Riparian woodland habitat change: Vegetation (acres)	Reservoir Beaver[1] (habitat units)[2]	Stream lost (acres)	habitat gained (acres)
Recommended plan	-45	-12	8	352
Alternative A	-44	-8	8	352
Alternative C	-23	-3	<1	14
1984 FES plan	-46	-2	10	393

[1] Net change with recommended riparian habitat acquisition, management, and improvement.

[2] A combined measure of habitat quantity and quality (see Wildlife analysis).

recommended plan. With the recommended mitigation measures, a net loss in habitat value for beaver would occur.

Alternative C.--As shown in table 8, alternative C would reduce the loss of wooded riparian habitat by 22 acres from the recommended plan. Very little stream habitat would be lost and little reservoir habitat would be gained. With the recommended mitigation measures, a net loss in habitat value for beaver would occur. Incidental benefits to some flood plain and riparian habitats would result from reducing high streamflows and rehabilitating the Diamond Fork stream channel.

Water Supply

Existing Conditions

Strawberry Reservoir.--Strawberry Reservoir is the largest water storage facility for the Bonneville Unit and will provide a reliable water supply in years of low runoff. The reservoir, created by the construction of Soldier Creek Dam on the Strawberry River, will have a capacity of 1,106,500 acre-feet and a surface area of 17,000 acres at its maximum water surface elevation of 7602 feet.

Strawberry Reservoir is the result of the enlargement of a smaller reservoir created by construction of Strawberry Dam and Indian Creek Dike in the early 1900's, both features of the Strawberry Valley Project. Total capacity of the smaller reservoir was 283,000 acre-feet including 13,000 acre-feet of

inactive storage. Inflow consisted of water from Strawberry River and water diverted through three feeder canals--Indian Creek, Trail Hollow, and Currant Creek. The average annual inflow to the smaller reservoir from all sources for the 1930 through 1973 period was approximately 74,500 acre-feet.

The outlet for the reservoir was the Strawberry Tunnel which conveyed water from the reservoir through the divide to Sixth Water Creek. The stored water diverted into Bonneville Basin met irrigation demands of lands in south Utah County. Historical releases from the reservoir to Bonneville Basin averaged 56,700 acre-feet annually. A maximum reservoir drawdown occurred beginning in 1931, when the water surface elevation dropped nearly 12.5 feet to an active capacity of about 28,000 acre-feet, and remained low through 1935. Surface area of the reservoir at that capacity was approximately 3,300 acres. The minimum water surface elevation of the reservoir occurred in 1961 when the active content was 7,600 acre-feet.

In 1985, Strawberry Dam was breached and the present Strawberry Reservoir was created. Present inflow to the reservoir consists of all inflow to the smaller reservoir, tributary inflow which occurs between the Strawberry and Soldier Creek Damsites, and water intercepted by the Strawberry Aqueduct from Duchesne River tributaries and conveyed to Strawberry Reservoir. The aqueduct, a nearly completed feature of the Bonneville Unit, has been delivering water to the reservoir in small but increasing amounts since 1971. When completed, this aqueduct will intercept the flows of nine streams along the south slope of the Uinta Mountains, beginning at Rock Creek and extending about 37 miles to Strawberry Reservoir. Present releases from the reservoir include irrigation releases to the Strawberry Valley Project through Strawberry Tunnel and fish releases from Soldier Creek Dam to Strawberry River of 26 cfs in the summer and 13 cfs in the winter.

Diamond Fork.--Diamond Fork, a tributary of the Spanish Fork River, is the principal stream in the area of the proposed features of the system. Its major tributaries are Sixth Water Creek and the stream in Cottonwood Canyon. First and Second Water Creeks are tributaries to Cottonwood Canyon. Third, Fourth, and Fifth Water Creeks are tributaries to Sixth Water Creek. These streams originate in the Bonneville Basin, high on the western slopes of the Wasatch Mountains, just west of the divide between the Colorado River Basin and the Great Basin.

An estimated 90,000 acre-feet of water annually enters the Spanish Fork River from Diamond Fork. This includes about 56,700 acre-feet which is released from Strawberry Reservoir through the Strawberry Tunnel to Sixth Water Creek. Thus, about

two-thirds of the existing Diamond Fork flow results from a transbasin diversion of water from the Colorado River Basin.

The Diamond Fork stream system flows from its headwaters just west of Strawberry Reservoir for about 18 miles to its confluence with Spanish Fork River. Natural flows of First, Second, Third, Fourth, and Fifth Water Creeks and upper Diamond Fork above the Three Forks confluence are greatest in the spring when snowmelt runoff is peaking. Peak flows during May and June are estimated to range from 40 to 50 cfs in upper Diamond Fork and 10 to 20 cfs in the remaining tributaries of the Diamond Fork drainage. The natural flows decline considerably in late summer and reach minimums in late fall or winter. Late season flows are estimated to be 1 to 5 cfs for all tributaries.

Sixth Water to Spanish Fork River Confluence.--Sixth Water Creek enters Diamond Fork about 10 miles above the confluence of Diamond Fork and the Spanish Fork River. The creek receives much of its water during the summer months from Strawberry Reservoir through the 3.8-mile-long Strawberry Tunnel. Increased flows of 480 to 500 cfs have been added to Sixth Water Creek and Diamond Fork since about 1920 for Strawberry Valley Project irrigation during peak summer demand periods. There are no major irrigation diversions above the confluence with Spanish Fork River.

Spanish Fork River From Confluence to Utah Lake.--From its confluence with Diamond Fork, the Spanish Fork River flows northwest about 21 miles to Utah Lake. There are no major tributaries to this section of the Spanish Fork River, but numerous large diversions are made for irrigation along the lower portion from April through mid-October. The average annual flow of the Spanish Fork River above the major diversions is 147,100 acre-feet. Irrigation diversions reduce this flow by about 95,500 acre-feet, or 65 percent, even after return flows and natural accretion have augmented the river just above Utah Lake. Stretches of the Spanish Fork River above Utah Lake are often dewatered because of irrigation diversions.

Utah Valley Streams.--Runoff from the west slopes of the Wasatch Mountains surrounding Utah Valley flows toward Utah Lake. Benjamin Slough and its main tributaries, Spring Creek and Beer Creek, drain most of the area south and west of the Spanish Fork River channel in southern Utah Valley. Most of the water in Benjamin Slough originates as ground-water seepage and as return flow from irrigation. Some flow is contributed by perennial streams such as Peteetneet and Summit Creeks and by sewage effluent from the cities of Salem and Payson. The combined average annual discharge of Beer Creek and Spring Creek is approximately 24,000 acre-feet.

Utah Lake and Jordan River.--Utah Lake was first developed as a storage reservoir in 1872 when a low dam was placed at the Jordan River outlet at its north end. The dam sometimes caused the lake to rise above its normal elevation during high inflow years, causing flooding of lakeshore lands. As discussed previously, the resulting conflict between the landowners and the water users was eventually settled in 1885 by an agreement in which "compromise level" of the lake was agreed upon and a marker was set at elevation 4489.34 feet above sea level. Whenever runoff forecasts during the lake filling season indicated that under controlled operation the lake level would exceed that elevation, the outlet gates were opened prior to and during the flood inflow season to permit outflow discharges comparable to natural outflow conditions until the lake level again subsided to compromise level after the flood season. Over the years, some disagreement over the exact elevation of the "compromise level" had continued between all parties with vested interests in the lake. In 1984, a renegotiated elevation was established through a new agreement at 4489.045 feet above mean sea level. However, the compromise level of 4489.34 feet above sea level was used for analyzing project impacts because Reclamation's studies were essentially completed, and no significant difference in impacts was expected from the more accurate level. A pumping plant was built in 1902 to permit lowering of the lake below its natural outlet elevation in order to increase its active storage capacity. The pumping plant has been modified and enlarged several times, and its present capacity is about 400 to 1,050 cfs, depending on the lake level. The present pumps will lower the lake to about 9.3 feet below compromise level.

During 1982, 1983, and 1984, an increase of precipitation on the Utah Lake-Jordan River drainage basin caused the lake to rise to high levels causing damage to lands surrounding the lake. The lake reached a peak elevation of 4494.7 feet in June 1984, 5.4 feet above compromise level. The extreme wet period was more severe than any period of record in relation to lake stages and the length of time the lake remained at high levels. The maximum daily flow of the Jordan River at the "Narrows" in 1984 was 3,029 cfs.

At compromise level, the present lake has a total water surface area of about 96,000 acres (150 square miles) and a total storage capacity of about 850,000 acre-feet. The active capacity is about 828,000 acre-feet within a drawdown of 12 feet below compromise level. The Utah Lake water users have a right to use the full active capacity of the lake when the need arises. In the 1930's, the lake was drawn down to a minimum capacity by the now abandoned Pelican Point Pumping Plant. The minimum level of the lake is about 14 feet below compromise level. Summer flows of tributary streams of Utah Lake are practically all diverted upstream for irrigation or for municipal and industrial uses.

Most of the winter flows and much of the spring season flood flows, however, enter the lake along with return flows from upstream diversions, ground water flows from springs in and adjacent to the lake, and precipitation on the lake water surface. Provo River is the largest tributary. Annual inflow to Utah Lake from all sources over the 1930-73 period has been estimated at an average of about 579,200 acre-feet with extremes of 1,217,500 acre-feet in 1952 to 285,100 acre-feet in 1934. These estimated inflows include surface and subsurface flows to the lake and precipitation on the lake water surface. During the period of study, the total outflow or releases from the lake averaged about 243,000 acre-feet annually including large releases or spills in high runoff years and small releases in low water years. The releases have varied from 527,800 acre-feet in 1953 to 75,000 acre-feet in 1935. Since the period of study, in 1983, a high runoff year characterized by flooding throughout the valley, 920,000 acre-feet were released from the lake.

Evaporation[2] losses from Utah Lake are relatively high, averaging about 4 feet annually. The high evaporation rate and losses from the lake result from the shallowness of the lake and its relatively warm temperatures, flat shoreline in some stretches, and exposure to winds. Evaporation losses from the lake water surface over the 1930-73 period have been estimated to average about 317,400 acre-feet annually, ranging from 386,900 acre-feet in 1952 when the lake was at a high level to 263,300 acre-feet in 1935 when the lake was at a low level. The estimates of average lake inflow and evaporation losses indicate that somewhat more than half of the water which enters the lake is consumed by evapotranspiration. In the extreme low runoff year of 1935, the estimated total inflow to the lake exceeded the estimated total evapotranspiration by only 57,700 acre-feet. The evaporation exceeds the outflow in Jordan River during most years.

Water released from the lake is used largely for irrigation in Salt Lake County and northwestern Utah County, and a water right has been obtained by Kennecott Copper Corporation for milling uses in western Salt Lake County. The chemical quality of the lake water generally precludes its direct use for municipal purposes and many industrial purposes. However, the Salt Lake County Water Conservancy District is constructing a pumping plant at Jordan Narrows which will allow Utah Lake water to be blended with other higher quality waters for municipal and industrial uses. Additionally, under present exchange agreements and operations, some of the lake water used for irrigation in Salt

[2] Evapotranspiration refers to total evaporation--the evaporation from all water, soil, snow, ice, vegetation, and other surfaces--plus transpiration. Evaporation is restricted to the net rate of vapor transport to the atmosphere from free water surfaces.

Lake County replaces some good quality water of mountain streams once used for irrigation permitting the latter to be used for municipal and industrial purposes in the county.

An average annual demand of 220,000 acre-feet was used in Reclamation's studies as the safe annual yield of the lake for industrial purposes and for irrigation of the land served from the lake. Although the demand is slightly less than the historical draft, the urbanization of Salt Lake County has decreased and will continue to decrease the irrigated land and consequently the irrigation demand on the lake.

The following figure compares historical Utah Lake water surface fluctuations with lake levels which would have occurred had present conditions existed during the period of study. For purposes of determining impacts to water sources under project conditions, it is necessary to determine what would have happened historically with present developments in place.

Between Utah Lake and Salt Lake City, the Jordan River gains substantial quantities of water by seepage from saturated valley fill as well as by tributary inflow, and it loses water by numerous diversions. The largest diversions from the river are made at Jordan "Narrows." Nearly all the water in the river at 9400 South Street in Salt Lake County is diverted at that point except when surplus water is released from Utah Lake to prevent flooding of the lake's shoreline. Inflow to the river north of 9400 South Street is adequate to meet all diversion requirements for river water in the Salt Lake Valley. The average flow at 2100 South Street in Salt Lake City is only slightly less than the flow at Jordan Narrows. The annual flows of Jordan River upstream from canal diversions at Jordan Narrows are 180,000 to 300,000 acre-feet during most years because of the regulated outflow from Utah Lake. However, during 1953 the annual flow was 528,000 acre-feet, and during 1935 it was only 75,000 acre-feet (Utah Lake was nearly dry at times during 1934 and 1935). The average annual flow during 1930-73 was 242,700 acre-feet.

At 2100 South Street in Salt Lake City, the flow of the river is divided between the river channel and the Surplus Canal, which was constructed chiefly to divert flood flows from the city but also to convey water to some users. Surplus water is routed through the canal to Great Salt Lake. The average annual flow of the Jordan River upstream from the Surplus Canal diversion was 232,500 acre-feet for the 1930 through 1973 period.

A large marshy area at the mouth of Jordan River has been altered by dikes and weirs to convert it to waterfowl management areas with a more stable water supply. Water in the river and in Surplus Canal is diverted to these areas, and small streams in Davis County contribute an undetermined amount of water to the

waterfowl areas. Precipitation and ground water seepage also contribute water to these areas. Water not utilized is discharged to Great Salt Lake.

Jordan River streamflows for historical and future without project conditions are shown in table 9.

Environmental Impacts

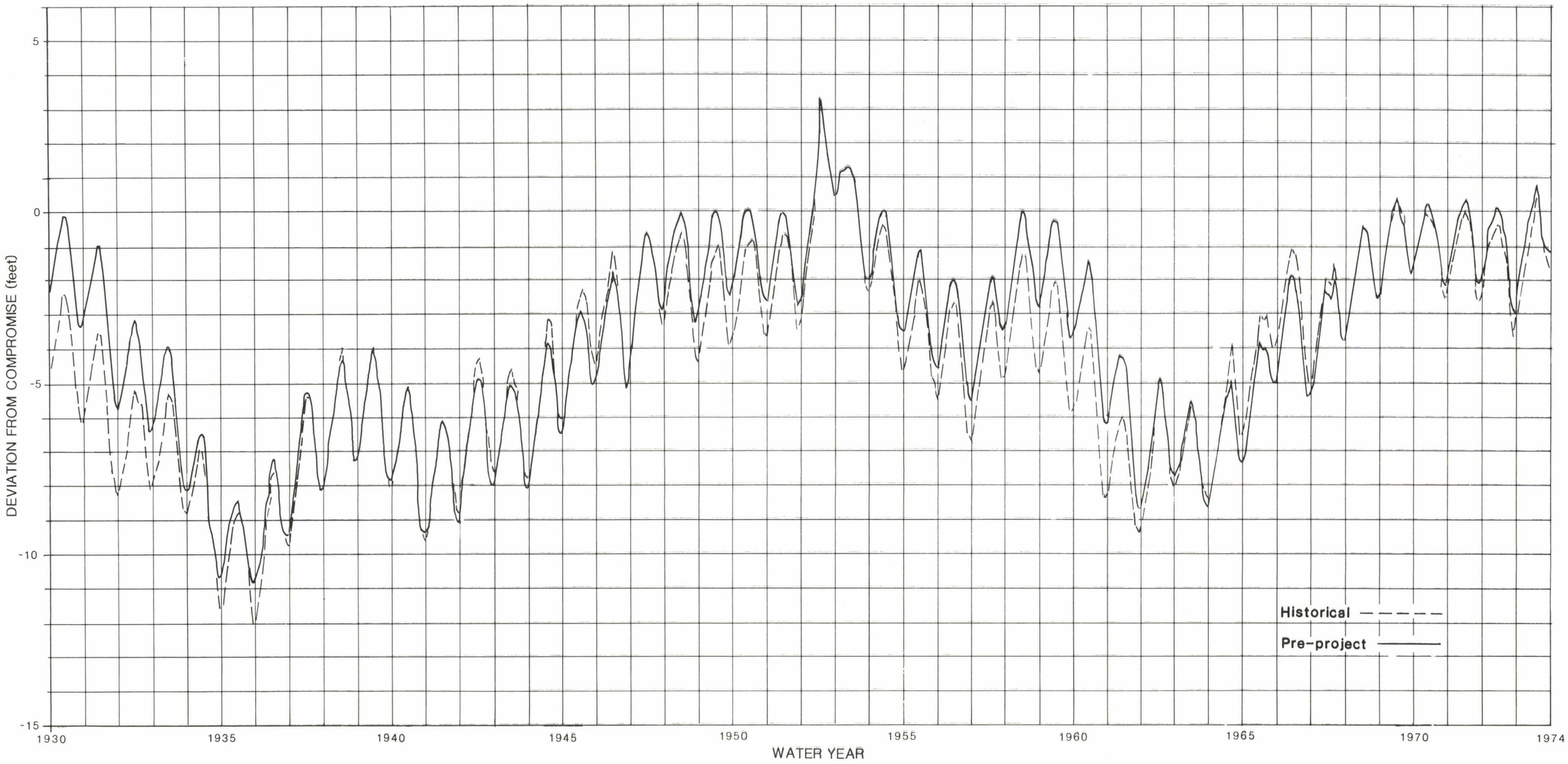
Recommended Plan.--With the recommended plan, the 163,400 acre-feet of water diverted annually from Strawberry Reservoir would be conveyed to the Bonneville Basin through the proposed Syar Tunnel, Sixth Water Aqueduct, and Last Chance Powerplant. Releases through Last Chance Powerplant would be discharged to Sixth Water Creek and flow to Monks Hollow Reservoir.

Sixth Water Creek.--Operational releases would be made to Sixth Water Creek, approximately 3 miles above the Three Forks area of Diamond Fork Canyon. Up to 600 cfs of project releases would be discharged from Last Chance Powerplant to Sixth Water Creek. No operational releases were to be made to Sixth Water Creek in the 1984 FES plan.

Sixth Water to Spanish Fork River Confluence.--Project water discharged to Sixth Water Creek would flow to Monks Hollow Reservoir which would provide peak releases for irrigation of lands in the Spanish Fork area. The reservoir would be filled at the end of each month when sufficient water was available in Strawberry Reservoir and sufficient capacity was available in Syar Tunnel. At a normal water surface elevation of 5,555 feet, the reservoir would have an active storage capacity of 26,700 acre-feet. The minimum surface elevation would be 5,445 feet.

Expected peak daily releases under project conditions for irrigation and municipal and industrial use would be 880 cfs, the same as in the 1984 FES plan. The maximum recorded historic flow was 1,850 cfs on May 15, 1984. Minimum releases would be no less than historic natural flows.

The Diamond Fork Pipeline would reduce flows below Monks Hollow by conveying up to 510 cfs of the total release to the confluence with the Spanish Fork River. As a result, the average long-term monthly flow in Diamond Fork below Monks Hollow is estimated to be in the 17 to 183 cfs range, slightly less than in the 1984 FES plan.



UTAH LAKE FLUCTUATIONS (1930-1973)

Historical Fluctuations Compared to Pre-project Fluctuations

Table 9.--Jordan River historical and future without project streamflows (unit--cfs).

Month	Historical monthly flows			Future without project monthly flows		
	Average year	Maximum year	Minimum year	Average year	Maximum year	Minimum year
		Jordan River at the Narrows				
October	194	198	99	197	217	189
November	74	118	18	87	159	46
December	75	101	18	70	256	9
January	89	228	0	87	356	9
February	135	358	0	151	468	51
March	161	449	0	172	583	49
April	220	590	0	265	752	164
May	566	1,203	545	629	1,218	591
June	644	1,366	556	869	1,430	834
July	751	1,060	384	875	1,119	881
August	703	870	242	583	881	593
September	555	716	94	362	734	383
		Jordan River at 5800 South Street				
October	234	265	169	255	382	131
November	156	212	94	210	433	84
December	155	158	89	217	510	88
January	172	346	78	233	638	57
February	234	468	95	264	688	61
March	259	558	91	287	748	57
April	235	686	64	249	745	61
May	228	859	177	260	860	173
June	237	869	200	304	899	199
July	293	498	229	327	558	165
August	324	368	241	338	628	148
September	303	363	230	306	684	106
		Jordan River at 2100 South Street				
October	300	325	246	313	443	156
November	266	250	229	267	493	120
December	270	342	218	282	579	127
January	233	501	195	294	701	94
February	259	628	202	327	753	96
March	279	790	202	355	819	99
April	288	933	173	321	823	121
May	415	1,272	174	352	963	93
June	486	1,376	138	380	988	58
July	300	675	138	310	546	62
August	289	450	128	296	590	60
September	325	368	146	306	687	65

Table 9.--Jordan River historical and future without project streamflows (unit--cfs).--continued

Month	Historical monthly flows			Future without project monthly flows		
	Average year	Maximum year	Minimum year	Average year	Maximum year	Minimum year
	Jordan River after Salt Lake City Wastewater Treatment Plant					
October	159	151	140	179	219	95
November	143	122	135	154	252	75
December	142	142	137	157	250	84
January	108	143	136	145	210	70
February	111	221	135	149	274	68
March	105	257	135	144	276	70
April	85	251	128	111	237	97
May	108	51	99	117	66	64
June	126	163	94	132	149	55
July	139	164	68	172	162	40
August	141	161	78	169	235	48
September	159	151	69	167	299	38

Spanish Fork River Confluence to Utah Lake.--A bifurcation structure near the confluence would divert excess pipeline flows to the Spanish Fork River just above the confluence with Diamond Fork and the remainder to the I&D System. The aqueduct would have a capacity of 180 cfs at this point. Up to 510 cfs of pipeline flow could be diverted to the river for downstream users.

Flows of the Spanish Fork River would be increased due to the delivery of project water to the Spanish Fork area and project deliveries to Utah Lake. Total flow in the river would be affected by existing diversion structures for power and irrigation. There would be no project features constructed on the river which would affect streamflows. The effects of the project would be buffered as a result of the river's larger natural flow. A summary of future without and recommended plan flows in Diamond Fork and Spanish Fork River for average, maximum, and minimum years is shown in table 10.

Impacts of the recommended plan on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be discussed in more detail in the environmental statement on the I&D System.

Alternative A.--With alternative A, the 199,200 acre-feet of water diverted annually from Strawberry Reservoir would be conveyed to the Bonneville Basin through the proposed Syar Tunnel, Fifth Water Aqueduct, and Last Chance Powerplant. Releases through Last Chance Powerplant would be discharged to Sixth Water Creek and flow to Monks Hollow Reservoir.

Table 10.--Diamond Fork and Spanish Fork River streamflows, recommended plan (unit--cfs).

	Future without monthly flows			Recommended plan monthly flows[1]		
	Diamond Fork below Monks Hollow					
Month	Average year	Maximum year (1953)	Minimum year (1934)	Average year	Maximum year (1965)	Minimum year (1961)
October	38	142	36	17	15	13
November	16	64	8	22	17	13
December	14	28	10	18	18	10
January	12	18	10	21	16	13
February	14	20	9	30	16	10
March	18	23	3	37	20	12
April	67	72	45	56	80	46
May	180	122	125	78	236	80
June	274	361	86	130	386	80
July	294	345	75	183	80	5
August	208	247	55	106	276	5
September	120	178	32	71	80	12
	Spanish Fork River at Castilla					
Month	Average year	Maximum year (1952)	Minimum year (1934)	Average year	Maximum year (1952)	Minimum year (1961)
October	93	96	80	80	68	46
November	70	67	54	93	67	47
December	68	63	57	85	65	41
January	67	75	52	81	75	46
February	82	85	65	123	86	50
March	113	107	60	178	109	58
April	246	1,054	101	286	1,037	87
May	463	1,862	181	498	1,753	349
June	404	617	128	541	538	178
July	363	452	101	567	543	18
August	282	335	93	429	389	42
September	178	313	61	228	217	47
	Spanish Fork River near Lake Shore					
Month	Average year	Maximum year (1952)	Minimum year (1963)	Average year	Maximum year (1952)	Minimum year (1961)
October	30	46	10	42	46	21
November	67	69	25	91	69	50
December	77	70	55	94	70	57
January	79	85	63	93	85	60
February	98	104	83	138	104	63
March	129	143	15	194	143	67
April	201	1,089	13	244	1,072	13
May	141	1,517	8	205	1,410	5
June	22	279	2	101	279	2
July	3	2	0	3	2	0
August	3	5	2	62	5	2
September	8	40	3	84	40	0

[1] Based on a Wasatch Aqueduct (I&D System) capacity of 180 cfs.

Sixth Water Creek.--Operational releases would be made to Sixth Water Creek, approximately 2.3 miles above the Three Forks area of Diamond Fork Canyon. Up to 600 cfs of project releases would be discharged from Last Chance Powerplant to Sixth Water Creek. No operational releases were to be made to Sixth Water Creek in the 1984 FES plan.

Sixth Water to Spanish Fork River Confluence.--Project water discharged to Sixth Water Creek would flow to Monks Hollow Reservoir which would provide peak releases for irrigation of lands in the Spanish Fork area. The reservoir would be filled at the end of each month when sufficient water was available in Strawberry Reservoir and sufficient capacity was available in 80 cfs.

Expected peak daily releases under project conditions for irrigation and municipal and industrial use would be 880 cfs, the same as in the 1984 FES plan. The maximum recorded historic flow was 1,850 cfs on May 15, 1984. Minimum releases would be no less than historic natural flows.

The Diamond Fork Pipeline would reduce flows below Monks Hollow by conveying up to 510 cfs of the total release to the confluence with the Spanish Fork River. As a result, the average long-term monthly flow in Diamond Fork below Monks Hollow is estimated to be in the 22 to 188 cfs range, slightly less than in the 1984 FES plan.

Spanish Fork River Confluence to Utah Lake.--A bifurcation structure near the confluence would divert excess pipeline flows to the Spanish Fork River just above the confluence with Diamond Fork and the remainder to the I&D System. The aqueduct would have a capacity of 180 cfs at this point. Up to 510 cfs of pipeline flow could be diverted to the river for downstream users.

Flows of the Spanish Fork River would be increased due to the delivery of project water to the Spanish Fork area and project deliveries to Utah Lake. Total flow in the river would be affected by existing diversion structures for power and irrigation. There would be no project features constructed on the river which would affect streamflows. The effects of the project would be buffered as a result of the river's larger natural flow. A summary of future without and alternative A flows in Diamond Fork and Spanish Fork River for average, maximum, and minimum years is shown in table 11.

Impacts of alternative A on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be discussed in the environmental statement on the I&D System.

Table 11.--Diamond Fork and Spanish Fork River streamflows, alternative A (unit--cfs).

	Future without monthly flows			Alternative A monthly flows[1]		
	Diamond Fork below Monks Hollow					
Month	Average year	Maximum year (1953)	Minimum year (1934)	Average year	Maximum year (1956)	Minimum year (1961)
October	38	142	36	22	12	13
November	16	64	8	24	10	13
December	14	28	10	22	13	10
January	12	18	10	28	80	13
February	14	20	9	34	80	10
March	18	23	3	38	23	12
April	67	72	45	59	80	46
May	180	122	125	87	164	80
June	274	361	86	143	292	80
July	294	345	75	188	270	5
August	208	247	55	143	205	5
September	120	178	32	77	109	12
	Spanish Fork River at Castilla					
Month	Average year	Maximum year (1952)	Minimum year (1934)	Average year	Maximum year (1952)	Minimum year (1961)
October	93	96	80	103	68	46
November	70	67	54	106	67	47
December	68	63	57	91	65	41
January	67	75	52	97	75	46
February	82	85	65	130	86	50
March	113	107	60	182	109	58
April	246	1,054	101	299	1,037	85
May	463	1,862	181	515	1,753	349
June	404	617	128	559	538	275
July	363	452	101	567	543	18
August	282	335	93	507	387	42
September	178	313	61	303	215	47
	Spanish Fork River near Lake Shore					
Month	Average year	Maximum year (1952)	Minimum year (1963)	Average year	Maximum year (1952)	Minimum year (1961)
October	30	46	10	65	46	21
November	67	69	25	104	69	50
December	77	70	55	100	70	57
January	79	85	63	109	85	60
February	98	104	83	145	104	63
March	129	143	15	198	143	67
April	201	1,089	13	256	1,072	13
May	141	1,517	8	223	1,410	5
June	22	279	2	117	279	2
July	3	2	0	3	2	0
August	3	5	2	139	5	2
September	8	40	3	159	40	0

[1] Based on a Wasatch Aqueduct (I&D System) capacity of 180 cfs.

Alternative C.--With alternative C, the 158,300 acre-feet of water diverted annually from Strawberry Reservoir would be conveyed to the Bonneville Basin through the proposed Syar Tunnel, Fifth Water Aqueduct, and Last Chance Powerplant. Releases through Last Chance Powerplant would be discharged to Sixth Water Creek and flow to Three Forks Reservoir, the Spanish Fork River and Utah Lake.

Strawberry Reservoir.--Annual fluctuations of Strawberry Reservoir would increase over preproject conditions with the increased inflows and outflows under project operation. The reservoir would fill during the winter and spring, and the largest releases, those for project irrigation, would be made in the summer. Strawberry Reservoir would provide the long-term storage necessary to meet demands in a drought cycle which means large releases of water would be required to meet downstream demands in a dry year. A maximum year represents a period when hydrologic conditions are wetter than normal, and storage facilities are storing runoff for use in a drier year. A minimum year represents a period when conditions are drier than normal and releases from reservoir storage would be greater to meet downstream demands. During dry years, inflows to the reservoir would be greatly reduced, resulting in a long-term drawdown condition. Table 12 shows reservoir conditions as presented in the 1973 Bonneville Unit FES. As shown in table 13, in an average year the reservoir would fluctuate in surface area from a maximum of 12,200 acres to a minimum of 11,650 acres under project conditions This represents a change of 4.6 feet in water depth, about 1.3 feet fewer than under the 1973 Recommended Plan.

Sixth Water Creek.--Operational releases would be made to Sixth Water Creek, approximately 3 miles above the Three Forks area of Diamond Fork Canyon. Up to 600 cfs of project releases would be discharged from Last Chance Powerplant to Sixth Water Creek. No operational releases were to be made to Sixth Water Creek in the 1984 FES plan.

Sixth Water to Spanish Fork River Confluence.--Project water discharged to Sixth Water Creek would flow to Three Forks Dam and then be diverted into the Diamond Fork Pipeline. Expected peak daily releases from Syar Tunnel under project conditions for irrigation and municipal and industrial use would be 600 cfs. The maximum recorded historic flow was 1,850 cfs on May 15, 1984. Minimum releases would be no less than historic natural flows.

The Diamond Fork Pipeline would reduce flows below Three Forks Dam by conveying up to 350 cfs of the total release to the

confluence with the Spanish Fork River. As a result, the average long-term monthly flow in Diamond Fork below Three Forks is estimated to be in the 46 to 181 cfs range.

Table 12.--Strawberry Reservoir active content and surface area, 1973 FES plan.

	Average year		Maximum year (1952)		Minimum year (1934)	
Month	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)
October	355,050	12,260	300,100	11,720	375,100	12,460
November	342,100	12,140	292,500	11,660	305,400	11,780
December	337,000	12,100	287,500	11,600	356,300	12,270
January	329,100	12,010	284,000	11,570	348,000	12,200
February	321,800	11,940	278,000	11,510	341,200	12,120
March	312,000	11,830	270,100	11,440	330,100	12,020
April	319,000	11,800	290,300	11,630	326,300	11,970
May	364,500	12,350	433,900	12,980	298,400	11,710
June	383,900	12,530	501,600	13,580	269,500	11,430
July	378,500	12,480	517,500	13,730	239,800	11,130
August	363,800	12,340	518,300	13,730	210,800	10,770
September	350,700	12,220	518,400	13,730	196,100	10,530

Table 13.--Strawberry Reservoir active content and surface area, alternative C.

	Average year		Maximum year (1952)		Minimum year (1934)	
Month	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)
October	312,000	11,830	282,300	11,560	679,400	15,120
November	313,200	11,850	284,700	11,580	678,400	15,110
December	305,700	11,790	276,500	11,490	672,300	15,070
January	301,900	11,740	284,100	11,570	668,600	15,030
February	298,200	11,710	288,400	11,610	660,800	14,980
March	292,000	11,650	294,500	11,670	631,200	14,730
April	297,600	11,700	321,700	11,940	607,900	14,520
May	339,600	12,110	461,000	13,400	563,600	14,130
June	348,000	12,200	532,500	13,850	519,000	13,740
July	326,500	11,980	545,600	13,970	477,800	13,370
August	304,000	11,780	542,300	13,940	442,600	13,050
September	295,600	11,680	541,500	13,930	418,800	12,850

Spanish Fork River Confluence to Utah Lake.--A bifurcation structure near the confluence would divert pipeline flows to the Spanish Fork River just above the confluence with Diamond Fork.

Flows of the Spanish Fork River would be increased due to the delivery of project water to the Spanish Fork area and project deliveries to Utah Lake. Total flow in the river would be affected by existing diversion structures for power and irrigation. There would be no project features constructed on the river which would affect streamflows. The effects of the project would be buffered as a result of the river's larger

natural flow. A summary of future without and alternative C flows in Diamond Fork and Spanish Fork River for average, maximum, and minimum years is shown in table 14.

Utah Valley Streams.--Because it is anticipated that the Strawberry Valley project would continue to operate as it does now, return flows from the area served would continue to accrue in Beer and Spring Creeks. Additionally, return flows from project deliveries would accrue in these creeks. Project deliveries that would affect the flows in these creeks include supplemental irrigation water deliveries to the Spanish Fork area and project water deliveries to Beer Creek from groundwater wells.

Streamflows in the upper reaches of Beer Creek (above the confluence of Spring Creek) would be increased during the water year due to project return flows and the delivery of project water from ground-water wells. This increase in flow is estimated to average 1,400 acre-feet per year. The increased streamflow would be diverted using existing diversion structures.

With alternative C, streamflows in Beer Creek near Utah Lake below the irrigation diversions would be approximately 2,000 acre-feet higher on an average annual basis than under historical conditions. Table 15 is a summary of Beer Creek flows under project conditions below the confluence with Spring Creek and Beer Creek.

Any return flow from project water diverted in the upper Beer Creek area would then be available for rediversion in the lower Beer Creek area. The irrigation demands of the lower Beer Creek area would be met by return flows from the upper Beer Creek area, return flows from lower lying lands in the Spanish Fork area, and from groundwater wells. The flows in the lower reaches of Beer Creek (below the confluence of Spring Creek) are expected to be increased by an average of 2,800 acre-feet per year. Much of this water will be diverted for irrigation use. Spring Creek, which is tributary to Benjamin Slough, would also experience slight increases in streamflow due to the capture of return flows from project water, but no project water would be delivered directly to the creek.

Utah Lake and Jordan River.--Under project conditions, the coordinated operation of Utah Lake and Strawberry Reservoir would not interfere with present operations of the lake. The lake would, in general, fluctuate on an annual basis nearly equal to that which has occurred historically (table 16). If adequate project water is available, the lake could be reregulated to maintain a minimum water surface elevation of 9.3 feet below compromise which is

Table 14.--Diamond Fork and Spanish Fork River streamflows, alternative C (unit--cfs).

	Future without monthly flows			Alternative C monthly flows[1]		
	Diamond Fork below Monks Hollow					
Month	Average year	Maximum year (1953)	Minimum year (1934)	Average year	Maximum year (1965)	Minimum year (1970)
October	38	142	36	46	16	18
November	16	64	8	74	80	17
December	14	28	10	71	80	16
January	12	18	10	66	80	16
February	14	20	9	62	80	16
March	18	23	3	63	80	18
April	67	72	45	84	80	30
May	180	122	125	123	445	80
June	274	361	86	156	352	80
July	294	345	75	181	281	107
August	208	247	55	94	230	80
September	120	178	32	67	79	17
	Spanish Fork River at Castilla					
Month	Average year	Maximum year (1952)	Minimum year (1934)	Average year	Maximum year (1952)	Minimum year (1961)
October	93	96	80	134	68	46
November	70	67	54	272	356	106
December	68	63	57	260	337	146
January	67	75	52	192	75	161
February	82	85	65	212	86	164
March	113	107	60	272	109	218
April	246	1,054	101	401	1,054	147
May	463	1,862	181	597	1,860	365
June	404	617	128	590	538	600
July	363	452	101	583	543	568
August	282	335	93	403	387	250
September	178	313	61	169	217	47
	Spanish Fork River near Lake Shore					
Month	Average year	Maximum year (1952)	Minimum year (1963)	Average year	Maximum year (1952)	Minimum year (1961)
October	30	46	10	96	46	21
November	67	69	25	270	358	109
December	77	70	55	269	342	163
January	79	85	63	204	85	176
February	98	104	83	227	104	176
March	129	143	15	289	143	226
April	201	1,089	13	358	1,089	71
May	141	1,517	8	302	1,517	5
June	22	279	2	136	279	2
July	3	2	0	13	2	0
August	3	5	2	24	5	2
September	8	40	3	17	40	0

[1] Based on a Wasatch Aqueduct (I&D System) capacity of 180 cfs.

Table 15.--Beer Creek flows near Lake Shore, alternative C (units--cfs)

Month	Future without monthly flows: Average year	Future without monthly flows: Maximum year (1952)	Future without monthly flows: Minimum year (1961)	Future with monthly flows: Average year	Future with monthly flows: Maximum year (1952)	Future with monthly flows: Minimum year (1961)
October	30.1	30.3	10.1	35.0	36.6	16.6
November	34.3	33.7	21.9	36.0	35.4	23.6
December	40.9	38.7	26.9	40.9	38.7	26.9
January	49.8	55.6	35.4	49.8	55.6	35.4
February	68.3	74.1	35.4	68.3	74.1	35.4
March	71.2	74.1	42.1	71.2	74.1	42.1
April	42.9	244.1	28.6	42.9	244.1	28.6
May	17.6	55.6	1.7	17.6	55.6	3.3
June	8.4	13.5	1.7	11.8	15.2	8.4
July	4.4	5.1	0.0	9.3	6.7	11.4
August	3.9	5.1	0.0	12.0	6.7	13.0
September	8.6	11.8	0.0	18.7	13.5	13.5

Table 16.--Utah Lake active content[1] and surface area - future without project

Month	Average year: Content (acre-feet)	Average year: Surface (acres)	Maximum year: Content (acre-feet)	Maximum year: Surface (acres)	Minimum year: Content (acre-feet)	Minimum year: Surface (acres)
October	310,300	80,900	535,500	88,600	73,400	69,700
November	345,000	82,300	586,100	90,100	86,900	70,500
December	393,900	84,200	663,900	92,300	122,600	72,500
January	440,200	85,900	719,900	94,000	157,800	74,200
February	486,300	87,300	769,000	95,500	189,900	75,700
March	525,000	88,300	826,700	97,300	199,900	76,200
April	543,000	88,800	917,800	99,500	167,900	74,700
May	522,000	88,200	1,098,600	104,000	92,100	70,800
June	472,700	86,900	1,044,000	102,600	3,000	63,600
July	391,900	84,100	942,900	100,100	-18,300	61,000
August	335,200	81,900	886,100	98,700	-48,200	56,200
September	305,100	80,700	829,900	97,300	-75,100	49,800

[1] Active content would be 0 acre-feet at 9.3 feet below elevation 4489.34.

higher than historical minimum levels. Maximum lake levels would be reduced by regulation of inflows at upstream project facilities.

As shown in table 17, in an average year the surface area of Utah Lake would fluctuate about 7,600 acres. This fluctuation represents a change of 2.7 feet in water surface elevation, about 0.2 foot less than under future without project conditions.

Table 17.--Utah Lake active content[1] and surface area, alternative C

Month	Average year		Maximum year		Minimum year	
	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)	Content (acre-feet)	Surface (acres)
October	320,200	81,300	536,600	88,700	78,500	70,000
November	354,000	82,700	586,100	90,100	86,900	70,500
December	402,600	84,500	663,900	92,300	122,600	72,500
January	448,800	86,200	726,200	94,200	157,800	74,200
February	492,800	87,400	762,900	95,300	195,000	76,000
March	528,700	88,400	812,700	96,900	225,000	77,300
April	543,200	88,800	918,800	99,500	200,000	76,200
May	527,300	88,400	1,094,000	103,900	134,800	73,100
June	478,500	87,000	1,035,600	102,400	52,300	68,200
July	401,300	84,400	940,700	100,000	36,800	66,900
August	347,700	82,400	888,800	98,700	16,300	65,000
September	317,000	81,200	833,000	97,400	0	63,300

[1] Active content would be 0 acre-feet at 9.3 feet below elevation 4489.34.

In analyzing project-induced changes, existing and expected conditions were compared for each alternative. Present users of Utah Lake and Jordan River water are expected to divert water as they have in the past. The pattern of water release from the lake to Jordan River for present users would not be affected by Bonneville Unit operation. However, lake spills to the Jordan River would be regulated, reducing flows of the Jordan River during peak flow periods. Bonneville Unit impacts would also be realized from wastewater treatment facilities due to increased return flows of project municipal and industrial deliveries to Salt Lake County. To determine the streamflow patterns that would occur as a result of project operations under the different alternatives, a simulation flow model was created. From the model, simulated streamflows were determined for maximum, minimum, and average hydrologic conditions for the 1930 to 1973 period of study.

In an average year, operational releases to the Jordan River for irrigation and industrial uses would be about the same as the future without the project. Nearly all major canal diversions from the river would be made in the "Narrows" or a few miles to the north. Nearly all the lake water that remained in the river at 9400 South Street would be diverted at that point except when extra water was released to prevent flooding of the shorelines.

Flows of the river under project conditions from 9400 South Street to the Great Salt Lake would be nearly the same as flows for future without project conditions during the winter months. Expected streamflows during the summer period would be up to approximately 100 cfs greater during an average year due to increased return flows of project municipal and industrial water

deliveries. A summary of average monthly project and future without project flows of Jordan River for average, maximum, and minimum years is given in table 18.

Water quality

Existing Conditions

Present Strawberry Reservoir.--The water quality in Strawberry Reservoir is still similar to that described in the 1984 FES except that Strawberry Dam and Dike have been breached and there is only one large reservoir instead of two segments. New areas have been inundated, such as Indian Creek Bay, resulting in localized heavy algae blooms in the bay areas.

Since the FES, an interagency team under the direction of Reclamation has developed a 20-year work plan for stream bank stabilization on streams tributary to Strawberry Reservoir. Implementation of this program was started in 1984. However, the Forest Service now has management responsibility for lands surrounding Strawberry Reservoir through Public Law 100-563, which provides for the transfer of these lands from Reclamation to the Forest Service. Management plans to include a streambank stabilization program are currently being developed which will help resolve existing problems such as high nutrient loading to the reservoir and depleted stream riparian zones and associated fish and wildlife habitats. Stream rehabilitation program has not progressed far enough to noticeably improve water quality in Strawberry Reservoir, but the completed program is projected to reduce phosphorus loading by about 4,000 kilograms per year (kg/yr) which represents a reduction of nearly 50 percent of the historical load.

Future Strawberry Reservoir.--Future total dissolved solids (TDS) levels in Strawberry are projected to average about 150 milligrams per liter (mg/L) compared to the present level of about 170 mg/L. This projected value was used in projecting water quality conditions and impacts in the Diamond Fork System.

Diamond Fork/Spanish Fork River System.--Present conditions in this system were described in the Diamond Fork System FES. High spring runoff during 1983-85 caused flooding and streambank erosion. This has resulted in unstable streambanks, particularly in Diamond Fork, and associated higher silt and turbidity levels in the streams. The Forest Service has rehabilitated sections of Diamond Fork.

Table 18.--Jordan River future without project and project streamflows, alternative C (unit--cfs)

Month	Future without project monthly flows			Project monthly flows		
	Average year	Maximum year	Minimum year	Average year	Maximum year	Minimum year
		Jordan River at Narrows				
October	197	217	189	201	216	190
November	87	159	46	77	169	46
December	70	256	9	56	249	9
January	87	356	9	77	356	9
February	151	468	51	135	468	51
March	172	583	49	161	574	49
April	265	752	164	245	747	164
May	629	1,218	591	626	1,221	590
June	859	1,430	834	859	1,416	833
July	875	1,119	881	873	1,108	882
August	583	881	593	595	886	592
September	362	734	383	373	745	384
		Jordan River at 5800 South Street				
October	255	382	131	255	375	126
November	210	433	84	200	439	80
December	217	510	88	203	499	84
January	233	638	57	223	634	54
February	264	688	61	248	684	55
March	287	748	57	276	735	53
April	249	745	61	229	734	55
May	260	860	173	282	888	182
June	304	899	199	342	919	215
July	327	558	165	368	585	183
August	338	628	148	380	670	165
September	306	684	106	333	714	122
		Jordan River at 2100 South Street				
October	313	443	156	331	454	154
November	267	493	120	269	511	118
December	282	579	127	280	578	126
January	294	701	94	296	709	93
February	327	753	96	322	760	92
March	355	819	99	356	818	107
April	321	823	121	330	842	120
May	352	963	93	407	1,024	108
June	380	988	58	470	1,060	83
July	310	546	62	416	638	94
August	296	590	60	396	690	87
September	306	687	65	376	760	89

Table 18.--Jordan River future without project and project streamflows, alternative C (unit--cfs).--continued

Month	Future without project monthly flows			Project monthly flows		
	Average year	Maximum year	Minimum year	Average year	Maximum year	Minimum year
	Jordan River below Salt Lake City Wastewater Treatment Plant					
October	179	219	95	197	233	98
November	154	252	75	162	266	77
December	157	250	84	162	255	87
January	145	210	70	152	218	72
February	149	274	68	154	282	69
March	144	276	70	150	282	79
April	111	237	97	123	252	100
May	117	66	64	143	78	78
June	132	149	55	175	178	88
July	172	162	40	242	204	64
August	169	235	48	236	289	73
September	167	299	38	213	342	56

Utah Lake/Jordan River.--The most prevalent water quality violations in Utah Lake are BOD and TDS. However, these are largely natural and uncontrollable since the high TDS is mainly the result of evaporation from the lake and high biochemical oxygen demand (BOD) is the result of biological growth and decay in the lake itself. There are fewer other violations in the lake than in its tributaries since pollutant degradation, dilution, and mineral precipitation are at work in the lake. More violations occur along the eastern margin of the lake where most of the surface tributaries and treated wastewater enter, and in the southern margins of Goshen Bay where surface wash, shallow water, and evaporation are dominant factors.

TDS in Utah Lake and its tributaries vary markedly over time. Wet and dry cycles last several years and cause larger variations than seasonal factors. Average monthly TDS ranges from a low of 420 mg/L in May 1952 to a high of 14,660 mg/L in September 1935. The lowest annual TDS average was 570 mg/L for water year 1953 and the highest was 4,610 mg/L in 1935. The average TDS for the period of study (1930-73) was 1,120 mg/L. These TDS variations are largely the result of natural, long-term wet and dry cycles which cause large variations in the amount of inflow which dilutes the saltier lake water and also flushes saltier water from the lake via the Jordan River.

Hypereutrophic loadings of total phosphorous and inorganic nitrogen occur in Utah Lake. Thus even large changes in nutrient loadings should have little effect on the productivity of the lake since nutrients are several times above growth-limiting values. High turbidity causing light limitation seems to be the limiting factor rather than nutrients during the productive summer season. This high turbidity is caused by fine bottom sediments which are almost constantly stirred and resuspended by wave action.

In summary, large, long-term natural variations in salt occur in the lake and are a dominant feature in the overall water quality of the lake. When all possible beneficial uses are considered, the lake contains poor-to-fair quality water, mainly due to natural factors. However, it contains fair-to-good quality water when judged by its State classification. Since the lake is naturally turbid, it can assimilate existing quantities of pollutants with little damage to established beneficial uses.

Detention time in Utah Lake averages about 3 years based on outflows. Hence, degradable pollutants entering Utah Lake have very little effect on the Jordan River. Any increases in pathogenic microbes and organic debris, including herbicides, pesticides, and heavy metal loadings to the lake, are largely attenuated by the time the waters exit the lake via the Jordan River. Changes in salts carry on down the river, as do changes in lake turbidity to some degree.

Environmental Impacts

Strawberry Reservoir.--

Recommended plan.--Impacts on water quality would not be significantly different from those presented in the 1984 FES. As in the FES, two extreme temperature scenarios were used to evaluate impacts on the Diamond Fork system: (1) when water released from Strawberry Reservoir would come from above the thermocline[3] during the entire summer stratification period and (2) when water would come from below the thermocline during the entire summer stratification period. The relative percent of the time each scenario would occur would vary for each alternative as shown in table 19.

Table 19.--Temperature scenarios for future Strawberry Reservoir releases

Location	Percent of time (years)[1] alternative			
	Recommended plan	A	C	1984 FES plan
Above thermocline	35-55	30-50	15-35	5-15
Mixed	10-25	15-30	20-40	10-20
Below thermocline	25-40	35-45	35-55	60-80

[1] Percents are for strongest summer stratification during July-August based upon reservoir outlet level of 7515 feet elevation and 1930-73 monthly operation studies.

[3] The level within a lake where an abrupt and obvious temperature change occurs between the upper warm portion and the lower cold portion.

During most summer stratification periods (years), water would come from either above or below the thermocline all season but not from both. The line entitled "mixed" in table 19 indicates the percent of time (years) water could be released from within the thermocline or possibly below the thermocline the first part of the year and from within or above the thermocline during the latter part of the summer. The differences in the percent of time water is released from the different levels would not significantly impact water quality in Strawberry Reservoir, but the differences in reservoir operation and water levels would alter the relative volumes of reservoir water above and below the thermocline with associated water temperatures, dissolved oxygen levels, and nutrient levels.

Alternative A.--Water quality in Strawberry Reservoir under alternative A would be similar to the recommended plan. The average reservoir content would be about 3 percent greater (418,000 acre-feet compared to 406,000 acre-feet), and the average detention time would be about 14 percent shorter (1.96 years compared to 2.29 years). The probability of eutrophy for each alternative is about 50 to 60 percent.

Alternative C. -- Water quality in Strawberry Reservoir under alternative C also would be similar to the recommended plan. The average content would be about 15 percent greater (466,000 acre-feet compared to 406,000 acre-feet), and the average detention time would be about 18 percent longer (2.71 years compared to 2.29 years).

Diamond Fork/Spanish Fork River System.--Water quality conditions in Monks Hollow Reservoir and immediately downstream for each alternative and the 1984 FES plan are summarized in table 20. Salinity levels in Monks Hollow Reservoir and in water released downstream are projected to average about 200 mg/L TDS under each alternative, which is within the range of existing conditions.

Recommended plan. -- Water quality conditions in Monks Hollow Reservoir and downstream in Diamond Fork with the recommended plan are projected to be similar to those described for the 1984 FES plan. The probability of eutrophy would range from 35 to 95 percent and average about 60 percent, lower than in the FES plan.

Monks Hollow Reservoir is expected to weakly stratify during May and June but should mix during July and August due to reservoir

Table 20.--Monks Hollow Reservoir water quality data summary

	Present condition	Recommended plan	Alternative A	Alternative C[1]	1984 FES plan
Maximum capacity (acre-feet)[1]		33,100	33,100		31,400
Maximum surface area (acres)[1]		352	352		343
Maximum depth (feet)[1]		228	228		230
Average contents (acre-feet)[2]		16,220	16,080		23,800
Average surface area (acres)[2]		235	234		294
Mean depth (feet)[2]		69	69		82
Detention time (days)[2]		18	16		20-40
Maximum reservoir temperature (°C)					
Condition A[3]		9-15	9-15	7-11	9-15
Condition B[4]		17-20	17-20	17-20	17-20
Maximum release temperature (°C)					
Condition A[3]	17-21	9-15	9-15	7-11	9-15
Condition B[4]	17-21	17-20	17-20	17-20	17-20
Maximum dissolved oxygen (mg/L)					
Condition A[3]	7-11	4-8	4-8	[5]6-10	[5]4-8
Condition B[4]	7-11	6-10	6-10	6-10	6-10

[1]Values given are projected for Diamond Fork in the Monks Hollow area for comparison with other alternatives.

[2]Average conditions during the May-September period.

[3]Condition A is for those years when water is released from below the thermocline in Strawberry Reservoir.

[4]Condition B is for those years when water is released from above the thermocline in Strawberry Reservoir.

[5]Dissolved oxygen would remain near saturation within a short distance (one-quarter to one-half mile) because of turbulence caused by the steep mountain terrain.

drawdown and large flushing flows. The average detention time for outflowing water would range from 60 days for May to 10 days for July and August and average 18 days for the May-September period. Density currents may develop at times.

As committed to in the 1984 FES, a monitoring program would be established to ensure satisfactory water quality. This program should last 5 to 10 years to adequately determine if a problem exists. If problem water temperatures or low dissolved oxygen levels in Diamond Fork occurred during project operation, a multilevel outlet on Monks Hollow Dam, aerators or destratifiers on Strawberry or Monks Hollow Reservoirs, or warming ponds or aerators on Diamond Fork below Monks Hollow Reservoir would be constructed, at project expense, as determined practical. Any power requirements would be small and would come from project power allocations. Reclamation would coordinate the monitoring program, the associated water quality studies, and the

development of any required mitigation measures with the State Bureau of Water Pollution Control and the appropriate resource agencies.

The projected low inorganic nitrogen concentrations and relatively high phosphorus concentrations in Monks Hollow Reservoir indicate about a 70 to 85 percent probability of blue-green algal dominance at least seasonally. However, as discussed in the 1984 FES, this is typical of northern Utah reservoirs and is not an issue requiring specific control plans or mitigation measures. The high hydraulic flushing rates may also induce physical mixing conditions incompatible with blue-green algae dominance. Thus, conditions may be better than predicted by existing empirical models. The high hydraulic flushing rate of Monks Hollow Reservoir exceeds the limits of great reliability in predicting eutrophy. This mixing should preclude the development of dissolved oxygen problems severe enough to cause fish kills often associated with blue-green algal blooms.

With operation of the recommended plan, turbidity and suspended solids would be significantly reduced in the upper 6.0 miles of Sixth Water Creek (from Strawberry Tunnel to Last Chance Powerplant) and in Diamond Fork below Monks Hollow Reservoir, as shown in table 21. Sediment load and channel erosion in upper

Table 21.--Monks Hollow Reservoir sediment load summary.

	Recommended plan	Alternative A	1984 Final Environmental Statement[1]
Total inflow (acre-feet)[2]	182,800	218,600	215,000
Reservoir capacity (acre-feet)	33,100	33,100	31,400
Capacity to inflow	0.18	0.15	0.15
Trap efficiency (percent)	[3] 92	[3] 91	91
100-year deposition (acre-feet)	[4] 1,310	[4] 1,300	[5] 1,270
Sediment of reservoir capacity (percent)	4	4	4
Annual sediment release (acre-feet)	1.1	1.2	1.2

[1] Figures differ insignificantly from the 1984 FES because of an adjustment for sediment storage in Sixth Water Reservoir.
[2] Includes both natural and Syar Tunnel flows.
[3] In years when cold water is withdrawn from below the thermocline in Strawberry Reservoir, underflow density currents may develop in Monks Hollow Reservoir. Under this condition, the sediment trapping efficiency of Monks Hollow Reservoir would be reduced and downstream turbidity levels would be increased.
[4] Based on annual sediment load of 14.2 acre-feet at damsite.
[5] Based on annual sediment load of 13.9 acre-feet at damsite and 0.3 acre-feet of storage in Sixth Water Reservoir.

Sixth Water Creek would be reduced because of the large reduction in releases from Strawberry Tunnel. Flows in the lower 3.8 miles of Sixth Water Creek from Last Chance Powerplant to Monks Hollow reservoir would be increased from a maximum monthly of 420 ft^3/s to 600 ft^3/s because of powerplant releases. This increase would result in increased channel erosion and sediment load in this reach. The increase would be offset by the reduction in the upper 6.0 miles. In Diamond Fork at Monks Hollow Dam, about 92 percent of the sediment inflow would be retained in the reservoir. As shown in table 22, the total sediment load at the mouth of Diamond Fork would be reduced about 62 percent from present conditions primarily because of sediment retention in Monks Hollow Reservoir. The Diamond Fork Pipeline would reduce flows in the Diamond Fork channel which would result in less turbidity, less channel erosion, and greater channel stability.

A monitoring program would be established to ensure satisfactory water quality in Diamond Fork. Impacts of the recommended plan on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River would be presented in the environmental statement on the I&D System.

Alternative A.--Water quality conditions in Monks Hollow Reservoir and downstream in Diamond Fork with alternative A are projected to be similar to those under the recommended plan. The probability of eutrophy would also range from 35 to 95 percent and average about 60 percent. The average detention time for outflowing water would range from 50 days during May to 8.5 days during September and average 16 days for the May-September period.

Table 22.--Stream sediment load summary (unit--tons/year)[1].

		Alternative			1984 Final Environmental Statement[2]
	Present load	Recommended plan	A	C	
	22,500	22,500	22,500	22,500	22,100
Below Monks Hollow Dam	22,500	1,750	1,910		1,910
At mouth of Diamond Fork	33,400	12,650	12,810	[3]32,840	12,810
Percent reduction at mouth of Diamond		62	62	3	62

[1] Based on a unit weight of 1589 tons/acre-foot.

[2] Figures differ insignificantly from the 1984 FES because of an adjustment for sediment storage in Sixth Water Reservoir.

[3] Small reduction in sediment because of Three Forks Reservoir.

Under operation of alternative A, turbidity and suspended solids levels would be significantly reduced in the upper 7.5 miles of Sixth Water Creek (from Strawberry Tunnel to Last Chance Powerplant) and in Diamond Fork below Monks Hollow Reservoir, as shown in table 21. Sediment load and channel erosion in upper Sixth Water Creek would be reduced because of the large reduction in releases from Strawberry Tunnel. Flows in the lower 2.3 miles of Sixth Water Creek from Last Chance Powerplant to Monks Hollow Reservoir would increase from a maximum monthly value of 420 ft^3/s to 600 ft^3/s because of powerplant releases. This increase would result in increased channel erosion and sediment load in this reach. This increase would be offset by the reduction in the upper 7.5 miles. In Diamond Fork at Monks Hollow Dam about 91 percent of the sediment inflow would be retained in the reservoir. As shown in table 22, the total sediment load at the mouth of Diamond Fork would be reduced about 62 percent from present conditions primarily because of sediment retention in Monks Hollow Reservoir. The Diamond Fork Pipeline would reduce flows in the Diamond Fork channel which would result in less turbidity, less channel erosion, and greater channel stability.

As in the recommended plan, a monitoring program would be established to ensure satisfactory water quality in Diamond Fork.

Alternative C. -- With alternative C, water quality would generally be similar to the recommended plan. The absence of Monks Hollow Reservoir would result in colder water being released into Diamond Fork under the cold water scenario (Condition A in table 11). Maximum summer temperatures under that scenario would only reach 7 to 11 °C (refer to table 20). Dissolved oxygen levels in Diamond Fork would be near saturation due to reaeration in the stream.

With alternative C, average annual flows in the Spanish Fork River would be higher than both present conditions and the recommended plan. Average annual flows in the upper Spanish Fork River would be 68 percent higher than present conditions and 23 percent higher than for the recommended plan. Average annual flows in the lower Spanish Fork River would be 1.6 times greater than present conditions and 63 percent high than for the recommended plan.

Average monthly flows would be up to 60 percent greater than present conditions in the upper Spanish Fork River and up to 5 times greater in the lower Spanish Fork River.

The increased flows in the upper Spanish Fork River under alternative C would result in additional bank erosion and sediment load. Increased flows in the lower Spanish Fork River, particularly in late summer and winter, would improve water

quality in the lower reaches by diluting the low flows which presently consist mostly of seepage and return flows.

As shown in table 22, without Monks Hollow Reservoir the sediment load at the mouth of Diamond Fork would not be noticeably reduced.

Utah Lake/Jordan River.--The primary indicator of project impacts in Utah Lake is the level of TDS in mg/L. TDS levels in Utah Lake and its tributaries differ markedly over time. These temporal variations consist of both seasonal patterns and longer term, wet and dry cycles.

A computer model (LKSIM), used to model the water and salt balance for the lake system, has been used to predict the salinity levels expected under alternative C and for historical and future without project conditions.

Modeling or other simulations over the long term for other quality constituents, such as pesticides, bacteria counts, nutrient levels, trace metals, and organic concentrations, is not practical. Although these constituents also would experience long-term variations, the variations would be much smaller since they are much less dependent on water quantities and evaporation than the salts. These other constituents are typically generated in large part from wastewater discharges, storm runoff, and pollutant dumping which are more independent of the water quantities in the lake system. Table 23 contains a comparison of average, maximum, and minimum TDS values for historical and future without project conditions and alternative C. The average TDS level for alternative C (1030 mg/L) would be about 6 percent less than the future without project level which would result in a slight improvement in the lake salinity level. This improvement is the result primarily of operating the lake at a higher level in low water years. The total inflow and outflow to the lake are approximately the same under future without project and alternative C.

Since water quality at the Jordan River Narrows is controlled primarily by the water quality in Utah Lake, TDS at the Narrows would average about 1030 mg/L with alternative C which would be a slight improvement over future without project conditions. Other water quality parameters would not be significantly impacted by the project, as previously discussed.

Impacts of the recommended plan and alternative A on Utah Lake and the Jordan River will be discussed in more detail the I&D System environmental statement.

Table 23.--Utah Lake salinity levels comparison of alternatives (1930-73).

Condition simulated	Utah Lake TDS (mg/L)		
	Average	Maximum	Minimum
Historical	1,120[2]	14,660	420
Future without project[1]	1,090	6,110	460
Alternative C	1,030	2,490	490

[1] Assumes full Provo River Project development. The average and maximum TDS values would be reduced if high quality M&I return flows entered the lake during the dry periods of the 1930's.
[2] Simulated maximum value resulting from 1934-35 drought.

Fish

Existing Conditions

Stream Fisheries.--The 1984 FES provided a detailed description of the fishery values of the Spanish Fork River, Diamond Fork, and Sixth Water Creek. Fifth Water Creek also was described in the 1984 FES but is not included in this analysis because none of the alternatives would affect this stream. Estimates of standing crop, habitat units, and angler use were developed for each stream for both wild and stocked trout in the FES. These estimates have been updated and revised in this analysis. Several stream reaches have been subdivided since the FES analysis to better define the project impacts on streamflows and to allow impact analysis of specific features. Reach 2A of the Spanish Fork River is dewatered by a major irrigation diversion during the summer, while Reach 2B would contain a substantial amount of water and associated fish habitat with the project that does not presently exist. In addition, Reach 1A of Sixth Water Creek would be inundated by Monks Hollow Reservoir under the recommended plan and alternative A, while Reach 1C would be inundated by Three Forks Reservoir under alternative C. Reaches 1B and 1D apply to each alternative, respectively, and extend from each reservoir to Fifth Water Creek. Reach 2A extends to the Last Chance Powerplant, as described in alternatives A and C, with Reach 2B stretching from that point to Reach 3. For the recommended plan, Reach 2B was further subdivided. Reach 2B(i) extends from the upper boundary of Reach 2A 1.5 miles upstream to the Last Chance Powerplant site. Reach 2B extends from the powerplant site to Reach 3. The following map depicts the various stream reaches which would be affected. Estimated existing fishery values of the Spanish Fork River, Diamond Fork, and Sixth Water Creek are presented in tables 24, 25, and 26, respectively.

T.6S.

T.7S.

T.8S.

T.9S.

T.10S.

R.2E.

R.3E.

R.4E.

R.5E.

R.6E.

UTAH LAKE

UINTA NATIONAL FOREST

MANTI – LASAL NATIONAL FOREST

PROVO RIVER

Provo Airport

PROVO

Springville

Spanish Fork near Lake Shore

LAKESHORE CANAL DIVERSION

Spanish Fork

SPANISH FORK

2A

2B

MILL RACE CANAL DIVERSION

EAST BENCH CANAL DIVERSION

SPANISH FORK DIVERSION

Salem

Payson

Santaquin

Spanish Fork near Castilla

Hobble Creek

Left Fork

Right Fork

Diamond Fork below Red Hollow

Diamond Fork near Thistle

Three Forks

MONKS HOLLOW RESERVOIR

Diamond Fork

Soldier Creek

Thistle Creek

Springville Crossing

Strawberry Tunnel at West Portal

Existing Strawberry Tunnel

Strawberry Reservoir

STRAWBERRY RIVER

WASATCH COUNTY UTAH

Water Creek

2B1

FIFTH WATER RESERVOIR

Sixth Water Creek

Fifth Water Creek

Fourth Water Creek

Third Water Creek

Second Water Creek

First Water Creek

Indian Creek

Chipman Creek

Carbonate Creek

KEY MAP

PROJECT AREA

UTAH

SCALE OF MILES

0 1 2 3 4 5

EXPLANATION

- (4) Fishery Study Sections
- Study Section Boundaries
- ▲ Gaging Stations
- Potential Reservoirs

REVISED JANUARY 1990

FIGURE 26

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL UTAH PROJECT
BONNEVILLE UNIT–UTAH

DIAMOND FORK SYSTEM

FISHERY STUDY SECTIONS AND STREAM GAGING STATIONS

DESIGNED _____ FIELD APPROVAL _____
DRAWN _____ TECHNICAL APPROVAL _____
CHECKED _____ APPROVED _____

PROVO, UTAH MAY 1983 66–418–5636

Table 24.--Trout fisheries data estimated for the Spanish Fork River below its confluence with Diamond Fork (1986).

Stream reach	Wild trout				Stocked trout		
	Standing Crop		Habitat	Angler use	Standing crop		Angler use
	Pounds/ acre	Pounds/ reach	units/ reach[1]	(days/ year)	Pounds/ acre	(Pounds/ reach)	(days/ year)
1. From Utah Lake upstream to end of Utah Lake backwater	No sample	No sample	No sample	No sample	0	0	0
2a. From backwater of Utah Lake upstream to Lake Shore Canal Diversion (5.7 miles)	0	0	0	0	0	0	0
2b. From Lake Shore Canal Diversion upstream to Mill Race Canal Diversion (7 miles)	0	0	0	0	0	0	0
3. From Mill Race Canal Diversion upstream to East Bench Canal Diversion (2.8 miles)	0	0	0	0	0	0	0
4. From East Bench Canal Diversion upstream to Spanish Fork Diversion Dam (1.6 miles)	5.0	16	17	10	0	0	0
5. From Spanish Fork Diversion Dam upstream to Diamond Fork confluence (4.2 miles)	8.3	224	242	172	0	0	0
Total		240	259	182	0	0	0

[1] Habitat was developed using the Binns and Eiserman method of stream evaluation.

Table 25.--Trout fisheries data estimated for Diamond Fork (1986).

Stream reach	Wild trout				Stocked trout		
	Standing crop		Habitat	Angler use	Standing crop		Angler use
	Pounds/ acre	Pounds/ reach	units/ reach	(days/ year)	Pounds/ acre	Pounds/ reach	(days/ year)
1. From Spanish Fork River upstream to Brimhall Canyon (5.0 miles)	10.1	371	401	238	57.6	2,107	3,733
2. From Brimhall Canyon upstream to proposed Monks Hollow Dam (3.0 miles)	11.8	183	198	109	57.6	893	1,582
3. From proposed Monks Hollow upstream to Sixth Water Creek (2.4 miles)	3.6	28	31	17	0	0	0
4. From Sixth Water Creek upstream to high water line of proposed Monks Hollow Reservoir (0.2 mile)	91.8	39	43	30	0	0	0
Total		621	673	394		3,000	5,315

Table 26.--Trout fisheries data estimated for Sixth Water Creek (1986).

Stream reach	Wild trout				Stocked trout		
	Standing crop		Habitat units/ reach	Angler use (days/ year)	Standing crop		Angler use (days/ year)
	Pounds/ acre	Pounds/ reach			Pounds/ acre	Pounds/ reach	
1. From Diamond Fork upstream to Fifth Water Creek (1.1 miles)	21.7	74	80	47	0	0	0
2. From Fifth Water Creek upstream (3.3 miles)	19.5	199	215	128	0	0	0
3. From upper boundary of Reach 2 upstream to West Portal (5.4 miles)	21.6	478	517	307	0	0	0
Total		751	812	482	0	0	0

Strawberry Reservoir.--Strawberry Reservoir has long been one of the best flatwater fisheries in the State of Utah. The reservoir is a Class I fishery as classified by the Utah Division of Wildlife Resources (UDWR) and currently provides about 250,000 angler days of use each year. The reservoir has also been the primary source of eggs for native cutthroat trout used in fish hatcheries in the State. UDWR annually stocks over 1 million cutthroat, rainbow, and brook trout in the reservoir. Strawberry Reservoir, enlarged as a result of the construction of Soldier Creek Dam and the breaching of Strawberry Dam, has considerably more potential for supplying high quality, family-oriented fishing. The UDWR has annually stocked 300,000 rainbow trout in the Soldier Creek arm of the reservoir for the past several years.

As presented in the 1973 Bonneville Unit FES, the enlarged Strawberry Reservoir will increase in maximum surface area from 8,400 acres to 17,120 acres. Recreation facilities have been constructed and lands within the reservoir management boundary have been converted from private to public (Forest Service) management. This has provided for greater public accessibility. The resulting angler use is estimated to increase from 206,700 angler days under historical conditions to an annual average of 252,500 angler days (table 27), resulting in an annual increase of over 22 percent. The (UDWR) management objective for the Strawberry Reservoir fishery is to provide a family recreational fishery by maintaining a minimum of about 250,000 angler days annually with a catch rate of 0.4 fish/hour. The desired game fish is about 12 inches in length and weighs about two-thirds of a pound.

The following fish species inhabit the reservoir:

rainbow trout (abundant)	longnose dace (scarce)
cutthroat trout (abundant)	fathead minnow (scarce)
brook trout (common)	Utah chub (increasingly abundant)
mountain sucker (scarce)	leatherside chub (scarce)
Utah sucker (abundant)	sculpin (scarce)
speckled dace (common)	redside shiner (abundant)

Of particular importance are the increasing populations of Utah chub and Utah sucker, which are effective competitors with trout. By using the food supply and habitat preferred by trout, large numbers of chubs have resulted in a deterioration of the trout fishery. The very large chub and sucker population in Strawberry Reservoir has caused a decline of angling success and pressure despite increased fish stocking. This trend is expected to continue, with angler use projected to decline to about 100,000 days annually if no remedial action is taken. An interagency team, which includes the Bureau of Reclamation, the Utah Division of Wildlife Resources, the Fish and Wildlife

Table 27.--Trout fisheries data estimated for Strawberry Reservoir.[1]

	Average surface area (acres)	Average standing crop (pounds)	Average angler use (days/year)
Historical[2]	5,900	1,463,200	206,700
Projected (1973 FES)[3]	12,000	1,956,000	252,500

[1] U.S. Fish and Wildlife Service. 1988. Draft Fish and Wildlife Coordination Act Report.

[2] Values were based on annual averages for 1930-73.

[3] Values were based on averages for years 1921-60 (the only data available for the Definite Plan Report as presented in the 1973 FES).

Service, the Forest Service, and private groups, has developed a plan to combat this problem. This plan would involve the treatment of the epilimnetic waters (top 30 feet) of Strawberry Reservoir in August and its tributaries in August and October with rotenone to eliminate an estimated 95 percent of the chubs and suckers in the drainage. Several species of game fish, selected for their ability to meet the UDWR's management goals for the fishery by limiting the nongame fish population, would be stocked in the reservoir about 6 weeks following treatment. Successful implementation of the plan would ensure projected angler use. However, the UDWR estimates that angler use could reach 300,000 days/year with this treatment and subsequent management program.

Another important fishery concern is the advanced nutrient enrichment (eutrophic) condition of Strawberry Reservoir and the potential for more intense problems if the situation is not controlled. The present eutrophication status has been described under the discussion of water quality. Periodic fish kills have been observed and appear to have been caused by excessive depletion of dissolved oxygen or may have been related to toxic substances released during decomposition of algal blooms. Fish mortality has been recorded in past years mainly during periods of low water levels. With the passage and implementation of Public Law 100-563, the Forest Service will take the lead in managing the 55,775 acres of Strawberry Valley Project lands proposed for transfer to their jurisdiction. The Forest Service will assume responsibility for developing appropriate management plans and resolving issues relating to livestock grazing, nutrient loading to the reservoir, depleted riparian zones, and related restoration of degraded fish and wildlife habitat on project lands.

Environmental Impacts

Stream Fisheries.--The 1984 FES provided a description of the methodology and assumptions used in the analysis of fisheries impacts. That description remains unchanged. However, in order to provide a more equal basis for comparison between project plans and associated fishery impacts presented in this document and in the 1984 FES, the updated information utilized as input to the habitat model was also applied to the future without project (table 28) and the 1984 plan through the same model (see table 29). These data refinements included the use of a more precise approach to the development of projected stream widths and water velocities, differences in project flows and features, and the fact that Fifth Water Creek was deleted from the analysis because it would be unaffected by the project. The above adjustments to the analysis provide comparability among the project plans, with all fishery-related differences among them caused only by differences in plans and operations rather than methods or data base. An additional difference is that hatchery trout under alternative C would be stocked at a rate of 16,217 pounds, or 49,142 fish, rather than 14,000 pounds, or 42,400 fish, as with the recommended plan and alternative A. Five years after project implementation, a stocking program of this magnitude would produce about 31,654 angler days annually with the recommended plan and alternative A and 35,582 angler days with alternative C.

Twenty years after implementation of either the recommended plan or alternative A, an angler-use carrying capacity of about 66,900 angler days would be reached and maintained through the remaining life of the project, whereas implementation of alternative C would produce about 87,500 angler days. A carrying capacity of 68,600 angler days was presented in the 1984 FES analysis.

The UDWR has agreed to provide half of the fish to be stocked and the remainder would be provided by Reclamation. The fish would be stocked at a rate of 306 to 336 pounds per acre, depending upon the specific alternative, which is similar to current stocking rates on several streams of equal size along the Wasatch Front, including Big Cottonwood Creek and the lower Provo River.

Recommended plan. -- The recommended plan would result in overall enhancement of stream fisheries in the Diamond Fork area, mostly as a result of the Diamond Fork Pipeline. Wild trout standing crop (total weight), habitat units (quality indicator), and angler use would increase over existing conditions by 35 percent, 35 percent, and 6 percent, respectively (table 30).

Table 28.---Trout fishery evaluation, fifth year of operation future without project.

Stream	Reach	Wild trout				Stocked trout		
		Standing crop		Habitat		Standing crop		
		Pounds/ acre	Pounds/ reach	units/ reach	Angler use (days/year)	Pounds/ acre	Pounds/ reach	Angler use (days/year)
Spanish Fork River	2a	0	0	0	0	0	0	
	2b	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
	4	5.0	16	17	21	0	0	0
	5	8.3	224	242	357	0	0	0
Diamond Fork	1	10.1	371	401	495	57.6	2,107	7,761
	2	11.8	183	198	227	57.6	893	3,289
	3	3.6	28	31	36	0	0	0
	4	91.8	39	43	63	0	0	0
Sixth Water	1	21.7	74	80	98	0	0	0
	2	19.5	199	215	264	0	0	0
	3	21.6	478	517	638	0	0	0
Total			1,612	1,744	2,199		3,000	11,050

Table 29.--Trout fishery evaluation, fifth year of operation 1984 FES plan.

Stream	Reach	Wild trout				Stocked trout		
		Standing crop		Habitat		Standing crop		
		Pounds/ acre	Pounds/ reach	units/ reach	Angler use (days/year)	Pounds/ acre	Pounds/ reach	Angler use (days/year)
Spanish Fork River	2a	0	0	0	0	0	0	0
	2b	4.2	116	125	48	0	0	0
	3	1.2	13	14	10	0	0	0
	4	1.5	6	7	11	0	0	0
	5	7.5	213	230	272	0	0	0
Diamond Fork	1	32.4	872	941	816	353	9,510	21,502
	2	36.5	462	501	392	353	4,490	10,152
	3	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0
Sixth Water	1a	0	0	0	0	0	0	0
	1b	29.4	50	54	57	0	0	0
	2a	36.5	73	79	97	0	0	0
	2b	36.5	124	134	167	0	0	0
	3	38.0	491	530	646	0	0	0
Total			2,420	2,615	2,516		14,000	31,654

Table 30.--Predicted effects of alternatives on stream trout fisheries 5 years after operation begins.

Alternative	Wild trout			Stocked trout	
	Standing crop (pound)	Habitat units	Angler use (days/ year)	Standing crop (pound)	Angler use (days/ year)
Existing condition	1,612	1,744	2,199	3,000	11,050
Recommended plan	2,183	2,348	2,332	14,000	31.654
Alternative A	2,338	2,527	2,430	14,000	31,654
Alternative C	3,123	3,377	2,945	16,217	35,582
1984 FES	2,420	2,615	2,516	14,000	31,654

Reach 4 of the Spanish Fork River would be slightly enhanced by project flows, with standing crop, habitat units, and angler use increasing by 12 percent, 12 percent, and 5 percent. Under project operation, increased flows in reach 5 would degrade fish habitat, primarily because of excessive water velocities. Wild trout standing crop, habitat units, and angler use would decrease by 31 percent, 31 percent, and 36 percent, respectively, in reach 5. These categories for all reaches of the Spanish Fork River combined would decrease by 28 percent, 28 percent, and 34 percent, respectively, under the recommended plan. Wild trout standing crop, habitat units, and angler use would increase by 163 percent, 163 percent, and 79 percent, respectively, in the lower two reaches of Diamond Fork (table 31). This significant gain more than compensates for the complete loss of habitat in reaches 3 and 4 of Diamond Fork because of inundation by Monks Hollow Reservoir, as well as the reduction in habitat on the Spanish Fork River, as discussed above, and Sixth Water Creek, as discussed below.

The Sixth Water Creek fishery would be adversely affected in reaches 1, 2A, and 2B(i) by the recommended plan. Reach 1A would be inundated by Monks Hollow Reservoir. Reductions in trout habitat in reaches 1B, 2A, and 2B(i) would occur because project water would enter the stream directly below the Last Chance Powerplant about 3.8 miles above Diamond Fork. These flows would be about 150 to 200 cfs higher than existing levels and would exhibit excessive water velocities and associated habitat degradation. Standing crop, habitat units, and angler use would decrease by 89 percent, 89 percent, and 75 percent, respectively, from existing conditions (table 31). Reaches 2B(ii) and 3 would revert to carrying natural flows throughout the year, which would be much less than existing irrigation flows. These lower natural flows would provide a slightly higher level of trout habitat because of the removal of the scouring irrigation flows from the channel. Standing crop and habitat units would show a 2 percent

Table 31.--Trout fishery evaluation, fifth year of operation, recommended plan.

Stream	Reach	Wild trout				Stocked trout		
		Standing crop		Habitat		Standing crop		
		Pounds/ acre	Pounds/ reach	units/ reach	Angler use (days/year)	Pounds/ acre	Pounds/ reach	Angler use (days/year)
Spanish Fork River	2a	0	0	0	0	0	0	0
	2b	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
	4	5.1	18	19	22	0	0	0
	5	5.6	155	167	227	0	0	0
Diamond Fork	1	36.5	1,059	1,144	937	333	9,677	21,880
	2	30.7	399	431	354	333	4,323	9,774
	3	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0
Sixth Water	1a	0	0	0	0	0	0	0
	1b	2.6	9	9	31	0	0	0
	2a	2.6	11	12	36	0	0	0
	2b(i)	2.6	6	7	39	0	0	0
	2b(ii)	36.5	35	38	40	0	0	0
	3	38.1	491	530	646	0	0	0
Total			2,183	2,348	2,332		14,000	31,654

and 1 percent increase, respectively, over existing conditions. Angler use would remain about the same.

As indicated in table 30, standing crop, habitat units, and angler use provided by the 1984 FES plan would be about 10 percent, 10 percent, and 7 percent higher, respectively, than for the recommended plan. This would be primarily because of better flows and subsequently improved trout habitat on specific reaches of all three streams with the 1984 FES plan (tables 30 and 31).

The recommended plan would have no major fishery impact from temperature and oxygen levels of water released below Monks Hollow Dam, as presented in the water quality section of this supplement and in the 1984 FES.

Flows in the Jordan River would be slightly affected with the recommended plan. These impacts will be discussed in the I&D System draft environmental statement. A general comparison of temperatures in Diamond Fork below Monks Hollow is presented in table 20. Maximum stream temperatures are shown for operational options representing years when water in Strawberry Reservoir is released from both above and below the thermocline. Releases from above the thermocline would have predicted maximum water temperatures of 17 to 20 °C for this alternative. These temperatures are similar to existing maximum temperature levels in Diamond Fork. Trout populations, therefore, would not be appreciably affected compared to present conditions. Maximum water temperatures of 9 to 15° C predicted with releases below the thermocline in Strawberry Reservoir would be approaching the lower end of the trout tolerance range, which could adversely affect trout growth.

Alternative A.--Like the recommended plan, this alternative would cause considerable enhancement to the overall fishery resource because of the Diamond Fork Pipeline. Wild trout standing crop, habitat units, and angler use would show an overall increase of 45 percent, 45 percent, and 11 percent, respectively, over existing conditions (table 32). Standing crop, habitat units, and angler use on the Spanish Fork River would exhibit an overall decrease of 22 percent, 21 percent, and 31 percent, respectively, although Reaches 3 and 4 would indicate enhancement of 100 percent, 106 percent, and 57 percent, respectively for these parameters. These parameters would also show a general reduction on Sixth Water Creek of 15 percent, 16 percent, and 16 percent, respectively. However, the fishery enhancement associated with the Diamond Fork Pipeline on lower Diamond Fork more than compensates for this reduction by removing high project flows from the channel. Wild trout standing crop,

Table 32.--Trout fishery evaluation, fifth year of operation, alternative A.

		Wild trout				Stocked trout		
		Standing crop		Habitat		Standing crop		
Stream	Reach	Pounds/ acre	Pounds/ reach	units/ reach	Angler use (days/year)	Pounds/ acre	Pounds/ reach	Angler use (days/year)
Spanish Fork River	2a	0	0	0	0	0	0	0
	2b	0	0	0	0	0	0	0
	3	2.0	14	15	11	0	0	0
	4	5.1	18	20	22	0	0	0
	5	5.6	156	169	228	0	0	0
Diamond Fork	1	34.0	1,091	1,179	957	306	9,812	22,185
	2	30.7	422	455	368	306	4,188	9,469
	3	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0
Sixth Water	1a	0	0	0	0	0	0	0
	1b	2.6	10	11	31	0	0	0
	2a	2.6	12	14	37	0	0	0
	2b	36.5	124	134	130	0	0	0
	3	38.1	491	530	646	0	0	0
Total			2,338	2,527	2,430		14,000	31,654

habitat units, and angler use would increase by 173 percent, 173 percent, and 84 percent, respectively, in Reaches 1 and 2 of Diamond Fork.

Wild trout standing crop, habitat units, and angler use produced by the 1984 FES plan would all be about 3 percent higher than for alternative A (table 30). This is primarily because of better flows and associated habitat on specific reaches of all streams with the 1984 FES plan.

The effects of this alternative on temperature and oxygen levels of water released below Monks Hollow Reservoir would be essentially the same as for the recommended plan and the 1984 FES plan.

Flows in the Jordan River would be slightly affected with alternative A. These impacts will be discussed in the I&D System draft environmental statement.

Alternative C.--Like the recommended plan, alternative C would cause considerable enhancement to the fishery resource because of the inclusion of the Diamond Fork Pipeline. Wild trout standing crop, habitat units, and angler use would be increased overall by 93 percent, 93 percent, and 34 percent, respectively (table 33). The lack of an Irrigation and Drainage System and a Monks Hollow Reservoir with this alternative provides excellent winter streamflows for trout as well as 2.4 miles of additional enhanced stream fisheries from an extended Lower Diamond Fork Pipeline. Although the potential for low summer water temperatures in Reach 3 of Diamond Fork causes the overall projected fisheries benefit in that reach to be substantially lower than it could otherwise, the overall benefit to fisheries would be much higher than with the other alternatives. Trout standing crop, habitat units, and angler use under this alternative would show an overall decrease on the Spanish Fork River of 4 percent, 4 percent, and 23 percent, respectively (tables 28 and 33). These parameters would exhibit an overall decrease on Sixth Water Creek of 17 percent, 17 percent, and 16 percent, respectively. As with the recommended plan and alternative A, however, this reduction is much more than offset by the fishery enhancement on lower Diamond Fork associated with the Diamond Fork Pipeline removing excessive project flows from the stream channel. Trout standing crop, habitat units, and angler use would increase by 290 per- cent, 289 percent, and 140 percent, respectively, in reaches 1, 2, and 3 of Diamond Fork with this alternative.

Wild trout standing crop, habitat units, and angler use provided by the 1984 FES plan would be about 29 percent, 29 percent, and 17 percent lower, respectively, than for alternative C

Table 33.--Trout fishery evaluation, fifth year of operation, Alternative C.

Stream	Reach	Wild trout				Stocked trout		
		Standing crop		Habitat		Standing crop		
		Pounds/ acre	Pounds/ reach	units/ reach	Angler use (days/year)	Pounds/ acre	Pounds/ reach	Angler use (days/year)
Spanish Fork River	2a	0	0	0	0	0	0	0
	2b	0	0	0	0	0	0	0
	3	.2	1	1	1	0	0	0
	4	7.6	26	28	27	0	0	0
	5	7.5	204	220	264	0	0	0
Diamond Fork	1	56.1	1,612	1,743	1,290	336	9,659	21,839
	2	47.5	612	662	482	336	4,341	9,815
	3	6.5	43	47	45	336	2,217	3,928
	4	0	0	0	0	0	0	0
Sixth Water	1c	0	0	0	0	0	0	0
	1d	1.8	3	4	27	0	0	0
	2a	1.8	7	8	33	0	0	0
	2b	36.5	124	134	130	0	0	0
	3	38.1	491	530	646	0	0	0
Total			3,123	3,377	2,945		16,217	35,582

(table 30), mainly because of the enhanced winter streamflows and the additional 2.4 miles of stream fishery available with the Monks Hollow Reservoir basin with this alternative.

The operational effects of the recommended plan on temperature and oxygen levels of water released below Monks Hollow Dam would be similar to the recommended plan. One exception is the projected low temperature range, 7 to 11 °C, predicted during years when water is released below the thermocline in Strawberry Reservoir. These temperatures are too low for trout and would likely limit growth and overall productivity in reaches 1 through 3 of Diamond Fork.

Oxygen levels in Diamond Fork below Three Forks would be maintained between 6 and 10 mg/L under this alternative as there would be no Monks Hollow Reservoir. These levels are near saturation and would have no impact on fisheries. The sediment load at the mouth of Diamond Fork would be reduced by about 3 percent, compared to a reduction of about 87 percent with the recommended plan and alternative A.

With alternative C, flows in the Jordan River would be about the same as at present from Utah Lake to 9400 South Street in Salt Lake County. From 9400 South Street to the Great Salt Lake, flows would be comparable to future without project conditions during most of the year but summer flows would be 20 to 105 cfs higher. Impacts on this already severely-stressed reach would not be significant, however, because of existing poor water quality, channelization, and irrigation diversions. Impacts of alternative C on Utah Valley streams and the Jordan River would not be significant.

Reservoir Fisheries.--

Monks Hollow Reservoir.--Since the cold water fishery in Monks Hollow Reservoir would consist entirely of stocked trout, potential productivity and angler used were based on several assumptions. These included specified trout stocking rates, growth rates, carryover, creel return, average catch rate, and angler-day length.

In order to provide comparability between the recommended plan and alternative A and the 1984 FES plan, the process for determining trout standing crop and angler use in this document was applied to the 1984 plan. Thus, any projected differences would be attributed to plans and operations rather than methods.

With the recommended plan and alternative A, Monks Hollow Reservoir would exhibit a similar potential as a fishery as the 1984 FES plan. The large seasonal drawdown of the reservoir from

352 to 142 acres would limit the productivity (table 34). Trout standing crop would range from 2,343 pounds per year at minimum water surface to 5,808 pounds per year at maximum level. Over the long-term, however, trout standing crop would probably stabilize close to the average of 4,075 pounds to reflect population adjustments to the summer irrigation drawdown to a minimum level in September/October and winter refilling to the maximum level by May. Angler use would range from 1,511 angler days per year to about 3,745 angler days per year, with an average of 2,628 angler days at these same levels. Access to the reservoir for fishing would also be somewhat limited due to the steep, rugged shoreline with either plan. Trout standing crop and angler use with the 1984 FES plan would range from 3,960 pounds to 5,660 pounds and 2,554 angler days to 3,650 angler days, respectively, at minimum and maximum water levels. Long-term standing crop and angler use would stabilize at about 4,810 pounds and 3,102 angler days, respectively, at average water levels. Potential standing crop would be higher with this plan because the drawdown would not be as great as with the recommended plan and alternative A.

Table 34--Predicted trout productivity and angler use, Monks Hollow Reservoir.

Alternative	Water level	Area (acres)	Standing crop (lbs/acre)	Total standing crop (lbs)	Angler use (days/ year)
Recommended plan	Maximum	352	16.5	5,808	3,745
	Minimum	142	16.5	2,343	1,511
A	Maximum	352	16.5	5,808	3,745
	Minimum	142	16.5	2,432	1,511
1984 FES	Maximum	343	16.5	5,660	3,650
	Minimum	240	16.5	3,960	2,554

Strawberry Reservoir.--Angler use predictions for Strawberry Reservoir were based on the assumption that angler use would change with changes in standing crop in total pounds as predicted by a mathematical model developed by Jenkins in 1982. The model predicts total fish standing crop using mean depth and nutrient predictions (expressed as total dissolved solids--TDS). This method addresses potential changes in fish biomass relative to physical changes in the reservoir from project operation. Percentage differences in standing crop between historical conditions and project alternative plans were used to determine angler use with each plan. The Utah Division of Wildlife Resources is currently planning to renovate the Strawberry

Reservoir fishery. This would be accomplished by eradication of nongame fish in the reservoir and through management with different game fish species to control nongame fish be predation and by competition for the food supply.

Although the values presented for fish standing crop and angler use do not precisely describe either existing or future biological conditions in the reservoir because of the unquantifiable effect of extreme water level fluctuations/ drawdowns and other physical and chemical parameters, the data do represent the range in values anticipated. Furthermore, the values are relative and thus provide an adequate base of comparison among all reservoir operations being considered.

The 1973 Bonneville Unit Final Environmental Statement evaluated the changes in fishery production because of enlargement of the reservoir as planned in 1964. According to the FES, the reservoir historically provided about 206,700 angler days per year. Under the 1964 plan, the average number of angler days was expected to be about 252,500 each year. However, operation of the reservoir in conjunction with the Diamond Fork System, as currently planned, would be different than previously described. This change in operation would, in turn, modify the productivity of the reservoir. In order to provide a relative comparison of the changes, the foregoing methods were used to estimate the angler use for the 1964 operations and alternative C of the Diamond Fork System under scenarios of both a treated (table 35) and untreated (table 36) reservoir. These values are then related back to the future without the project condition. The current use and minimum fishery goal on Strawberry Reservoir, as stated previously, is about 250,000 angler days per year.

As shown in table 35, a treated Strawberry Reservoir would, on the average, be slightly reduced in surface acreage and angler use than previously proposed in the 1964 plan. Total angler use would average about 338,200 days per year with alternative C, about 5,000 less than with the 1964 plan and about 37,000 less than the future without condition. However, the fishery goal of maintaining a minimum of 250,000 angler days per year would be more than met assuming the Utah Division of Wildlife Resource's plans for reservoir renovation and management with different game species, plus the Forest Service's rehabilitation and stabilization of all major reservoir tributaries, are effective in controlling nongame fish populations and minimizing nutrient loadings in the reservoir. Angler use could be as high as 300,000 days per year according to Division of Wildlife Resources estimates of treatment benefits. If the change in fishery management is not effective, the angler use would decline rapidly

Table 35.--Trout fisheries data estimated for Strawberry Reservoir for each project alternative assuming full treatment[1].

Alternative	Average surface area (acres)	Pounds/ acre	Average standing crop (total pounds)	Average angler use (days/year)
Historical	5,650	351	1,983,150	206,700
1964 plan[2]	12,200	270	3,294,000	343,350
Alternative C[3]	11,800	275	3,245,000	338,200
Future without condition[3]	14,700	245	3,601,500	375,400

[1] U.S. Fish and Wildlife Service. 1987. Draft Fish and Wildlife Coordination Act Report [7].
[2] Values were based on averages for years 1921-60, the only data available for the Definite Plan Report.
[3] Values were based on annual averages for 1930-73.

Table 36.--Trout fisheries data estimated for Strawberry Reservoir assuming no treatment[1].

Alternative	Stocked fish (pounds)	Percent[2] (creeled)	Harvest (pounds)	Average angler use[3] (days/year)
Historical	[4]35,434	35	82,680	206,700
1964 plan	[5]60,000	30	42,000	105,000
Alternative C	60,000	25	35,000	87,500

[1] Personal communication from Utah Division of Wildlife Resources, 1987.
[2] Return to creel for catchable size trout (7/pound) is 25 to 35 percent, depending on the alternative selected.
[3] Angler catch rate = 0.3 fish/hour; length of angler day = 4 hours; size of fish creeled = 3 fish/pound.
[4] 5-inch fish.
[5] Fishery maintained with subsistence stocking. Maximum hatchery capacity available = 60,000 pounds.

to the levels indicated in table 36 for each alternative. Alternative C with reservoir treatment would meet the minimum fishery goal and at levels comparable to those estimated for project conditions in the 1964 Definite Plan Report. This assessment also holds true during times when the reservoir approaches the minimum volume of 162,000 acre-feet and surface area of 6,900 acres. Although standing crop and angler use of 2,221,800 pounds and 231,600 days, respectively, would be about 15 percent less than the 1964 Definite Plan Report and 35 percent less than the future without condition, a net increase of 44 percent over historical conditions would still occur.

In addition to the predicted impacts on the reservoir fishery, this alternative would cause the inundation of an average of about 1,650 feet of tributary streams during May through August. This inundation represents an additional 4.4 percent loss as compared to the 1964 Definite Plan Report. During the primary spawning month of May, the additional inundation is expected to be about 5,700 feet of stream, representing a 17.9 percent decrease in spawning habitat over the Definite Plan Report.

Impacts on Strawberry Reservoir from the recommended plan and alternative A will be discussed in the I&D System draft environmental statement.

Utah Lake.--Alternative C would have no significant impacts on the Utah Lake fishery. Impacts of the recommended plan and alternative A will be presented in the draft environmental statement on the I&D System.

Wildlife

Existing Conditions

As described in the 1984 FES, the Diamond Fork area supports a variety of terrestrial wildlife adapted to mountainous habitats. The baseline conditions for the five indicator species remain the same as described in the FES. These species include the mule deer, bobcat, golden eagle, Cooper's hawk, and beaver. The Fish and Wildlife Service's Habitat Evaluation Procedures (HEP) were used to describe the quantity and quality of habitat available to the indicator species in the study area. More detail is found in the FES.

In the Spanish Fork area, wildlife species are those adapted to habitats found on or adjacent to agricultural lands. common small mammals include mice, gophers, skunks, and muskrats. A variety of small birds such as the meadow lark, starling, blackbirds, sparrows, and crow is found. Upland game animals are represented by the ring-necked pheasant, mourning dove, and cottontail rabbit. Various species of snakes, toads, frogs, and lizards are also common to the area. Waterfowl which feed on the agricultural lands include the Canada goose and several species of ducks. Increased agricultural production under all alternatives would not adversely impact any of these species. Any beneficial effects would be offset by more intensive cultivation practices.

Environmental Impacts

The Fish and Wildlife Service's HEP were used to describe project impacts of the system alternatives and to develop mitigation options for terrestrial wildlife species. This analysis, shown in table 37, was based on the habitat lost or gained. Table 38 also shows a comparison of habitat unit losses and gains for each alternative, including average annual habitat units with and without the onsite mitigation option for each indicator species. Net impacts (losses or gains) to each key species are assumed to be similar in magnitude for both the onsite and offsite mitigation plans (table 38), since both options provide compensation for similar habitats and wildlife populations.

Recommended plan.--As shown in table 38, the recommended plan would reduce beaver habitat by 14 percent. About 20 percent of the total loss would be offset by the preferred mitigation option. A mule deer habitat loss of 1.8 percent would occur, but 91 percent of this loss would be offset by habitat protection, improvements, and management of winter ranges. Impacts on golden eagles would be next in magnitude, with 0.6 percent of the AAHU's lost. However, mitigation measures would more than compensate for all of the losses. Losses of bobcat AAHU's would be about 0.5 percent which would be overcompensated, while losses to Cooper's hawk would be about 0.8 percent which would be undercompensated. With the exception of the beaver and Cooper's hawk, impacts on wildlife species under the recommended plan would be less than under the 1984 FES plan.

Alternative A.--Impacts of alternative A would be generally greater than for the recommended plan because of additional surface disturbance from the Fifth Water Aqueduct and access roads. The greatest impact would be to beaver with a net AAHU loss of 7 percent. Losses of beaver habitat would be considerably less than with the recommended plan. With the preferred mitigation plan, AAHU's for mule deer and Cooper's hawk would be reduced by less than 1 percent. Bobcat and golden eagle would be overcompensated.

Alternative C.--Impacts of alternative C would be significantly less than with the recommended plan the 1984 FES plan because of the elimination of Monks Hollow Reservoir. With the preferred mitigation plan, beaver AAHU's would be reduced about 3 percent and mule deer and Cooper's hawk AAHU's would be reduced less than 1 percent. Bobcat and golden eagle would be overcompensated.

Table 37.--Impacts on wildlife habitat caused by the Diamond Fork System alternatives compared to the 1984 FES plan.

Alternative	Species	Habitat acres lost	
		Permanent	Temporary
Recommended plan	Mule deer range[1]		
	Nonwinter	387	60
	Normal winter	607	245
	Severe winter	713	340
	Bobcat	334	610
	Golden eagle	536	661
	Cooper's hawk	98	11
	Beaver	37	14
A	Mule deer range[1]		
	Nonwinter	648	75
	Normal winter	771	251
	Severe winter	713	340
	Bobcat	341	624
	Golden eagle	545	698
	Cooper's hawk	98	22
	Beaver	14	28
C	Mule deer range[1]		
	Nonwinter	648	75
	Normal winter	723	58
	Severe winter	561	1
	Bobcat	70	92
	Golden eagle	182	166
	Cooper's hawk	63	22
	Beaver[2]	+21	28
1984 FES plan	Mule deer range[1]		
	Nonwinter	1,339	360
	Normal winter	446	303
	Severe winter	702	352
	Bobcat	426	1,151
	Golden eagle	643	1,284
	Cooper's hawk	98	23
	Beaver[2]	+9	28

[1] These figures include loss of habitat value and use by mule deer caused by construction disturbance and use of primary access roads.

[2] There is a net gain in usable habitat for beaver because of the elimination of high irrigation flows in upper Sixth Water Creek.

Table 38.--Project changes in AAHU[1] for each alternative, Diamond Fork Power System.

Indicator species	AAHU[1] without project	Project changes	Net changes with mitigation
		1984 FES Plan	
Mule deer range	71,995	-1,917	-45
Nonwinter	27,390	-842	-779
Normal winter	29,260	-350	+495
Severe winter	15,400	-725	+239
Bobcat	17,556	-111	+150
Golden eagle	51,425	-643	+59
Cooper's hawk	2,365	-20	-14
Beaver	110	-8	-2
		Recommended plan[2]	
Mule deer range	71,995	-1,300	-66
Nonwinter	27,390	-225	-183
Normal winter	29,260	-408	+149
Severe winter	15,400	-667	-32
Bobcat	17,556	-82	+90
Golden eagle	51,425	-320	+143
Cooper's hawk	2,365	-18	-15
Beaver	110	-15	-12
		Alternative A[2]	
Mule deer range	71,995	-1,617	-105
Nonwinter	27,390	-389	-338
Normal winter	29,260	-535	+147
Severe winter	15,400	-693	+86
Bobcat	17,556	-84	+127
Golden eagle	51,425	-332	+235
Cooper's hawk	2,365	-20	-16
Beaver	110	-12	-8
		Alternative C[2]	
Mule deer range	71,995	-1,449	-156
Nonwinter	27,390	-395	-352
Normal winter	29,260	-508	+76
Severe winter	15,400	-546	+120
Bobcat	17,556	-22	+158
Golden eagle	51,425	-127	+358
Cooper's hawk	2,365	-16	-12
Beaver	110	-7	-3

[1] Average annual habitat units.
[2] The net losses and gains of AAHU's are based on the onsite option assuming that the offsite option would compensate to the same degree.

Endangered Species

With the recommended plan and alternative A there would be fewer impacts to terrestrial and aquatic resources than those described

in the FES. Therefore, there would be no adverse impacts on the bald eagle, the peregrine falcon, or the June sucker--all endangered species. On January 21, 1987, the Fish and Wildlife Service concurred in the "no effect" determination for alternative A [8]. The recommended plan would have fewer impacts on aquatic ecosystems than alternative A, and alternative C would have fewer impacts on terrestrial ecosystems than alternative A. Therefore, the recommended plan and alternative C would have no effect on threatened or endangered species.

Insect Pests and Vectors

As explained in the FES, habitat for insect pests and vectors under any of the system alternatives would be reduced from future without project conditions. Potential for vector-related diseases such as encephalitis and malaria would also be reduced from future without project conditions. The reduction in habitat would, however, result in a reduction in food sources for other animals.

Air Quality

Impacts on air quality from either system alternative would be the same as in the 1984 FES. Slightly increased levels of pollutants would not be significant to the excellent overall air quality of the Diamond Fork area.

Temporary adverse impacts associated with project construction would be mitigated as discussed in the FES.

Geology and Seismicity

General

The Diamond Fork area has experienced recurring major structural deformation from Precambrian (earliest geological time to 570 million years ago) through Tertiary (65 million years ago to 1.8 million years ago) times. The following map shows the general geology of the area. During these times, the Wasatch Mountains were pushed up into high, rugged peaks by great thrust faults which folded and pushed the rocks from the west as much as 10 miles. This was followed by intensive, extrusive and intrusive igneous activity. In later Cenozoic time (65 million years ago to present times), the rocks were subjected to basin and range type block faulting resulting in north-south trending mountains and valleys throughout the project area.

The Wasatch Mountain range was subjected to repeated Pleistocene (1.8 million to 10,000 years ago) glaciation, producing steep-sided, U-shaped valleys and sharply carved peaks.

Subsequent to the glacial activity, other erosional agents have altered and sculptured the topography. Mass wasting was particularly active, and numerous slumps, landslides, and talus accumulations are conspicuous along the higher benches.

Seismotectonic studies in the project area have defined three active faults and have assigned maximum credible earthquakes of Richter Scale magnitude of 6.5 for the Stinking Springs Fault, 7.0 for the Strawberry Fault, and 7.5 for the Wasatch Fault zone. The Stinking Springs and Strawberry Faults are located approximately 9 miles and 4.5 miles, respectively, east of the inlet portal of Syar Tunnel, and the Wasatch Fault is located about 20 miles west of the portal. Earthquakes occur an average of every 2,200 years on the Stinking Springs and Strawberry Faults. Recent detailed geologic studies by Woodward-Clyde consultants have documented the displacement rate of the Wasatch Fault. They concluded that earthquakes in the magnitude range of 6.5 to 7.5 occur an average of every 500 to 2,600 years on the fault segments studied.

Existing Geology of Feature Sites

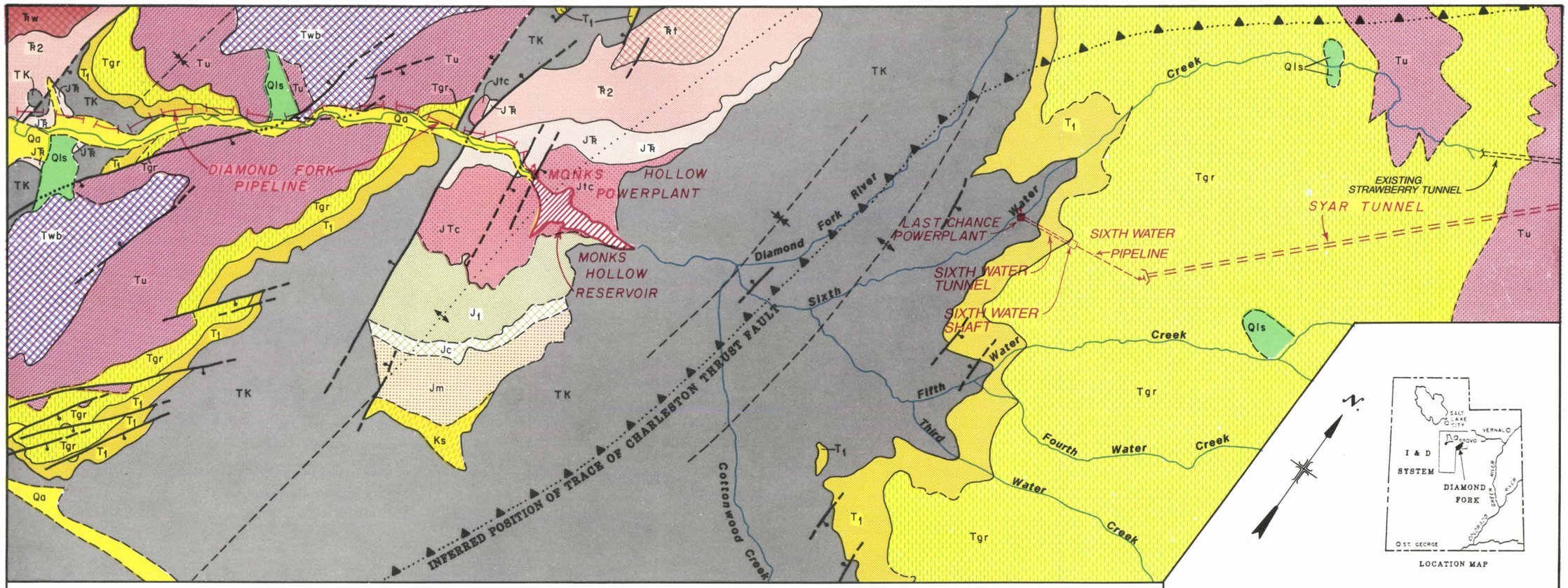
Syar Tunnel.--Construction of the inlet portal of Syar Tunnel was completed in 1984 as part of the Strawberry Tunnel Rehabilitation. The remaining portion to be constructed will encounter shale, sandstone, limestone, and siltstone of the Tertiary Uinta and Green River Formations. Several faults are expected to be crossed by the tunnel. Also, considerable ground water, up to 10 cfs, is expected to be encountered over the tunnel length. The outlet portal would be located at Rays Valley. Geologic investigations include research of existing data, surface mapping, drilling, and sampling with core holes.

Sixth Water Aqueduct.--

Sixth Water Pipeline.--Sixth Water Pipeline would be constructed entirely in the Tertiary Age Green River Formation. The Green River Formation is predominantly shale with lesser amounts of limestone, sandstone, and siltstone. The formation weathers to rounded slopes with occasional limestone ledges up to 3 feet high. The bedding dips gently (5 to 15 degrees) to the northeast. Four faults are known to cross the alignment.

Seven test pits, two drill holes, three exploratory trenches, and numerous hand auger holes have been excavated along the pipeline alignment. Geologic exploration is essentially complete and a geologic design data report is currently being compiled.

Sixth Water Shaft and Tunnel.--The Sixth Water Shaft and Tunnel would be constructed in Tertiary Age Green River, Colton,



LOCATION MAP

GEOLOGIC EXPLANATION

QUATERNARY

- Qa — Alluvium and colluvium
- Qls — Landslide deposits

TERTIARY

- Twb — Wanrhodes volcanics
- Tu — Uinta Formation
- Tgr — Green River Formation
- T1 — Flagstaff Limestone
- TK — North Horn Formation

CRET.

- Ks — Sanpete Formation

JURASSIC

- Jm — Morrison Formation
- Jc — Curtis Formation
- J1 — Entrada Formation
- JTc — Twin Creek Formation
- JR — Nugget Sandstone

TRIASSIC

- TR2 — Ankareh Limestone
- TRt — Thaynes Formation
- TRw — Woodside Shale

SYMBOLS

Fault – bar and ball on downthrown side, dashed where inferred, dotted where concealed. Thrust fault – barbs on upper plate.

Contact – dashed where inferred

Anticline – dashed where inferred, dotted where concealed

Syncline – dashed where inferred

Geology compiled from A.A. Baker 1976, G.E. Young 1976, and L.F. Hintze 1980.

1 0 1 2

SCALE OF MILES

EXPLANATION

- PROPOSED PIPELINE
- PROPOSED POWERPLANT
- PROPOSED RESERVOIR
- PROPOSED TUNNEL

GENERAL GEOLOGY of the DIAMOND FORK AREA

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and Flagstaff Formations. The Green River Formation consists of limestone, shale and sandstone. The Colton Formation consists predominantly of calcareous siltstone with lesser amounts of limestone and sandstone. The Flagstaff Formation intertongues with the Colton in the Sixth Water canyon area and consists predominatnly of limestone, with lesser amounts of sandstone and siltstone. Bedrock in the shaft and tunnel area dips gently to the north. The shaft and tunnel area is crossed by several faults, but all are considered inactive. Groundwater inflows are expected to be low to moderate.

Surface mapping in the area is complete. Four test trenches were excavated and two holes drilled along the shaft and tunnel alignment. Geologic investigations are complete and a geologic design data report is in preparation.

Last Chance Powerplant.--Depending on final design grade, the powerplant would be founded on Quaternary streamfill deposits or bedrock of the Flagstaff Formation. The streamfill consists of poorly graded to clayey gravel with cobbles and boulders. The Flagstaff Formation is predominantly limestone, with lesser amounts of sandstone and siltstone. Some dewatering would be required during construction.

Geologic investigations included surface mapping, three drill holes, and a test pit. Additional investigations could be required. Geologic investigations will be tabulated in a geologic design data report.

Monks Hollow Dam and Reservoir.--Geologic conditions at Monks Hollow Damsite are the same as presented in the 1984 FES. Thirty-five exploratory drill holes have been completed to date at the site.

The dam has been designed to withstand a 7.5-magnitude earthquake associated with the Wasatch Fault and a 6.75-magnitude earthquake associated with the Little Diamond Creek fault. Additional exploration is planned, including short adits into the abutments to further define rock conditions.

Monks Hollow Powerplant.--The Monks Hollow Powerplant would be founded on bedrock composed of sandstone of the Nugget Formation.

Diamond Fork Pipeline.--The Diamond Fork Pipeline would be founded on streamfill and alluvial fan deposits composed of lean and sandy clay to poorly graded gravel and cobbles. Ground water would be encountered by the excavation for 40 percent of the alignment and would require dewatering.

Over 90 test pits and exploratory auger holes have been completed along the alignment. Stability problems and excavation characteristics are evaluated in a geologic design data report of April 1988.

Diamond Fork Powerplant.--The Diamond Fork Powerplant would be founded on interbedded sandstone and shale of the Ankareh Formation of Triassic Age. One drill hole has been completed to evaluate geologic conditions.

Environmental Impacts

Landslides and seismicity in the Diamond Fork System area, seepage from the proposed reservoirs, and effects upon mineral resources are the primary concerns associated with the geology of the project features. Information on the landslides, seismicity, and seepage was presented in the 1984 FES.

A low grade phosphate deposit occurs in the Park City Formation about 7 miles northwest of the confluence of the Diamond Fork Creek and Spanish Fork River near the head of Little Diamond Creek. This deposit was strip mined at one time but is no longer in operation. No commercial phosphate deposits would be affected by any of the project features.

Possibilities for building stone exist in the area. Algal limestone has been quarried from the North Horn Formation near Birdseye, Utah, about 10 miles south of the confluence of Diamond Fork Creek and the Spanish Fork River. Castilla Springs in Spanish Fork Canyon has produced white sandstone; however, no known commercial quality deposits would be affected by any of the project features.

Cultural Resources

Existing Conditions

As discussed in the 1984 FES, Class III intensive cultural resource surveys had been completed for approximately 90 percent of the project area for all alternatives with no National Register-listed or eligible prehistoric or historic cultural resources identified. The Fifth Water Aqueduct alignment (alternatives A and C only), Sixth Water Aqueduct alignment (recommended plan only), Last Chance Powerplant site, Three Forks Dam and Reservoir areas (alternative C only), transmission line alignments, material source areas, access roads, and contractor staging areas would require Class III surveys.

Environmental Impacts

Based on the aforementioned surveys of approximately 90 percent of the project area, Reclamation made a "determination of no effect" to known National Register eligible or listed cultural resources for the alternatives included in the 1984 FES plan. The Utah State Historic Preservation Officer concurred with this determination on January 11, 1983 [9]. Reclamation would complete Class III surveys in the project areas mentioned above, evaluate all sites discovered, determine project impacts on National Register eligible sites, and mitigate project impacts on listed or eligible sites.

Social and Economic Considerations

Environmental Impacts

Population and Demographics.--The population and demographics of Utah County, the major area of impact, have remained generally the same as described in the 1984 FES. As shown in table 39, the recommended plan and alternative A are expected to result in a population influx to the county of about 513 persons in the peak year of construction. This is a significant reduction from the 1984 FES which estimated an influx of 1,905 persons during the 2 peak years of construction. The decrease is mostly attributable to the lengthening of the construction period from the 4 years presented in the FES to 7 years. An increase of 513 persons to the population base represents less than one-third of 1 percent and is not considered a significant impact.

Population impacts associated with alternative C would be less than with the recommended plan or alternative A. The estimated influx to Utah County during the peak year of construction would be about 348 persons (see table 40). In other years, project-related population increases would be less.

Economy.--The recommended plan and alternative A would result in an estimated 2,229 work-years in direct employment, about 1,776 work-years in indirect employment, and about 856 work-years in other employment created through the purchase of materials and equipment (table 41). In contrast, the 1984 FES plan would have created an estimated 3,525 work-years in direct employment, 2,810 work-years in indirect employment, and 2,850 work-years in other employment. During the 7-year construction period, an estimated 4,861 work- years would be created in Utah County from construction of the recommended plan and alternative A, with 1,300 work-years in the peak year. In the 1984 FES plan, an estimated 12,275 work-years of employment would have been created with about 3,610 work-years in each of the 2 peak years.

Table 39.--Construction phase direct employment, immigration, and household impacts--recommended plan and alternative A

	Year						
	1	2	3	4	5	6	7
	1989	1990	1991	1992	1993	1994	1995
Total local direct employment jobs[1]	247	753	952	795	504	218	96
Direct jobs filled by local workers[2a]	193	587	743	620	393	170	75
Construction worker influx[2a]	54	166	209	175	111	48	21
Single construction workers[2b]	10	30	38	32	20	9	4
Married without family present[2c]	10	30	38	32	20	9	4
Married with family present[2d]	35	105	133	111	71	31	13
Spouses of workers[2e]	35	105	133	111	71	31	13
Children of workers[2f]	44	136	171	143	91	39	17
Total construction worker related influx[2g]	134	406	513	429	273	119	51
Local population directly supported by construction salaries[3]	617	1,879	2,376	1,984	1,258	544	240
Total population supported by construction salaries[4]	751	2,285	2,889	2,413	1,531	663	291

[1] See table 41.

[2] Bureau of Reclamation Construction Worker Survey, Mountain West Research, Inc., for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, October 1977, Agua Fria.

[2a] 78.0 percent of the onsite jobs were filled by locals while 22.0 percent were filled by immigrants.

Of those moving into the area:

[2b] 18.2 percent of the workers were single.

[2c] 18.2 percent of the workers were married but did not bring their families.

[2d] 63.6 percent of the workers were married but brought their families.

[2e] 63.6 spouses.

[2f] 81.8 children.

[2g] A total influx of 245.4 people immigrating.

[3] Local population supported based on local workers times the average household size for the project area (3.2).

[4] Total population supported is sum of influx and locally supported families.

Table 40.--Construction phase direct employment, immigration, and household impacts--alternative C

	Year						
	1	2	3	4	5	6	7
	1989	1990	1991	1992	1993	1994	1995
Total local direct employment jobs[1]	359	441	504	514	671	321	302
Direct jobs filled by local workers[2a]	283	348	397	405	529	253	238
Construction worker influx[2a]	76	93	107	109	142	68	64
Single construction workers[2b]	14	17	19	20	26	12	12
Married without family present[2c]	14	17	19	20	26	12	12
Married with family present[2d]	48	59	68	69	90	43	41
Spouses of workers[2e]	48	59	68	69	90	43	41
Children of workers[2f]	62	76	87	89	116	56	52
Total construction worker related influx[2g]	186	228	261	267	348	166	158
Local population directly supported by construction salaries[3]	905	1,112	1,271	1,296	1,692	809	762
Total population supported by construction salaries[4]	1,091	1,340	1,532	1,563	2,040	975	920

[1] See table 42.

[2] Bureau of Reclamation Construction Worker Survey, Mountain West Research, Inc., for Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, October 1977, Agua Fria.

[2a] 78.8 percent of the onsite jobs were filled by locals while 21.2 percent were filled by immigrants.

Of those moving into the area:

[2b] 18.2 percent of the workers were single.

[2c] 18.2 percent of the workers were married but did not bring their families.

[2d] 63.6 percent of the workers were married but brought their families.

[2e] 63.6 spouses.

[2f] 81.8 children.

[2g] A total influx of 245.4 people immigrating.

[3] Local population supported based on local workers times the average household size for the project area (3.2).

[4] Total population supported is sum of influx and locally supported families.

Table 41.--Construction phase income and employment impacts--recommended plan and alternative A.

	Unit	Construction year 1 1989	2 1990	3 1991	4 1992	5 1993	6 1994	7 1995	Total
Total construction costs[1]	$1,000	17,248	52,488	66,455	55,440	35,178	15,204	6,718	248,731
Onsite government salaries[2a]	$1,000	730	2,220	2,811	2,345	1,488	643	284	10,521
Contractor onsite labor salaries[2b]	$1,000	4,053	12,335	15,617	13,028	8,267	3,573	1,579	58,452
Total onsite salaries[2b]	$1,000	4,783	14,555	18,428	15,373	9,755	4,2216	1,863	68,973
Adjusted construction costs[2c]	$1,000	14,230	43,303	54,825	45,738	29,022	12,543	5,542	205,203
Onsite government employees[2d]	Work years	25	77	97	81	51	22	10	363
Contractor onsite labor[2e]	Work years	129	394	499	416	264	114	50	1,866
Total work years	Work years	154	471	596	497	315	136	60	2,229
Contract onsite jobs[2f]	Jobs	222	676	855	714	453	196	86	
Total local direct employment[2g]	Jobs	247	753	952	795	504	218	96	
Total local indirect employment[3]	Work years	123	375	475	396	251	108	48	1,776
Total local other employment[4]	Work years	59	181	229	191	121	52	23	856

[1] Based on January 1987 costs. These are the allocated construction costs of the project in thousands of dollars.

[2] Construction Impact for each $1,000,000 of Appropriations--Percentage of Each Trade, July 1980, Engineering and Research Center, Denver, Colorado.

For each $1,000,000:

[2a] 14.1 percent is spent on government salaries of which 30 percent (4.2 percent of total) is for local Federal Government salaries.

[2b] 23.5 percent is spent for contractor onsite labor; therefore, 27.7 percent is directly spent on local salaries. All figures rounded to be presented to the nearest $1,000.

[2c] Based on construction costs trends composite index for the cost level shown in footnote 2 (132) divided by the cost level of the E&R Center report shown in footnote 1 (160), the index to adjust construction costs for employment impact calculations is 0.8250.

[2d] 5.9 work years of government employment per million dollars is purchased of which 30 percent (1.8 work years) is local Federal Government employees.

[2e] 9.1 work years contractor onsite labor; therefore, 10.9 work years of local labor is purchased per million dollars.

[2f] Contractor onsite jobs equals contractor onsite labor work years times adjustment for 7 month construction season (1.71).

[2g] Adding onsite government employee work years to contractor onsite jobs yields the total direct employment in terms of jobs. All figures rounded to the nearest whole job or work years. Adding the full time government positions to the seasonal contractor labor positions available during the 7 month construction season yields the total direct employment in terms of jobs.

[3] The estimate of indirect employment was derived from using a multiplier for new construction for the Mountainlands Plan District (1.7971). Information provided by Donald L. Snyder, Associate Professor, Economics, Utah State University, 1986.

[4] Other is the estimate of 30 percent of the value of all materials, equipment, etc., sold in Utah County, induced and stemming from project construction, divided by the 1980 annual average wage in Utah County.

Estimated employment with alternative C is estimated at 1,947 work-years in direct employment, 1,552 work-years in indirect employment, and 745 work-years in other employment (table 42). A total of 4,244 work-years would be created during the 7-year construction period, with about 916 work-years in the peak year.

Infrastructure and Values

Housing.--The recommended plan and alternative A would create a need for an estimated 160 housing units in Provo, Orem, Spanish Fork, Springville, and Payson, considerably less than the 595 units estimated in the FES. The relatively brief duration of the construction period suggests that temporary accommodations would provide the most practical and feasible solution to this need. Many students at Brigham Young University and Utah Technical College in Provo rely on similar housing, but the project-related need is not expected to significantly impact the housing market.

Alternative C would result in a need for about 110 housing units in the area. Again, this need is not expected to significantly impact the housing market.

Education.--The recommended plan and alternative A would result in an additional 171 school-age children in the peak year of construction (table 39), compared with 590 in the 1984 FES plan. The increase with the recommended plan and alternative A represents less than one-half of 1 percent of the Utah County school-age population. An additional 7 teachers would be required, 20 less than in the 1984 FES plan.

Payment of the costs associated with an increased number of students could vary considerably, depending on the methods the school districts select to handle the short-term influx. Any cost increase, however, would be paid jointly from local taxes, State funds, and Federal impact-aid funds available under Public Law 81-874 and subsequent amendments to alleviate the effects of Federal projects. No long-term increase in student enrollment is expected in the area school districts as a result of the project.

Alternative C would result in an additional 116 school-age children during the peak year of construction (table 40). An additional five teachers would be needed.

Health and Medical Care.--Because the anticipated project-related population influx would be slight, no additional health and medical care facilities would be needed with either the recommended plan or alternatives A or C.

Table 42.--Construction phase income and employment impacts--alternative C.

	Unit	Construction year 1 1989	2 1990	3 1991	4 1992	5 1993	6 1994	7 1995	Total
Total construction costs[1]	$1,000	25,007	30,754	35,210	35,892	46,867	22,366	21,059	217,155
Onsite government salaries[2a]	$1,000	1,058	1,301	1,489	1,518	1,982	946	891	9,185
Contractor onsite labor salaries[2b]	$1,000	5,877	7,227	8,274	8,435	11,014	5,256	4,949	51,032
Total onsite salaries[2b]	$1,000	6,935	8,528	9,763	9,953	12,996	6,202	5,840	60,217
Adjusted construction costs[2c]	$1,000	20,631	25,372	29,048	29,611	38,665	18,452	17,374	179,153
Onsite government employees[2d]	Work years	37	45	51	52	68	33	31	317
Contractor onsite labor[2e]	Work years	188	231	264	269	352	168	158	1,630
Total work years	Work years	225	276	315	321	420	201	189	1,947
Contract onsite jobs[2f]	Jobs	322	396	453	462	603	288	271	
Total local direct employment[2g]	Jobs	359	441	504	514	671	321	302	
Total local indirect employment[3]	Work years	179	220	251	256	335	160	151	1,552
Total local other employment[4]	Work years	86	106	120	123	161	77	72	745

[1] Based on January 1987 costs. These are the allocated construction costs of the project in thousands of dollars.

[2] Construction Impact for each $1,000,000 of Appropriations--Percentage of Each Trade, July 1980, Engineering and Research Center, Denver, Colorado.

For each $1,000,000:

[2a] 14.1 percent is spent on government salaries of which 30 percent (4.2 percent of total) is for local Federal Government salaries.

[2b] 23.5 percent is spent for contractor onsite labor; therefore, 27.7 percent is directly spent on local salaries. All figures rounded to be presented to the nearest $1,000.

[2c] Based on construction costs trends composite index for the cost level shown in footnote 2 (132) divided by the cost level of the E&R Center report shown in footnote 1 (160), the index to adjust construction costs for employment impact calculations is 0.8250.

[2d] 5.9 work years of government employment per million dollars is purchased of which 30 percent (1.8 work years) is local Federal Government employees.

[2e] 9.1 work years contractor onsite labor; therefore, 10.9 work years of local labor is purchased per million dollars.

[2f] Contractor onsite jobs equals contractor onsite labor work years times adjustment for 7 month construction season (1.71).

[2g] Adding onsite government employee work years to contractor onsite jobs yields the total direct employment in terms of jobs. All figures rounded to the nearest whole job or work years. Adding the full time government positions to the seasonal contractor labor positions available during the 7 month construction season yields the total direct employment in terms of jobs.

[3] The estimate of indirect employment was derived from using a multiplier for new construction for the Mountainlands Plan District (1.7971). Information provided by Donald L. Snyder, Associate Professor, Economics, Utah State University, 1986.

[4] Other is the estimate of 30 percent of the value of all materials, equipment, etc., sold in Utah County, induced and stemming from project construction, divided by the 1980 annual average wage in Utah County.

Transportation.--Project-caused traffic increases on transportation routes leading to project construction sites would be slight with the recommended plan and alternatives A and C; therefore, no adverse impacts are anticipated. When U.S. Highway 6 was reconstructed after the 1983 mudslide at Thistle, turning lanes were included at the junction with Diamond Fork Road. The turning lanes have helped lessen the traffic congestion impact anticipated in the 1984 FES.

Relocations.--Two or three seasonal single-family dwellings and other improvements are located on lands proposed for acquisition for the project. These dwellings are not occupied during the winter, nor are they the primary residence of the owners or summer occupants; therefore, no individuals or families would be relocated. The other improvements include barns and outbuildings. Some improvements may need to be purchased and removed by a clearing contractor or sold back to the original owners for salvage.

All relocation assistance would be accomplished under provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646). The primary assistance provided by Reclamation would be payments for the removal of any personal property from the acquired lands.

Social Effects Analysis

The social account (table 43) displays the social impacts and social effects; that is, the evaluation of the impacts from the perspective of the groups and communities affected for each of the alternatives and the 1984 FES plan. The 1984 FES plan was used as the basis for comparison with one exception--project cost was felt to be of salient concern and, therefore, was also included as a social factor in this analysis. Although project cost was not originally included in the Social Account shown in the FES plan, it has been included in the analysis for the 1984 FES plan in this report for purposes of comparison to the other alternatives.

Impact Factors.--The first column in table 43 lists the social impact factors judged to be significant in the 1984 FES analysis. Selection of factors was influenced by local publics, particularly those individuals and organizations responsible for the maintenance and provision of the impacted social services and facilities. To allow for proper comparison of alternatives, the same factors and ranges have been held constant in this analysis. The only exception, as previously stated, is that project cost was included as a social factor.

Table 43.--Social account table.

Impact factor	Factor weights	Impact levels	SWB scores	Weighted SWB scores
Recommended plan and alternative A				
Employment[1]	220	1,656.0	415	91
Project cost[2]	175	248.7	988	173
Health[3]	146	3.0	940	137
Economics[4]	95	66.6	294	28
Education[5]	94	171.0	814	78
Housing[6]	94	160.0	892	84
Crime[7]	58	11.0	978	57
Power[8]	58	68.5	342	20
Transportation[9]	58	762.0	880	51
Overall SWB score				720
Alternative C				
Employment[1]	220	1,167.0	327	72
Project cost[2]	175	217.7	885	155
Health[3]	146	3.0	940	137
Economics[4]	95	60.0	250	23
Education[5]	94	116.0	898	86
Housing[6]	94	110.0	850	80
Crime[7]	58	9.0	982	57
Power[8]	58	70.0	350	20
Transportation[9]	58	537.0	979	57
Overall SWB score				689
1984 FES Plan				
Employment[1]	220	4,310.0	876	193
Project cost[2]	175	372.7	655	115
Health[3]	146	17.0	240	35
Economics[4]	95	97.2	639	60
Education[5]	94	590.0	169	16
Housing[6]	94	891.0	366	35
Crime[7]	58	70.0	540	32
Power[8]	58	166.2	831	49
Transportation[9]	58	1,212.0	166	10
Overall SWB score				543

[1] Bureau of Reclamation projections for total direct, indirect and other jobs from project construction.

[2] Bureau of Reclamation estimated expenditure in millions of dollars to complete project features.

[3] Total hospital bed years required as determined by current population-bed ratio times total construction-related population influx.

[4] Total project materials, equipment, and labor costs at 30 percent of construction cost.

[5] Total community household projections.

[6] Projections of workers' school-age children for year of maximum impact.

[7] 1982 Utah County crime rate for year of maximum impact adjusted for population increase.

[8] Project megawatts of power generated.

[9] Traffic volume based on employment projection for year of maximum impact times multiplier of 0.80.

Factor Weights.--The second column contains the weights associated with each factor. These weights indicate, on a scale from 0 to 1,000, the relative social significance attached to the impact factors by the groups affected by the plans. As can be seen, the factors are ranked from the most important to the least.

Impact Levels.--The column labeled impact levels show the impact of an alternative on each social impact factor. These impacts are, for the most part, quantifiable projections; for example, the number of construction labor personnel required to construct the different alternatives or economic stimulus to the area through construction labor wages spent in local communities.

Social Well-Being Scores (SWB).--The SWB scores, which range from 0 to +1,000, show the degree to which an alternative's impact approaches the most or least desired level of impact, as based on the affected public's values and preferences.

Weighted SWB Score.--To reflect the social significance of the impact, each SWB score is multiplied by the importance weight attached to the associated impact factor. These scores then reflect both the relative desirability of impact (the SWB score) and the social importance of the attribute being affected (the weight).

Overall SWB Score.--To obtain an overall social effect rating of an alternative, each plan's weighted SWB scores are summed. These total scores can be compared against each other to determine whether an alternative produces an overall social benefit or cost to the affected group or community.

As can be seen in table 43, all three alternatives and the 1984 FES plan show a positive net social benefit. There is, however, a relatively small difference in benefits between the recommended plan and alternatives A and C, and a somewhat significant difference between those alternatives and the 1984 FES plan.

Agricultural Development

Existing Conditions

Areas to be served with water from the Diamond Fork System are among the highest developed and most productive in the State of Utah. These areas hold even greater potential if full water needs are met.

The agricultural economy of the area is based primarily upon the production of livestock and livestock products. Nearly all the crops produced are utilized as livestock feed. The principal kinds of livestock are dairy cows and beef cattle. Availability of grazing on public lands is one of the reasons for the importance of livestock in this area. These public grazing lands fit well into an irrigation agriculture. Irrigated land is the base of operations where the winter feed is produced and fed. Mountain ranges provide the grass and forage for summer grazing. Because of the temperate climate, good soil, and in some cases a late season water supply, fruit crops in the form of apples, peaches, and sweet and sour cherries are also significant.

A large part of the project area has suffered from a shortage of irrigation water during the later months of the growing season. As a result, farmers have been forced to adjust their crops and agriculture to their water supply. This has meant raising mainly hay and grain. Alfalfa, barley, corn silage, and corn refuse are used as winter feed crops to fatten cattle. This feeding of cattle during the winter is also a means of utilizing farm labor in the winter.

The size of farms varies considerably. The more extensive types of farming, such as dryland grain and beef farms, are generally larger than the fruit and dairy farms when measured in acres.

Environmental Impacts

General.--Farm incomes would be increased soon after delivery of project water has begun. Historically, the demand for irrigation water has not been met by direct diversions from local streams, and irrigation supplies have been exhausted before the end of July. One of the purposes of the Diamond Fork System is to provide a supplemental water supply to presently irrigated lands so that a full water supply can be utilized. With project features, irrigation lands can be regulated to meet the idea' and of agricultural crops in the area. Agricultural statistics under project conditions are presented in table 44.

As shown in table 44, annual gross agricultural production would be increased by about $7,139,000, and the increase in net farm incomes would ultimately amount to $1,769,000 annually. Increases in production resulting from project irrigation are shown in table 45. These increases are estimated at about 33,000 tons of forage, 383,000 bushels of grain, 6,000 animal unit months (AUM)[4] of grazing, and 436,000 bushels of fruit.

[4] Animal unit months represent the amount of feed necessary to support one cow and her unweaned calf or five sheep for 1 month.

Table 44.--Agricultural statistics for Diamond Fork System area lands.[1]

Item and unit of measurement	Quantity
Farms and farmland	
Farms (number)	195
Average farm size (acres)	255
Irrigated land per farm (acres)	245
Irrigation	
Average annual diversion requirement (acre-feet)	144,800
Average existing water supply (acre-feet)	116,700
Supplied by project (acre-feet)	23,600
Average shortage (acre-feet)	4,500
Value of agricultural products sold	
Livestock and products (dollars)	2,209,000
Crops (dollars)	4,930,000
Total (dollars)	7,139,000
Farm values and expenses	
Value of land and improvements (dollars)	8,127,000
Value of machinery and equipment (dollars)	6,530,000
Farm production expenses (dollars)	5,370,000
Livestock inventory	
Beef cattle and calves (head)	930
Beef feeders (head)	1,245
Dairy cows (head)	585

[1] Data obtained from Bureau of Reclamation estimates and farm management surveys.

Livestock production would increase and would continue as a major farm enterprise. With the net increase in crop production and grazing capacity, it has been estimated that up to 2,760 additional head of cattle could be supported on the farms throughout the year with no effect on public lands where grazing permits are at capacity.

In addition to the direct annual irrigation benefits of $1,769,000 measured by the increase in net farm income for the project area, indirect benefits are also provided in the form of an increased stimulus to the area's business community and tax base. These indirect benefits generated as money received in one economic sector are then spent by that sector and received by one or more other sectors, causing a chain reaction of spending and respending. These indirect annual benefits of $947,000 include increased profits to retail and wholesale businesses which (1) handle, process, and market farm produce and (2) supply goods and services to project farms.

Impacts on Farm Operations.--Although project water would help to increase crop yields and net farm income, it is not expected to affect crop types, farm sizes, or farm types. The project supplemental water would average only about 1/2 acre-foot per acre and would represent a rescheduling of irrigation rather than an increased annual supply. Irrigation would benefit about

Table 45.--Crop and grazing production with and without the Diamond Fork System.

	Acreage irrigated	Unit	Annual production		
			Without project	With project	Project increase
Farmstead	1,077				
Alfalfa hay	21,888	ton	115,000	136,000	21,000
Barley	14,756	bushel	1,579,000	1,875,000	296,000
Corn silage	2,952	ton	62,000	74,000	12,000
Corn grain	3,541	bushel	462,000	549,000	81,000
Aftermath grazing[1]		AUM[2]	22,000	26,000	4,000
Irrigated pasture	985	AUM[2]	11,000	13,000	2,000
Apples	2,681	bushel	2,326,000	2,762,000	436,000

[1] Grazing of alfalfa, barley, and corn acreage after harvest of crops.
[2] AUM = animal unit month.

195 families (800 people) that receive some portion of their income from farming. Increased income to these families from project irrigation is estimated at $1,769,000 annually or about $9,000 per family. This represents an increase in net farm income over nonproject conditions. The equivalent of up to 85 new on-farm jobs would be created with total annual wages estimated at $782,000. Although authorizing legislation prohibits the delivery of project water to lands of more than 960 acres in single ownership, surveys indicate that no farms in the project service area would be affected by the legislative limitation.

Agricultural Chemicals.--There would be some increase in the use of agricultural chemicals in the project area as a result of project operation. However, the increase would probably consist almost entirely of fertilizers rather than pesticides, whose use would not change. The amount of fertilizer applied to farmlands would increase somewhat because of an assured late season water supply and the addition of new lands under project operation. Increases would take place in the application of phosphate fertilizers on alfalfa crops and, to a lesser extent, in the use of nitrogen fertilizers on small grain and grasses. The primary impact area would be in surface water quality, but the impact is predicted to be minimal.

Grazing

Impacts on grazing on public lands would be essentially the same as in the 1984 FES for the recommended plan and alternative A (580 AUM's). A reduction of 110 AUM's would occur with alternative C, 470 less than with the 1984 FES plan.

Electrical Energy

Transmission Line Routing

The transmission line alignment shown on the map following page 8 represents a preliminary corridor approximately 1/2 mile in width. The final alignment would be located within this corridor so that visual impacts and disturbances to vegetation, wildlife, and soils resulting from construction, operation, and maintenance of the transmission facilities are reduced. Ease of access to the transmission lines would also be an important factor in determining the final alignment. The transmission line corridor was established as a joint effort of Western, Reclamation, and the Forest Service. Western will coordinate with interested agencies in selecting the final centerline within the corridor.

Environmental Consequences of Transmission Facilities

With alternative A, up to three powerplants would be linked to the interconnected transmission system by 13.6 miles of transmission line. Power from Monks Hollow Powerplant would be carried to Last Chance Switchyard over a 13.8-kilovolt (kV) line. A 138-kV line would connect Last Chance Switchyard to the interconnected transmission system at the Tank Hollow Substation. A separate 46-kV line would connect the Diamond Fork Powerplant to the interconnected system. Construction of all three powerplants is contingent upon non-Federal financing.

The transmission line alignments have been designed to have relatively low visual impact. About 4.7 miles of the total 16.6 miles of line would not be visible from roads, more than the 4.0 miles in the 1984 FES. Care was taken to ensure that most of the remaining line would not be visible on the skyline. Steel towers, if used, would be darkened and conductors would be nonreflecting. There would be selective vegetative clearing, mainly of trees, from about 50 acres within the corridor right-of-way, of which less than 2 acres would be riparian habitat. This is less than the 70 acres presented in the FES. Less than 19 acres would be totally cleared for the switchyards and substations, as compared to 27 acres in the FES. The corridor would span five streams, one less than in the 1984 FES, but since there would be no road crossings and structures would be kept away from streambanks, accelerated soil erosion into these watercourses would be minimal.

Environmental Consequences of Distributing Diamond Fork Power

Non-Federal financing would be required for construction of power generating capacity beyond project pumping requirements. Proposals for non-Federal financing would be evaluated through a public participation process. Western Area Power Administration would be responsible for obtaining NEPA compliance for distributing Diamond Fork power that was surplus to project needs.

Recreation and Tourism

Impacts of the recommended plan and alternatives A and C on recreation and tourism would be the same as in the 1984 FES plan.

Cumulative Impacts

NEPA compliance for the Municipal and Industrial System was originally attained in 1979, and construction has been under way on the project's delivery system. Due to modifications in the Jordanelle Reservoir plan and highway relocations, however, a supplement to the FES evaluating the changed impacts and updating the plan was completed in 1987.

The environmental consequences of the Diamond Fork System are analyzed in this document. Because the construction schedule and general area of the system and the I&D System are similar, some social and economic impacts would be cumulative. These impacts will be discussed in the I&D System draft environmental statement.

In summary, all of the environmental impacts for all systems of the Bonneville Unit, including the Diamond Fork System, have been publicly identified and evaluated regardless of whether they are aggregate or truly cumulative.

CHAPTER IV

CONSULTATION AND COORDINATION

Introduction

After the Final Environmental Statement was filed in 1984, issues and concerns raised by the public and government agencies led the U.S. Bureau of Reclamation (Reclamation) to coordinate with other agencies having planning responsibilities and to maintain an ongoing public involvement program. This program was designed to keep the public informed of progress, decisions, and future activities and to provide opportunity for a voice in the decisionmaking process. The program offered a forum to discuss modifications to the system plan and to achieve acceptance of proposed plans for action. This chapter presents a record of consultation, coordination, and public involvement and describes how these activities resulted in the modifications described in this supplement. In addressing these objectives, the chapter fulfills the requirements of a Public Involvement Summary Report.

Public consultation and coordination activities for the Diamond Fork System which were conducted prior to October 1984 are described in the 1984 Final Environmental Statement (FES). This discussion includes only those activities which occurred after the FES was published.

On January 19, 1984, Reclamation suggested that the State of Utah undertake a public review of the Bonneville Unit. The Governor agreed and established a review team. The review team solicited input on issues and concerns about the Bonneville Unit at public meetings held May 7-11, 1984, in Salt Lake City, Orem, Duchesne, Heber City, and Richfield. Notification of the date, location, and purpose of these scoping meetings was sent to the news media, state legislators, county commissioners, mayors, water user organizations and associations, Federal and State agencies, environmental groups, engineering firms and consultants, universities, policy board members, civic organizations, and others within the 12-county area involved with the Bonneville Unit.

Oral and written data gathered from public scoping meetings were condensed by the review team into eight broad categories: municipal, industrial, and agricultural water needs; project economics; proposed Diamond Fork power; Jordanelle Dam construction; Utah Lake diking; water rights; wildlife; and recreation. State review team members subsequently held numerous meetings and interviews with individuals, interested groups, agencies, associations, and organizations to gather further detailed oral and written explanations bearing on these categories of concern.

Approximately 1,500 copies of the draft report of review team findings were published and distributed free of charge. Notification of a second round of public meetings was included with

copies of the draft document and was also sent to the same list used to notify the public of the previous scoping meetings. Public meetings to review the draft report were held October 1-5 and October 8-10, 1984, in Heber City, Provo, Salt Lake City, Duchesne, Richfield, Gunnison, Delta, and Nephi. The State's review concluded late in 1984 with publication of a final report containing the State's recommendations [4]. Answers to oral and written comments on the draft report from the second round of public meetings were included in the final report submitted to the Governor. Copies of the final review report were distributed free of charge to all individuals and organizations on the notification list.

The team published its findings in December 1984 and recommended that a significant scaling down of the system be considered. As a result of the State review and environmental, economic, and marketing studies by Reclamation, alternative A for the system is a scaled-down, flow-through system.

During the fall of 1985, considerable media attention was focused on the Central Utah Project's Bonneville Unit. This renewed attention was the result of proposed modifications to the repayment contract between the United States and the Central Utah Water Conservancy District and the subsequent election which was held November 19, 1985. The election provided the public an opportunity to become acquainted or reacquainted with the project's benefits and costs and to exercise judgment on its feasibility and acceptability. Although the narrow issue of the election was whether a supplemental repayment contract for the delivery of municipal water should be approved, the special election was widely regarded as a vote for or against the project. The results of the special election indicated a significant level of public approval, with nearly 73 percent of the vote in favor of the new repayment contract for the project.

In connection with the special election, Reclamation personnel participated in presentations to the public and were interviewed by the news media. Newspapers in the Central Utah Project area carried major articles discussing all facets of the project, the Bureau of Reclamation, and the Colorado River Storage Project for a period of 4 to 5 months. Radio and television stations conducted special programs on the history of and issues concerning the Central Utah Project. Interviews were held with project officials as well as with proponents and opponents of the project.

Development of the downsized system plan is the direct result of a public consultation and coordination process. On March 29, 1985, a notice was published in the Federal Register by the Western Area Power Administration (Western) concerning a proposal for developing and marketing power from the 166.2-megawatt (MW) Diamond Fork System as outlined in the 1984 FES. The purpose of

the notice, which was prepared jointly by Western and Reclamation, was to initiate a public consultation and comment process to explore the potential for the combination of Federal and non-Federal financing to fund the construction of the system and to develop a marketing plan for utilization of the resource. The deadline for written comments was May 6, 1985. Further, a combined public information and comment forum was held in Salt Lake City on April 25, 1985, at which representatives of Western and Reclamation explained the proposal and alternatives for construction and marketing the power produced.

Comments were received from 23 respondents. Very few of the respondents indicated that they were willing to participate in financing the 166.2-MW project due to its relatively high cost of $1,650 per kilowatt (kW); however, several indicated that they would be interested in a smaller, lower cost plan.

In response to the Federal Register notice, the Colorado River Energy Distributors Association (CREDA) and the Strawberry Water Users Association (SWUA) both submitted proposals which included alternate designs for the project. Both proposals included a smaller scale development and relied on use of the existing Strawberry Tunnel, a feature of the Strawberry Valley Project.

Reclamation worked closely with CREDA and SWUA in reviewing the proposals. The proposals were compared against each other and other plan configurations developed by Reclamation. Results of the evaluation indicated that the cost of the project using the existing tunnel and the cost using a new tunnel were approximately equal due to rehabilitation that would be required on the old tunnel and additional facilities that would be required to connect the tunnel to the system.

At their December 12, 1985, board meeting, the Central Utah Water Conservancy District (CUWCD) passed a resolution urging Reclamation to proceed with construction of the plan which included Syar Tunnel. This resolution was based on a belief that a new tunnel, designed and constructed using state-of-the-art techniques, would be more reliable than the rehabilitated 75-year-old tunnel. The SWUA Board of Directors had previously passed a motion at their December 11, 1985, meeting which supported the CUWCD resolution.

Alternative A described in this report is similar to the plan outlined in the CREDA proposal. The CREDA plan was modified to include Syar Tunnel, and Last Chance Powerplant was moved upstream to reduce project costs through use of shorter waterways and a more readily accessible powerplant site.

Additionally, recreation facilities, access road alignments, and transmission line corridors for alternative A were determined

through careful coordination with the Forest Service. Western was involved in selecting the recommended transmission line corridors.

An environmental scoping meeting was held in Spanish Fork in June 1986 to allow the public the opportunity to express concerns and issues regarding the new alternative A for the Diamond Fork System. Concerns expressed at the meeting regarding the system included claims to power rights under the Strawberry Valley Project and economic impacts that downsizing of the system might have on other Bonneville Unit project purposes.

Subsequent to formulation of alternative A, SWUA expressed interest in developing a portion of the system. Based on a July 30, 1986, Solicitor's opinion requested by Reclamation, it has been determined that SWUA has certain power rights as part of the Strawberry Valley Project. These rights were established in an October 9, 1940, repayment contract between SWUA and the United States. Reclamation is working closely with SWUA to allow SWUA the opportunity to develop the power associated with those rights and to ensure that those rights are not violated.

Reclamation and Western hope to execute contracts for non-Federal financing of power features not required for project purposes in the near future. If no agreements for non-Federal financing have been made in the near future, then Reclamation would proceed with construction of the 10.5 MW of power needed for project pumping loads. Development of the remaining power potential would be deferred until non-Federal financing was available.

The draft supplement to the 1984 FES was released in April 1989. Approximately 300 copies were distributed for review to Federal, State, and local agencies and to water-user organizations, conservation groups, educational institutions, news media, and individuals. Copies were also made available for public inspection at local libraries and college and university libraries. A partial distribution list is included at the end of this supplement. This list specifies agencies and organizations which received the draft supplement and those who commented on it.

The review period began with publication of the notice of availability in the Federal Register of May 1, 1989, and officially ended June 29, 1989. Written comments received after that date, however, have been accepted and considered in the preparation of this final supplement to the FES.

Formal public hearings were held June 20 and 21, 1989, to receive comments on the draft supplement. Notice of the hearings was made in the Federal Register of May 18, 1989. The hearings were held at Red Lion Inn, Salt Lake City, Utah, June 20 at 7:00 p.m. and at Holiday Inn, Provo, Utah, June 21 at 7:00 p.m. The hearings adjourned at 9:30 p.m. after all who wished had spoken.

Grant Vaughn, an attorney for the Department of the Interior, Salt Lake City, Utah, conducted the hearings. Representatives of the Upper Colorado Regional Office in Salt Lake City and the Utah Projects Office in Provo were present to officially represent the Bureau of Reclamation and to receive testimony.

A total of about 30 people attended the two hearings. Oral testimony was presented by 11 individuals. Following is a list of those testifying, in the order which they appeared at each hearing.

Date and name	Representing
June 20, 1989	
Mr. Gary Aitken	Strawberry Water Users Association
Mr. Fred Reimherr	Stonefly Society of the Wasatch
Mr. Peter Hovingh	Utah Associated Garden Clubs
Mr. Carl Andreasen	Stonefly Society of the Wasatch and Federation of Fly Fishers
June 21, 1989	
Mr. Rick Cox	Provo River Water Users Association
Mr. Gary Aitken	Strawberry Water Users Association
Ms. Sammy Meadows	Sundance Resort
Mr. Brent Morris	Utah County Commission
Ms. Lillian Hayes	Utah Chapter Sierra Club
Mr. Alan Gault	Spanish Fork Joint River Committee
Mr. Paul Jones	Self

A verbatim transcript of each hearing was recorded by an official reporter. Copies of the transcripts can be purchased from the reporting service, Intermountain Court Reporters, 5980 South 300 East, Murray, Utah, 84107. Copies are also available for inspection at the locations listed below.

Regional Director
Bureau of Reclamation
Room 7418, Federal Building
125 South State Street
Salt Lake City, Utah 84147

Projects Manager
Utah Projects Office
302 East 1860 South
Provo, Utah 84601

Reports Division
Bureau of Reclamation
Denver Office
Room 554, Building 67
Denver Federal Center
Denver, Colorado 80225

The following pages include summaries of concerns expressed orally at the hearings; comments received by Reclamation in letter form which were also read at the hearings; and written comments submitted by government entities, organizations, and

individuals during the review period, all with Reclamation's responses. The final supplement has been expanded and modified where appropriate to accommodate the input received in these comments.

The comment and response section has two major divisions: (1) oral comments and responses and (2) written comments and responses. Oral comments at the hearings centered on issues pertaining to potential power development, impacts to fish and wildlife, water use philosophy, allocation of project costs, mitigation land aqcuisition, public involvement, and water distribution. Responses to the major issues raised at the hearings are presented on the following pages. Where the same issues are raised in both oral and written comments (letters), the responses are presented only in the written comments section.

Oral Comments and Responses

ORAL COMMENT 1: Throughout the draft supplement, a number of references are made to 56,700 acre-feet of Strawberry Project water being diverted to the Bonneville Basin. However, it is noted at the bottom at page 20 that such quantity is currently being negotiated with the association and does not represent its true entitlement to the Strawberry Project water.

It is accurate to state that the quantity of Strawberry Project water is currently being negotiated, but it should be noted that since 1941, the releases of Strawberry Project water from the Strawberry Reservoir have averaged 61,500 acre-feet annually, and not 56,700 acre-feet as referred to on page 43 of the draft supplement.

RESPONSE 1: See response to written comment 113.

ORAL COMMENT 2: It is noted on page 9 under "Syar Tunnel" that a 50 ft^3/s valve will be installed in the tunnel to divert flows to the existing Strawberry Tunnel to provide the capability of maintaining or enhancing the fishery in Sixth Water Creek. However, the draft supplement does not discuss the impacts to power generation in the Diamond Fork System, which will result from bypassing the Last Chance Powerplant with that quantity of water. Such bypass would increase the association's percentage of hydropower generation. However, such bypass would also reduce the power generation potential of the Diamond Fork System.

RESPONSE 2: See response to written comment 7.

ORAL COMMENT 3: In December 1987, Western Area Power Administration and Reclamation approved the association's proposal for an allocation of 11.75 megawatts of power and energy prior to construction of the Diamond Fork Power System with

provision for the association to nonfederally finance the Diamond Fork Power System if not otherwise constructed. The association still desires to construct hydropower generating facilities in the Diamond Fork System, and suggestions that alternative B or C and the 50 ft^3/s diversion to the Strawberry Tunnel would substantially reduce that hydropower generation potential. As noted above, it is essential that the association develop revenues to rehabilitate its 80-year-old project. Revenues from hydroelectric power generation in the Diamond Fork System are essential for that purpose.

Thus, the association respectfully supports alternative A and Option 1 as most compatible with Strawberry Project purposes. The association proposes to submit comments to the draft supplement to set forth its position in more detail.

RESPONSE 3: See response to written comment 7 and the first paragraph of Chapter II, Alternatives in the final supplement.

ORAL COMMENT 4: I feel this document represents a sort of piecemeal approach to project planning. It indicates that the Diamond Fork facility will transport an unspecified amount of water to an unspecified location for unspecified uses, future uses. After approval of this document by the EPA and Army Corps of Engineers, the U.S. Bureau of Reclamation will fill in these blanks as they desire.

Seemingly, there's a number of important issues that are going to have to be settled before it really can be completed. These include the resolution of the Uinta Basin streamflow issue, the Ute Indian water conflicts, and the fate of the Bonneville irrigation and drainage system. All these problems have a significant impact on the operation of the Diamond Fork System. And we feel that approval of the Diamond Fork System should be combined with the environmental impact statement addressing these issues together rather than in isolation.

RESPONSE 4: See response to written comments 58 and 101.

ORAL COMMENT 5: Next, we're concerned about the massive increase in water that will flow in Sixth Water Creek. A major project alteration with this supplement was the deletion of the 3-mile-long pipeline connecting the Last Chance Powerplant with the Monks Hollow Dam area. This will produce very large increases in streamflow on Sixth Water Creek. Much of the silt level will be doubled, and high flows will extend well into the fall time. Instead of constructing this pipeline, the entire outflow of the Last Chance Powerplant will be dumped into Sixth Water Creek. The current flow of the Strawberry Project through Sixth Water-Diamond Fork System is producing massive erosion and turbid water conditions. How this can withstand these increases is completely ignored in this compliance document. I regard this as a very

significant oversight. I don't feel it's appropriate just to say that the pipeline was deleted and letting it go at that.

RESPONSE 5: See response to written comment 2.

ORAL COMMENT 6: Next, we're concerned about the stream sediment transport in the Diamond Fork, Spanish Fork. Muddy, turbid flows produced by operations of the Strawberry Project almost completely destroyed the value of this river system. There are indications that instead of rectifying the situation, that even with the Bureau's optimistic figures contained in this document, it could indicate that turbidity problems might actually be aggravated by operations of the Diamond Fork System. For instance, under alternative C, the Diamond Fork would carry yearly approximately 32,000 tons of silt a year. This represents a 3 percent reduction from the present operation. However, this silt would be carried by 40 percent less water so that the turbidity in Diamond Fork System under alternative C would increase.

With alternatives A and B, there's a projected 35 percent decrease in silt being carried by the stream system, but there is reason to believe that this figure is not accurate, since the same figure was used in the 1984 EIS, and the pipeline has since been depleted, and without the pipeline more sediment would be produced. In either event, it is not clear that the Diamond Fork can carry a quarter ton of silt per acre foot and still be a viable trout stream.

This point has an important financial and legal aspect. If these figures are accurate and the Diamond Fork cannot be rehabilitated as a trout stream, then claiming that the cost of the Diamond Fork Pipeline to be a fish and wildlife expense is a fraudulent appropriation of funds by the Bureau.

RESPONSE 6: See response to written comments 3 and 104.

ORAL COMMENT 7: We are also concerned about the operation of the Strawberry River, the CUP, or Spanish Fork River. The CUP proposes to magnify the destructive high flows produced by the earlier Strawberry project on Spanish Fork River. The peaks come later in the year, substantially higher figure on the Spanish Fork, and there's no indication in either this document or the earlier 1984 document that the Spanish Fork River can maintain these flows in an environmentally acceptable manner.

RESPONSE 7: See response to written comment 106.

ORAL COMMENT 8: We feel the U.S. Bureau of Reclamation announced a new policy direction to implement a multiple use planning approach in new projects and ongoing operations. This document shows very little evidence of this new Bureau policy.

RESPONSE 8: See response to written comment 107.

ORAL COMMENT 9: We want affordable water, and when we turn on the faucet we want to know that the water coming in the faucet has not caused any species to become extinct.

RESPONSE 9: See response to written comment 36.

ORAL COMMENT 10: And we want to know that water is not being wasted.

RESPONSE 10: See response to written comment 34.

ORAL COMMENT 11: We looked at the Diamond Fork System, and we find a high quality of Uinta Mountain water is being dumped into Utah Lake, 80,000 to 105,000 acre-feet for M&I purposes. We think this is one of the biggest wastes of high quality water that the Federal government has probably ever seen.

RESPONSE 11: See response to written comment 35.

ORAL COMMENT 12: We look at the affordable water. We see that this 80,000 to 105,000 acre-feet of water that's going into Utah Lake for M&I purposes has been scaled up from the 40,000 acre-feet of water that was listed in one of the previous documents.

RESPONSE 12: See response to written comment 35.

ORAL COMMENT 13: And we ask now, what does this do to the repayment contract that the voters approved of? Does this mean that the Strawberry collecting system, Diamond Fork, and probably irrigation system is all going to be paid for the municipal and industrial users? And what will be the total cost of the M&I and will this still be under the contract we voted for?

RESPONSE 13: See response to written comment 37.

ORAL COMMENT 14: When it comes to meeting the assurances that these species aren't becoming extinct because of the project, we don't see any assurances at all. ...We see that there are no biological surveys here in the Provo River that include mollusks. The amphibian population are totally unknown.

RESPONSE 14: See response to written comment 36.

ORAL COMMENT 15: We see an awful lot of water coming down the streets and sidewalks, and we would like to know where is the water conservation planning in Utah? We see the draft review of the State water plan, and...they basically admit there is no water conservation in Utah. We hear that the Bureau's going to have a water conservation planning that's implemented basically after the CUP is fully constructed. We would like to know where the water conservation is.

RESPONSE 15: See response to written comment 34.

ORAL COMMENT 16: There is one other aspect that is alluded to in this, in that Utah Lake is naturally polluted. I don't know what natural pollution is. You have terrific lakes and polluted lakes, and but one thing that I do know is that most of the fish species in that lake are extinct, almost all of the mollusk species in that lake are extinct, and it used to just be a very rich place for fish and mollusks. And I can't find any amphibians on the lake, and there used to be. And then we asked, "What has happened to this lake?" And one of the things that Diamond system has implicated is that because there is natural, or human pollutions coming from irrigation runoff, ...it wouldn't really impact the already polluted lake.

RESPONSE 16: See response to written comment 54.

ORAL COMMENT 17: And then we see the Jordanelle Dam being constructed on Deer Creek; that's holding water back. And they talk about the Great Basin national memoirs; 1981, it talks about the hydrology of Utah Lake. The Utah Lake holds roughly 870,000 acre-feet of water. The inflows to that lake is 520,000 acre-feet of water. If one assumes, then, that during spring runoff most of the increase came into the lake that they would have been pretty well washed out of a lot of its natural pollutants. We don't see any studies showing historic turnover of the lake before man diverted the streams. And we see that the lake could be an awful lot more purer than what it is to support the present...population.

RESPONSE 17: See response to written comment 54.

ORAL COMMENT 18: Thus, we do have many reservations about the Diamond system, and we do note that in their alternative A and B, most of the impact is deferred to the irrigation and drainage system, and we would suggest that, basically, you defer the entire Diamond Fork System to the irrigation and drainage system and start over.

RESPONSE 18: See response to written comment 58.

ORAL COMMENT 19: One of the big concerns I've got is how in the world 77 percent of this is coming from Fish and Wildlife funds when I can't conceivably see how any of it's going to improve any of the fish and wildlife in that area. From my understanding, the area is so saturated with power projects and that none of the power companies are that willing to become involved in it. So it seems that like they couldn't find the available funds from these sources and they turned it to fish and wildlife.

RESPONSE 19: See response to written comment 62.

ORAL COMMENT 20: You mentioned nothing about winter streamflows or summer streamflows.... It's my understanding that you're taking the full 130,000 ft^3/s.... That leaves approximately

6,000 ft^3/s left for that drainage, which is to my knowledge barely enough to water the rocks. And it's a big certain of mine that we are footing the bill, almost the entire bill for this, and yet I can see it doing nothing but hurting the fish and wildlife in that area.

RESPONSE 20: See response to written comment 5.

ORAL COMMENT 21: On pages 17 through 19 of the draft supplemental EIS, there are 1,030 acres of land that are designated for mitigation use. These lands are presently Provo River Project lands, though cost of purchasing these lands are borne by the (Provo River Water Users') Association through the 1936 repayment contract that the association has with Bureau of Reclamation.

The association opposes any transfer of these lands directly to any other organization for any other purpose other than for project purposes. They have stated so in letters to the Bureau of Reclamation dated October 21, 1987, November 6, 1987, and November 17, 1988. The November 17, 1988, is a 17 page document outlining the legal and the equity obligations of the Bureau of Reclamation to the association. Although we recognize the title to this piece of property is in the name of the United States Government, it is also held in trust by the Secretary of the Interior for the Provo River Project, and not for any other project.

Giving this land to another project such as the CUP or any other entity such as Department of Wildlife Resources is analogous to your home mortgage company giving your home to someone else while you're still living there and making payments on that home. The law does not permit Reclamation to transfer land in this manner. Under the Surplus Acquired Lands Act of 1911, it requires a Secretary to dispose of land only when it is in the best interest of that project, and if it does so, it must be disposed of at fair market value with the proceeds being credited to that project. Subsection I and J.

Fact Finders Act of 1924 also states that any profits from project lands must be separated and not be commingled with the proceeds or the revenues of another project. Reclamation simply cannot compel any project to subsidize another project. If they do so they must provide fair market value for that land exchanged.

The monies used for mitigation of the Central Utah Project or Section VIII funds - the Section VIII funds also do not give Reclamation authority to divest one project of land for benefit of another.

The association tends to submit formal written comments following these proceedings. However, it is also my understanding that Reclamation and regional solicitor have agreed to involve the

association in any future discussions or negotiations concerning these lands. On page 19 it says on the second paragraph, "Reclamation prefers the offsite mitigation option because about 90 percent of the lands under consideration are already federally owned or in Federal ownership and most of these are under Reclamation jurisdiction and can easily be transferred to the appropriate management agency with the least impact to the tax payer and private owner." These lands will not be easily transferred because the association will be taken kicking and screaming all the way through the courts in order to protect their rights.

RESPONSE 21: See response to written comment 94.

ORAL COMMENT 22: Sundance's primary concern from a cursory examination of the document is that there are no guaranteed minimum or maximum streamflows in connection with the project. And from the situation we looked at Provo River last year, we really believe that guaranteed minimum streamflow is very important to protect the fishery.

RESPONSE 22: See response to written comment 7.

ORAL COMMENT 23: My concern is that in reviewing the supplement...is that it does not go down and address the environmental concerns of the six other counties south of Utah County that are part of what is referred to as the I&D Project.

Of course, I've been critical in the past at the cost of that project, but I am also very sympathetic to the 12 counties who would like to have input to make sure the environmental concerns are taken care of. Not only that, to make sure that they are equitable treated on this project. And what this tells me is that there is the possibility there is no intent of going forward with that I&D Project.

So my only concern is that if that's the case, fine. If it is not, then I think they should include it in the environmental impact study for the six counties to the south, and unless they plan on doing that, after they feel that they have secured funding. What this has brought to my attention from people who have contacted me is, it's very clear, maybe there is no intent of doing that I&D Project.

RESPONSE 23: See response to written comment 58.

ORAL COMMENT 24: I attended the 1972 impact statement hearing in Orem, and Delta area was well represented. They brought busloads of children to the hearing, and they on their buses, "people are more important than fish." And so the irrigation part of the project was the heart of the project, and to just simply not even mention it in this supplement, I think, is quite a flagrant omission.

RESPONSE 24: See response to written comment 58.

ORAL COMMENT 25: It appears to me and to the Sierra Club that this document is merely trying to fulfill some kind of a requirement for maybe an outdated EIS. We see that the power has been eliminated from the Diamond Fork System, even in the title. And so it just seems inappropriate you would file a supplement for a major project like this when the original EIS is no longer valid.

There's no evidence in the subject statement to support the claim that...this is a compliance document for section 404, permitted within the Clean Water Act, Public Law 95-217, or that it complies with Executive Order 11988 for plains management and Executive Order 11900, protection of wetlands. Nowhere in the document are these matters addressed. But it is claimed that this is a compliance document.

RESPONSE 25: See response to written comment 97.

ORAL COMMENT 26: It says that "Depending on whether or not the I&D System is constructed and the size of the transbasin diversion, certainly the amount of the diversion should be made," the Bureau should know what that is. And under alternatives A and B, they do not honor the instream flow agreement. So certainly those two alternatives could not be considered in good faith.

RESPONSE 26: See response to written comment 16.

ORAL COMMENT 27: S&F, they don't bring enough water over; the Syar Tunnel certainly could be too big.

RESPONSE 27: See response to written comment 82.

ORAL COMMENT 28: Alternative C would dam and flood areas in Diamond Fork. The ecology of that canyon is an unusual desert environment. One of its residents is the western milk snake which enjoys a protected status in the State of Utah.

We really know little about Diamond Fork, and there could be much more to be discovered. It is important that this canyon be studied before the ecology of the canyon is disturbed. It is a painful thought to think of the flooding of this canyon.

RESPONSE 28: See response to written comment 100.

ORAL COMMENT 29: The Bureau said, "We can accommodate all of the public's comments, and any comments or any remarks of the consultants." And this was very offensive to me, but we found that indeed they can; they can simply ignore what the public has to say. And they do this repeatedly. And I think it's too bad; I think it's obvious that...the public is cut out of the public participation process. It's evident in the group you have here

tonight. I just think that while we know that our comments can be and probably will be ignored, at least we can continue to participate; and I'm impressed with the number of people who know absolutely nothing about what we're talking on here tonight. They do not understand anything about the Central Utah Project, and that is because it isn't an open process that concerns the district and the Bureau are engaging in.

RESPONSE 29: See response to written comment 98.

ORAL COMMENT 30: From what I read, I couldn't figure out whether the Three Forks Dam was on all three streams or just Sixth Water and Cottonwood, or on the other stream. I would like to have that cleared up.

RESPONSE 30: See alternative C map.

ORAL COMMENT 31: What are they going to do about measuring the streamflow into the dam and out of it. We should have some understanding to protect our water rights on the river. A device of some kind should be built on each diversion dam to measure the water.

RESPONSE 31: Reclamation will comply with the requirements of the State Engineer to measure water diversions and releases. This will ensure proper allocation of water according to recognized water rights. All project features will have any necessary water measurement facilities to ensure compliance with this requirement.

ORAL COMMENT 32: What would one have to do to get on the mailing list for not just this document, but other notices of hearings...to stay a little more informed of the process?

RESPONSE 32: You are already on the mailing list.

Written Comments and Responses

Sixteen letters commenting on the draft supplement to the 1984 FES have been received by Reclamation. Some of the views expressed in these letters parallel those given at the public hearings, but they cover a much wider range of concerns. Responses to the written comments are presented below. The responses are grouped alphabetically in three categories, as follows: (1) Federal agencies, (2) State agencies, and (3) private organizations. The original letters of written comment are on file in the Upper Colorado Regional Office of the Bureau of Reclamation in Salt Lake City, Utah, and a copy of each is included at the end of this section. Letters requiring no response are also included. Letters were received from the following.

Federal Agencies

Department of Agriculture
Forest Service
Department of the Army
Corps of Engineers*
Department of Health and Human Services
Public Health Service, Center for Disease Control*
Department of the Interior
Bureau of Mines*
Fish and Wildlife Service
Environmental Protection Agency*

State

State of Arizona
Department of Commerce*
State of Utah
Division of Environmental Health
Office of Planning and Budget

Private Organizations

Central Utah Water Conservancy District
Intermountain Water Alliance
National Wildlife Federation
Provo River Water Users Association
Sierra Club
Stonefly Society of the Wasatch
Strawberry Water Users Association

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* No response required

Forest Service letter dated June 28, 1989.

WRITTEN COMMENT 1: Discuss the effect of releasing excess water to the Spanish Fork River on fish, recreation, and channel stability.

RESPONSE 1: Impacts from the recommended plan and alternative A on the Spanish Fork River fishery, recreation, channel stability, and other parameters will be discussed in the I&D System EIS. However, a full analysis of fishery impacts from higher project flows in the river was conducted and is discussed in the final supplement. The recreation plan for the Diamond Fork System is

discussed in the 1984 FES. A description of sediment load and channel erosion impacts on the river with alternative C has been included in the final supplement.

WRITTEN COMMENT 2: Two-thirds of the water in Diamond Fork is the result of transbasin diversion from Strawberry Reservoir. Discuss the result of the increase in flow on channel stability and water quality.

RESPONSE 2: Flows in the upper 6 miles of Sixth Water Creek from Strawberry Tunnel to the proposed Last Chance powerplant will be significantly reduced under project operation due to the use of Syar Tunnel to convey transbasin diversions. The maximum long-term average monthly flow from the Strawberry Tunnel will be reduced from about 280 ft^3/s to 7 ft^3/s and the maximum monthly flow will be reduced from about 420 ft^3/s to 30 ft^3/s. This results in reduced channel erosion, reduced sediment load, and greater channel stability in this reach of Sixth Water. A landslide in this reach has been a significant source of sediment due to the high tunnel releases undercutting the toe of the slide. With the greatly reduced flows, the slide should have greater stability and the sediment contribution will be reduced.

Flows in the lower 3.8 miles of Sixth Water Creek from Last Chance powerplant to Monks Hollow Reservoir will be increased due to releases from the powerplant. Maximum monthly flows will be increased from 420 ft^3/s to 600 ft^3/s which will increase channel erosion and sediment load in this reach. This increase in sediment load would be offset by the reduction in the upper 6 miles resulting from significantly reduced flows.

Flows and sediment load in Diamond Fork channel below Monks Hollow Reservoir will be reduced under project operation. Average annual flow volume will be reduced about 40 percent and maximum monthly flow in an average year will be reduced by 38 percent due to the operation of the Diamond Fork pipeline. Sediment load in tons at the mouth of Diamond Fork will be reduced by 62 percent due to the retention of sediment in Monks Hollow Reservoir. The maximum monthly flow will be about the same as preproject conditions. This will result in less turbidity, less channel erosion, and greater channel stability.

WRITTEN COMMENT 3: Alternative A suggests that sediment yield will be reduced 62 percent at the mouth of Diamond Fork. Channel capacity might be reduced as a result of sediment accumulation in the stream channel. Discuss the downstream effects of mobilizing and transporting this sediment during rare flood events.

RESPONSE 3: The lower flows described in the response to written comment 2 and the trapping of sediment in Monks Hollow Reservoir will result in less sediment transport which will reduce sediment accumulation in the channel in lower Diamond Fork. Operation of Monks Hollow Reservoir will reduce flood peaks on Diamond Fork. However, during rare flood events, flood peaks will not be

completely controlled and additional sediment transport and channel erosion will occur but not to the extent that has occurred historically.

WRITTEN COMMENT 4: We are disappointed that the Bureau deleted the purposed (sic) Rays Valley-Springville crossing road reconstruction project. The road was enclosed in the 1984 Final Environmental Impact Statement (EIS). We believe it is in the best interest to complete this road as originally planned. There will be a lot of traffic on this road by those who want access to the upper part of the Monks Hollow Reservoir and the Three Forks Area. We strongly recommend the Bureau add this road back into the reconstruction program.

RESPONSE 4: The Rays Valley-Springville crossing road has been eliminated from the project plan. Under previous alternatives it provided needed access to the proposed powerplant and the Sixth Water Facilities of the Diamond Fork System. The plan as presently envisioned no longer requires that access and the road will not be included as a project facility.

WRITTEN COMMENT 5: With the first diversion of Project water being made this year through the Strawberry Aqueduct and Collection Systems, we believe this commitment for the nonguaranteed portion should be discussed with the other Agencies who are party to the Stream Flow Agreement and the commitment made as quickly as possible.

RESPONSE 5: Reclamation's recommended plan, alternative B, as described in the final supplement, provides for the full 44,400 acre-feet to be left in the Uinta Basin streams. This plan will provide for both the guaranteed and nonguaranteed portions of the 1980 Stream Flow Agreement. The final supplement has been expanded to discuss the Stream Flow Agreement and the associated Aquatic Mitigation Plan for the Uinta Basin streams.

WRITTEN COMMENT 6: With the construction of the Syar Tunnel and the capability it will have to deliver water to Sixth Water Creek, it is very important to restore some fishery habitat on the upper reaches of the Sixth Water Creek. The valve that will be installed between the Syar Tunnel and the old Strawberry Tunnel will be very important in providing flow for fish habitat in the upper reaches of the stream.

RESPONSE 6: We recognize the importance of the valve in providing flow for fish habitat in Sixth Water Creek. However, the valve's ultimate worth is contingent upon the availability of project water for bypass into the stream. A definitive water supply for this bypass has not been identified at this time as stated on page 142 of the draft Supplement. Reclamation is committed to working with the Forest Service and other resource agencies to resolve this issue as indicated on page 155 of the 1984 FES.

WRITTEN COMMENT 7: The Aquatic Mitigation Plan prepared by the Interagency Biological Assessment Team recommended 49 cubic feet per second (cfs) minimum for summer flow and 32 cfs for minimum winter flows. We recommend the Bureau adopt these suggested flows and plan for them.

RESPONSE 7: We assume that the comment is referring to recommended fishery flows in Sixth Water Creek. Initially, it must be clarified that the Aquatic Mitigation Plan mentioned in the comment is that plan developed for the Strawberry Aqueduct and Collection System and not for the Diamond Fork System. Flow release to Sixth Water Creek was included in the Collection System Plan as an acceptable mitigation option for that system only if recommended onsite measures, which are currently being implemented, could not be completed. It should also be noted that these flows are not minimums, but rather are considered preferred flows in the analysis conducted by the Interagency Biological Assessment Team. The release of these flows into Sixth Water Creek would provide an optimum level of fish habitat and subsequent potential for a good quality fishery given the constraints of the existing channel morphology.

A specific fishery mitigation plan was not required for the Diamond Fork System because of the substantial fishery enhancement on lower Diamond Fork from the removal of excessive flows by the Diamond Fork Pipeline. Adoption of the stated flow recommendations for Sixth Water Creek would constitute overall fishery enhancement for the Diamond Fork System above levels projected in the draft supplement. However, the availability of flows for this purpose has not been determined as discussed in the response to written comment 8. It should be noted that fish habitat restoration on Sixth Water Creek is included as part of the Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System. This effort would maximize habitat at reduced project flows.

WRITTEN COMMENT 8: The increased size of the Diamond Fork Pipeline from Monks Hollow Dam to Spanish Fork River will make it possible to improve fishery habitats along this reach. The 510 cfs pipeline will handle much of the summer flows. However, the limiting factor will be winter flows sufficient to sustain over wintering populations of fish. We recommend the Bureau provide adequate winter flows to sustain wintering trout.

RESPONSE 8: Additional winter flows are generally not needed to support the projected fishery benefits as presented in the draft Supplement because about 86 percent of these benefits are derived from fish stocking. However, we recognize that additional winter flow would provide increased potential for overwinter survival and subsequent harvest of both stocked and natural fish populations. Resolution of the potential availability of project flow for winter releases is deferred to the operational analysis and documentation to be completed for the I&D System EIS. It should be clearly understood, however, that the provision of flow

releases above natural levels during the winter would represent fishery enhancement above levels projected in the draft supplement.

WRITTEN COMMENT 9: We do not concur that the Fifth Water Trailhead and loop trail system in the Fifth and Sixth Water drainage should be deleted. The Three Forks Area in Diamond Fork presently serves as a trailhead for three extremely popular drainages for hiking and horseback riding on the Spanish Fork Ranger District. They are the Fifth Water, Sixth Water and Cottonwood Drainages. With the construction of Monks Hollow Dam, the only access to these drainages would be from the upper ends of the Fifth and Sixth Water Drainages where no access facilities will be available or the Monks Hollow Recreation Area which is a five-mile hike or horseback ride around the Reservoir.

RESPONSE 9: This document is not the proper forum to discuss changes in the project recreation plan. Reclamation will consider this proposed modification to the recreation plan and pursue it with the Forest Service in further discussions.

Letter from Fish and Wildlife Service Utah-Colorado Field Office, dated July 5, 1989.

WRITTEN COMMENT 10: In general, we find that the subject document accurately describes impacts of the three evaluated alternatives and plans considered in the 1984 Final Environmental Impact Statement (INT-FES 84-30) on fish and wildlife resources within the Diamond Fork Drainage. The document, however, does not contain evaluations of the impacts of alternatives A and B on the resources of Strawberry Reservoir, Utah Lake, the Jordan River and Utah Valley streams. The document proposes that these impacts be addressed in another Environmental Impact Statement for the Irrigation and Drainage (I&D) System. We believe that the subject document is adequate in regard to alternative C, which assumes that the System would not constructed; however, an overall comparison with alternatives A and B will necessitate evaluations of impacts outside the Diamond Fork Drainage.

RESPONSE 10: This document discusses the impacts of the Diamond Fork water conveyance system. A complete evaluation and comparison of impacts associated with the I&D System on the resources of Strawberry Reservoir, Utah Lake, the Jordan River, and Utah Valley streams will be included in a separate environmental statement for the I&D System of the Bonneville Unit, as necessary.

WRITTEN COMMENT 11: Another concern that we have about alternative A, is the impacts it would have on stream fisheries in the Uinta Basin. Alternative A assumes that sources of water to meet fisheries goals stated in the 1980 Streamflow Agreement, that do not require a reduction in the transbasin diversion, will be found. We do not believe that there are feasible means for

protecting stream fisheries affected by the Strawberry Aqueduct and Collection System without reducing the transbasin diversion. Readers should be made aware of the consequences of alternative A to the Uinta Basin stream fisheries.

RESPONSE 11: Alternative A assumed a pumpback system that would provide fishery flows in the affected Uinta Basin streams. See response to written comment 5.

WRITTEN COMMENT 12: The preliminary recommendations that we have offered for planning purposes have been incorporated in plans presented in the document. We wish to modify several of these preliminary recommendations.

RESPONSE 12: The Fish and Wildlife Service should provide the Bureau of Reclamation recommendations through the Fish and Wildlife Coordination Act process. There has been established an interagency team to review Reclamation's plans and to develop mitigation plans. We expect to receive any "modifications" to fish and wildlife mitigation plans after this team has had a chance to analyze the latest project plans and comment on any changes the Fish and Wildlife Service is proposing to recommend. Reclamation is not inclined to make changes in the project plan without having the above process completed.

WRITTEN COMMENT 13: Readers should be made aware of the sever consequences to the Uinta Basin fisheries if alternative A is selected. The May 1979 "Summary of Analysis of Alternative Streamflows for Fishery Purposes Strawberry Aqueduct, Bonneville Unit, Central Utah Project" also known as the "Governor's Report," evaluated the results of various quantities of water to protect fisheries of the affected Uinta Basin streams. Alternative 2 in this report would provide 22,300 acre-feet of water for protection of the fisheries, which is comparable to flows that would be available with alternative A in the document now under review. This amount of water for protection of the fisheries would result in a 63-percent reduction in adult trout habitat in the affect Uinta Basin streams and angler use would be reduced by 53 percent.

RESPONSE 13: The 1973 Final Environmental Statement for the Bonneville Unit evaluated the results of diverting project flows from the Uinta Basin streams; therefore, no further analysis is required in this statement. See responses to written comments 5 and 11.

WRITTEN COMMENT 14: Pages 2-3, Interrelationships, Bonneville Unit. This section should be expanded to address evolvement of the 1980 Streamflow Agreement. In a November 3, 1973, new release, the Secretary of the Department of the Interior recognized the need for additional streamflows in streams affected by the Strawberry Aqueduct and Collection System and indicated that an equitable solution would be forthcoming. At that time, only 6,500 acre-feet of water annually had been

provided for preserving affected streams. In 1978, under President Carter's water policy directives, greater emphasis was placed on fishery values, and studies were initiated to determine the effects of alternative streamflows. This led to the previously mentioned May 1979 report and to the Streamflow Agreement. The fact that the Streamflow Agreement goal for fisheries cannot be met if alternative A is selected should be clearly stated.

RESPONSE 14: See response to written comments 5 and 13.

WRITTEN COMMENT 15: An environmental comparison of alternative C with plans addressed in the 1984 Environmental Statement is possible; however, the net effects of alternatives A and B are not addressed in the subject document. Consequently, comparisons of the total impacts of these latter two alternatives cannot be made at this time.

RESPONSE 15: Summary table 2 and table 6 of the final supplement have been expanded to compare the impacts of those alternative plans presented in the 1984 FES with those included in this supplement to the FES. Also, see response to written comment 10.

WRITTEN COMMENT 16: Pages 22-23. The following statement needs to be clarified, "With alternative A and 1984 FES plan, only 6,500 acre-feet would be collected from the Uinta Basin tributaries. Therefore, with alternative B, 37,900 acre-feet of additional water would remain in the Uinta Basin."

The 6,500 acre-feet of water specified in an April 12, 1965, resolution by the State of Utah plus an additional 37,900 acre-feet that would be provided with the reduced transbasin diversion if alternatives B or C are selected would equal the 44,400 acre-foot amount specified in the Streamflow Agreement. The minimum amount of water that would be available for the Uinta Basin under terms of the Streamflow Agreement is 22,300 acre-feet. This is the minimum that should be assured with plans considered in 1984.

RESPONSE 16: Under the recommended plan (alternative B in the draft supplement) and alternative C, the transbasin diversion would be reduced by 37,900 acre-feet. This reduction, in addition to the 6,500 acre-feet which would remain in the Uinta Basin for stream fishery purposes, would provide the full 44,400 acre-feet goal of the 1980 Stream Flow Agreement.

WRITTEN COMMENT 17: Pages 33-35, Comparative Analysis of Impacts. As previously stated, an analysis of the impacts of alternatives A and B on Strawberry Reservoir, Utah Lake, the Jordan River and Utah Valley streams is not included in the subject document. Consequently, a comparison of the overall advantages or disadvantages is absent.

RESPONSE 17: See response to written comment 10.

WRITTEN COMMENT 18: Also, it would be appropriate to compare the effects of alternative A to alternatives B and C on the Uinta Basin streams addressed in the 1980 Streamflow Agreement.

RESPONSE 18: See response to written comment 13.

WRITTEN COMMENT 19: Pages 45-47, Utah Lake and Jordan River. No impacts on Utah Lake or the Jordan River are anticipated with alternative C. The impacts to these resources with alternatives A and B are to be addressed in a future Environmental Impact Statement on the I&D System. A potential future without-or-with-the-project condition that is not described in the subject document is a wildlife refuge on Utah Lake.

One proposal refuge would encompass about 50,700 acres of lands and waters in vicinity of Provo and Goshen Bays and Benjamin Slough. The purchase of up to 54,000 acre-feet of water for annual operations of this facility is also part of the proposed plans.

RESPONSE 19: The Fish and Wildlife Service has investigated the possibility of the development of a wildlife refuge management area in conjunction with Utah Lake. However, the Bureau of Reclamation is not aware that any official action taken on the part of the Fish and Wildlife Service that would establish this refuge in any official capacity that it would require Reclamation to address it in the context of the Bonneville Unit. Should the refuge reach some level of status between now and the time when the Draft Environmental Statement for the Irrigation and Drainage System is published, the impacts of the Irrigation and Drainage System on a proposal will be considered.

WRITTEN COMMENT 20: Again it is mentioned that impacts of alternative B on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be discussed in the draft environmental statement on the I&D System.

Comments made previously on the need for this evaluation to compare the alternatives are applicable.

RESPONSE 20: See response to written comment 10.

WRITTEN COMMENT 21: One proposal refuge would encompass about 50,700 acres of lands and waters in vicinity of Provo and Goshen Bays and Benjamin Slough. The purchase of up to 54,000 acre-feet of water for annual operations of this facility is also part of the proposed plans.

RESPONSE 21: See response to written comment 19.

WRITTEN COMMENT 22: Page 75. Plans for a chemical treatment of Strawberry Reservoir to renovate the fishery in 1989 have been postponed. Involved agencies are in agreement that the treatment is warranted and are hopeful that it can be accomplished soon.

There are no plans for the immediate stocking of smallmouth bass after the chemical treatment, but this species may be stocked later, if necessary, to aid in controlling the Utah chub.

RESPONSE 22: The proposed chemical treatment, including the schedule, is the responsibility of the Utah Division of Wildlife Resources. Therefore, all reference to the scheduling of this action and species to be stocked following treatment have been deleted from the draft Supplement.

WRITTEN COMMENT 23: Page 89. Plans for the renovation of Strawberry Reservoir in 1989 are mentioned. As previously stated, these plans have been postponed.

RESPONSE 23: See the response to written comment 22.

WRITTEN COMMENT 24: Page 89. Utah Lake. It is stated that alternative C will have no impacts on the Utah Lake fishery, and that the impacts of alternatives A and B will be presented in the draft environmental statement on the I&D System.
Without thorough knowledge of the total impacts of all of the alternatives, comparisons are difficult to make.

RESPONSE 24: See response to written comment 10.

WRITTEN COMMENT 25: Pages 137-142. Attachment 2, Fish and Wildlife Service Recommendations. Our draft Fish and Wildlife Coordination Act Report is being revised, and several recommendations are being modified.

In conjunction with recommendation 16 (page 141), investigations of the feasibility of adjusting flow release patterns from Strawberry Reservoir for maintenance of the fishery in Diamond Fork below Monks Hollow Reservoir during winter months is warranted. We recommend that minimum streamflows of 80 cfs be maintained as much of the time as possible.

In conjunction with recommendation 19(a) (page 142), the feasibility of bypassing summer (April 1 - September 30) streamflows of 49 cfs and winter (October 1 - March 31) streamflows of 32 cfs to Sixth Water Creek warrants investigation

RESPONSE 25: Refer to response to written comment 12. In response to the Fish and Wildlife Service recommendations to investigate the feasibility of providing additional flows in Diamond Fork and Sixth Water Creek, Reclamation is evaluating this option.

Letter from Utah Department of Health, Division of Environmental Health, dated June 29, 1989.

WRITTEN COMMENT 26: We support the Bureau's conclusion at the top of p. 67 regarding the potential problem with water

temperature and low dissolved oxygen levels in Diamond Fork. It appears from the modeling for condition A (releasing from below the thermocline on Strawberry) that dissolved oxygen levels will be below State water quality standards and beneficial uses would be impaired. We request that in the Final EIS, Reclamation describe specifically how this entire Diamond Fork-Spanish Fork River system be monitored to accurately document such problems. We request that Reclamation coordinate closely with the Bureau of Water Pollution Control in the water quality studies. We also request that Reclamation coordinate with the State during development of measures to mitigate temperature and dissolved oxygen problems.

RESPONSE 26: Reclamation has committed to monitor the Diamond Fork-Spanish Fork River system and to mitigate any violations of the State water quality standards.

Reclamation will coordinate closely with the Bureau of Water Pollution Control and the resource agencies in developing the monitoring program and in conducting the water quality studies. As requested, we will also coordinate with the State during the development of measures to mitigate temperature and/or dissolved oxygen problems, if they occur. The final supplement has been modified to include this coordination.

Letter from State of Utah Office of Planning and Budget, dated June 28, 1989.

WRITTEN COMMENT 27: On page 20, alternative A states: "The average annual diversions to the Bonneville Basin would consist of 142,500 acre-feet of project water developed in the Uinta Basin, and 56,700 acre-feet of Strawberry project water." The 1984 Final Environmental Impact Statement for the Diamond Fork System indicates that an average of 137,400 acre-feet of project water, and 61,000 acre-feet of Strawberry project water would be diverted annually from Uinta Basin. Please explain the difference in the figures, and if additional project water has been identified since 1984 for diversion to the Bonneville Basin, could that extra water be used to help meet the 1980 Instream Flow Agreement.

RESPONSE 27: The total annual diversion to the Bonneville Basin for alternative A of 199,200 acre-feet is nearly the same as the total for the 1984 Final Environmental Impact Statement of 198,400 acre-feet. The small difference comes from a slightly different project demand pattern which is present in these two alternatives. The difference between the two Strawberry Valley Project diversions (56,700 acre-feet versus 61,000 acre-feet) has occurred because we used estimates based on our best assumptions at the time these two documents were written. We are in the process of negotiating with the Strawberry Valley water users to determine the Strawberry Valley diversion, but it will not be known until the negotiations have been completed.

WRITTEN COMMENT 28: Though the 1980 Instream Flow Agreement is mentioned on page 22, more discussion of this agreement needs to be contained in the document. For example, alternative A does not recognize that the Central Utah Water Conservancy District agreed to provide an additional 15,800 acre-feet of water for instream flows in the Uinta Basin.

RESPONSE 28: See response to written comment 5.

WRITTEN COMMENT 29: Further, alternative C indicates that it would satisfy the requirements of the 1980 Instream Flow Agreement by reducing the trans-basin diversion. Does this mean that alternative C would be essentially the same as alternative B, and provide the entire 44,400 acre-feet of the required Uinta Basin instream flow?

RESPONSE 29: See response to written comment 16.

Letter from Central Utah Water Conservancy District, dated June 29, 1989.

WRITTEN COMMENT 30: The alternatives presented do not evaluate the difference in scope of power development, but evaluate alternative uses of water, keeping the power system essentially the same.

RESPONSE 30: Reclamation took the word "power" out of the system title to reflect a change from a hydropower production to an emphasis on a project water conveyance system. The supplement evaluates alternatives of a conveyance system. This document is a supplement to the 1984 FES for the "Power System," and as such accurately and completely describes the environmental impacts of additional features and modifications to the "Power System." See responses to written comments 10 and 15.

WRITTEN COMMENT 31: The Central Utah Water Conservancy District, therefore, brings to the attention of the Bureau that this supplement cannot be a Supplement to the Final Impact Statement of the Diamond Fork Power System because:

1. The scope of the document has changed to something different than a power system EIS as originally described in the 1973 Bonneville Unit EIS and the Diamond Fork Power System Final Environmental Impact Statement.

2. The alternatives presented in the Draft Statement have nothing to do with evaluating differences in the Diamond Fork Power System.

3. The document inaccurately and incompletely describes the alternatives presented.

4. The alternatives are written to describe the difference in levels of irrigation developments (although they are not adequately described) when in reality the different alternatives really measure alternative levels of fishery flow development in the Strawberry Aqueduct.

It seems, therefore, that the document pretends to be a supplement to a Final EIS on a power system; changing the emphasis to evaluating alternatives on different lines of irrigation. But, in reality, the document develops plans for different levels of stream fishery flows in the Strawberry Aqueduct which are not evaluated or described at all.

RESPONSE 31: See response to written comment 30. Reclamation believes that the subject supplement is in substantial compliance with the desires of the district.

The alternative plans described in the supplement were developed to correspond with irrigation concepts, facilities, and operation of the proposed I&D System. See response to written comments 5 and 10.

WRITTEN COMMENT 32:

Comments on "Need for Action," page 6

Alternatives A and B have features in the same location at the beginning and end of the Diamond Fork Power System. The Syar Tunnel is the same, and Monks Hollow Dam and Reservoir is the same. The power system in between is different, and that should be the main emphasis of this document.

Paragraph 1 sates, "The only significant concerns and needs which emerged since publication of the EIS are related to electrical energy requirements.... Because irrigation of lands in the Spanish Fork area has been included as a project purpose...."

The irrigation requirements in the Juab area and Sevier River area are also included in alternatives A and B, but not described in the EIS. To be a complete EIS, these irrigation areas need to be described. It seems that Reclamation decided they wanted to construct a certain power plant and needed something to help justify it so they added the Spanish Fork irrigation as a project purpose.

In analyzing the Diamond Fork System in this manner, the District suggests that Reclamation seems to be losing sight of the original statement or game plan of the 1973 Bonneville Unit EIS in that six systems will have EIS's prepared: (1) Starvation Collection System, (2) Strawberry Aqueduct and Collection System, (3) Diamond Fork Power System, (4) Irrigation and Drainage System, (5) Municipal and Industrial Water System, and (6) Bureau of Indian Affairs Activity.

The Final Environmental Impact Statement on the Diamond Fork Power System described a power system with a Syar Tunnel and a Monks Hollow Dam and Reservoir. The Supplement to the Final Environmental Impact Statement described a plan for a power system that includes a Syar Tunnel and a Monks Hollow Dam and Reservoir at the same locations and capacities as the original Final Impact Statement. It seems that Reclamation has authority and direction to construct Syar Tunnel and Monks Hollow Dam and Reservoir, and that they need only to write an EIS on the power system Reclamation suggests should be built between those two facilities, and to describe its impact on the environment, and to leave the Irrigation and Drainage System and the alternative levels of stream fishery flows to an additional EIS as directed by the 1973 Bonneville Unit EIS.

By including the problem of alternative use in the Irrigation and Drainage System and the bringing up the problems of the different levels of the stream fishery flows, it really places the Diamond Fork Power System beyond and out of scope of that originally contemplated in the 1973 Bonneville Unit EIS.

It seems that although Reclamation describes the problem of non-Federal versus Federal Government development of the power plants as a possibility, they need to better describe why they are recommending what they are recommending, and what happens if the non-Federal developer wants to construct something larger or smaller than projected by Reclamation. Can the water conveyance facilities permit any change to happen?

RESPONSE 32: The Diamond Fork System is that set of project features conveying water from the enlarged Strawberry Reservoir to the confluence of the Diamond Fork with the Spanish Fork River. This system is primarily a water conveyance facility. Additionally, any power need for project purposes is developed within the system, and provision for non-Federal power development is made. This document supplements the 1984 Diamond Fork Power System Final Environmental Impact Statement, covering modifications and alternatives developed since that point in time. Project plans pertaining to Syar Tunnel, Monks Hollow Reservoir, and the Diamond Fork Pipeline have not changed since that point in time. Power development needs have changed. Accordingly, the alternatives discussed in this document were investigated to accommodate this change.

The Juab and Sevier River areas are included in the Irrigation and Drainage (I&D) System, and description and impacts associated with this system will be covered in the I&D System Environmental Statement, as will the Spanish Fork area irrigation. Since the Spanish Fork area irrigation was added as a Diamond Fork System feature since the 1984 EIS, these lands are covered in this document. This was determined appropriate since delivering project water to these lands required construction of no project facilities beyond those already included in the Diamond Fork System.

The "game plan" of the 1973 FES and associated court decisions is being followed. As was mentioned above, the intent of this document is to supplement the Final Environmental Statement for the Diamond Fork Power System, which was filed in 1984. This supplement covers features of this system which have changed since that point in time. Environmental statements have discussed the Starvation Collection System, Strawberry Aqueduct and Collection System, and Municipal and Industrial System. The environmental statement for the Irrigation and Drainage System remains to be done.

The project plan has been modified and refined since the 1973 Bonneville Unit FES and 1984 Diamond Fork FES. Modifications to project features in the Diamond Fork System as a result of these changes are covered in this document. Modifications to features in the Irrigation and Drainage System as a result of these changes will be covered in the Irrigation and Drainage System Environmental Statement.

The Diamond Fork System is sized for water delivery and not for the development of hydropower. The development of power is, among other things, dependent upon scheduling and the availability of project water. The potential for power development is maintained where practical, but the purpose of the system is water delivery, and facility sizing and location will remain unchanged.

Expressions of interest for funding power development in Diamond Fork have been received, and Reclamation and the Western Area Power Administration are preparing to pursue a public process for non-Federal power development in Diamond Fork. This process will identify the evaluation and selection criteria, financing options, and select the sponsor. It is anticipated that details regarding operation, maintenance, control, and marketing will be refined during the public process and contract negotiations.

Development of power sufficient for project purposes is covered in this document. Additional power development and any associated changes to Diamond Fork System features by another entity would need to be covered under a separate NEPA document.

WRITTEN COMMENT 33:

Comments on Operating Facilities and Project Administration, page 14

"Operating facilities and project administration would be the same as presented in the FES, with two exceptions. The Central Utah Water Conservancy District or other entity designated by Reclamation would operate the project water conveyance facilities...."

This District has, by virtue of a contract, the right to operate the project water conveyance facilities. We presently operate the Syar Tunnel inlet facilities, and do not intend on relinquishing that to another entity.

RESPONSE 33: The text of the final supplement has been modified to clarify this issue.

Letter from Intermountain Water Alliance from June 6, 1989.

WRITTEN COMMENT 34: There is no mention of the conservation plan to reduce the demand for the trans-basin diversion (see the letter from the U.S. Environmental Protection Agency in the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System of the Bonneville Unit of the Central Utah Project, page 201 and the Bureau's response, Issue 73a, 73b, and 73c). Note that water conservation plans will begin to be implemented during the years 1995 and 2000 (page 179), long after the Central Utah Project is completed. The ramification of this delayed water conservation effort (and we have not even seen a preliminary plan yet!) are:

a. There will be no water conservation because repayment of water contracts will require continued wastage of water and there will be huge surpluses of water for the next 50 years in all regions the Central Utah Project operates. Already during the sixth driest year on record (1988), there was no rationing of water and neither Little Dell or the Jordanelle Projects were operating and the Red Fleet Reservoir near Vernal was utilized only for token reasons. Flaming Gorge continues to be sitting still without any water being utilized.

b. The Central Utah Project is contrary to water conservation. Dual-water systems which are popular throughout most of Utah are not utilized in Utah and Salt Lake Counties - the two counties being the recipient of most of the waters of the Jordanelle and Diamond Fork System. Continued wastage of culinery (sic) water on lawns in these two counties will continue.

c. Utah is perhaps the only State in which water conservation is nonexistent. In the Public Review Draft State Water Plan 1989 it is stated: "Presently, state water policy on conservation is in its early stages" (page 17-1). It is ironic that the Federal agency, the Bureau of Reclamation has no water conservation plan at this time, even though it has been operating in the arid west for 80 years.

Thus, with continued emphasis on water development, the taxpayers will, both literally and figuratively, continued to be soaked.

RESPONSE 34: Although no specific section of the Diamond Fork System of the environmental statement references water conservation, it would be in error to assume that the Bonneville

Unit does not concern itself with that subject. Since the Diamond Fork System is a water conveyance system, with limited consumption of water anticipated, it would be inappropriate to discuss conservation in the document. That the Bonneville Unit will address conservation issues is evidenced by the assumption that municipal demands, on a per capita basis, will decline in future years. Also, sprinkler irrigation is the method likely to be implemented in the Irrigation and Drainage System. We also note that the current draft of the potential CUP ceiling bill, in section 104, takes a strong stand requiring specific water conservation plans by the users. If the district fails to adopt such plans by 1996, a penalty of up to 0.1 percent of the previous annual Municipal and Industrial shall be imposed by the Secretary. We believe these items clearly demonstrate the existing support for conservation.

WRITTEN COMMENT 35: A second big problem is that the Diamond Fork System will take high quality water from the Uinta Mountains and dump 105,300 acre-feet (Plan A), 89,000 acre-feet (Plan B), and 82,100 acre-feet (Plan C) into the highly eutrophic, slightly saline Utah Lake for Municiple (sic) and Industrial Use. This compares to the recommended plan (Supplement to Definite Plan Report advanced draft, Oct. 1987, Figure 10) of 44,600 acre-feet of water from the Diamond Fork System into Utah Lake. This is probably the biggest waste of pure mountain water in the world. The downgrading of high quality water could be altered if the Wallburg tunnel were implemented. (This alternative has always been dismissed by water developers with the statement: The Wallburg tunnel has been adequately considered but the alternative is dismissed. There has been no good reason for the dismissing of this alternative and the public has not seen any discussion of the alternative.) The implementation, of course, would have eliminated the Jordanelle alternative as well as the transbasin diversion, but apparently does not meet the mythological standards that drive Utah's water works. The present water policy, the Diamond Fork System, should the scheme as described in the latest Draft report come to fruition, would be contrary to all of the last 30 years of efforts in the United States of preserving high quality water.

RESPONSE 35: Under the operation study for the recommended plan (alternative B), the total transbasin diversion is 163,400 acre-feet. Of this amount, 800 acre-feet is Monks Hollow evaporation, 61,500 acre-feet is for Strawberry Valley Project, 13,200 acre-feet is for Spanish Fork supplemental irrigation and 55,600 acre-feet is for the Irrigation and Drainage System. Therefore, only 32,300 acre-feet actually enters Utah Lake. This water essentially replaces high quality Provo River water which is stored in Jordanelle Reservoir as part of the Municipal and Industrial System.

Under alternative A, 48,000 acre-feet actually enters Utah Lake, and 82,100 acre-feet enters Utah Lake under alternative C. This

water is primarily used as an exchange for high quality Provo River water stored in Jordanelle Reservoir.

The Round Valley Alternative (Wallsburg Tunnel) to the Diamond Fork System was discussed in the 1973 Bonneville Unit Final Environmental Statement and the 1979 Municipal and Industrial System Final Environmental Statement. Both of these statements are public documents. As stated in these documents, preliminary analysis indicated that this alternative would cost more than the Diamond Fork System plan and that there would be significant loss in potential power generation capability, in part because the Diamond Fork flows would not be used for power generation.

WRITTEN COMMENT 36: A third big problem is that the Bureau of Reclamation continues to advocate off-site mitigation. This is disastrous in the west and will lead to extinctions of species because no biological survey of the region has been instituted. It may already have contributed to the extinction of the Wasatch Western Spotted Frog. The area proposed for destruction by the Bureau of Reclamation (the Provo River and Spanish Fork River systems) have an abundant diversity of aquatic species that do not occur in the Strawberry River area. Likewise, the Strawberry River area has one species of leech that is not found in the Bonneville Basin. The species survived in regions which were neither flood by Pleistocene Lake Bonneville nor glaciated by the alpine glaciers. See Figure 1 for a list of amphibians and leeches. Mollusks and fish show similar results.

Mitigation in Strawberry Drainage would affect 60 percent of the species found in the Weber drainage, 60 percent of the species found in the Provo drainage, and 50 percent of the species found in Diamond/Spanish Fork drainage with respect to amphibians and leeches. Improving of Strawberry area for aquatic species and the destruction of the Bonneville drainages will only lead to regional and even total extinction of animals. The Strawberry drainage lacks four out of five species of Erpobdellidae leeches and both the Ranidae amphibians. Unfortunately, it has been easy for the Bureau of Reclamation to dismiss sound biological data as well as sound biological principles due to the lack of money for this mulitbillion (sic) dollar project. (See the discussions in the Record of Decision for the Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial System of the Bonneville Unit of the Central Utah Project). Approval of off-site mitigation for the Central Utah Project is biologically unsound and reckless, since it puts too many eggs in one basket and does not recognize the diversity of habitats that occur in the Bonneville Basin.

A second aspect of this mitigation is that the wetlands formed from return flows from agricultural uses are wetlands in a very superficial sense. No mollusks, leeches, or amphibians (with the possible exception of the chorus frog) will occupy these sites unless introduced by man. There are springs in the Bonneville Basin below the 1552 meter elevation (the high water elevation of

the Pleistocene Lake) that do not contain leeches, mollusks, or amphibians after 10,000 years of existence and these springs are very numerous. Thus forming wetlands is not the same as preserving wetlands.

A third aspect of this mitigation is that each spring has its own unique fauna in arid regions. Manipulations of springs have destroyed portions of this fauna (as the western spotted frog in the Wasatch). The Draft statement does not adequately describe just what wetlands and riparian zones will be destroyed or what springs will be destroyed (by widening the roads). Thus there is no way of assessing the information.

RESPONSE 36: Mitigation plans for the Diamond Fork System were cooperatively developed under requirements of the Fish and Wildlife Coordination Act with the U.S. Fish and Wildlife Service, Utah Division of Wildlife Resources, and U.S. Forest Service. All of these agencies have agreed and signed off on the fish and wildlife mitigation plans. The offsite mitigation option is part of a three-system mitigation plan cooperatively prepared and agreed to by Reclamation and these cooperating resource agencies, and as such is in compliance with the Fish and Wildlife Coordination Act.

WRITTEN COMMENT 37: The fourth major problem is that water allocation from agriculture to municipal and industrial use has drastically changed during the rewriting of the Diamond Fork system. Presently it seems that the major portion of the water is now being allocated for municipal and industrial use from the Strawberry Collection and the Diamond Fork transbasin diversion. How does this affect the repayment ceiling which the voters approved (see chapter IV for all your approval). It now seems that most of the cost of these two components will now have to be included within these ceilings. Please state the present acre-feet breakdown for each component (M&I, collector system, Diamond Fork System, I&D system) for M&I use under its obligatory payback scheme and the cost these acre-feet represent under your latest revised scheme.

RESPONSE 37: Reclamation disagrees. The amount of water allocated to M&I, specifically Salt Lake and Utah Counties, is unchanged. Costs allocated to M&I are within the cost ceiling imposed by the 1985 Supplemental Repayment Contract. A breakdown of costs by component is outside the scope of this document.

WRITTEN COMMENT 38: Thus we ask: (1) Where is you conservation plan; (2) How can you take high quality water and dump it into a eutrophic, saline lake; (3) Does the Bureau have any concern for aquatic fauna and any appreciation for its habitats; and (4) Just what is the breakdown of the cost of the project to M&I users?

RESPONSE 38: See responses to written comments 34, 35, 36, and 37.

WRITTEN COMMENT 39: Page 5, page 90. Please list the species of toads and frogs which are common to the area and when and how was this commoness (sic) determined.

RESPONSE 39: Species of toads and frogs found in the area in conjunction with inventories of habitats adjacent to Utah Lake (Utah Division of Wildlife Resources, 1982, Utah Lake Terrestrial Wildlife Inventory, pages 238-242) were:

Name	Occurrence based on sighting
Bullfrog	Widely distributed but infrequently observed.
Western chorus frog	Abundant in shallow wetted areas.
Western leopard frog	Abundant in shallow wetted areas.
Western toad	Sightings were rare.
Woodhouse's toad	Sightings were rare.

WRITTEN COMMENT 40: Page 6 and 7 and throughout the report. Supplemental irrigation. What is the cost of this water per acre-foot and can the agricultural community afford this water? What happens in wet years when this water is not needed?

RESPONSE 40: NEPA does not require a breakdown of costs or financial analysis; therefore, these are not included in this document. However, a repayment contract has been signed, and repayment by the irrigators is limited by their ability to pay.

The irrigation water supply from the project is a long-term average supply. It will vary from year to year. In wet years, or in years when less than the average is needed, the water will be stored in project reservoirs for use in succeeding years.

WRITTEN COMMENT 41: The entire report: It seems that most of the impacts and benefits of alternatives A and B are deferred to the Irrigation and Drainage component analysis. This leaves only one alternative (C) which is discussed. If alternative A and B are not selected, then what needs does the Bureau of Reclamation have for power? Where and how will this power be used? Who will operate the "joint" power plant and will this joint operation be paid (page 10-11)? What if Pacific Corp or some other shareholder-owned utility wish (sic) to build the power plant (page 13)? Would the electricity generation be managed by Western Area Power Administration? What is the difference between operate the power plant and control the power plant (page 15)?

RESPONSE 41: Impacts and benefits of the Diamond Fork System are adequately addressed in this document for all alternatives. Alternative B has been selected as the recommended plan.

If alternative C were selected, Bonneville Unit Project pumping requirements would have been reduced.

Reclamation and Western Area Power Administration are preparing to pursue a public process for non-Federal power development. This process will identify the evaluation and selection criteria, financing options, and select the sponsor. It is anticipated that details regarding operation, maintenance, control, and marketing will be developed during the public process and contract negotiations.

WRITTEN COMMENT 42: Off-site or on-site mitigation options will not compensate fully for losses of all indicator species as well as other affected wildlife species and their habitats. This statement in the Draft is absolute nonsense unless a thorough biological survey is performed. Beaver do not indicate any aquatic species that exists in springs and flowing waters. Just where are the aquatic areas which will be impacted? What about the springs in lower Diamond fork found in the ribboned section of the river? Will these springs be affected and how will the impacts be mitigated?

RESPONSE 42: See response to written comment 36. Also, the Environmental Protection Agency and Corps of Engineers, both of which have regulatory responsibilities under the Clean Water Act and Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) have either concurred or had no comment on the proposed mitigation measures. Letters of comment from these agencies are included in this final statement.

Any springs found in the lower Diamond Fork stream channel below Monks Hollow Reservoir will not be adversely impacted by the project. A small sulphur spring near the proposed Monks Hollow Dam axis would be eliminated by construction of the dam. Because of the adverse impacts of the sulfur springs on water quality of Diamond Fork, there would be no attempt to mitigate for this lost spring.

WRITTEN COMMENT 43: Page 19. Off-site mitigation proposed just because the Bureau of Reclamation already owns 90 percent of the land is an absurd reason for off-site mitigation. Diversity of habitats as well as locations in different areas is a far more sound principle of wildlife conservation and enhancement practices - instead of putting all eggs in a bottomless basket.

RESPONSE 43: See response to written comments 36 and 42. Also, Reclamation now owns most of the proposed mitigation land, but over 50 percent of the mitigation lands were previously purchased

from private landowners for Bonneville unit mitigation purposes (see table 3).

WRITTEN COMMENT 44: Page 27. Where would the bedload material be deposited after removal from the reservoir?

RESPONSE 44: Any sediment disposal site would be carefully located to avoid significant adverse environmental effects. Alternative B is now the recommended plan. Under this plan, Three Forks Reservoir will not be built.

WRITTEN COMMENT 45: Page 35. With the large fluctuation of Monk's Hollow reservoir and during the summer recreational period, will this reservoir support a standing crop of 17 pounds per acre of fish?

RESPONSE 45: The analysis of the fish standing crop potential of Monks Hollow Reservoir, as well as the analysis of stream fishery impacts, was performed in compliance with Fish and Wildlife Coordination Act requirements and was an interagency effort by a team of biologists representing the Fish and Wildlife Service, Bureau of Reclamation, Forest Service, Utah Division of Wildlife Resources, and Central Utah Water Conservancy District. It was based on several assumptions supported by Utah Division of Wildlife Resources practices and surveys of stocked trout fisheries. These included specified trout stocking rates, growth rates, carryover, creel return, average catch rate, and angler-day length. Operation of the reservoir, including fluctuation levels, was given serious consideration in developing the assumptions. The standing crop estimate of 17 pounds per acre, considered low by most standards, is reflective of a totally stocked fishery with stocking levels and projected growth rates commensurate with a reservoir with a large fluctuation in water level. All phases of the analysis and the results were agreed upon by everyone else on the interagency team.

WRITTEN COMMENT 46: Page 39. Where is the location of the 28 acres which will be temporary (sic) lost and the 23 to 44 acres which will be permanently lost.

RESPONSE 46: Riparian habitat impacted by the various project alternatives will be mostly along Diamond Fork with a small portion, 1 acre or less on Sixth Water Creek. Revised estimates show a permanent loss of from 24 to 45 acres and a temporary loss of from 14 to 18 acres.

Project feature	Acres of riparian habitat impacted
Recommended plan	
Monks Hollow Dam, Powerplant, and Reservoir	35 acres permanent loss

Project feature	Acres of riparian habitat impacted
Sixth Water Tunnel and Last Chance Powerplant	<1 acre permanent loss
Access roads	1 acre permanent loss
Recreation sites	8 acres permanent loss
Diamond Fork Pipeline	14 acres temporary loss
Alternative A	
Monks Hollow Dam, Powerplant, and Reservoir	35 acres permanent loss
Fifth Water Tunnel and Last Chance Powerplant	<1 acre permanent loss
Access roads	1 acre permanent loss
Recreation sites	8 acres permanent loss
Diamond Fork Pipeline	14 acres temporary loss
Alternative C	
Three Forks Dam	14 acres permanent loss
Fifth Water Tunnel and Last Chance Powerplant	<1 acre permanent loss
Access roads	1 acre permanent loss
Recreation sites	8 acres permanent loss
Diamond Fork Pipeline	18 acres temporary loss

WRITTEN COMMENT 47: Will the Diamond Fork road require widening and hence destroy the adjacent springs?

RESPONSE 47: The Diamond Fork road from the mouth of Diamond Fork Canyon (junction with U.S. 6) to Monks Hollow Dam will be upgraded and widened. The Diamond Fork Pipeline will be buried in sections of the new road. There would be no springs impacted by the road construction. A water line from an uphill spring to a Forest Service campground would be replaced.

WRITTEN COMMENT 48: Page 41. Streams need floods to maintain stream beds. Controlling floods ultimately destroys stream beds.

RESPONSE 48: We assume that the intent of this comment is referring to the fact that Monks Hollow Dam would serve as a sediment trap and eliminate the annual recharge of gravels to lower Diamond Fork from tributary flood flows, although Wanrhodes Canyon and Little Diamond Creek are below the dam and would continue to provide sediment during runoff. Peak flows would be reduced below Monks Hollow Dam due to flood control operation, but flooding would not be eliminated from Diamond Fork.

WRITTEN COMMENT 49: Page 46. What were the flows in 1982 to 1985 as compared to 1952 extreme of 1,217,500 acre-feet?

RESPONSE 49: The years 1982 to 1985 are outside of the period of study 1930 to 1973. This period of record was used because it covers a representative period of dry, wet, and near average years. Also, the hydrologic conditions during this period should give water supply amounts which will accurately estimate long-term averages. We do not consider the flow data from 1982 to 1985 to be necessary for this document.

WRITTEN COMMENT 50: Page 48. Why would the reservoir be filled at the end of each month? Why not keep the reservoir at more constant level?

RESPONSE 50: It would be necessary to have Monks Hollow Reservoir full during certain months of the year (particularly before the irrigation season) so that the project water users will be able to meet peak irrigation demands. The operation of Monks Hollow presented in this document is an estimate of the operation of the reservoir. The future operation of Monks Hollow will depend on several factors including the irrigation demand patterns of the water users.

WRITTEN COMMENT 51: Page 48. Table of Utah Lake fluctuations. Please update the figure to include the years from 1974 to and through 1988 which would include three very wet years as well as some very dry years.

RESPONSE 51: The years 1974 to 1988 are outside of the period of study (1930 to 1973) which was used for the water supply operation studies in this document (for an explanation of why this period was used, see the response to written comment 49). We do not consider updating through 1988 to be necessary for this document. A more detailed analysis of Utah Lake will be covered in the future I&D System EIS.

WRITTEN COMMENT 52: Page 52. Table 10. What is the historic numbers without Strawberry users contributions (which were disastrous the (sic) stream fisheries?

RESPONSE 52: We consider the flows as displayed in table 10, which represent existing conditions, to be adequate for the

evaluation of impacts. A table such as table 10 consisting of flows excluding Strawberry Valley water users contributions from Strawberry Reservoir would be outside the scope of this document.

WRITTEN COMMENT 53: Page 60. "Present user of Utah Lake and Jordan River water are expected to use water as they have in the past." This statement does not take into account the tremendous conversion of agricultural lands to urban lands which now utilize culinery water for outdoor watering instead of Jordan River and Utah Lake waters. What is the yearly loss of agricultural lands in Salt Lake and Utah Counties during the past 10 years?

RESPONSE 53: The paragraph in question has been changed to read, "Present users of Utah Lake and Jordan River water are expected to divert water as they have in the past." From 1978 to 1987, irrigated agricultural lands in both Salt Lake and Utah Counties have decreased by 29.8 percent and 13.3 percent, respectively. The decrease in agricultural lands is primarily due to urban development.

WRITTEN COMMENT 54: Page 63. Explain the "natural pollution" factors. If it is natural, it seems that these factors should not be considered as pollution. In as much as the Bureau of Reclamation admits that the lake contains poor-to-fair quality of water, why is the Bureau insisting that high quality water from the Uinta Mountain be dumped into this lake for M&I uses? It should be noted that although the natural chemicals in Utah Lake may always have contributed to the eutrophic state of the Utah Lake, the natural fauna of Utah Lake is all but eliminated with respect to both fish and molluscan fauna - mostly because of the human impacts, water use, and return flows from industrial and agricultural waters.

RESPONSE 54: A further discussion of water quality conditions in Utah Lake and project impacts will be provided in the Irrigation and Drainage System EIS. Page 63 of the draft supplement has been modified to avoid the confusion caused by the use of the word "pollution." Refer to the response to written comment 35 for a discussion of project water in Utah Lake.

WRITTEN COMMENT 55: Page 67. "Impacts of alternative A on Strawberry Reservoir, Utah Lake, Utah Valley streams and the Jordan River will be presented in the I&D system draft statement." Yet over 100,000 acre-feet of high quality water is being dumped into Utah Lake for M&I use. It seems that all major consequences of the Central Utah Project are deferred to later analysis - after the project is built. Yet each component is supposed to stand on their own merits.

RESPONSE 55: See response to written comment 35 for a discussion of high quality water entering Utah Lake. See written comment 58

for a discussion of the process for preparing environmental impact statements for the Bonneville Unit.

WRITTEN COMMENT 56: Page 71-75. Strawberry Reservoir treatment is highly uncertain and is not schedule for 1989. Strawberry Reservoir will be considered as the chubbiest lake for Utahn suckers. This reservoir may end up with zero recreational benefits. Then the cost-benefit ratio of the entire Strawberry Collection system could end up with a totally unfavorable ratio. Still the Bureau proposes to destroy more important stretches of high quality trout streams in the Diamond Fork drainage.

RESPONSE 56: See the response to written comment 22 concerning Strawberry Reservoir treatment. Assuming that this occurs as planned, the concern expressed about declining recreation benefits would no longer be valid. It should be noted, however, that the recreation benefits were originally based upon a specific level of projected angler use on the reservoir. The Utah Division of Wildlife Resources is responsible for managing the fishery and maintaining associated angler use at or near this level.

With reference to Reclamation proposing to "destroy more important stretches of high quality trout streams in the Diamond Fork drainage," the pages cited in the comment (71-75) do not discuss impacts, but instead contain a discussion of existing conditions. Anticipated fishery impacts of the project alternatives are found on pages 76 through 89 of the draft Supplement. Although specific reaches of Sixth Water Creek and the Spanish Fork River would experience a reduction of fish habitat due to project operation, fish habitat and standing crop in the majority of the drainage would show significant enhancement. This is especially true of Diamond Fork below Monks Hollow Reservoir, where much of the historically high irrigation flows would be carried in the Diamond Fork Pipeline and a more optimal fishery flow would be released to the stream, providing ideal habitat conditions for fish.

WRITTEN COMMENT 57: Page 110. If irrigation would benefit about 195 families (800 people) that receive some portion of their income from water, the Diamond Fork System is not only providing supplemental water but providing this water to hobbie (sic) farms. The 85 new on farm jobs with total annual wages estimated at $782,000 means these new jobs for the average family size of 4 would earn an individual $9,000 per year. Without food stamps, it sounds as though slave and child labor is being encouraged!

RESPONSE 57: The Diamond Fork System provides a supplemental water supply to 47,880 acres of land. The number of families receiving benefits from the system was estimated by converting the benefitted land area to an equivalent number of full-time farming operations, not hobby farms. 47,880 acres divided by

195 farms is approximately 245 acres per farm. A 245-acre farm would normally be considered a working size farm.

The 85 new onfarm jobs is an estimate of equivalent full-time jobs attributed to the supplemental water supplied by the Diamond Fork System. This estimate was obtained by dividing the increase in farm labor generated by the project (187,500 hours) by the hours in a typical farm work year (2,200 hours per year). This increase in labor is due primarily to an increase in yields obtained from a more stable and reliable supply of water. Therefore, it is anticipated that the demand for most of this labor would be needed on a seasonal basis which would employ more workers for a short duration (part-time/temporary) rather than provide 85 full-time job opportunities. It is also anticipated that the increased labor demand would be filled from the labor pool currently available in the area. This pool consists mostly of high school and college students during the summer months as well as migrant workers and housewives during the fruit harvest season.

The $782,000 total annual wages is estimated by multiplying the increase in farm labor attributed to the supplemental water (187,500 hours) by the annual average farm labor wage rate for field and livestock workers ($4.17 per hour). It should be remembered that since the purpose of the Diamond Fork System is to provide a supplemental water supply to existing farms, these wages are essentially an additional source of income to the beneficiaries, not the sole source.

Letter from National Wildlife Federation, dated July 14, 1989.

NOTE: Because of the length of the Federation's letter, only the bold headings are shown here for comments 58 through 73. Responses are provided for all comments included under the bold headings, however. The complete text of the Federation's comments is included in the copy at the back of this document.

WRITTEN COMMENT 58: The Draft Supplement's scope is unnecessarily narrow and fails to identify the cumulative environmental effects that are likely to be experienced in combination with the construction of other features of the Bonneville Unit.

RESPONSE 58: The Federal District Court in 1974 declared that the Bonneville Unit Final Environmental Statement (INT FES 73-42) was adequate for the Strawberry Collection System, but instructed Reclamation to prepare separate environmental statements on other systems of the Bonneville Unit. Impacts of the M&I System were evaluated in a final statement (INT FES 79-55) and a supplement to the final (INT FES 87-8). Reclamation also prepared the 1984 FES (INT FES 84-30) on the Diamond Fork Power System, and this

supplement to that statement merely provides analysis on additional alternatives under consideration.

Public Law 100-563 did require Reclamation to prepare an environmental statement on the I&D System by December 31, 1989. However, this requirement was rescinded by Congress (Senate Hearings 101-193, Part 1). At present, the planning process for the I&D System is on hold until Congress provides funding for the system. Because of this delay, Reclamation cannot include the Diamond Fork System and the I&D System Plans together in one environmental statement. A separate statement will be prepared which will evaluate those I&D System alternatives which will be formulated to operate in unison with the recommended Diamond Fork System plan described in this final supplement.

Salinity impacts to the Colorado River System caused by the development of the Bonneville Unit were presented in the INT FES 79-55, the Final Environmental Impact Statement for the M&I System, Bonneville Unit, dated October 25, 1979.

See response to written comment 5 regarding the Aquatic Mitigation Plan for fishery impacts in the Uinta Basin.

WRITTEN COMMENT 59: The Draft Supplement fails to identify and evaluate the implications for the Diamond Fork system and the Bonneville Unit of obligations to meet Ute Indian Water Rights.

RESPONSE 59: Many options remain for the satisfaction of the 1965 Deferral Agreement by any or all of the signatory entities. Reclamation, the Ute Tribe, the State of Utah, and the CUWCD are currently evaluating options which might satisfy both the terms of the agreement and the current tribal representatives. Reclamation disagrees that this environmental statement is an appropriate vehicle to array and evaluate the options of the settlement. If a potential settlement were to impact existing plans or facilities, we assume that appropriate NEPA compliance would be required. Until such time as the agreement is declared in default, we continue to honor the commitment.

WRITTEN COMMENT 60: The alternatives presented in the Draft Supplement raise numerous questions about the Bureau's intended purposes for the Bonneville Unit, and about the design assumptions. The Bureau should consider several variations on the alternatives presented.

RESPONSE 60: Reclamation agrees that the current statement is improved by adding the display of additional alternatives. We have therefore expanded summary table 2 and table 6 from the draft supplement to display the full array of alternatives considered in the 1984 FES and this supplement.

Reclamation disagrees with the comment that no further funding be expended. Our position remains that the clear intent of the language providing for a programmatic ES followed by separate NEPA compliance on each system is to allow continued construction of early systems while final details for subsequent systems are being developed.

WRITTEN COMMENT 61: Of the three alternatives presented, NWF finds that alternative C is the least environmentally damaging and is probably more cost-effective that (sic) A or B. We strongly believe, however, that other alternatives and certain variations on alternative C must be explored. These alternatives are likely to be better from and (sic) environmental perspective and significantly more cost-effective.

RESPONSE 61: Reclamation evaluation of the proposed alternatives has resulted in alternative B as our preferred alternative for the final supplement. We believe it provides a significant balance in meeting overall project objectives.

WRITTEN COMMENT 62: The Bureau should identify the cost-allocation and the relative cost-effectiveness for fishery mitigation and enhancement for alternatives presented.

RESPONSE 62: A discussion of cost allocations is beyond the scope of NEPA documents. The Diamond Fork Pipeline was included as a major fishery enhancement feature in the plan in the 1984 FES. This feature was included in the plan as a result of recommendations and coordination with cooperating resource agencies under the authority of the Fish and Wildlife Coordination Act.

WRITTEN COMMENT 63: Alternative A should be eliminated from further consideration.

RESPONSE 63: In the final supplement, Reclamation has identified alternative B as its recommended plan. Alternative B fully meets the goal of the Stream Flow Agreement.

WRITTEN COMMENT 64: The Diamond Fork conveyance facilities are generally oversized for each alternative considered. The Bureau should evaluate the incremental benefits and costs of reducing the size and capacity of the Diamond Fork system facilities.

RESPONSE 64: From a practical standpoint, the physical dimension of tunnel construction equipment sets the minimum facility size. In addition, the sizes required are primarily based upon the peak capacities and hydraulic grade line considerations necessary for meeting demand deliveries rather than annual volumes. The comparison to annual deliveries is not a valid one. We also point out that the environmental impacts of pipes and tunnels are very insensitive to small changes in diameter. Since the FSFES'

primary purpose is to describe those impacts, any small changes would not modify the expected impact. Reclamation further contends that costs and benefits of alternatives are not appropriately discussed in NEPA documents.

WRITTEN COMMENT 65: The Bureau should consider other alternatives in the Final Supplement.

RESPONSE 65: See response to written comments 60 and 64.

WRITTEN COMMENT 66: The Draft Supplement to the EIS is incomplete because it does not contain an economic analysis of the alternatives.

RESPONSE 66: Inclusion of an economic analysis is beyond the scope of a NEPA document.

WRITTEN COMMENT 67: Discount rate.

RESPONSE 67: See response to written comment 40.

WRITTEN COMMENT 68: Spanish Fork supplemental irrigation.

RESPONSE 68: See response to written comment 40.

Providing irrigators in the Spanish Fork area with a supplemental water supply will reduce their irrigation shortages and improve their farming operations.

WRITTEN COMMENT 69: Water quality reduction in the Colorado River.

RESPONSE 69: See the third paragraph of the response to written comment 58.

WRITTEN COMMENT 70: Value of hydropower on the Colorado River.

RESPONSE 70: See the response to written comment 40.

The depletion of water has been recognized since the beginning of the various projects in the power rate studies in forecasting the amount of energy generated and revenue required for project repayment.

The transbasin diversion in the Diamond Fork system consists of Bonneville Unit water and also an annual average of approximately 61,500 acre-feet of water from the existing Strawberry Valley Project. This is part of the water for which the State of Utah has entitlement as a result of the Upper Colorado River Basin Compact.

WRITTEN COMMENT 71: Hydropower facilities on the Diamond Fork system.

RESPONSE 71: The Diamond Fork System is sized for water delivery and not for the development of hydropower. The development of power is, among other things, dependent upon scheduling and the availability of project water and does not control the amount of the transbasin diversion.

Reclamation believes that the policy of requiring non-Federal funding for power development is an adequate measure of the need for additional power and the size of the power development. Expressions of interest for funding power development in Diamond Fork have been received, and Reclamation and the Western Area Power Administration are preparing to pursue a public process for non-Federal power development in Diamond Fork.

WRITTEN COMMENT 72: The Draft Supplement fails to identify minimum and maximum flows and flow regimes that would be established as Reclamation environmental commitments to give assurances that fishery measures will have a reasonable chance of success.

RESPONSE 72: The project flow regimes, including long-term averages and monthly flows for maximum and minimum years, are identified on page 52 of the draft Supplement. The 1984 FES contained a narrative of the methodology and assumptions used for the analysis of fishery impacts. This analysis reflects anticipated changes to the existing fishery caused by primarily average monthly project flows, but full consideration and consensus was also given by the interagency team of biologists conducting the analysis to the effects of projected minimum and maximum flows on the fishery. None of the participating agencies have made specific recommendations regarding maximum flows other than suggesting that the Diamond Fork Pipeline be made as large as economically feasible to remove excess flows from the channel below Monks Hollow Dam.

In response to the question of whether Reclamation had made a firm minimum flow and seasonal regime commitment to the upper Sixth Water fishery, please see the response to written comment 7.

The question of whether the proposed fishery mitigation has a reasonable chance of succeeding with these flow conditions was raised. First of all, it should be made clear that fishery mitigation is not required as part of the Diamond Fork System. This is because of the significant fishery enhancement on Diamond Fork below Monks Hollow Reservoir from placing excess project flows in the Diamond Fork Pipeline. It was the consensus of the interagency biological team that the suggested enhancement was definitely achievable with project streamflows.

In response to the comment that Reclamation should address measures to be taken at water intakes and penstocks to avoid damage to fish and wildlife, please note that the 1984 FES on page 163 discusses potential fish movement through the Syar Tunnel intake and indicates that this issue would be addressed after the system is built and operating. A fish movement study would be conducted with the other resource agencies to determine the magnitude of the problem and develop appropriate mitigation measures as needed. This is a Fish and Wildlife Service recommendation and a Reclamation environmental commitment as indicated on page 142 of the draft Supplement. The interagency team agreed that no measures would be needed on the outlet from Monks Hollow Reservoir because of the stocked fishery and projected low productivity. Consequently, no recommendation was made.

WRITTEN COMMENT 73: The Final Supplement should be revised to include data and information to improve public understanding of the proposal and to aid the public in evaluating the benefits and costs of each alternative evaluated.

RESPONSE 73: We consider evaluating the benefits and costs of each alternative to be outside the scope of this document. It is our opinion that the flow data in this document is adequate for the required analysis and that providing more detailed streamflow information is not necessary for the purposes of this EIS.

Because the Diamond Fork System is mainly a conveyance system, we feel that including water distribution flow charts in this document is not necessary. More detailed information regarding the project operation can be found in the monthly operation studies. The operation studies portray a simulated operation of all major features of the project using hydrologic data for the period 1930 through 1973. The operation studies are too comprehensive to be included in this document. More detailed information on water supply distribution including flow charts and operation studies will be available in the future I&D System EIS or at the Utah Projects Office in Provo, Utah.

Elevation profile drawings of each alternative have been incorporated into the final document.

WRITTEN COMMENT 74: Page 6. What is the evidence for the statement that additional agricultural water will reduce outmigration from rural areas to urban areas? Is it not the case, generally, that urban expansion is moving into rural portions of Utah County due to population expansion and a general trend toward in-migration to this area of the state?

RESPONSE 74: There are many variables that influence population migration. Water could be one of these variables. Currently, it

is popular opinion that a supplemental water supply for agriculture wold reduce outmigration in many of the rural areas of the project. This is based on the assumption additional agricultural water would improve crop yields and thus serve as an economic stimulus to the agricultural sector, making it more lucrative to remain in the agricultural sector. However, agricultural census data is desegregated to the county level only; therefore, it is difficult to factually support the concept in designated portions of the county. Therefore, the portion of the sentence where it is stated, "...and also would reduce outmigration from rural to urban areas," has been deleted from the text of the document.

As suggested, there has been urban expansion in Utah County. However, the vast majority has occurred in the northern and central portion of the county. This area of Utah County serves as a bedroom community for the densely populated Salt Lake area.

WRITTEN COMMENT 75: Page 9. To what extent is the purpose of the 50 cfs valve on the Strawberry tunnel intake intended to maintain and to what extent enhance the Sixth Water fishery? How will its costs be allocated?

RESPONSE 75: See the responses to written comments 6 and 7. The cost for this feature would be allocated to fish and wildlife.

WRITTEN COMMENT 76: Page 15. The fishery measures should include establishment of minimum and maximum flow rates in the Diamond Fork River to protect the fishery.

RESPONSE 76: See the response to written comment 72.

WRITTEN COMMENT 77: Pages 17, 18. For the offsite wildlife mitigation plan, all parcels are to be managed either by the Utah Division of Wildlife Management or the U.S. Forest Service. What arrangements has the Bureau made to assure that funding will be assured for the habitat improvements and the operation and maintenance of these areas?

RESPONSE 77: Habitat improvements on mitigation lands have been programmed by Reclamation to come out of CRSP section 8 funds. Reclamation will request these funds on an annual basis. Reclamation's policy under normal conditions is that operation and maintenance costs of mitigation lands and features will be provided for by the respective managing agencies.

WRITTEN COMMENT 78: Page 20. How will the 2,800 acre-feet of Diamond Fork water be replaced from water in Utah Lake?

RESPONSE 78: Approximately 2,800 acre-feet of Diamond Fork flows tributary to the Spanish Fork River will be released from Monks Hollow Reservoir into the Wasatch Aqueduct for project use.

Since this water would normally flow into Utah Lake, it belongs to the Utah Lake water users; therefore, 2,800 acre-feet will be purchased from Utah Lake water users.

WRITTEN COMMENT 79: Pages 20, 24, 28. It would be helpful if these Project Operation descriptions could be expanded beyond the "average annual diversion" with an additional description of the operations in maximum wet and dry periods and at various ranges of flows and water demand scenarios, including the effects on streamflows under these varying conditions.

RESPONSE 79: We have included the maximum and minimum annual flows for key stream reaches in the final supplement. More detailed information regarding the project operation can be found in the monthly operation studies (see the response to written comment 73). The future I&D System EIS will contain more detailed information regarding project operation.

WRITTEN COMMENT 80: Page 27. Why is the capacity of the Upper Diamond Fork pipeline rated at 350 cfs. Could this pipeline carry more water than that?

RESPONSE 80: The capacity of the Upper Diamond Fork pipeline was reduced under alternative C because water deliveries would not be required to the Irrigation and Drainage System. This reduction in capacity was to be accomplished by reducing the diameter of the pipeline (see comparison of feature sizes in summary table 1). This would preclude putting more than 350 ft^3/s through the pipeline.

WRITTEN COMMENT 81: Page 27. It should probably be pointed out that the reason for the lower energy value is because of the necessity of diverting less water to meet the 1980 instream flow agreement commitment, which was ignored in alternative A.

RESPONSE 81: The text of the final supplement has been modified to clarify that alternative C actually increases energy production over the recommended plan because of increased transbasin diversions.

WRITTEN COMMENT 82: Pages 31, 32. Why are the pipeline and tunnel sizes in Options 1 and 2 8 feet and 8.5 feet, respectively. Isn't this considerably larger than necessary? What would be the smallest diameter pipe or tunnel necessary to pass the proposed water diversion through the Fifth Water reach?

RESPONSE 82: The diameter of long tunnels is generally governed by practicality of construction. In order to provide for adequate tunnel ventilation, excavated material removal, and personnel working space, the tunnel must be initially excavated a minimum diameter of 10 to 12 feet. After the excavation is completed, the tunnel is then lined with concrete to a specified

finished diameter. Making a smaller diameter tunnel requires a thicker concrete lining, thus raising the total cost. These factors are taken into account in the project design stage so as to minimize total project costs.

WRITTEN COMMENT 83: Page 33. The word "Alternatives" should be replaced with "Alternative" to be grammatically correct.

RESPONSE 83: The sentence has been revised as suggested.

WRITTEN COMMENT 84: We hope additional alternatives will be considered in the FS as we have suggested above.

RESPONSE 84: See response to written comment 60.

WRITTEN COMMENT 85: Page 43. What is the expected average annual and maximum and minimum inflow (in periods of high and low water" to the expanded Strawberry Reservoir? What portion is due to (1) the Strawberry Collection System, and (2) other tributary sources.

RESPONSE 85: Strawberry Reservoir was mentioned in this document to support alternative C. Since alternative C is not the recommended plan, we are of the opinion that computing additional data related to Strawberry Reservoir is not appropriate. All necessary information about Strawberry Reservoir will be covered in the I&D System EIS.

WRITTEN COMMENT 86: Pages 50, 51, 56. How, with an expected peak daily release of 880 cfs, does the Bureau expect to maintain flows for a quality fishery in the Diamond Fork in the range of 22 to 180 cfs for alternative A and for similar values for the other alternatives? Obviously the instantaneous flows will rise much above that. How much? How often will major fluctuations be experienced? What is the tolerance for such higher flows by both the trout and their progeny and their food sources and streambanks? This illustrates the weakness of presenting only "average long term monthly flows."

RESPONSE 86: The Diamond Fork Pipeline has a designed flow capacity of 510 ft^3/s. Subtracting 510 ft^3/s from the 880 ft^3/s peak release mentioned in the comment leaves a peak flow of 370 ft^3/s in the Diamond Fork channel during 1 summer month, which is the maximum instantaneous flow that the stream below Monks Hollow Reservoir would experience due to anticipated project releases. In addition, a flow of this magnitude would not occur every year of the 43-year period of record. This is not an extremely high flow and would not be detrimental to fish or reduce the project stream fishery benefits below Monks Hollow Reservoir in any way as determined by the impact analysis conducted by the interagency biological team. Historical releases from Strawberry Reservoir have been as high as 500 ft^3/s,

which have scoured the stream channels and caused a significant reduction in fish habitat and food production from excessive water velocities. However, these were higher and were sustained for longer periods of time than the peak project releases. Natural peak flows may add to this during some years, but such occurrences would be beyond Reclamation's ability to control through operation of Monks Hollow Dam.

WRITTEN COMMENT 87: Page 54. For the Diamond Fork below Monks Hollow, while maximum summer flows for alternative B are similar to current maximum flows, minimum flows are extremely low and likely to seriously damage any fishery. The Bureau should address how with such flows for months on end it expects to maintain significant fishery benefits.

RESPONSE 87: The fishery analysis was based upon having winter (October through March) minimum flows in Diamond Fork at least as high on the average as historical conditions. Table 11 on page 54 of the draft supplement shows winter flows during the average year as being higher with the project. There may be drought periods where the minimum flow may need to be less than historical because of other demands on the water, but these occurrences would be rare.

WRITTEN COMMENT 88: Page 58. What would be the constraints to provision of "adequate project water" that is said to be necessary to provide for higher than historic levels in Utah Lake?

RESPONSE 88: Because future operating procedures for Utah Lake are not yet defined, it is not possible at this time to say exactly how project water will be used in the operation of Utah Lake regarding the maintenance of a minimum water surface elevation. More information about the operation of Utah Lake will be available in the future I&D System EIS.

WRITTEN COMMENT 89: Page 67. What is the current level of uncertainty in the Bureau's water quality model for the Monks Hollow Reservoir that requires the Bureau to wait on a study of at least five to ten years after the construction in order to decide on the necessity of providing for multi-level outlet works at Monks Hollow Dam? What are the recommendations of the state and federal fishery agencies. What are the estimated costs of such measures, and what would be the cost savings in installation during construction instead of retrofitting them in the future?

RESPONSE 89: Current state-of-the-art water quality modeling is not sufficient to establish the definite need for a multilevel outlets works or other water quality mitigating measures at this time. Furthermore, experience with similar reservoirs in the intermountain area suggests that no such problems will occur. As discussed in more detail in the 1984 FES and in the 1988 draft

supplement DPR, the temperature ranges projected should not cause significant impacts, nor have they been a major issue with the State Bureau of Water Pollution Control or the resource (fishery) agencies.

Due to increasing interest in water quality concerns, however, reservoir and stream water quality will be monitored and should such problems become evident, will be corrected at project expense. Reclamation will coordinate with the State and resource agencies in establishing the monitoring program, conducting the water quality studies, and in developing any mitigation measures if it is determined any are necessary. Reclamation believes it is improbable that mitigation measures will be required.

The State and resource agencies are in agreement with this plan. Reclamation has not made detailed cost estimates for mitigation measures because the need has not been established. Reclamation does not believe it to be a prudent use of taxpayers' money to plan or construct features that have not been determined necessary.

WRITTEN COMMENT 90: Pages 67, 70. The FS should provide a comparison of water quality impacts on Utah Lake between alternatives A and B and alternative C. It is not acceptable to defer comment on the salinity and other water quality effects of alternatives A and B to the upcoming I&D EIS, while presenting the impacts of alternative C. Recent press reports have indicated a prediction that the Bonneville Unit as planned would be damaging to crops now irrigated from lake waters. The Bureau should present the water quality impacts for all alternatives under consideration in the same environmental impact statement to allow for comparison.

RESPONSE 90: Development of the Irrigation and Drainage System is assumed under alternatives A and B; therefore, the impacts to features of the Irrigation and Drainage System, which includes Utah Lake, will covered in the Irrigation and Drainage System FES.

Under alternative C, the Irrigation and Drainage System would not be built; therefore, Utah Lake impacts have been included for this alternative in the Diamond Fork FES. See written comment 58 for a discussion of the process for preparing environmental impact statements for the Bonneville Unit.

WRITTEN COMMENT 91: Pages 108, 110. The DS predicts that the net farm income increase for each of the 195 Spanish Fork area farmers that would receive supplemental irrigation water would be $1,769,000, or approximately $9,072 per farmer (or $37.00 per irrigated acre). The FS should indicate whether the farmers' ability to repay the construction costs under these circumstances would be greater than the predicted $1.33 per acre per year

repayment ability identified in the Bureau's FY 1990 Project Data Sheet. For these farmers, what is the Bureau's estimate of ability to repay construction costs?

RESPONSE 91: See response to written comment 40.

WRITTEN COMMENT 92: Pages 140, 141. The Bureau's response to the Fish and Wildlife Service's recommendations regarding plans to meet the Secretary's 44,400 acre-foot Uinta basin instream flow agreement are troubling for two reasons: (1) the Bureau suggests that it does not know if the Secretary's agreement is feasible, and (2) it also implies that the Bureau does not know if alternative B and C are feasible. At what point will the question of feasibility be resolved, if not in the Environmental Impact Statement?

RESPONSE 92: Reclamation has concluded that alternative B is feasible and has selected this as the recommended plan as described in this final supplement.

WRITTEN COMMENT 93: Page 142. Regarding the 50 cfs valve the Bureau has committed to install to connect the Syar Tunnel with the existing Strawberry Tunnel to provide fishery flows in the Sixth Water Creek, the Bureau states: "This valve will allow the release of up to 50 cfs into Sixth Water Creek to support a stream fishery if flows are available" (emphasis added). The FS should identify what factors will determine "if flows are available?" Is there a Reclamation commitment to a minimum flow to protect the Sixth Water trout fishery?

RESPONSE 93: See the responses to written comment 6 and 7.

Letter from Provo River Water Users Association, dated June 28, 1989.

WRITTEN COMMENT 94: In the Draft Supplement to the Final Environmental Statement on the Diamond Fork System, Reclamation states that its preferred wildlife mitigation option is an offsite mitigation plan that incorporates and involves the administrative transfer of Provo River Project lands. The offsite mitigation proposal contemplates the taking of 1,030 acres of lands acquired for the Provo River Project to compensate for wildlife habitat losses caused by the Bonneville Unit. The Association strongly opposes this proposal.

The 1,030 acres are part of approximately 1,400 acres of land acquired for the Provo River Project. With the exception of about 80 acres of land which were withdrawn, the entire costs of these lands were included in the Association's Repayment Contract dated June 27, 1936.

The sum and substance of it all is that while title to the 1,030 acres of Project lands is in the name of the United States, those lands are not public lands per se since they are to be held in trust by the Secretary for the benefit of the Provo River Project. The lands in question were acquired for Provo River Project purposes, not Bonneville Unit Project purposes, and the lands cannot be severed from the Provo River Project without constituting a material breach of the Association's Repayment Contract.

Reclamation does not have the authority to sever and transfer lands from one project to another. The only provision of Reclamation law that provides for the disposal of Provo River Project lands is the Sale of Surplus Acquired Lands Act of 1911. According to that Act, lands acquired for the Provo River Project can be severed only if the Secretary determines that it would be i. the best interest of the Provo River Project. The Act also makes it clear that if divested of Project lands, the Association is entitled to the full fair market value of such lands. Reclamation's preferred option of mitigation violates the Act since Reclamation has not made this determination. In fact, Reclamation's only concern seems to be for the Bonneville Unit.

Subsection (I) and (J) of the Fact Finders Act of 1924 also bears on Reclamation's proposal to have the Association mitigate for Bonneville Unit wildlife impacts. By these two provisions, Congress made it clear that all profits derived from Reclamation Project lands must be kept separate. Reclamation has no discretion to compel one project to subsidize another. That is precisely what Reclamation is suggesting the Association do here, unless Reclamation intends to credit the Association's Repayment Contract with the full fair market value of the 1,030 acres.

Finally, the Association would remind Reclamation that mitigation is governed by Section 8 of the Colorado River Storage Project Act. The only lands that can be used for mitigation purposes are those which were acquired specifically for the purpose of mitigation. Section 8 does not give Reclamation the authority to divest one project of its lands for the benefit of another.

In sum, the Association urges that Reclamation follow its onsite mitigation plan as described on page 18 of the Draft Supplement to the Final Environmental Statement, Diamond Fork System. This onsite option meets the obligations of the Bonneville Unit to mitigate its wildlife impacts without interfering with the Provo River Project and the Association's vested contractual rights thereunder. If, however, Reclamation decides on the offsite option, the Association must be compensated at the fair market value for the taking of the 1,030 acres of Provo River Project lands.

RESPONSE 94: Reclamation acknowledges that the Deer Creek lands proposed for use as wildlife mitigation were acquired as part of the Provo River Project. If Reclamation concludes that these lands cannot be used for mitigation purposes under the Bonneville Unit, then other lands will be considered, as needed, to accomplish the wildlife mitigation objective.

Letter from Utah Chapter Sierra Club, dated June 29, 1989.

WRITTEN COMMENT 95: It is illogical for the Bureau of Reclamation to prepare this draft supplement to the Final Environmental Impact Statement because the project has been so radically changed that the FEIS no longer described the project being constructed. Further, it appears to be illegal to proceed with construction, as the BOR is now doing with portions of the Diamond Fork System. That "system" has undergone major changes, and is yet to be finalized.

RESPONSE 95: Please refer to written comment 58.

WRITTEN COMMENT 96: A glaring deficiency of the draft supplement is the absence of any mention of the Sevier River Basin and of the plan to deliver water to that area. It should be recalled that in the hearing of September 1972 on the final environmental statement, busses of high school students were brought from Delta. Large signs on the sides of the busses said: "People are More Important than Fish." Despite such display of local enthusiasm, there is little indication that farmers from that area will subscribe to purchase project water.

RESPONSE 96: Impacts of the Bonneville Unit on the Sevier River Basin will be covered under the environmental statement for the I&D System.

WRITTEN COMMENT 97: There is no evidence in the subject draft supplemental to support the claim this is a compliance document for Section 404 permits under the Clean Water Act, (Public Law 95-217), or that it complies with Executive Order 11988, Floodplains Management; or with Executive Order 11900, Protection of Wetlands. Nowhere in the document are these matters addressed. Merely making claims of compliance does not establish compliance.

RESPONSE 97: The Corps of Engineers' comments on the draft supplement dated July 20, 1989, seem to agree that the 404(b)(1) analysis as required by the Clean Water Act was appropriate. In response to the allegation that there is no evidence that we have complied with Executive Orders 11988 and 11900, the impacts of the alternative presented in the draft supplement are not significantly different from the 1984 Final Environmental Statement. We have identified a different organization of

features and sizes. Essentially, these Executive Orders were complied with in the 1984 Final Environmental Statement.

WRITTEN COMMENT 98: Of the approximately one million people in the Central Utah Water Conservancy District, only about seven people expressed their views at the public hearings on this DS held on June 20 and 21, 1989. Clearly, there is little public involvement in the important matters considered. Further, no cooperating agencies presented statements as to their positions and responsibilities relating to the project.

RESPONSE 98: The public was clearly given opportunity to comment on the draft supplement. There has been considerable input from the public and numerous local, state, and Federal agencies during the plan formulation process. Comments on the draft supplement were received in writing from many of these cooperating agencies. These comments are included in this final supplement.

WRITTEN COMMENT 99: We call attention to the need to make public the 1988 Definite Plan Report, the existence of which we have become aware through statements made by BOR officials. The original 1964 DPR is long out of date. We believe that it is illegal for this project to proceed before a revised definite plan report has been adopted by the proper authority.

RESPONSE 99: Reclamation acknowledges the need for a supplement to the 1964 Definite Plan Report in order to accurately describe the current plan for the Irrigation and Drainage System of the Bonneville Unit. Beginning in the early 1980's, Reclamation began the process of developing that supplement only to have modification to the plan render invalid each draft document prior to its finalization. The May 1988 draft is the latest in a series of three drafts which only partially reflect the Irrigation and Drainage System being unanimously supported by the Utah Delegation. Once the draft legislation is enacted, Reclamation will produce any necessary supplement to the 1964 Definite Plan Report.

WRITTEN COMMENT 100: The environment of Diamond Fork Canyon has not been adequately studied. It is known that one inhabitant of Diamond Fork is the Western milk snake, which is protected by the State of Utah. The desert ecology of the canyon should not be disrupted by a project which has not been clearly defined.

RESPONSE 100: There have been adequate terrestrial and aquatic inventories and studies of the Diamond Fork Canyon area prior to preparation of the 1984 FES. These studies provided the baseline information for the impact analyses in the 1984 FES and this supplement. The Utah milk snake was identified in the wildlife inventory as being present in the study area. The Utah milk snake is listed in the 1987 list of "Native Utah Wildlife Species of Special Concern" as a "sensitive" species.

Letter from Stonefly Society of the Wasatch, dated June 20, 1989,

WRITTEN COMMENT 101: Piecemeal Project Planning

This document represents a piece meal approach to project planning. It indicates that the Diamond Fork Facility will transport an unspecified amount of water to an unspecified location for unspecified uses. After approval of this document by the EPA and Army Corps of Engineers, the US Bureau of Reclamations (sic) will fill in these blank spots as they desire. Resolution of the Uintah Basin streamflows issue, the Ute Indian water conflict, and the fate of the Bonneville Irrigation and Drainage System will all have a significant impact on the Diamond Fork System. Approval of the Diamond Fork System should be combined with an EIS document addressing these issues rather than in isolation.

RESPONSE 101: See response to written comment 58. Also, selection of alternative B as the recommended plan provides for instream flows in the Uinta Basin which, along with the planned mitigation measures, will fully compensate for impacts to those streams. Issues related to the Ute Indian water rights is beyond the scope of this NEPA document.

WRITTEN COMMENT 102: Massive Increase in Sixth Water Flows

A major project alteration is the deletion of the 3 mile long pipeline connecting the Last Chance Power Plant with the Monks Hollow Dam. This will produce large increases in streamflow on Sixth Water Creek. The following chart presents these flow changes.

Instead of constructing this pipeline, the entire outflow of the Last Chance Plant will be dumped into Sixth Water Creek. The current flow of Strawberry Project Water through the Sixth Water-Diamond Fork System is producing massive erosion and turbid water conditions. How this channel can withstand these increases is completely ignored in the compliance document. I regard this as a very significant oversight which should be dealt with before final approval of this document.

RESPONSE 102: See response to written comment 2.

WRITTEN COMMENT 103: Stream Sediment on the Diamond Fork-Spanish Fork

The muddy turbid flows produced by the operations of the Strawberry Project almost completely destroy the value of this river system. There are indications that instead of rectifying this situation, that even with the Bureaus (sic) optimistic figures these turbidity problems might be made worse by operations of the Diamond Fork System. For instance under

alternative C, the Diamond Fork would carry yearly 32,840 tons of silt, a 3% reduction from the present operation. However, this silt would be carried by 40% less water.

Thus, under alternative C, each acre foot of (water) would actually carry about 70% more silt than at present (.67 ton of silt per acre foot as opposed (to) .41 tons of silt per acre foot of water). With alternatives A and B, there is a projected 35% decrease in silt being carried by the stream, but there is reason to believe that this is not actually the case. The supplement claims the same silt flow figures as in the 1984 EIS even though pipeline above Monks Hollow Dam has been deleted.

RESPONSE 103: Refer to the responses to written comments 3 and 104.

WRITTEN COMMENT 104: In either event it is not clear that the Diamond Fork can carry .26 tons of silt per acre of water and still be a viable trout stream.

RESPONSE 104: The sediment load, of which silt is only one component, is projected to be much lower, as shown on page 68 of the draft Supplement, than is indicated in the comment. Sediment load below Monks Hollow Reservoir would change from 0.3 ton/acre-foot to 0.04 ton/acre-foot, a decrease of 87 percent over existing conditions. Sediment load at the mouth of Diamond Fork would lessen from 0.44 ton/acre-foot to 0.26 ton/acre-foot, a reduction of 41 percent from existing conditions. The anticipated fishery benefits were based in part on the expected decline in streambank erosion and sedimentation from lower project flows.

WRITTEN COMMENT 105: This point has important financial and perhaps legal aspects. If these figures are accurate and the Diamond Fork can not be rehabilitated as a trout stream, then claiming the cost of the cost of the Diamond Fork Pipeline as a fish and wildlife expense is fraudulent.

RESPONSE 105: The figures presented in the comment are not accurate. See the response to written comment 104.

WRITTEN COMMENT 106: Operation of the Spanish Fork River

The CUP proposes to further magnify the destructive high flows produced on the Spanish Fork River by the earlier Strawberry Project. These flows are shown on the figure below.

Neither this document nor the earlier 1984 EIS adequately described the destructive consequences of these high flow. The lower Spanish Fork has both low and water quality problems which should be addressed in considering water flow changes produced by the CUP. This canyon and river system could easily rival the

value of the Provo Canyon to the state of Utah, but implementation of this present plan promises to doom forever this potential beautiful area.

RESPONSE 106: Both the 1984 FES on pages 162-172 and the draft supplement on pages 76-86 contain a thorough analysis of the impacts to the Spanish Fork River fishery for each project alternative. This includes anticipated changes to trout standing crop, habitat units, and angler use as a result of stated differences between existing and project flow regimes. Adverse impacts to the upper Spanish Fork River from the Diamond Fork confluence to the Spanish Fork Diversion due to higher project flows are well defined. Beneficial fishery impacts to the lower Spanish Fork River from increased flows, as well as lower Diamond Fork from reduced flows, are also well-documented and represent the consensus of the interagency biological team that conducted the analysis. The enhanced stream sections would produce fishery benefits that far outweigh adverse impacts experienced in the other stream reaches. Water quality problems in lower Spanish Fork River consist of poor quality irrigation return flows and sedimentation. The project would provide for some dilution of the irrigation return flow water with increased project releases during the summer months. Turbidity and sediment from upstream sources would be lessened because of the reduced sediment load coming from Diamond Fork. Any additional erosion and subsequent sediment originating in the Spanish Fork River below the Diamond Fork confluence would be removed from the river at the Spanish Fork Diversion and would have no major impact on the fishery resource. Further discussion of channel erosion and sediment load impacts predicted for alternative C have been added to the draft supplement. Additional discussion of fishery and water quality impacts to this river would be included in the I&D System EIS.

WRITTEN COMMENT 107: The US Bureau of Reclamation recently announced a new policy direction implementing a multiple use planning approach in new projects. There is very little evidence of this new Reclamation policy in the Diamond Fork Supplement.

RESPONSE 107: The Diamond Fork System, which is the subject of the statement, is part of the Bonneville Unit of the Central Utah Project. As such, the planning, design, and construction of the unit has been underway for many years. The project was authorized for construction in 1956, thereby confirming the intent of Congress to build the project as described in the Definite Plan Report. To assume that any major changes in policy direction could be easily incorporated at this time is not reasonable. Planning for all Reclamation projects has been and continues to be nested in sound multiple-use planning principles.

Letter from Strawberry Water Users Association, dated June 28, 1989.

WRITTEN COMMENT 108: Purpose of the Diamond Fork system (pages 1, 2). On page 2, the last sentence in the first paragraph should read "The potential also would exist for further hydroelectric development by other non-federal funding." to specifically provide for non-federal funding the hydroelectric development.

RESPONSE 108: The sentence has been revised to state that the potential would also exist for further hydroelectric development to be financed by non-federal entities.

WRITTEN COMMENT 109: Strawberry Valley Project (pages 2, 3). On page 2, the first sentence of the first full paragraph should read "The Strawberry Valley Project is a forerunner of the Central Utah Project." since the phrase "completed in 1922" is inaccurate.

RESPONSE 109: The sentence has been revised as suggested.

WRITTEN COMMENT 110: Location and Setting (pages 4, 5). The first sentence of the last paragraph on page 5 should add the cities of Mapleton, Elk Ridge and Woodland Hills, and the population ("28,374") should be adjusted accordingly (currently approximately "42,000").

RESPONSE 110: The sentence has been revised to indicate a population of 35,572 based on the 1980 census.

WRITTEN COMMENT 111: Syar Tunnel (page 9). It is noted on page 9 under "Syar Tunnel" that a 50 cfs by-pass valve will be installed in the tunnel to diver flows to the existing Strawberry Tunnel to provide a capability for maintaining a fishery in Sixth Water Creek. The Draft Supplemental does not discuss or evaluate the impacts from such diversion on the power generation of the Diamond Fork System. It appears that such bypass diversion would constitute major federal action which would require a further environmental Impact Study so that all impacts on the Diamond Fork System are disclosed in accordance with the law.

RESPONSE 111: See the responses to written comment 6 and 7.

WRITTEN COMMENT 112: Table 1 (p. 10). Footnotes 1 and 2 under table 1 should be changed from non-Federal development to non-Federal funding, to be consistent throughout the draft supplement.

RESPONSE 112: The footnotes have been revised to be consistent with the response to written comment 108.

WRITTEN COMMENT 113: Project Operation (pages 19, 20). The last sentence of the paragraph at the top of page 20 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

Alternative B (pages 22-25). The third to last sentence of the Paragraph at the top of Page 24 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

RESPONSE 113: These changes have been incorporated into the final supplement.

WRITTEN COMMENT 114: Alternative C (pages 25-30). The third sentence of the first paragraph on page 25 should specify non-federal funding instead of non-federal development to be consistent throughout the Draft Supplement.

RESPONSE 114: The sentence has been revised to be consistent with the response to comment 108.

WRITTEN COMMENT 115: Table 5 (page 26). In Table 5 on Page 26, the 60 MW capacity should be in line with Last Chance Powerplant instead of with Fifth Water Penstock.

RESPONSE 115: The table has been revised as suggested.

WRITTEN COMMENT 116: Alternative C (pages 25-30). The last sentence of the first full paragraph on page 28 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

RESPONSE 116: See response to written comment 113.

WRITTEN COMMENT 117: Option 2 (pages 31-32). Option 2 reduces the power potential of Last Chance Power Plant from 60 MW to 48 MW which is not in the best interests of developing the power potential of the Diamond Fork System. The Fifth Water tunnel should be lined to provide for power development and to reduce the risks of tunnel failure.

RESPONSE 117: Option 2 does reduce the power potential. The objective is to minimize environmental impacts and project water development costs. Project facilities are sized for project water delivery, not for power generation. Current plans include lining the tunnel.

WRITTEN COMMENT 118: Diamond Fork (pages 43-44). The second sentence of the last paragraph on page 43 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

RESPONSE 118: The 56,700 acre-foot figure was the historical diversion during the 1930-73 period and, therefore, has not been changed.

WRITTEN COMMENT 119: General Geology Map (between pages 94-95). The map of General Geology of the Diamond Fork area should include the location of the powerplant shown in Option 2 and should also show the Strawberry Tunnel.

RESPONSE 119: The map has been revised as suggested.

Environmental Consultation

Throughout the studies on the system, a number of environmental concerns and suggestions have been voiced by entities who have assisted by providing data, performing studies, reviewing and commenting, providing opinions and interpretations, scoping environmental concerns, suggesting interpretive investigations, and offering other points of view. The system is now a better project because of that participation, and Reclamation gratefully acknowledges the contributions of the following entities: Uinta National Forest; State of Utah Governor's Office; Western Area Power Administration; Corps of Engineers; Environmental Protection Agency; Utah Division of Wildlife Resources; U.S. Fish and Wildlife Service; and Central Utah Water Conservancy District, Orem, Utah.

Fish and Wildlife Coordination Activities

1972-76.--Preliminary studies and investigations were carried out by the Center for Health and Environmental Studies, Brigham Young University, to document existing biological data for feature areas of the Central Utah Project including the Diamond Fork System areas of impact. Reclamation contracted with the Utah Division of Wildlife Resources for fishery, vegetation, and wildlife resource inventories of the power system project area. These were carried out during 1975-76.

1983-84.--Interagency teams were organized to analyze the fishery and terrestrial wildlife impact of the system alternatives and to provide mitigation recommendations. The teams consisted of biologists from Reclamation, the Uinta National Forest, the Utah Division of Wildlife Resources, the Fish and Wildlife Service, and the Central Utah Water Conservancy District. The teams' analyses and recommendations were included in the Fish and Wildlife Service's Fish and Wildlife Coordination Act Reports and in the Draft and Final Environmental Impact Statements.

1984-89.--The Diamond Fork System interagency fish and wildlife teams reanalyzed the fish and wildlife impacts and revised mitigation measures, where needed, to cover changes resulting from planning refinements.

As a result of the interagency teams' efforts, the Fish and Wildlife Service has prepared a draft Fish and Wildlife Coordination Act report specifically for the modified Diamond Fork System. The Fish and Wildlife Service's report outlines measures to minimize and mitigate fish and wildlife impacts. Reclamation has incorporated the Fish and Wildlife Service's recommendations in this supplement as discussed in attachment 2.

Endangered Species Consultation

1983-84.--Consultation with the Fish and Wildlife Service concerning endangered species in the Diamond Fork System area was completed for the 1984 FES plan. There were no effects on any threatened or endangered species.

1986-87.--Consultation with the Fish and Wildlife Service resulted in a no effect determination for alternative A [8].

Wetlands Consultation

Wetland occurrence and values in the project area have been thoroughly considered in conjunction with impacts on riparian habitat and coordinated with the Corps of Engineers and the Environmental Protection Agency (EPA) in conjunction with the study and review of impacts on vegetative types and terrestrial wildlife habitats. This has been accomplished by the terrestrial wildlife interagency team, as discussed above, and the cooperating agencies.

Terrestrial wildlife mitigation plans have been developed to compensate for any net losses of riparian wetland values by the acquisition, management, and improvement of riparian habitats. The detailed 404(b)1 analysis, presented as attachment 1 to this document, has been prepared in order to satisfy the Federal Clean Water Act Section 404 requirements for dredge and fill activities in surface waters and wetlands. This evaluation has also been prepared to coordinate public review of wetland impacts and other related issues as required by Executive Orders 11988 (Flood Plain Management) and 11990 (Protection of Wetlands).

Cultural Resources Consultation

Consultation with the Utah State Historic Preservation Office has been continuous since 1975 through review and acceptance of

cultural resources studies in the system area. In January 1983, the Utah State Historic Preservation Officer concurred with the determination of no effect for the system alternative covered in the 1984 FES [9].

A Programmatic Memorandum of Agreement will be developed to facilitate the consultation process with the Utah State Preservation Office and the Advisory Council on Historic Preservation. This agreement will stipulate Reclamation's responsibilities for completion of class III inventories in project areas and mitigation of project impacts on National Register eligible sites.

Recreation

As mentioned previously, recreation facilities for the system were planned by the Forest Service in cooperation with Reclamation.

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This Final Supplement to the Final Environmental Impact Statement for the Diamond Fork System was prepared by the Upper Colorado Region, Bureau of Reclamation, P.O. Box 11568, 125 South State Street, Salt Lake City, Utah 84147. A list of persons who prepared significant background material and various sections of the statement or participated to a significant degree in preparing the statement is presented below.

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Name: Leon G. Colborn
Position: Fish and Wildlife Biologist
Education: B.S. Fisheries; M.S. Fisheries
Experience: 23 years
Participation: Fish and wildlife analysis and mitigation measures

Utah Division of Wildlife Resources

Name: Kendall L. Nelson
Position: Regional Resource Analyst
Education: B.S. Wildlife Management; M.S. Range Management
Experience: 26 years
Participation: Wildlife analysis and mitigation measures

Name: Maureen Wilson
Position: Aquatic Resource Analyst
Education: B.S. Wildlife Biology; M.S. Limnology
Experience: 6 years
Participation: Fisheries analysis and mitigation measures

Central Utah Water Conservancy District

Name: Quentin Bliss
Position: Consultant/Senior Biologist
Education: B.S. General Agriculture, M.S. Fishery Science
Experience: 20 years
Participation: Fishery analysis and review

REFERENCES CITED

1. Bureau of Reclamation. October 4, 1984. Diamond Fork Power System Final Environmental Impact Statement (INT FES 84-30). Upper Colorado Region, Salt Lake City, Utah.

2. U.S. Department of the Interior, State of Utah, Forest Service, and Fish and Wildlife Service. February 27, 1980. Instream Flow Agreement.

3. Bureau of Reclamation, Fish and Wildlife Service, Forest Service, Utah Division of Wildlife Resources, and Central Utah Water Conservancy District. December 1988. Aquatic Mitigation Plan for Strawberry Aqueduct and Collection System.

4. State of Utah, Department of Natural Resources. December 1984. State Review of Bonneville Unit, Central Utah Project, Final Report.

5. Fish and Wildlife Service. February 4, 1987, memorandum to Bureau of Reclamation, Salt Lake City, Utah. Wildlife Mitigation Plan for Strawberry Collection System, Municipal and Industrial System and Diamond Fork Power System, Bonneville Unit, Central Utah Project.

6. Fish and Wildlife Service. December 1979. Classification of Wetlands and Deepwater Habitats of the United States.

7. Fish and Wildlife Service. 1987. Draft Fish and Wildlife Coordination Act Report.

8. Fish and Wildlife Service. January 21, 1987, memorandum to Bureau of Reclamation, Salt Lake City, Utah. Section 7 Consultation on Diamond Fork Power System Update, Bonneville Unit, Central Utah Project.

9. Utah State Historical Society, Division of State History. Letter from State Historic Preservation Officer regarding Diamond Fork Power System, January 11, 1983.

ATTACHMENT 1

SECTION 404(b)1 (PUBLIC LAW 95-217) EVALUATION
Diamond Fork System
BONNEVILLE UNIT
CENTRAL UTAH PROJECT
BUREAU OF RECLAMATION

I. INTRODUCTION

This section evaluates two alternatives of the Diamond Fork System having features which would require Section 404 permit authorization if these features did not qualify for the Section 404(r) exemption. A description of the features can be found in Chapter II, Alternatives. This attachment would exclude the need of applying for a Section 404 permit of the Clean Water Act for the system.

II. PROJECT DESCRIPTION

A. Location: Refer to Chapter I, Location and Setting.

B. General Description: Refer to Chapter II, Alternatives.

C. Authority and Purpose: Refer to Chapter I, Purpose of the Supplement to the Environmental Impact Statement and Purpose of the Diamond Fork System.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material.

a. Zone 1 Material: Impervious earthfill, primarily clays of alluvium and glacial outwash.

b. Zone 2 Material: Pervious rockfill; gravelly, glacial morainal materials.

c. Riprap Materials: Quartzite and quartzose sandstone.

d. Concrete.

2. Location of Discharge Site and Quantity of Material Placed into Waters of the United States. Also refer to Chapter II for additional information.

a. Last Chance Powerplant - Approximately 1,450 cubic yards will be placed into Sixth

Water associated with the Last Chance Powerplant construction and Sixth Water Tunnel construction. This includes 100 cubic yards of concrete for construction of the flow control structure associated with the powerplant, 350 cubic yards for streamflow protection, and 1,000 cubic yards for placement of tunnel spoil.

b. Monks Hollow Dam and Reservoir - Approximately 150,000 cubic yards of fill will be needed to construct the dam for the recommended plan and Alternative A.

c. Three Forks Dam - Approximately 65,000 cubic yards of fill will be needed to construct the dam for Alternative C.

d. Diamond Fork Pipeline - It is anticipated that the Diamond Fork stream channel will be crossed 8-10 times, requiring about 500 yards of fill to construct the pipeline crossings. A channel change of about 900 lineal feet of stream fill will also be required in four locations. Approximately 30 cubic yards of fill will be needed to construct the pipeline under Wanrhodes Creek.

e. Diamond Fork Road Rehabilitation - two stream crossings will be required: at Wanrhodes Creek and at Little Diamond Creek. About 500 yards of fill will be placed at these locations. Slope restoration and riprap protection will be provided along 3,100 feet of Diamond Fork Road and the Diamond Fork channel at 12 different locations, requiring approximately 7,200 cubic yards of riprap and 5,000 cubic yards of backfill. This action will restore damage caused by flooding in 1984.

f. Diamond Fork Powerplant - Approximately 460 cubic yards of fill will be needed to construct the structure. It is anticipated that most of the fill will be used for the tailrace construction.

g. Stream Mitigation - Approximately 2,000 cubic yards of material will be placed into Diamond Fork to improve stream habitat.

h. Recreation Facilities at Monks Hollow Dam - Approximately 500 cubic yards of fill will be needed to construct the facilities.

3. Source of Material: Refer to Chapter II, Alternatives.

E. Description of Proposed Discharge Sites.

1. Size (acres of wetlands, riparian, and benthos covered by the fill).

	Name	Acres
a.	Last Chance Powerplant	*
b.	Monks Hollow Dam	1
c.	Diamond Fork Pipeline	14-18[1] temporary
d.	Diamond Fork Powerplant	*
e.	Stream Mitigation	*
f.	Monks Hollow Dam Recreational Facilities	*
g.	Access roads	1

*Less than 1 acre.

2. Type of Habitat: Refer to Chapter III, Vegetation.

3. Timing and Duration of Discharges.

		Timing	Number of years
a.	Alternative A	1989-95	7
b.	Recommended plan	1989-95	7

III. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. The disposal site for permanent features such as dams, powerplants, and some recreational facilities would cover and eliminate the substrate within the riverbeds affected. The disposal site for temporary features such as cofferdams associated with river crossings for pipelines and power plants and recreational facilities would also cover the existing substrate. However, the

[1] 14 acres for the recommended plan and Alternative A and 18 acres for Alternative C.

impacts would be temporary and should return to preconstruction conditions once construction ceases.

2. Sediment Type - After inundation, the rocky substrate of the riverbed within the reservoir would fill in and become a silt and mud bottom; however, the general geometry/topography in the reservoir would be essentially unchanged.

3. Dredged/Fill Material Movement - The construction material would be placed and compacted to the extent necessary to retard the downstream movement of fill.

4. Physical Effects of the Benthos - Benthic communities would be eliminated in the embankment (disposal) areas. However, benthic communities covered by temporary features will be lost for a short duration. They should begin to reestablish themselves once construction ceases.

   Many species of benthos living in the riverine habitat would be lost and replaced with low densities of species living in a reservoir environment. The community structure of the benthos would be altered to lower species diversity, composition, and biomass. The function of the benthic communities, however, would remain the same (providing food for higher organisms and acting as decomposers passing nutrients through the system), although this function would take place at a lower rate.

5. Actions Taken to Minimize Impacts: Refer to Chapter III, Water Quality.

B. Water Circulation, Fluctuation, and Salinity Determinations

   1. Water.

      a. Salinity. Not significant. Refer to Chapter III, Water Quality.

      b. Water Chemistry. Refer to Chapter III, Water Quality.

      c. Clarity, Color, Odor, Taste. Not significant.

      d. Dissolved Gas.--Refer to Chapter III, Water Quality.

      e. Eutrophication.--Refer to Chapter III, Water Quality.

2. Current Patterns and Circulation.

   a. Current Patterns and Flow - The construction of the impoundments would impede the river flow and back up water that would form the reservoirs.

   b. Velocity - The dam's storage capabilities would make it possible to regulate tailwater flows.

   c. Stratification: Refer to Chapter III, Water Quality.

   d. Hydrologic Regime: Refer to Chapter II, Project Operation, for each alternative.

3. Normal High Water Fluctuations - Construction of the dams would permanently alter the normal high water fluctuation of the stream by blocking the channel and forming a reservoir. The dams would make it possible to regulate the tailwater flows. Construction of the pipelines would alter and reduce the existing flows and would reduce erosion and turbidity.

4. Salinity Gradients. Not significant.

5. Minimize Impacts: Refer to Chapter III, Water Quality.

C. Suspended Particulate: Turbidity Determination.

1. Turbidity - Increased levels of suspended solids and turbidity would result during construction. It is expected that these levels would be local and only temporary.

2. Effects.

   a. Light Penetration - Light transmission within the dam and diversion structures would be completely eliminated by the fill material. The temporarily increased levels of turbidity and suspended solids resulting from construction activities would reduce overall light penetration in the streams.

   b. Dissolved Oxygen: Refer to Chapter III, Water Quality.

   c. Toxics and Organics - The material to be used for fill (except for the core of earthfill dams which would not be in direct contact with

surface waters) would be inert material consisting of concrete, sand, gravel, and rock (riprap) obtained from sources in the immediate area.

d. Pathogens. Not applicable.

e. Esthetics: Refer to Chapter III, Topography and Scenery.

3. Effects on Biota.

a. Primary Production - Existing vegetation would be lost in those impoundment areas to be covered by the fill and subject to inundation.

b. Suspension/Filter Feeders - Existing riverine habitat would be changed to lacustrine habitat and result in lower diversity of organisms.

c. Sight Feeders: Refer to Chapter III, Fish.

4. Minimize Impacts: Refer to Chapter III, Fishery and Wildlife Measures and Mitigation and Other Mitigation Measures for each alternative.

D. Contaminant Determinations - The fill material does not include any contaminants that would degrade the aquatic habitat. The material to be used for fill (except for the core of the earth-fill dams which would not be in direct contact with surface waters) would be inert material consisting of concrete, sand, gravel, and rock obtained from sources in the immediate area. In addition, the fill material with particle sizes larger than silt, is substantially the same material as the substrate at the proposed disposal sites. Fill material used in construction would be obtained from a nearby source and would not be expected to be contaminated.

E. Aquatic Ecosystem and Organism Determination.

1. Plankton and Nekton - Present populations within the riverine habitat would be eliminated by the fill material; however, both nektonic and planktonic populations would continue to exist upstream and downstream of the project features.

2. Benthos (acres of benthos covered by fill).

a. Last Chance Powerplant - 0.1 acre
b. Monks Hollow Dam - 0.5 acre
c. Diamond Fork Pipeline - 3 acres temporary
d. Diamond Fork Powerplant - 0

e. Stream Mitigation - <5 acres temporary
f. Monks Hollow Dam Recreation Facilities - 0

3. Aquatic Food Web - Not significant because the fill material would not be contaminated.

4. Special Aquatic Sites.

   a. Sanctuaries and Refuges. There are no such areas.

   b. Wetlands. The river crossings for the pipeline would require the removal or clearing of vegetation along the streambanks. The willows and grassy areas should re-establish themselves once construction ceases. Revegetation and stabilization plans would be required to accomplish this re-establishment in a short time. The construction of the Diamond Fork Pipeline would result in the temporary loss of less than 1 acre of cattail marsh habitat which should re-establish itself once construction ceases. Monks Hollow Dam and Powerplant would resultin the loss of 35 acres of riparian habitat. The reservoir to be formed behind the dam will create 352 acres of lacustrine habitat. An additional 8 acres of riparian habitat would be lost due to expansion of recreation facilities, and 1 acre would be lost due to road fills.

      Last Chance Powerplant, streambank protection, and tunnel waste would result in the loss of about 0.5 acre of riparian habitat including about 0.05 acre of streamside wetland.

      The stream mitigation for Diamond Fork would result in a stable and reliable stream flow. This should result in the formation of additional riparian habitat.

   c. Mudflats - Not applicable.

   d. Vegetated Shallows - There are no such areas.

   e. Coral Reefs - There are no such areas.

   f. Riffle and Pool Complexes - Riffle and pool complexes would be destroyed by the placement of fill for the impoundment and the formation of the reservoir pool. The existing riverine areaswithin the above areas would be changed to a lacustrine habitat type.

5. Threatened and Endangered Species: Refer to Chapter III, Endangered Species.

6. Other Wildlife - The food chain production of the lacustrine habitat would be severely limited when compared to the food chain production of existing wetlands/riverine habitats within the reservoir areas. Species diversity for birds, mammals, reptiles, amphibians, insects, and vegetation would be lost within the impoundments. The number of shorebirds would increase in the area because of the reservoirs and their fluctuating shorelines which would provide food for many of the shorebird species; however, because of the annual reservoir water level fluctuations, the resulting environment would be relatively unstable when compared to the existing wetland/riverine habitats. As a result, there would be only limited use by semiaquatic mammals, reptiles, amphibians, aquatic insects, and aquatic vegetation. There would be an increase in waterfowl during their migration periods; however,waterfowl production would be decreased because of lack of vegetative cover and food provided by the existing habitat.

7. Actions to Minimize Impacts: Refer to Chapter III, Fishery and Wildlife Measures and Mitigation and Other Mitigation Measures, for each alternative.

F. Proposed Disposal Site Determination.

1. Mixing Zone - Not significant. Major areas where fill is to be placed would be dewatered at the time of fill placement. Short-term turbidity increases would occur at feature sites during construction.

2. Determination of Compliance with Applicable Water Quality Standards: Refer to Chapter III, Water Quality.

3. Potential Effects on Human Use Characteristics.

   a. Municipal and Private Water Supply. Not applicable.

   b. Recreation and Commercial Fisheries: Refer to Chapter III, Recreation.

   c. Water-related Recreation: Refer to Chapter III, Recreation.

d. Esthetics: Refer to Chapter III, Topography and Scenery.

e. Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Reserves: Refer to Chapter III, Cultural Resources.

G. Cumulative Effects: Refer to Chapter III, Flood Plains and Wetlands, Water Quality, Fish, Grazing, and Cumulative Impacts.

H. Secondary Effects: Refer to Chapter III, Topography and Scenery, Vegetation, Floodplains and Wetlands, Water Quality, Fish, Grazing, and Cumulative Impacts.

IV. FINDINGS OF COMPLIANCE FOR DIAMOND FORK SYSTEM

A. No significant adaptions of the guidelines (40 CFR 230) were made relative to this evaluation.

B. The various practical alternatives are evaluated in the 1984 Final Environmental Impact Statement.

C. The planned disposal of dredged material will not violate any applicable State water quality standards. A NPDES permit or a State turbidity waiver will be obtained for any work affecting waters of the United States.

D. The use of the selected disposal sites will not harm any endangered species or their critical habitat.

E. The proposed disposal of dredged material will not result in significant adverse effects on human health and welfare, including municipal and private water suppliers,recreation and commercial fishing, plankton, life stages of aquatic life, fish, shellfish, wildlife, and special aquatic sites which have not been mitigated. Further, significant adverse effects on aquatic ecosystem diversity, productivity, and stability and recreational, aesthetic, and economic values will not occur which have not been mitigated.

F. Appropriate steps to minimize potential adverse impacts of the discharge in aquatic systems will be undertaken.

G. On the basis of the guidelines (40 CFR Part 230, published in the July 1, 1985, Code of Federal Regulations) the proposed disposal sites for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

ATTACHMENT 2

FISH AND WILDLIFE SERVICE RECOMMENDATIONS

By a December 12, 1988, memorandum, the Fish and Wildlife Service (FWS) transmitted to Reclamation a draft Fish and Wildlife Coordination report with tentative fish and wildlife recommendations for the modified Diamond Fork System plan. The recommendations and Reclamation's responses are listed below.

1a. Recommendation: Fish and wildlife mitigation should be accomplished on schedules that are at least concurrent and proportional with such project construction.

Response: Mitigation measures will be programed to coincide with project construction schedules. However, actual implementation of mitigation measures will depend on adequate congressional funding in any given year.

1b. Recommendation: Mitigate wildlife losses in accordance with the January 1987 "Wildlife Mitigation Plan for Strawberry Collection System, Municipal and Industrial System and Diamond Fork System, Bonneville Unit, Central Utah Project." (This plan provides for the acquisition and transfer of 6,000 acres of land to be managed for wildlife habitat, with improvements as specified.)

Response: The preferred offsite wildlife mitigation plan, as described in this report, does contain the 6,000 acres for wildlife mitigation. The plan has been included in Attachment 3 as a Reclamation environmental commitment.

2. Recommendation: Reclamation and the Forest Service should monitor construction activities with the intent of minimizing damages to habitat and avoiding disturbances during critical wildlife breeding and wintering periods.

Response: This is a Reclamation environmental objective as stated above under specific recommendations for mule deer and golden eagles.

3. Recommendation: Alterations of the rock cliff area immediately north of Monks Hollow should be avoided to the extent practicable. (This is important bobcat denning and hunting habitat.

Response: The only impact to this area will be construction of the access road to the right abutment of Monks Hollow Dam and to the day-use area near the mouth of Red Hollow.

4. Recommendation: Design and operate the proposed Red Ledge Campground in a manner to avoid adverse effects on nesting golden eagles and wintering bald eagles, as specified.

   Response: The specific stipulations were cooperatively developed by Reclamation, the Forest Service, the Fish and Wildlife Service, and the Utah Division of Wildlife Resources to accomplish this recommendation as stated in the 1984 FES. The Forest Service has agreed to the stipulations.

5. Recommendation: Unnecessary destruction of, or harmful disturbance to, severe deer winter range should be avoided. Public access into severe winter range areas should be controlled during the winter periods (December 1 to April 15). Project access roads in these areas should be closed to public traffic, especially snowmobiles, during this time.

   Response: As stated in the 1984 FES, Reclamation will provide mitigative measures, as appropriate, to compensate for any unavoidable impacts to winter ranges. Reclamation supports the recommendation that public access to these areas should be restricted during the winter; however, the Fish and Wildlife Service must negotiate with the Forest Service to implement the recommendation in harmony with the Uinta National Forest Travel Plan.

6. Recommendation: Existing roads which will no longer be necessary for access, after project access roads are constructed, should be closed to all traffic and rehabilitated to provide wildlife habitat.

   Response: Reclamation supports this recommendation and will cooperate with the Forest Service to accomplish it within constraints of the Uinta National Forest Management Plan.

7. Recommendation: Minimize disturbance to vegetation and landscapes by confining construction activities to specific areas actually needed for project purposes.

Response: This is a Reclamation environmental commitment as stated in the 1984 FES.

8. Recommendation: Rehabilitate temporarily disturbed landscapes to the best possible conditions practicable to maximize wildlife habitat value. Measures should include:

   a. Stockpiling and replacing topsoil.

   b. Fertilize disturbed areas and revegetate with appropriate seed mixes and/or seedlings. Revegetate disturbed big game winter range with browse and forb species that the Forest Service, Utah Division of Wildlife Resources and Service recommends for specific sites.

   c. Restoring disturbed stream areas to natural conditions and protecting and replanting cottonwoods and willows.

   Response: These are Reclamation environmental commitments as stated in the 1984 FES.

9. Recommendation: Project construction and major operation and maintenance activities in areas of critical big game winter range should not be scheduled during the critical period, December 1 to April 15. Exceptions to this requirement could be made during winters that snow cover on foraging areas is sparse.

   Response: This is a Reclamation environmental objective and has been included as a recommended wildlife measure in this report and in the 1984 FES.

10. Recommendation: Construction camps, processing facilities, equipment pools, and other areas of intensive human use should not be located on lands that are important for wintering big game animals and should not be nearer than 1 mile from any of the active eagle nesting sites.

    Response: This is a Reclamation environmental objective as stated in the 1984 FES.

11. Recommendation: Annual monitoring of golden eagle nesting activity should be continued for a period of at least 5 years after completion of the project.

Response: This recommendation has been added to the list of Reclamation environmental commitments (see attachment 3).

12. Recommendation: Avoid disturbing construction and major operation and maintenance activities within 0.6 mile of golden eagle nesting sites during the breeding season (February 15 to May 15). No disturbing activities should be permitted until after the eaglets have fledged, about mid-June. An exception to this policy could occur in any year when it is verified that eagles are not nesting at a given eyrie location.

    Response: This is a Reclamation environmental commitment as stated in the 1984 FES.

13. Recommendation: Electrical transmission facilities should be designed to prevent electrocution of eagles, and all transmission lines should be located away from main roads a sufficient distance (200 to 300 yards) to minimize the potential of shooting and harrassment of large raptors which may use the towers or poles for perching.

    Response: The Western Area Power Administration has agreed to accommodate these recommendations as per 1984 FES.

14. Recommendation: Investigate the feasibility of reducing the transbasin diversion to retain sufficient water in the Uinta Basin to provide at least 44,400 acre-feet of water to meet the goal of the February 27, 1980, Streamflow Agreement.

    Response: The feasibility of reducing the transbasin diversion by at least 44,400 acre-feet is being studied under the ongoing implementation plan for the Streamflow Agreement. The recommended plan and alternative C provide for the reduced transbasin diversion.

15. Recommendation: Stream channel rehabilitation work should be accomplished on lower Diamond Fork to ensure that appropriate benefits are achieved and maintained.

    Response: As stated in the 1984 FES environmental commitments, Reclamation will consult with the Forest Service to consider channel rehabilitation work on lower Diamond Fork to ensure that the fishery benefits attributable to the Diamond Fork pipeline are realized and maintained.

16. Recommendation: The 510-cfs Diamond Fork Pipeline should be an integral part of the project plan.

    Response: This is a Reclamation environmental commitment as included in attachment 3 of this report.

17. Recommendation: Provide public access in perpetuity on private lands along the lower 2.0 miles of Diamond Fork. Fee title acquisition is preferred to ensure the needed angler access and protection of fish habitat.

    Response: Acquisition of this angler access is included in the recommended plan and alternatives A and C as a fishery measure and environmental commitment (attachment 3). Fee title acquisition will be Reclamation's objective.

18. Recommendation: Monitor dissolved oxygen concentrations and water temperatures in Diamond Fork below Monks Hollow Dam. To ensure fishery benefits, minimum dissolved oxygen concentrations of 5 mg/L or higher must be maintained and water temperatures should be at or near 55°F as much of the time as possible.

    Response: Establishment of a monitoring program to ensure satisfactory water quality in Diamond Fork is a Reclamation environmental commitment as stated in attachment 3 of this report.

19a. Recommendation: Investigate the feasibility of bypassing water to Sixth Water Creek via the proposed Syar Tunnel and placing a 50-cfs valve to connect the new Syar Tunnel with the existing Strawberry Tunnel.

    Response: As described in the 1984 FES, a 50-cfs flow-bypass valve will be included in the connection between Syar Tunnel and the existing Strawberry Tunnel. This valve will allow the release of up to 50 cfs into Sixth Water Creek to support a stream fishery if flows are available.

19b. Recommendation: Improve stream fish habitat in 7.5 miles of Sixth Water Creek and 4.0 miles of Diamond Fork upstream from the Springville crossing.

    Response: These recommendations are being considered as part of the "Aquatic Mitigation Plan" for the Strawberry Aquduct and Collection System.

20. Recommendation: A study to quantify the movement of fish through Syar Tunnel after completion of the project should be provided for. The results of these studies should be considered in determining mitigation needs.

    Response: This is a Reclamation environmental commitment as stated in the 1984 FES.

ATTACHMENT 3

ENVIRONMENTAL COMMITMENTS

Major environmental commitments made for the Diamond Fork System were listed in the 1984 FES. Changes in those commitments are listed below. Numbers in parentheses refer to numbers in the FES.

1.(1) Wildlife mitigation will consist of the acquisition, habitat improvement, and management of up to 6,000 acres of private and/or public land. The minimum requirement is 4,100 acres for the recommended plan.

2.(2) A total capacity of 510 cfs will be included in the Diamond Fork Pipeline for the purpose of removing project water, as well as existing high irrigation flows, from the lower Diamond Fork to mitigate potential project impacts and provide enhancement to the fishery resource.

3.(11) A monitoring program will be established to ensure satisfactory water quality in Diamond Fork below Monks Hollow Reservoir. If problems occur with low dissolved oxygen during project operation, corrective measures such as a multi-level outlet on Monks Hollow Dam, aerators or destratifiers on Strawberry or Monks Hollow Reservoirs, or warming ponds or aerators on Diamond Fork below Monks Hollow Reservoir will be constructed, as required, to guarantee a minimum dissolved oxygen content of 5 mg/L.

4.(18) Water temperature will also be monitored. Impact analyses thus far indicate that predicted stream temperatures under both alternatives will either be close to the optimum 55°F or will not be appreciably different from existing temperatures and, therefore, will not represent a significant impact requiring mitigation. If temperature conditions vary too much from this level, then measures similar to those discussed in item 3 will be implemented in order to support predicted fishery benefits.

5.(19) With the recommended plan and Alternatives A and C, there will be no Sixth Water Dam and, therefore, no commitment for a minimum flow below the damsite.

6. Public fishing access will be acquired to the lower 2 miles of Diamond Fork. This is a change from the 5 miles in the 1984 FES recommended plan. Three miles of access have already been acquired by the Forest Service as a result of a land exchange with a private landowner.

7. As required by Reclamation Instructions, a General Plan will be prepared by Reclamation and approved by the cooperating agencies for mitigation measures involving land transfers to other agencies. Specific wildlife management plans will be prepared for each management area. The General Plan and the specific wildlife management plans will be prepared and approved before mitigation lands are developed or transferred to another agency for management.

8. Continue monitoring the nesting activity of golden eagles in the Diamond Fork area for a period of at least 5 years after completion of the project.

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U.S. Department of the Interior Natural Resources Library, Washington, D.C.
Weber State College Library, Ogden, Utah

News Media

Associated Press, Salt Lake City, Utah
Central Utah Journal, Orem, Utah
Deseret News, Salt Lake City, Utah
KWCR Radio, Ogden, Utah
Payson Chronicle, Payson, Utah
Provo Daily Herald, Provo, Utah
Salt Lake Tribune, Salt Lake City, Utah
Spanish Fork Press, Nephi, Utah
Springville Herald, Springville, Utah
United Press International, Salt Lake City, Utah

Power Interests

Arizona Power Authority, Phoenix, Arizona
Arizona Public Service, Phoenix, Arizona
Bountiful Light and Power, Bountiful, Utah
Brigham City Power, Brigham City, Utah
Colorado River Energy Distributors Association, Sandy, Utah
Colorado-Ute Electric Association, Inc., Montrose, Colorado

Power Interests (continued)

Deseret G&T Cooperative, Sandy, Utah
Flowell Electric Association, Fillmore, Utah
Heber Light & Power, Heber City, Utah
Intermountain Consumer Power Association, Sandy, Utah
Intermountain Power Agency, Murray, Utah
Lehi Power Department, Lehi, Utah
Moon Lake Electric Association, Roosevelt, Utah
Murray City Power, Murray, Utah
Nephi City Power, Nephi, Utah
Pacific Power and Light Company, Portland, Oregon
Payson City Corporation, Payson, Utah
Plains Electric Generation and Transmission Company, Albuquerque, New Mexico
Provo City Utilities, Provo, Utah
Public Service Company, Denver, Colorado
Public Service Company of New Mexico, Albuquerque, New Mexico
Salem City and UMPA, Spanish Fork, Utah
Southwest Utah Co-op Power Federation, Salt Lake City, Utah
Spanish Fork City Power & Light, Spanish Fork, Utah
Springville Power & Light Company, Springville, Utah
Tri-State Generation & Transmission Association, Denver, Colorado
Utah Associated Municipal Power Systems, Sandy, Utah
Utah Municipal Power Agency, Springville, Utah
Utah Power & Light Company, Salt Lake City, Utah
Utility Commission, St. George, Utah
Wyoming Municipal Power Agency, Lusk, Wyoming
Wyoming Rural Electric Association, Casper, Wyoming

Local Agencies and Private Organizations

American Fishery Society, Garden City, Utah
American Wilderness Alliance, Englewood, Colorado
Audubon Society, Orem, Utah
R.W. Beck & Associates, Phoenix, Arizona
Boettcher & Company, Salt Lake City, Utah
Brigham Young University, Civil Engineering Department, Provo, Utah
Central Utah Water Conservancy District, Orem, Utah
Orem-Provo Chamber of Commerce, Orem, Utah
Payson Chamber of Commerce, Payson, Utah
South Salt Lake Chamber of Commerce, Salt Lake City, Utah
Spanish Fork Chamber of Commerce, Spanish Fork, Utah
Springville Chamber of Commerce, Springville, Utah
Colorado River Board of California, Los Angeles, California
Colorado River Commission of Nevada, Las Vegas, Nevada
Colorado Water Congress, Denver, Colorado
Council on Utah's Resources, Salt Lake City, Utah
Defenders of Our Utah Streams and Environment, Salt Lake City, Utah
Duncan, Allen & Mitchell, Washington, DC
Engineering Science, Alpine, Utah

Local Agencies and Private Organizations (continued)

Environmental Defense Fund, Boulder, Colorado
Escalante Wilderness Society, Salt Lake City, Utah
Eyring Research Institute, Provo, Utah
Federation of Fly Fishermen, Salt Lake City, Utah
Friends of the Earth, Colorado Springs, Colorado
Harrison Western Corporation, Lakewood, Colorado
Intermountain Water Alliance, Salt Lake City, Utah
I.W.L.A. Monte Cristo Chapter, Salt Lake City, Utah
Juab County Commissioner, Nephi, Utah
Lakeshore Irrigation Company, Spanish Fork, Utah
League of Women Voters, Salt Lake City, Utah
Mapleton Irrigation Company, Mapleton, Utah
Mayor, Town of Elk Ridge, Elk Ridge, Utah
Mayor, City of Mapleton, Mapleton, Utah
Mayor, City of Orem, Orem, Utah
Mayor, City of Payson, Payson, Utah
Mayor, City of Provo, Provo, Utah
Mayor, City of Salem, Salem, Utah
Mayor, City of Salt Lake, Salt Lake City, Utah
Mayor, City of Santaquin, Santaquin, Utah
Mayor, City of Spanish Fork, Spanish Fork, Utah
Mayor City of Springville, Springville, Utah
Mayor, Town of Woodland Hills, Salem, Utah
Metropolitan Water District of Orem, Orem, Utah
Metropolitan Water District of Provo, Provo, Utah
Metropolitan Water District of Salt Lake City, Salt Lake City, Utah
Mountain Lands Association of Governments, Provo, Utah
National Parks & Conservation Association, Cottonwood, Arizona
National Resources Defense Council, Incorporated, Washington, DC
National Wildlife Federation, Fort Collins, Colorado
Provo Reservoir Water Users, Incorporated, Orem, Utah
Provo River Water Users Association, Provo, Utah
Prudential-Bache Securities, Salt Lake City, Utah
Salt Lake County Commission, Salt Lake City, Utah
Salt Lake County Council of Governments, Bountiful, Utah
Salt Lake County Development and Promotion Board, Salt Lake City, Utah
Salt Lake County Flood Control-Highway District, Salt Lake City, Utah
Salt Lake County Human Services, Environmental Health,
Salt Lake City, Utah
Salt Lake County Water Conservancy District, Salt Lake City, Utah
Salt River Project, Phoenix, Arizona
Save Our Rivers Committee, West Bountiful, Utah
Sierra Club, Timpanogos Chapter, Provo, Utah
Sierra Club, Utah Chapter, Salt Lake City, Utah
Sierra Club Legal Defense Fund, Incorporated, Denver, Colorado
Snow, Christensen & Martineau, Salt Lake City, Utah
Spanish Fork Livestock Association, Spanish Fork, Utah
Spanish Fork River Commissioner, Spanish Fork, Utah
Spanish Fork River Distribution System, Lake Shore, Utah

Local Agencies and Private Organizations (continued)

Spring Lake Irrigation Company, Payson, Utah
Springville Irrigation Company, Springville, Utah
Stone Fly Society of the Wasatch, Salt Lake City, Utah
Strawberry Water Users Association, Payson, Utah
Sundance Enterprises, Salt Lake City, Utah
Trout Unlimited, Salt Lake City, Utah
Uintah Basin Association of Governments, Roosevelt, Utah
Upper Colorado River Commission, Salt Lake City, Utah
Utah Association of Counties, Salt Lake City, Utah
Utah Association of Soil Conservation Districts, Sandy, Utah
Utah Audubon Society, Salt Lake City, Utah
Utah Cattlemen's Association, Salt Lake City, Utah
Utah Committee of Consumer Services, Salt Lake City, Utah
Utah Congress Watch, Salt Lake City, Utah
Utah County Commission, Provo, Utah
Utah County Mosquito Abatement, Provo, Utah
Utah County Wildlife Federation, Payson, Utah
Utah Environmental Center, Salt Lake City, Utah
Utah Farm Bureau Federation, Murray, Utah
Utah Heritage Foundation, Salt Lake City, Utah
Utah Lake and Jordan River Commission, Bluffdale, Utah
Utah Lake Distributing Company, West Jordan, Utah
Utah League of Cities and Towns, Salt Lake City, Utah
Utah Nature Study Society, Salt Lake City, Utah
Utah State University, Civil Engineering Department, Logan Utah
Utah Transit Authority, Salt Lake City, Utah
Utah Valley Industrial Development Association, Provo, Utah
Utah Water Users Association, Bountiful, Utah
Utah Water Resources Council, Salt Lake City, Utah
Utah Wilderness Association, Salt Lake City, Utah
Utah Wildlife and Outdoor Recreation Association, Ogden, Utah
Utah Wildlife Federation, Salt Lake City, Utah
Utah Wildlife Society, Salt Lake City, Utah
Wasatch County Planner, Heber City, Utah
Wasatch Front Regional Council, Bountiful, Utah
Weber State College, Engineering Department, Ogden, Utah
West Field Irrigation Company, Spanish Fork, Utah
Western States Water Council, Salt Lake City, Utah
W.F. Sigler & Associates, Incorporated, Logan, Utah
Women's State Legislative Council, Midvale, Utah
Arthur Young & Company, Salt Lake City, Utah

Land Owners and Interested Individuals

Jay and Linda Allen, American Fork, Utah
Charles R. Allred, Richfield, Utah
Ralph Andrus, Spanish Fork, Utah
Leo Brady, Duchesne, Utah

Land Owners and Interested Individuals (continued)

John Childs, Mapleton, Utah
Michael Childs, Mapleton, Utah
Don A. Christiansen, Orem, Utah
Dennis Clark, Orem, Utah
Nancie Coburn, Payson, Utah
Charles Crozier, Neola, Utah
J.W. Dansie, Spanish Fork, Utah
Fred J. Diamond, Springville, Utah
George W. Diamond, Murray, Utah
James L. Diamond, Springville, Utah
Robert Disbrow, Spanish Fork, Utah
John Dredge Jr., Orem, Utah
Jay W. Franson, Highland, Utah
Bruce Gammon, Provo, Utah
Marc Hadlock, American Fork, Utah
Keith Hanks, Provo, Utah
James C. Hansen, Springfield, Vermont
Timothy J. Harrison, Tucson, Arizona
Lillian Hayes, Provo, Utah
Peter Hovingh, Salt Lake City, Utah
Diane L. Jarvis, Provo, Utah
Leon Jensen, Goshen, Utah
Theron Jensen, Sandy, Utah
Bruce A. Johnson, P.E., Boise, Idaho
Bruce Kaliser, Salt Lake City, Utah
James B. Lee, Salt Lake City, Utah
Lynn Ludlow, Provo, Utah
Ronald McKee, Tridell, Utah
Joseph L. Moore, West Valley City, Utah
Garth Morgan, Sandy, Utah
George E. Morse, Provo, Utah
J. Niel Nielson, Gunnison, Utah
Harry D. Opfar, Pleasant Grove, Utah
John C. Patrick, Springville, Utah
Robert Pruitt III, Salt Lake City, Utah
David Rasmussen, Vernal, Utah
Olyn Reay, Salt Lake City, Utah
Clyde Ritchie, Heber City, Utah
Lyle Robinson, Tulia, Texas
Paul T. Sant, Salt Lake City, Utah
Shirley M. Scott, Woodbridge, Virginia
Verlyn Shumway, Orem, Utah
L.Y. Siddoway, Vernal, Utah
Clyde A. Swenson, Spanish Fork, Utah
John M. U'ren, Salt Lake City, Utah
P. Waldo Warnick, Delta, Utah
Melvin B. White, Bluebell, Utah
Charles W. Wilson, Salt Lake City, Utah
Ronald S. Wilson, Fillmore, Utah

Land Owners and Interested Individuals (continued)

Robert Winget, Provo, Utah
Lynn R. Winterton, Roosevelt, Utah
Don Wride, Spanish Fork, Utah
Estel L. Wright, West Valley City, Utah

LETTERS OF COMMENT

United States Department of Agriculture | Forest Service | Intermountain Region | 324 25th Street Ogden, UT 84401

Reply to: 1950

Date: June 28, 1989

Mr. Wayne E. Cook
Bureau of Reclamation
Upper Colorado Regional Office
PO Box 11568
Salt Lake City, UT 84147

Dear Mr. Cook:

We have read the Draft Supplement to the Final Environmental Impact Statement for the Diamond Fork System of the Bonneville Unit, Central Utah Project. Enclosed are the comments of both the Uinta National Forest and the Regional Office.

If you have any questions, please call Gary Boyle, Water Rights Specialist, Range and Watershed Management. His phone number is (801)625-5360.

Sincerely,

/s/T.A. Roederer

J. S. TIXIER
Regional Forester

Enclosures

cc:
P&B
Uinta (W.Hanks)

USDA Forest Service Comments:

1. Discuss the effect of releasing excess water to the Spanish Fork River on fish, recreation, and channel stability.

2. Two-thirds of the water in Diamond Fork is the result of transbasin diversion from Strawberry Reservoir. Discuss the result of the increase in flow on channel stability and water quality.

3. Alternative A suggests that sediment yield will be reduced 62 percent at the mouth of Diamond Fork. Channel capacity might be reduced as a result of sediment accumulation in the stream channel. Discuss the downstream effects of mobilizing and transporting this sediment during rare flood events.

4. We are disappointed that the Bureau deleted the purposed Rays Valley--Springville crossing road reconstruction project. The road was enclosed in the 1984 Final Environmental Impact Statement (EIS). We believe it is in the best public interest to complete this road as originally planned. There will be a lot of traffic on this road by those who want access to the upper part of the Monks Hollow Reservoir and the Three Forks Area. We strongly recommend the Bureau add this road back into the reconstruction program.

5. We are very concerned about the nonguaranteed portion of the February 27, 1980, Stream Flow Agreement which calls for an additional 22,100 acre-feet of water to meet minimum stream flows. The guaranteed portion of 22,300 acre-feet added to the 22,100 acre-feet equals the total commitment of 44,400 acre-feet. A reduction in transbasin diversion discussed in Alternative B and C may meet this commitment as discussed in Alternative A.

With the first diversion of Project water being made this year through the Strawberry Aqueduct and Collection Systems, we believe this commitment for the nonguaranteed portion should be discussed with the other Agencies who are party to the Stream Flow Agreement and the commitment made as quickly as possible.

6. With the construction of the Syar Tunnel and the capability it will have to deliver Project water to Sixth Water Creek, it is very important to restore some fishery habitat on the upper reaches of Sixth Water Creek. The valve that will be installed between the Syar Tunnel and the old Strawberry Tunnel will be very important in providing flow for fish habitat in the upper reaches of the stream.

7. The Aquatic Mitigation Plan prepared by the Interagency Biological Assessment Team recommended 49 cubic feet per second (cfs) minimum for summer flows and 32 cfs for minimum winter flows. We recommend the Bureau adopt these suggested flows and plan for them.

8. The increased size of the Diamond Fork Pipeline from Monks Hollow Dam to Spanish Fork River will make it possible to improve fishery habitats along this reach. The 510 cfs pipeline will handle much of the summer flows.

However, the limiting factor will be winter flows sufficient to sustain over wintering populations of fish. We recommend the Bureau provide adequate winter flows to sustain wintering trout.

9. The draft supplement makes a one paragraph statement on the recreation resource on page 13 and reads as follows:

"Recreation facilities for the system were planned by the Forest Service in cooperation with Reclamation and are the same as presented in the FES with one exception. Picnic facilities at the Monks Hollow Recreation Area would consist of 20 tables with shelters and two group shelters, rather that the 25 tables in the FES."

We concur with the need for shelters at the group sites because of the full-sun exposure at the group site location.

10. The following is a tabulation of recreation facilities outlined in the October 1984, FES which are to be constructed and financed as part of the Diamond Fork System:

1. Monks Hollow Recreation Area: Located one-half mile below the Monks Hollow Dam, it consists of 96 camping units, one day use area with 40 parking spaces, 25 picnic tables, and a restroom; and a fisherman access point with 6 parking spaces and a restroom.

2. Diamond and Palmyra Campgrounds: These existing campground located two miles below Monks Hollow Dam would have 10 units added to them to replace the capacity lost at Hawthorn and Three Forks Campgrounds.

3. Monks Hollow Day-Use Area: Located adjacent to the north side of the Monks Hollow Reservoir, it would be used for hand launching of nonmotorized boats. There would be an asphalt parking lot for 20 cars, a restroom, and appropriate signs.

4. Lower Diamond Fork Trailhead: Would be constructed 2.5 miles below the Monks Hollow Dam. The trailhead would include parking for 20 vehicles and allow for trailer use. It would include a stock unloading ramp, hitching racks, and a restroom. This trailhead would serve existing trail systems in the area.

5. Monks Hollow Trail: This trail would begin at the Monks Hollow Recreation Area and would be located around the south side of Monks Hollow Reservoir to the Three Forks Area.

We concur the above facilities are necessary to accommodate the increased visitor use that will be generated by the Diamond Fork Project.

We do not concur that the Fifth Water Trailhead and loop trail system in the Fifth and Sixth Water drainage should be deleted. The Three Forks Area in Diamond Fork presently serves as a trailhead for three extremely popular drainages for hiking and horseback riding on the Spanish Fork Ranger District. They are the Fifth Water, Sixth Water and Cottonwood Drainages. With the construction of Monks Hollow Dam, the only access to these drainages would be from the upper ends of the Fifth and Sixth Water Drainages where no access

facilities will be available or the Monks Hollow Recreation Area which is a five-mile hike or horseback ride around the Reservoir.

We suggest relocating the proposed Fifth Water Trailhead Facility to the upper end of Monks Hollow Reservoir which will still be served by good road access from the Springville Crossing Area. This trailhead would also serve as a day-use fisherman access area to the Reservoir which will be stocked with fish by Utah Division of Wildlife Resources and will no longer have the hazardous peaking power fluctuations which would endanger the fishermen. The canyon is narrow at the upper end of the Reservoir but a suitable site can be located for this trailhead. Approximately 3/4-mile of new trail and three-foot bridges will be needed to provide access to these three drainages from the trailhead.

Past experience has shown even with the 100' draw-down potential over the recreation season at the Monks Hollow Reservoir, there will be a high-public demand for access to the east end of the Reservoir. The need for a trailhead facility in that area is reinforced by the fact the present Three Forks Trailhead will be inundated and will not be replaced by the proposed Fifth Water Trailhead under the Fifth Water Pumped Storage Alternative.

ORIGINAL

ENV-6.00
CU

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814-4794

REPLY TO
ATTENTION OF

June 20, 1989

Colorado/Great Basin Branch

RECEIVED BOR SLC
OFFICIAL FILE COPY

JUN 14'89

Date	Initials	
		100
6/14		ACC 440
		K 430
6/19		700
		150

Mr. Wayne E. Cook
Acting Regional Director
Bureau of Reclamation
Upper Colorado Regional Office
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Mr. Cook:

We have reviewed the Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project. Our previous comments of July 20, 1983, which you included as page 344 of your Final Environmental Statement, Diamond Fork Power System, Bonneville Unit, Central Utah Project, are still valid.

Thank you for the opportunity to provide review comments.

Sincerely,

for John A. Sabilosky
Walter Yep
Chief, Planning Division

C

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

July 20, 1983

SPKED-W

Mr. Clifford I. Barrett,
Regional Director
Bureau of Reclamation
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Mr. Barrett:

The Draft Environmental Statement, Diamond Fork Power System, Bonneville Unit, Central Utah Project, transmitted to the Executive Director of Civil Works Environmental Programs, Office of the Chief of Engineers, has been referred to the Sacramento District for direct reply.

We have reviewed the Draft Statement and have concluded that the proposed project will neither conflict with nor adversely affect flood control, navigation, or other jurisdictional responsibilities of the Corps of Engineers.

The Draft Statement indicates that flood control would be provided by Syar, Sixth Water, and Monks Hollow Reservoirs. Preliminary flood control evaluations have been made by our District. More detailed studies and development of flood control operating criteria will be made as appropriate to your detailed study needs.

We have reviewed the Draft EIS with respect to the requirements of Section 404 of the Clean Water Act. It is our judgement that the Draft EIS contains the requisite information necessary for evaluation of the proposed discharges under Section 404(b)(1) guidelines. It is further our judgement that the proposed discharges are consistent with these guidelines.

Thank you for the opportunity to provide review comments.

Sincerely,

Michael J. Connor
for George C. Weddell
Chief, Engineering Division

DEPARTMENT OF HEALTH & HUMAN SERVICES

env. 6.00

Public Health Service CW

Centers for Disease Control
Atlanta GA 30333

June 2, 1989

Regional Environmental Officer
Bureau of Reclamation
P.O. Box 11568
Salt Lake City, Utah 84147

JUN 5 '89

Dear Sir:

Thank you for sending the Final Environmental Impact Statement (FEIS) for "Diamond Fork System." We are responding on behalf of the U.S. Public Health Service. Since we did not provide comments on the Draft EIS, we have no comments to offer on the FEIS.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for further documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

David E. Clapp, Ph.D., P.E., CIH
Environmental Health Scientist
Center for Environmental Health
and Injury Control

ORIGINAL

United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Intermountain Field Operations Center

June 23, 1989

Your reference:
D-5900

Memorandum

To: Regional Environmental Officer, Bureau of Reclamation, 125 South State Street, P.O. Box 11568, Salt Lake City, Utah 84147

From: Chief, Intermountain Field Operations Center

Subject: Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project (Final Environmental Impact Statement)

Personnel of the Bureau of Mines reviewed the subject document to determine whether mineral resources are adequately addressed.

The document addresses geology, mineral resources, production facilities and current production, and expected impacts on these resources and facilities resulting from construction of the project. All previously expressed concerns of the Bureau of Mines have been addressed; accordingly, we have no objection to the revised project plans or the document as received.

for William Cochran

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
UTAH-COLORADO FIELD OFFICE
2060 ADMINISTRATION BUILDING
1745 WEST 1700 SOUTH
SALT LAKE CITY, UTAH 84104-5110

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

(FWE)

July 5, 1989

MEMORANDUM

TO: Regional Environmental Officer, Upper Colorado Region, Bureau of Reclamation, Salt Lake City, Utah

FROM: ACTING Field Supervisor, Fish and Wildlife Enhancement, Fish and Wildlife Service, Salt Lake City, Utah

SUBJECT: Review of Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project (DES 89-10)

This is in response to your memorandum of April, 1989, which transmitted the subject document for review by interested agencies, organizations, and individuals. We have reviewed the document and offer the following comments.

In general, we find that the subject document accurately describes impacts of the three evaluated alternatives and plans considered in the 1984 Final Environmental Impact Statement (INT-FES 84-30) on fish and wildlife resources within the Diamond Fork Drainage. The document, however, does not contain evaluations of the impacts of Alternatives A and B on the resources of Strawberry Reservoir, Utah Lake, the Jordan River and Utah Valley streams. The document proposes that these impacts be addressed in another Environmental Impact Statement for the Irrigation and Drainage (I & D) System. We believe that the subject document is adequate in regard to Alternative C, which assumes that the System would not be constructed; however, an overall comparison with Alternatives A and B will necessitate evaluations of impacts outside of the Diamond Fork Drainage.

Another concern that we have about Alternative A, is the impacts it would have on stream fisheries in the Uinta Basin. Alternative A assumes that sources of water to meet fisheries goals stated in the 1980 Streamflow Agreement, that do not require a reduction in the transbasin diversion, will be found. We do not believe that there are feasible means for protecting stream fisheries affected by the Strawberry Aqueduct and Collection System without reducing the transbasin diversion. Readers should be made aware of the consequences of Alternative A to the Uinta Basin stream fisheries.

The preliminary recommendations that we have offered for planning purposes have been incorporated in plans presented in the document. We wish to modify several of these preliminary recommendations.

Our specific comments are as follows:

Summary, page S-2 states that, "Alternatives B and C provide for a reduced transbasin diversion of water from the Uinta Basin to the Bonneville Basin to satisfy the requirements of an instream fishery flow agreement for Uinta Basin streams. Alternative A provides for a larger transbasin diversion and assumes that the instream flow agreement would be satisfied by other means."

We believe the assumption that water to meet the 44,400 acre-foot goal of the Streamflow Agreement can be met without reducing the transbasin diversion is unrealistic. A search for alternative sources of water to meet the 44,400 acre-foot goal for preserving the fishery without reducing the planned 136,600 acre-foot transbasin diversion was initiated shortly after signing of the February 27, 1980 agreement. Since that date there has been a diligent search for feasible means to accomplish this, with none having been identified. We believe the alternatives have been exhausted.

At the time the Streamflow Agreement was signed, it was expected that 50 percent of the adult trout habitat could be retained by providing 44,400 acre-feet of water for the fisheries. Means of mitigation other than streamflows were planned to compensate for the other 50 percent of the loss.

Readers should be made aware of the severe consequences to the Uinta Basin fisheries if Alternative A is selected. The May 1979 "Summary of Analysis of Alternative Streamflows for Fishery Purposes Strawberry Aqueduct, Bonneville Unit, Central Utah Project" also known as the "Governor's Report", evaluated the results of various quantities of water to protect fisheries of the affected Uinta Basin streams. Alternative 2 in this report would provide 22,300 acre-feet of water for protection of the fisheries, which is comparable to flows that would be available with Alternative A in the document now under review. This amount of water for protection of the fisheries would result in a 63 percent reduction in adult trout habitat in the affected Uinta Basin streams and angler use would be reduced by 53 percent.

Pages 2-3, Interrelationships, Bonneville Unit. This section should be expanded to address evolvement of the 1980 Streamflow Agreement. In a November 3, 1973 news release, the Secretary of the Department of the Interior recognized the need for additional streamflows in streams affected by the Strawberry Aqueduct and Collection System and indicated that an equitable solution would be forthcoming. At that time, only 6,500 acre-feet of water annually had been provided for preserving affected streams. In 1978, under President Carter's water policy directives, greater emphasis was placed on fishery values, and studies were initiated to determine the effects of alternative streamflows. This led to the previously mentioned May 1979 report and to the Streamflow Agreement. The fact that the Streamflow Agreement goal for fisheries can not be met if Alternative A is selected should be clearly stated.

Page 7, Alternatives. Alternatives B and C provide for the retention of 44,400 acre-feet of water in the Uinta Basin to meet fishery needs identified in the 1980 Streamflow Agreement. Alternatives A and B assume that the I & D System will be constructed and it is proposed that impacts that they will have on

resources of Strawberry Reservoir, Utah Lake, the Jordan River and Utah Valley streams be addressed in an Environmental Impact Statement on that project if plans for that system proceed. Alternative C corresponds to a no action alternative for the I & D System.

An environmental comparison of Alternative C with plans addressed in the 1984 Environmental Statement is possible; however, the net effects of Alternatives A and B are not addressed in the subject document. Consequently, comparisons of the total impacts of these latter two alternatives can not be made at this time.

Pages 22-23. The following statement needs to be clarified, "With Alternative A and the 1984 FES plan, only 6,500 acre-feet would be collected from the Uinta Basin tributaries. Therefore with Alternative B 37,900 acre-feet of additional water would remain in the Uinta Basin."

The 6,500 acre-feet of water specified in an April 12, 1965 resolution by the State of Utah plus an additional 37,900 acre-feet that would be provided with the reduced transbasin diversion if Alternatives B or C are selected would equal the 44,400 acre-foot amount specified in the Streamflow Agreement. The minimum amount of water that would be available for the Uinta Basin under terms of the Streamflow Agreement is 22,300 acre-feet. This is the minimum that should be assured with plans considered in 1984.

Pages 33-35, Comparative Analysis of Impacts. As previously stated, an analysis of the impacts of Alternatives A and B on Strawberry Reservoir, Utah Lake, the Jordan River and Utah Valley streams is not included in the subject document. Consequently, a comparison of the overall advantages or disadvantages is absent. Also, it would be appropriate to compare the effects of Alternative A to Alternatives B and C on the Uinta Basin streams addressed in the 1980 Streamflow Agreement.

Pages 45-47, Utah Lake and Jordan River. No impacts on Utah Lake or the Jordan River are anticipated with Alternative C. The impacts to these resources with Alternatives A and B are to be addressed in a future Environmental Impact Statement on the I & D System. A potential future without-or-with-the-project condition that is not described in the subject document is a wildlife refuge on Utah Lake.

One proposal refuge would encompass about 50,700 acres of lands and waters in vicinity of Provo and Goshen bays and Benjaman Slough. The purchase of up to 54,000 acre-feet of water for annual operations of this facility is also part of the proposed plans.

Page 53. Again it is mentioned that impacts of Alternative B on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be discussed in the draft environmental statement on the I & D System.

Comments made previously on the need for this evaluation to compare the alternatives are applicable.

One proposal refuge would encompass about 50,700 acres of lands and waters in vicinity of Provo and Goshen bays and Benjaman Slough. The purchase of up to 54,000 acre-feet of water for annual operations of this facility is also part of the proposed plans.

Page 75. Plans for a chemical treatment of Strawberry Reservoir to renovate the fishery in 1989 have been postponed. Involved agencies are in agreement that the treatment is warranted and are hopeful that it can be accomplished soon. There are no plans for the immediate stocking of smallmouth bass after the chemical treatment, but this species may be stocked later, if necessary, to aid in controlling the Utah chub.

Page 89. Plans for the renovation of Strawberry Reservoir in 1989 are mentioned. As previously stated, these plans have been postponed.

Page 89. Utah Lake. It is stated that Alternative C will have no impacts on the Utah Lake fishery, and that the impacts of Alternatives A and B will be presented in the draft environmental statement on the I & D System.

Without thorough knowledge of the total impacts of all of the alternatives, comparisons are difficult to make.

Pages 137-142. Attachment 2, Fish and Wildlife Service Recommendations. Our draft Fish and Wildlife Coordination Act Report is being revised, and several recommendations are being modified.

In conjunction with recommendation 16 (page 141), investigations of the feasibility of adjusting flow release patterns from Strawberry Reservoir for maintenance of the fishery in Diamond Fork below Monks Hollow Reservoir during winter months is warranted. We recommend that minimum streamflows of 80 cfs be maintained as much of the time as possible.

In conjunction with recommendation 19(a) (page 142), the feasibility of bypassing summer (April 1 - September 30) streamflows of 49 cfs and winter (October 1 - March 31) streamflows of 32 cfs to Sixth Water Creek warrants investigation.

We appreciate the opportunity to review the subject document.

CLARK R. JOHNSON

cc: ✓Projects Manager, Utah Projects Office, BR, Provo, Utah
Director, UDWR, Salt Lake City, Utah
Forest Supervisor, Uinta National Forest, USFS, Provo, Utah
CUP Liaison Officer, U.S.F.S., Provo, Utah

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

Ref: 8WD-EAB
Regional Environmental Officer
Bureau of Reclamation
125 South State Street
P O Box 11568
Salt Lake City, Utah 84147

JUN 28

Dear Environmental Officer:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act, Region VIII of the Environmental Protection Agency (EPA) has finished its review of the draft supplement to the Final Environmental Impact Statement (DSFEIS) for the Diamond Fork System, Central Utah Project, Bonneville Unit.

This is a smaller scale version of the project the Final Environmental Statement (FES) of which was submitted for review by the Bureau of Reclamation (BOR) in 1984. Market forces have dictated an adjustment in scope, and a decreased emphasis on power generation. Comments here will be addressed only to those aspects of the project which differ from the previous submission.

The primary purpose of this project is to implement trans-basin diversion of water from the Unita Basin of the Upper Colorado River Basin to the Bonneville Basin of the Great Basin. The diversion would provide water for municipal and industrial (M&I) and irrigation and drainage (I&D) purposes.

This DSFEIS provides a thorough documentation of the impacts associated with the proposed changes to the originally conceived project. Mitigation measures, already included in the original, have been incorporated into this revision. In general, environmental impacts associated with this project have been decreased, and are well documented. In particular, the EPA appreciates the comprehensive manner in which the BOR has analyzed potential riparian and wetland impacts, and incorporated appropriate mitigation plans into its proposed project implementation planning. The BOR has also shown concern in monitoring environmental impacts, and in avoiding degradation of water quality.

In view of the preceding, Region VIII of the EPA finds that it has no significant objections to the proposed changes to this project which have been documented in the SDFEIS. The EPA appreciates the opportunity to conduct this review. If the Bureau has any additional comments or questions concerning our review, please contact either myself, or Gene Kersey, Project Review Officer, at FTS 564-7117, or commercial 303-294-7117.

Sincerely;

for Robert R. DeSpain, Chief
Environmental Assessment
Branch

ROSE MOFFORD
GOVERNOR

ARIZONA DEPARTMENT OF COMMERCE

STATE CAPITOL
1700 WEST WASHINGTON
PHOENIX, ARIZONA 85007
(602) 542-5371
FAX: (602) 542-2146

DAVID P. JANKOFSKY
DIRECTOR

MEMORANDUM

TO : DOI BOR

FROM : ARIZONA STATE CLEARINGHOUSE

DATE : June 9, 1989

RE : BUREAU OF RECLAMATION
DRAFT SUPPLEMENT TO THE FINAL EIS DIAMOND FORK SYSTEM
15.999
AZ890505800011

This memorandum is in response to the above project submitted to the Arizona State Clearinghouse for review.

The project has been reviewed pursuant to the Executive Order 12372 by certain Arizona State officials and Regional Councils of Government.

If the Standard Form 424 was submitted with the application, it is attached for your information.

No comments were received on this project. It was supported as written. If any comments are received we will forward them to you for your consideration.

Attachment

cc: Arizona State Clearinghouse
Applicant

ORIGINAL

DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

Norman H. Bangerter
Governor
Suzanne Dandoy, M.D., M.P.H.
Executive Director
Kenneth L. Alkema
Director

288 North 1460 West
P.O. Box 16690
Salt Lake City, Utah 84116-0690
(801) 538-6121

June 29, 1989

Regional Environmental Officer
U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Regional Office
125 Salt State, P.O. Box 11568
Salt Lake City, Utah 84147

Dear Sirs:

Thank you for the opportunity to review the *Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project.*

We support the Bureau's conclusion at the top of p.67 regarding the potential problem with water temperature and low dissolved oxygen levels in Diamond Fork. It appears from the modeling for condition A (releasing from below the thermocline on Strawberry) that dissolved oxygen levels will be below state water quality standards and beneficial uses would be impaired. We request that in the Final EIS Reclamation describe specifically how this impact will be mitigated and water quality standards maintained. We recommend that the entire Diamond Fork-Spanish Fork River system be monitored to accurately document such problems. We request that Reclamation coordinate closely with the Bureau of Water Pollution Control on the water quality studies. We also request that Reclamation coordinate with the State during the development of measures to mitigate temperature and dissolved oxygen problems.

It appears that alternatives A & B of the project could improve Diamond Fork significantly through retaining some 92 percent of the sediment load in Monks Hollow Reservoir. It was quite difficult to understand the full impact of the project on water quality because much of the discussion was deferred to the EIS on the I&D system. Thus we reserve the right to further comment on the operation of the entire system until we see the EIS on the I&D system.

For now we basically concur with the water quality assessment and evaluation of impacts and look forward to working with you on completion of the I&D EIS.

Sincerely,

Jay B. Pitkin

for Don A. Ostler, Director
Bureau of Water Pollution Control

MKR/ag
cc: Lary Scanlan
Steve Noyes
4030y-36

ORIGINAL

Norman H. Bangerter
Governor
Dale C. Hatch, C.P.A., J.D.
Director
Michael E. Christensen, Ph.D.
Deputy Director

OFFICE OF PLANNING AND BUDGET

116 State Capitol Building
Salt Lake City, Utah 84114
(801) 538-1027

June 28, 1989

Mr. Weston J. Hirschi, Acting Regional Director
Upper Colorado Region
Bureau of Reclamation
P.O. Box 11568
Salt Lake City, UT 84147

Dear Mr. Hirschi:

The State of Utah, through the Resource Development Coordinating Committee, has reviewed the Draft Supplement to the Final Environmental Impact Statement for the Diamond Fork System. The Committee reaffirms the state's position of support for completion of the Bonneville Unit, including the Irrigation and Drainage System. Therefore, the Committee does not support Alternative C. With regards to Alternatives A and B, the Committee raises the following concerns:

1. On page 20, Alternative A states: "The average annual diversions to the Bonneville Basin would consist of 142,500 acre-feet of project water developed in the Uinta Basin, and 56,700 acre-feet of Strawberry project water." The 1984 Final Environmental Impact Statement for the Diamond Fork System indicates that an average of 137,400 acre-feet of project water, and 61,000 acre-feet of Strawberry project water would be diverted annually from Uinta Basin. Please explain the difference in the figures, and if additional project water has been identified since 1984 for diversion to the Bonneville Basin, could that extra water be used to help meet the 1980 Instream Flow Agreement?

2. Though the 1980 Instream Flow Agreement is mentioned on page 22, more discussion of this agreement needs to be contained in the document. For example, Alternative A does not recognize that the Central Utah Water Conservancy District agreed to provide an additional 15,800 acre-feet of water for instream flows in the Uinta Basin. Further, Alternative C indicates that it would satisfy the requirements of the 1980 Instream Flow Agreement by reducing the trans-basin diversion. Does this mean that Alternative C would be essentially the same as Alternative B, and provide the entire 44,400 acre-feet of the required Uinta Basin instream flow?

The Committee appreciates the opportunity to review the Environmental Impact Statement.

Sincerely,

Michael E. Christensen

Michael Christensen
State Planning Coordinator

MAB/jll

ORIGINAL

Central Utah Water Conservancy District

355 WEST 1300 SOUTH OREM, UTAH 84058
TELEPHONE (801) 226-7100

June 29, 1989

JUL 1 0 89

ISD

Regional Environmental Officer
Bureau of Reclamation
125 South State Street
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Sir:

This District has reviewed the Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project and offer the following comments:

General Comments

The subject document is described as a Draft Supplement to the Final Environmental Impact Statement for the Diamond Fork System; whereas, the original wording was the Final Environmental Impact Statement for the Diamond Fork Power System. We note that the word "Power" has been dropped. The cover sheet states that, "This supplement describes the environmental impacts of reducing the size of the Diamond Fork Power System plan since publication of the Final Environmental Statement, (INT-FES 84-30). The alternatives presented do not evaluate the difference in scope of power development, but evaluate alternative uses of water, keeping the power system essentially the same. Alternatives A & B would deliver water to both the Municipal and Industrial System and the Irrigation and Drainage System while Alternative C corresponds to No Action Alternative for the I&D System.

The Central Utah Water Conservancy District, therefore, brings to the attention of the Bureau that this supplement cannot be a Supplement to the Final Impact Statement of the Diamond Fork Power System because;

1) The scope of the document has changed to something different than a power system EIS as originally described in the 1973 Bonneville Unit EIS and the Diamond Fork Power System Final Environmental Impact Statement.

2) The alternatives presented in the Draft Statement have nothing to do with evaluating differences in the Diamond Fork Power System.

3) The document inaccurately and incompletely describes the alternatives presented.

4) The alternatives are written to describe the difference in levels of irrigation developments (although they are not adequately described) when in reality the different alternatives really measure alternative levels of fishery flow development in the Strawberry Aqueduct.

It seems, therefore, that the document pretends to be a supplement to a Final EIS on a power system; changing the emphasis to evaluating alternatives on different lines of irrigation. But, in reality, the document develops plans for different levels of stream fishery flows in the Strawberry Aqueduct which are not evaluated or described at all.

Comments on "Need for Action", page 6

Alternatives A & B have features in the same location at the beginning and end of the Diamond Fork Power System. The Syar Tunnel is the same, and Monks Hollow Dam and Reservoir is the same. The power system in between is different, and that should be the main emphasis of this document.

Paragraph 1 states, "The only significant concerns and needs which emerged since publication of the EIS are related to electrical energy requirements . . ." "Because irrigation of lands in the Spanish Fork area has been included as a project purpose . . ."

The irrigation requirements in the Juab area and Sevier River area are also included in Alternatives A & B, but not described in the EIS. To be a complete EIS, these irrigation areas need to be described. It seems that Reclamation decided they wanted to construct a certain power plant and needed something to help justify it so they added the Spanish Fork irrigation as a project purpose.

In analyzing the Diamond Fork System in this manner, the District suggests that Reclamation seems to be losing sight of the original statement or game plan of the 1973 Bonneville Unit EIS in that six systems will have EIS's prepared: (1) Starvation Collection System, (2) Strawberry Aqueduct and Collection System, (3) Diamond Fork Power System, (4) Irrigation and Drainage System, (5) Municipal and Industrial Water System, and (6) Bureau of Indian Affairs Activity.

The Final Environmental Impact Statement on the Diamond Fork Power System described a power system with a Syar Tunnel and a Monks Hollow Dam and Reservoir. The Supplement to the Final Environmental Impact Statement described a plan for a power system that includes a Syar Tunnel and a Monks Hollow Dam and Reservoir at the same locations and capacities as the original Final Impact Statement. It seems that Reclamation has authority and direction to construct Syar Tunnel and Monks Hollow Dam and Reservoir, and that they need only to write an EIS on the power system Reclamation suggests should be built between those two facilities, and to describe its impact on the environment, and to leave the Irrigation and Drainage System

and the alternative levels of stream fishery flows to an additional EIS as directed by the 1973 Bonneville Unit EIS.

By including the problem of alternative use in the Irrigation and Drainage System and the bringing up the problems of the different levels of the stream fishery flows, it really places the Diamond Fork Power System beyond and out of scope of that originally contemplated in the 1973 Bonneville Unit EIS.

It seems that although Reclamation describes the problem of non-federal versus federal development of the power plants as a possibility, they need to better describe why they are recommending what they are recommending, and what happens if the non-federal developer wants to construct something larger or smaller than projected by Reclamation. Can the water conveyance facilities permit any change to happen?

Comments on Operating Facilities and Project Administration, page 14

"Operating facilities and project administration would be the same as presented in the FES, with two exceptions. The Central Utah Water Conservancy District (CUWCD) or other entity designated by Reclamation would operate the project water conveyance facilities . . ."

This District has, by virtue of a contract, the right to operate the project water conveyance facilities. We presently operate the Syar Tunnel inlet facilities, and do not intend on relinquishing that to another entity.

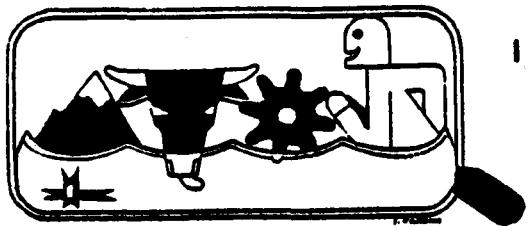
This District has also been studying a District sponsored main conveyance system pipeline instead of the Wasatch Aqueduct and Mona-Nephi Aqueduct and has been working with Reclamation on interfacing that system with the Monks Hollow Dam and Reservoir and Diamond Fork pipeline. We anticipate that the interfacing can be made without any major changes.

If you have any questions on the above comments, please contact us.

Very truly yours,

Don A. Christiansen
General Manager

DAC/ST:llg



INTERMOUNTAIN WATER ALLIANCE

721 Second Avenue
Salt Lake City
Utah
84103

June 6, 1989

Regional Environmental Officer
Bureau of Reclamation
125 South State Street
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Environmental Officer:

Concerning the Draft Supplement to the Final Environmental Impact Statement for the Diamond Fork System of the Bonneville Unit of the Central Utah Project:

Intermountain Water Alliance has four major concerns with the new Diamond Fork System.

1) There is no mention of the conservation plan to reduce the demand for the trans-basin diversion (see the letter from the U.S. Environmental Protection Agency in the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System of the Bonneville Unit of the Central Utah Project, page 201 and the Bureau's response, Issue 73a, 73b, and 73c). Note that water conservation plans will begin to be implemented during the years 1995 and 2000 (page 179), long after the Central Utah Project is completed. The ramification of this delayed water conservation effort (and we have not even seen a preliminary plan yet!) are

a) There will be no water conservation because repayment of water contracts will require continued wastage of water and there will be huge surpluses of water for the next 50 years in all regions the Central Utah Project operates. Already during the sixth driest year on record (1988), there was no rationing of water and neither Little Dell or the Jordanelle Projects were operating and the Red Fleet Reservoir near Vernal was utilized only for token reasons. Flaming Gorge continues to be sitting still without any water being utilized.

b) The Central Utah Project is contrary to water conservation. Dual-water systems which are popular throughout most of Utah are not utilized in Utah and Salt Lake counties- the two counties being the recipient of most of the waters of the Jordanelle and Diamond Fork System. Continued wastage of culinery water on lawns in these two counties will continue.

c) Utah is perhaps the only State in which water conservation is non-existant. In the Public Review Draft State Water Plan 1989 it is stated: "Presently, state water policy on conservation is in its early stages" (page 17-1). It is ironic that the Federal agency, the Bureau of Reclamation has no water conservation plan at this time, even though it has been operating in the arid west for 80 years.

Thus with continued emphasis on water development, the taxpayers will, both literally and figuratively, continued to be soaked.

2) A second big problem is that the Diamond Fork System will take high quality water from the Uinta Mountains and dump 105,300 acre-feet (Plan A), 89,000 acre-feet (Plan B), and 82,100 acre-feet (Plan C) into the highly eutrophic, slightly saline Utah Lake for Municiple and Industrial Use. This compares to the recommended plan (Supplement to Definite Plan Report advanced draft, Oct. 1987, Figure 10) of 44,600 acre-feet of water from the Diamond Fork System into Utah Lake. This is probably the biggest waste of pure maountain water in the world. The downgrading of high quality water could be altered if the Wallburg tunnel were implemented (This alternative has always been dismissed by water developers with the statement: The Wallburg tunnel has been adequately considered but the alternative is dismissed. There has been no good reason for the dismissing of this alternative and the public has not seen any discussion of the alternative). The implementation, of course, would have eliminated the Jordanelle alternative as well as the transbasin diversion, but apparently does not meet the mythological standards that drive Utah's water works. The present water policy, the Diamond Fork System, should the scheme as described in this latest Draft report come to fruition, would be contrary to all of the last 30 years of efforts in the United States of preserving high quality water.

3) A third big problem is that the Bureau of Reclamation continues to advocate off-site mitigation. This is disastrous in the west and will lead to extinctions of species because no biological survey of the region has been instituted. It may already have contributed to the extinction of the Wasatch Western Spotted Frog. The area proposed for destruction by the Bureau of Reclamation (the Provo River and Spanish Fork River systems) have anabundant diversity of aquatic species that do not occur in the Strawberry River area. Likewise the Strawberry River area has one species of leech that is not found in the Bonneville Basin. These species survived in regions which were neither flooded by Pleistocene Lake Bonneville nor glaciated by the alpine glaciers. See Figure 1 for a list of amphibians and leeches. Mollusks and fish show similar results.

Figure 1. Distribution of leeches and amphibians in the Wasatch area.

	Bonneville Basin			Colorado River Basin
	Weber	Provo	Spanish For	Strawberry
A. tigrinum	+	+	-	+
P. triseriata	+	+	+	+
B. boreas	+	+	-	+ (adult only)
R. pipiens(disappearing)	+	+	-	-
R. pretiosa (extinct)	+	+	-	-
H. stagnalis	+	+	+	+
P. picta	-	+	-	+
P. ornata	-	-	-	+
G. complanata	+	+	-	+
E. punctata	+	+	+	+
E. dubia	+	+	+	-
E. parva	-	-	+	-
N. obscura	+	+	+	-
M. microstoma	-	-	+	-
H marmorata	-	+	-	-
# species	10	12	6	8

Mitigation in Strawberry Drainage would affect 60% of the species found in the Weber drainage, 60% of the species found in the Provo drainage, and 50% of the species found in Diamond/Spanish Fork drainage with respect to amphibians and leeches. Improving of Strawberry area for aquatic species and the destruction of the Bonneville drainages will only lead to regional and even total extinction of animals. The Strawberry drainage lackes four out of five species of Erpobdellidae leeches and both the Ranidae amphibians. Unfortunately, it has been easy for the Bureau of Reclamation to dismiss sound biological data as well as sound biological principles due to the lack of money for this mulitbillion dollar project. (See the discussions in the Record of Decision for the Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial System of the Bonneville Unit of the Central Utah Project). Approval of off-site mitigation for the Central Utah Project is biologically unsound and reckless, since it puts too many eggs in one basket and does not recognize the diversity of habitats that occur in the Bonneville Basin.

A second aspect of this mitigation is that the wetlands formed from return flows from agricultural uses are wetlands in a very superficial sense. No mollusks, leeches, or amphibians (with the possible exception of the chorus frog) will occupy these sites unless introduced by man. There are springs in the Bonneville Basin below the 1552 meter elevation (the high water elevation of the Pleistocene Lake) that do not contain leeches, mollusks, or amphibians after 10,000 years of existence and these springs are very numerous. Thus forming wetlands is not the same as preserving wetlands.

A third aspect of this mitigation is that each spring has its own unique fauna in arid regions. Manipulations of springs have destroyed portions of this fauna (as the western spotted frog in the Wasatch). The Draft statement does not adequately describe just what wetlands and riparian zones will be destroyed or what springs will be destroyed (by widening the roads). Thus there is no way of assessing the information.

4) The fourth major problem is that water allocation from agriculture to municipal and industrial use has drastically changed during the rewriting of the Diamond Fork system. Presently it seems that the major portion of the water is now being allocated for municipal and industrial use from the Strawberry Collection and the Diamond Fork transbasin diversion. How does this affect the repayment ceiling which the voters approved (see Chapter IV for all your approval). It now seems that most of the cost of these two components will now have to be included within these ceilings. Please state the present acre-feet breakdown for each component (M¢I, collector system, Diamond Fork System, I&D system) for M&I use under its obligatory payback scheme and the cost these acre-feet represent under your latest revised scheme.

Thus we ask: 1) Where is your conservation plan; 2)How can you take high quality water and dump it into a eutropic, saline lake; 3) Does the Bureau have any concern for aquatic fauna and any appreciation for its habitats; and 4) Just what is the breakdown of the cost of the project to M&I users?

Specific comments

Page 5. Page 90. Please list the species of toads and frogs which are common to the area and when and how was this commoness determined.

Page 6 and 7 and throughout the report. Supplemental irrigation. What is the cost of this water per acre-foot and can the agricultural community afford this water? What happens in wet years when this water is not needed?

The entire report: It seems that most of the impacts and benefits of Alternative A and B are deferred to the Irrigation and Drainage component analysis. This leaves only one Alternative (C) which is discussed. If Alternative A and B are not selected, then what needs does the Bureau of Reclamation have for power? Where and how will this power be used? Who will operate the "joint" power plant and will this joint operation be paid (page 10-11). What if Pacific Corp or some other share-holder owned utility wish to build the power plant (page 13)? Would the electricity generation be managed by Western Area Power Administration? What is the difference between operate the power plant and control the power plant (page 15).

Page 19. Off-site or on-site mitigation options will not compensate fully for losses of all indicator species as well as other affected wildlife species and their habitats. This statement in the Draft is absolute nonsense unless a thorough biological survey is performed. Beaver do not indicate any aquatic species that exists in springs and flowing waters. Just where are the aquatic areas which will be impacted? What about the springs in lower Diamond Fork found in the ribboned section of the river? Will these springs be affected and how will the impacts be mitigated?

Page 19. Off-site mitigation proposed just because the Bureau of Reclamation already owns 90% of the land is an absurb reason for off-site mitigation. Diversity of habitats as well as locations in different area is a far more sound principle of wildlife conservation and enhancement practices- instead of putting all eggs in a bottomless basket.

Page 27. Where would the bedload material be deposited after removal from the reservoir?

Page 35. With the large fluctuation of Monk's Hollow reservoir and during the summer recreational period, will this reservoir support a standing crop of 17 lbs per acre of fish?

P. 39. Where is the location of the 28 acres which will be temporary lost and the 23 to 44 acres which will be permanently lost? Will the Diamond Fork road require widening and hence destroy the adjacent springs?

P. 41. Streams need floods to maintain stream beds. Controlling floods ultimately destroys stream beds.

Page 46. What were the flows in 1982 to 1985 as compared to 1952 extreme of 1,217,500 acre-feet?

Page 48. Why would the reservoir be filled at the end of each month? Why not keep the reservoir at more constant level?

Page 48. Table of Utah Lake fluctuations. Please update the figure to include the years from 1974 to and through 1988 which would include three very wet years as well as some very dry years.

Page 52. Table 10. What is the historic numbers without Strawberry water users contributions (which were disastrous the the stream fisheries).

Page 60. "Present users of Utah Lake and Jordan River water are expected to use water as they have in the past". This statement does not take into account the tremendous conversion of agricultural lands to urban lands which now utilize culinery water for out-door watering instead of Jordan River and Utah Lake waters. What is the yearly loss of agricultural lands in Salt Lake and Utah counties during the past ten years?

Page 63. Explain the "natural pollution" factors. If it is natural, it seems that these factors should not be considered as pollution. In as much as the Bureau of Reclamation admits that the lake contains poor-to-fair quality of water, why is the Bureau insisting that high quality water from the Uinta Mountain be dumped into this lake for M & I uses? It should be noted that although the natural chemicals in Utah Lake may always have contributed to the eutrophic state of the Utah Lake, the natural fauna of Utah Lake is all but eliminated with respect to both fish and molluscan fauna- mostly because of the human impacts, water use, and return flows from industrial and agricultural waters.

Page 67. "Impacts of Alternative A on Strawberry Reservoir, Utah Lake, Utah Valley streams and the Jordan River ill be presented in the I & D system draft statement". Yet over a 100,000 acre-feet of high quality water is being dumped into Utah Lake for M&I use. It seems that all major consequences of the Central Utah Project are deferred to later analysis- after the project is built. Yet each component is suppose to stand on their own merits.

Page 71-75. Strawberry Reservoir treatment is highly uncertain and is not scheduled for 1989. Strawberry Reservoir will be considered as the chubbiest lake for Utahn suckers. This reservoir may end up with zero recreational benefits. Then the cost-benefit ratio of the entire Strawberry Collection system could end up with a totally unfavorable ratio. Still the Bureau proposes to destroy more important stretches of high quality trout streams in the Diamond Fork drainage.

Page 110. If irrigation would benefit about 195 families (800 people) that receive some portion of their income from water, the Diamond Fork System is not only providing supplemental water but providing this water to hobbie farms. The 85 new on farm jobs with total annual wages estimated at $782,000 means these new jobs for the average family size of 4 would earn an individual $9000 per year. Without food stamps, it sounds as though slave and child labor is being encouraged!

Intermountain Water Alliance and other environmental organizations have long followed large projects in Utah. We have questioned the needs of Intermountain Power Project, Hunter 3 and 4 (UP&L), Desert G&T Bonanza Power Project, the White River Dam (Which the governor of Utah stated that it was both in the National and State interest to build), and the Diamond Fork Power Project. In all these cases, the world would have been better off financially and environmentally if the environmental organizations were heeded.

Intermountain Water Alliance, after reading this latest Draft now concludes that the Diamond Fork System and the Agricultural and Irrigation System is likewise not needed. We see no conservation plan in Utah, assuring us that Utah will continue to be the biggest user and waster of water in the North America. We see no clear reason for taking clean water from the high mountains and dumping it into Utah Lake for M&I purposes. We see no reason to spend millions of dollars for supplemental irrigation water for hobby farmers. And we continue to see destruction of the environment. We see past stated benefits (fishing in Strawberry Reservoir) rapidly disappearing.

What we recommend is for the Bureau of Reclamation to drop the Diamond Fork System and the Irrigation and Drainage System from the Central Utah Project. Should at some later time the Wasatch Front need water from the Colorado River drainage, then the State of Utah or the Central Utah Water Conservancy District can build the transbasin diversion.

It is unfortunate that this letter will probably fall on blind eyes as has all other criticisms of water projects in Utah.

Sincerely,

Peter Hovingh, Trustee
Intermountain Water Alliance

Working for the Nature of Tomorrow

NATIONAL WILDLIFE FEDERATION

1400 Sixteenth Street, N.W., Washington, D.C. 20036-2266 (202) 797-6800

July 14, 1989

JUL 19'89

7/20 REC'D

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Regional Environmental Officer
Bureau of Reclamation
125 South State Street
P.O. Box 11568
Salt Lake City, UT 84147

Dear Sir:

The National Wildlife Federation appreciates the opportunity to submit the following comments on the Draft Supplement to the Final Environmental Impact Statement for the Diamond Fork System, Central Utah Project, Bonneville Unit. In particular we appreciate the time extension for submitting comments granted by yourself and the Acting Regional Environmental Officer in our phone conversations of June 28 and July 5th. We understand the comments will be given full consideration.

NWF is the nation's largest conservation organization with over 5.8 million members and affiliate state conservation organizations in 51 states and territories, including the Utah Wildlife Federation. NWF has been directly involved in the planning and environmental review stages thorough virtually all of the developmental history of the Central Utah Project. NWF's members utilize for their benefit and enjoyment the many lakes, streams, tributaries, lands, and fish and wildlife and recreational resources affected by the Bonneville Unit. NWF has continuing concerns about the effects of the Bonneville Unit on important environmental resources of the Bonneville and Colorado River basins as well as the appropriateness of the CUP's plans for water resource development and utilization in the state of Utah.

NWF believes that the Bonneville Unit is currently reaching a critical juncture. Major decisions must now be made regarding the project's ultimate design, its costs and how they will be borne, and the

fundamental purposes the project is intended to serve. Nowhere are these decisions more critical than the ultimate form and function that the Diamond Fork system takes.

The one major feature of the Bonneville Unit that is largely complete after more than 20 years of construction is the Strawberry Collection System. Like many other parts of the nation. in the intervening period Utah has undergone significant if not radical economic and demographic change. Water needs have changed as well as public attitudes toward the treatment and use of water resources. Choices will have to be made as to how Uinta basin water developed by the Bonneville Unit will now be used.

The design of the conveyance facility is the subject of this Draft Supplement. The project is moving toward critical decisions on how much, to where and at what cost to whom will water be conveyed from the Uinta basin to the Bonneville basin. For too long, the Bonneville Unit has been sold as a panacea for every water problem in Utah, both rural and urban. In reality many will say it is causing more problems than it solves. The project has been seriously oversold and is now stretched to the breaking point.

We urge the Bureau to take an extremely hard look at what it is doing in developing plans for a conveyance facility. This Draft Supplement takes an all too narrow view of the alternatives before the agency and the environmental impacts involved, and it ducks serious questions about the basic purposes of the Bonneville Unit and the underlying economic, environmental, and contractual realities. As a result it fails to meet the mandate of NEPA that it was intended to serve. We offer our comments in a constructive spirit so that these failings may be overcome.

GENERAL COMMENTS ON THE DRAFT SUPPLEMENT

Our general comments on the Draft Supplement (DS) fall into the following five categories: 1) the scope of the document and the cumulative effects which are unaddressed but are likely to occur in combination with other portions of the project that are integrally tied to the Diamond Fork System plan; 2) omissions from the analysis of factors that may significantly affect both the operation of the Diamond Fork System and the project's resulting environmental and economic feasibility; 3) the appropriateness of the alternatives

selected; additional alternatives that should be seriously formatted and evaluated; the lack of an economic analysis of alternatives; 4) additional measures needed to assure the effectiveness of the proposed mitigation; and 5) additional data and information that should be included in the supplement to assist the public in evaluating and commenting on the alternatives proposed.

1. The Draft Supplement's scope is unnecessarily narrow and fails to identify the cumulative environmental effects that are likely to be experienced in combination with the construction of other features of the Bonneville Unit.

One of the primary weaknesses of the Draft Supplement is its failure to identify the environmental impacts associated with the construction and operation of the Bonneville Unit's Irrigation and Drainage (I & D) and the Municipal and Industrial (M & I) Water Supply systems and the operation of the Strawberry Collection system, each of which utilizes or supplies water conveyed by the Diamond Fork system. While the DS identifies impacts at Strawberry Reservoir, for instance, it does not identify Uinta stream fishery impacts or Colorado River basin salinity impacts of the alternatives presented. Alternative A assumes the full transbasin diversion level for the I & D system which will have extremely damaging effects on Uinta fisheries and riparian wildlife. Impacts of diversions contemplated in Alternatives B and C will be significant, but less severe.

Nor is there a comparison of relative impacts if Diamond Fork water is used primarily for I & D purposes or, instead, primarily for M & I purposes as suggested by the alternatives. By providing essentially two alternatives for review, one which assumes an I & D system and the other which assumes a small amount of water will be used for local irrigation and the rest for M & I use, the Bureau implicitly acknowledges that major project design decisions have yet to be finalized. It is impossible to fully evaluate the environmental impacts and the feasibility of Alternatives A & B, for example, without knowing the environmental impacts of the I & D system. These are "actions" as described in the CEQ NEPA implementing regulations at 40 CFR 1508.25. Thus, the actions required for development of the I & D system are so intimately related to the design of the Diamond Fork system that they should be discussed in the same environmental impact statement. Because the Bureau is required to complete an environmental impact statement on the I &

D system by December 31, 1989, (pursuant to P.L. 100-563) the effects of the Diamond Fork system should be discussed in the context of the I & D environmental statement, along with all other impacts hydrologically related to the transbasin diversion.

2. The Draft Supplement fails to identify and evaluate the implications for the Diamond Fork system and the Bonneville Unit of obligations to meet Ute Indian Water Rights.

The DS fails to describe the Bureau's current plans to meet the terms of the 1965 Ute Indian Deferral Agreement and the consequences for the operation of the Diamond Fork system and Bonneville Unit if the terms of the agreement are not met. The DS recognizes the rights granted in the Deferral Agreement, but does not address the fact that since that agreement was made, the Bureau has found the water developments the Bureau was contemplating to provide replacement water for the Ute tribe to be largely infeasible.

The Final Supplement (FS) should describe the current situation regarding these water rights and the Secretary's current understanding of his obligations under the Agreement. The FS should address how the Bureau currently plans to provide water to the Utes. The FS should indicate how much water would be available for transbasin diversion through the Diamond Fork System after the year 2005, in the event that the Ute's water would no longer be available for the Bonneville Unit. The FS should also describe how the system (along with the I & D and the M & I systems) would be operated under those conditions. What is the cost of providing water to the Utes, or conversely purchasing water from the Utes?

3. The Alternatives presented in the Draft Supplement raise numerous questions about the Bureau's intended purposes for the Bonneville Unit, and about the design assumptions. The Bureau should consider several variations on the alternatives presented.

The Draft Supplement fails to meet the CEQ's NEPA requirements that the Bureau consider a full range of reasonable alternatives to the proposed action. (See especially 40 CFR 1502.14, 1501.2(c), 1507.2(d) and 1508.25(b)) Because fundamental questions obviously exist regarding the size and ultimate purposes to be served by the

transbasin diversion, the Bureau should consider a wider range of alternatives than is presented in the DS. We suggest several additional alternatives and variations on alternatives presented be evaluated. We would also recommend that no further funds be expended on major water supply or delivery features of the Bonneville Unit, including the Diamond Fork system, until these fundamental questions about water availability, the location of ultimate use, and the general purposes for which water will be utilized have been answered.

General description of alternatives proposed in the Draft Supplement.

Generally, for background, the DS presents three alternatives for the Diamond Fork system.

Alternative A represents a full diversion from the Uinta Basin for the I & D and system that fails to leave in the Colorado basin (Uinta) streams an additional minimum of 37,900 acre-feet to meet the requirements of the 1980 minimum instream flow agreement between the Secretary, the Governor of Utah, the Bureau, the Central Utah Water Conservancy District and federal and state resource agencies.

Alternative B assumes construction of the I & D system as in Alternative A, but reduces the diversion to meet the instream flow requirements.

Alternative C is the same as Alternative A & B down to the point of delivery of water to the Sixth Water Creek. From there it eliminates the Monks Hollow Dam, substitutes a much smaller and less damaging Three Forks Dam, lengthens the Upper Diamond pipeline from 7.2 miles to 9.9 miles, but decreases its diameter from 8 feet to 7 feet. Like B, Alternative C adheres to the 1980 minimum instream flow agreement. It assumes that the I & D system will not be built, but instead that most of the new water will be used for M & I purposes through exchange from Utah Lake to Jordanelle Dam on the Provo River.

Each of the three assumes delivery in the vicinity of 18,000 to 19,000 acre-feet of supplemental irrigation water to the Spanish Fork area as well as delivery of Strawberry Project water.

Of the three alternatives presented, NWF finds that Alternative C is the least environmentally damaging and is probably more cost-effective that A or B. We strongly believe, however, that other alternatives and certain variations on Alternative C must be explored. These alternatives are likely to be better from and environmental perspective and significantly more cost-effective.

The major advantages of Alternative C over A & B, briefly are: it result: in less damage to fish and wildlife habitat, it would eliminate Monk's Hollow Dam and Reservoir (thus eliminating a wide range of associated adverse environmental impacts), and it would have generally greater potential for wild trout habitat establishment. It is likely that the increased flexibility for operations and flow scheduling associated with the greater M & I deliveries will result in more stable flow regimes in the Diamond and Spanish Fork rivers, and therefore more reliable conditions to promote fishery development contemplated in the alternative.

The Bureau should identify the cost-allocation and the relative cost-effectiveness for fishery mitigation and enhancement for alternatives presented.

The Bureau should reevaluate the cost allocation and the effectiveness of proposed fishery mitigation and enhancement for the Diamond Fork system and present the findings in the final supplement. First of all, in the FY 1989 fish and wildlife cost allocation, the Bureau reallocated the costs of the Diamond Fork pipeline to 77.6% ($48,558,000) non-reimbursable fish and wildlife costs. We believe this is a gross misallocation. The pipeline is a major water supply feature and should be allocated as such. It is also likely that a fish and wildlife mitigation and enhancement investment of $48,558,000 elsewhere in the project could be much more cost effective in terms of fishery production and angler days. In the FS the Bureau should evaluate such alternative fishery investment possiblities. The Bureau should also spell out in the Final Supplement in much greater detail how fish and wildlife cost allocations are made and justified for the project.

Alternative A should be eliminated from further consideration.

Of the three alternatives presented, we believe Alternative A serves no useful purpose since it admittedly violates the Secretary's 1980 Instream Flow Agreement. It should be eliminated from consideration in the Final Supplement. We understand that at Congress' insistence last year the Bureau abandoned the "recirculation" plan for meeting the 44,400 acre-foot instream flow requirement for Uinta basin streams. To our knowledge, the only practical option that remains for the Bureau is to limit the transbasin diversion and leave more water in Uinta basin streams. If the Bureau is still considering diverting an average 199,200 acre-feet per year via the Diamond Fork system, then the Final Supplement must address in detail the diversion's environmental effects on all the streams and water-related resources of the Uinta and Colorado river basins, including fishery impacts and upstream and downstream water quality impacts as mentioned above.

The Diamond Fork conveyance facilities are generally oversized for each alternative considered. The Bureau should evaluate the incremental benefits and costs of reducing the size and capacity of the Diamond Fork system facilities.

In reviewing the Alternatives, we are struck by the fact that sizing of the Diamond Fork conveyance facilities bears little or no relationship to expected diversion levels or "capacity" ratings displayed. For instance, for Alternative A & B (as described on page 10), the 8-foot diameter, 7.2 mile Upper Diamond Fork pipeline is rated for 510 cfs capacity. Applying the Hazen-Williams formula to a similar pipeline with 300 feet of head, the capacity would be over 900 cfs. Similarly, while Alternative C's 7-foot diameter Upper Diamond Fork pipeline is rated for 350 cfs (Table 5), applying the same kind of analysis for an estimated 350-foot head, would show a pipeline capacity of over 600 cfs.

At a recent briefing in Salt Lake City, the Project Manager indicated that the Bureau was already moving toward a "vertical shaft" option for the Fifth Water aqueduct portion of the project similar to the options described on pages 30 and 31 of the DS. These options assume pipeline and tunnel diameters of 8 or 8.5 feet, which are larger than those in Alternatives A, B, or C for the same reaches, and

would essentially create a conveyance size (diameter) of at least 8 feet through the entire Diamond Fork System, if adopted. The only exception would be the Upper Diamond Fork pipeline for Alternative C which would be 7 feet with a parallel stream carrying additional flows. It would appear that the Bureau is seeking to develop an entire conveyance tunnel and pipeline system with at least an 8-foot diameter, although such capacity appears to be considerably greater than would be required for the diversion that is described.

A further question is that although the total diversion is reduced from Alternative A (199,200 acre-feet) to Alternative B (163,400 acre-feet) by nearly 36,000 acre-feet, why is there no change in pipeline dimension to reflect the reduced diversion. An obvious consequence of reducing flows without reducing the size of the conveyance-works would be to significantly increase the cost per acre-foot of delivered water. The FS should identify what would be the cost of water for each of the alternatives.

In a March 18, 1988, letter to Rep. Wayne Owens, Regional Director Clifford Barrett indicated that the water supply purposes of the Diamond Fork pipeline required only a 180 cfs capacity and that the remaining capacity was for fish and wildlife mitigation and enhancement. Director Barrett presumably was describing the planned project, including the I & D system. For Alternative C, the function of the pipeline would not include the high seasonal deliveries contemplated for the I & D system, but instead its emphasis would be on existing Strawberry Project deliveries and M & I deliveries scheduled over the course of a full year. Because of the difference in the Diamond Fork's function under Alternative C, would not a smaller, less expensive tunnel and pipeline system serve the project purposes equally well?

The Bureau should provide a precise breakdown of the costs and a more detailed description of the hydrologic operation of each alternative. In the Final Supplement, the Bureau should address whether significant cost savings and reduction in environmental impact could be achieved by sizing all or portions of the Diamond Fork system with smaller conveyance facilities and flow capacities that more closely conform to the projected deliveries. The benefits and costs of reducing the size and capacity of the tunnel and pipeline should be reevaluated. The irrigation and drainage system and most or all of the planned hydropower capacity are unlikely to be built. What are the incremental benefits and costs of changing to a 6 foot

pipeline? a 5 foot pipeline? a 4 foot pipeline? a 2-foot pipeline? Such alternative configurations should be presented in the FS.

The Bureau should consider other alternatives in the Final Supplement.

Besides the variations we have suggested on the alternatives presented in the DS, the Bureau should also consider other alternatives. These should at least include a review of the Wallsburg Tunnel alternative described in the 1973 Bonneville Unit FEIS and the M & I System FEIS and the possibility of extending the Diamond Fork System to include a water supply pipeline from the Spanish Fork area to the north end of Utah Lake.

Both these alternatives would assume a reduction of planned irrigation deliveries and a concentration on serving municipal water demands in the Wasatch Front. We read the Bureau's inclusion of Alternative C in the DS as an indication that the Bureau has doubts about the viability of the I & D System as currently planned, doubts which NWF shares. The Bureau is aware that no acceptable new financing mechanism has yet been found for the I & D system, the farmers will payback less than $20 million over 50 years for a federal investment of nearly $1 billion, and the federal investment subsidy would be nearly $4000 per acre for land that is generally now worth only $800 to $1500 an acre (some considerably less). Under the circumstances, we would urge the Bureau to consider the environmental impacts and the benefits and costs of substituting the Wallsburg conveyance system from Strawberry Reservoir to the Provo River for the Diamond Fork system.

The Bureau should also consider the environmental impacts and benefits and costs of extending the Diamond Fork system for the purpose of meeting M & I deliveries. Instead of directing deliveries to Utah Lake, as proposed in Alternative C, water could be piped to the distribution network at the north end of Utah Lake. Any such pipeline route considered, of course, should minimize impacts on existing development, residents and important wildlife areas. We believe the Bureau should consider in the FS the feasibility of a pipeline route along or in the vicinity of the existing Interstate 15 corridor, east of Utah Lake. Such a project might result in considerably less environmental impact and cost than routes nearer to the Wasatch foothills that have been publicly discussed recently.

The Draft Supplement to the EIS is incomplete because it does not contain an economic analysis of the alternatives.

The significant changes in the recommended plan for the Bonneville Unit since the preparation of the 1983 Plan Report, draft revised Definite Plan Report (October 1987), and the 1984 Final EIS, require the preparation of a Revised Plan Report/EIS. The evaluation and display of the economic effects of each alternative and varying sizes of each alternative will have material bearing on the decision-making process.

The preparation of this Supplemental EIS provided the Bureau of Reclamation with an excellent opportunity to reevaluate the National Economic Development (NED) benefits and costs of the Bonneville Unit and the Diamond Fork System. It failed to do so. The U.S. Water Resources Council's Principles and Guidelines benefit standard is defined as "the willingness of users to pay for each increment of output from a plan." The changes in conditions making the 1983 plan no longer practicable will result in incremental changes in output and costs of the Diamond Fork System and the Bonneville Unit that must be estimated and evaluated. The Diamond Fork System is at a new decision point where the estimation of the remaining benefits and remaining costs is likely to affect the selection of the recommended plan.

Discount rate

The Supplement to Definite Plan Report (SDPR) of October 1987 used an outdated discount rate of 3.125 percent rather than the designated discount rate for Fiscal Year 1988 of 8.625%. The lower interest rate was applicable in 1964 when the first Definite Plan Report was prepared and is irrelevant to the opportunity costs of funds to the Federal government today. The Principles and Guidelines and an Office of Management and Budget directive require the calculation and display of benefits and costs using the current discount rate. The use of the current discount rate enables decisionmakers to evaluate alternative uses of scarce public funds on a comparable basis.

The selection of the discount rate is a critical variable in the calculation of benefits and cost. The $2,050 million total cost of the Bonneville Unit has an annual equivalent value of only $67 million at 3.125% (SPDR 1987 p. S-9) but has an annual equivalent value of

$182 million at 8.625%. The annualized cost of $182 at the current discount rate is much larger than the annual direct benefits of $102 million (SPDR 1987 p. S-9).

Spanish Fork supplemental irrigation

For each of the alternatives the DS presented estimates that supplemental irrigation would provide annual benefits of approximately $1.7 million, or $9,000 per family. It appears to us that the costs of this portion of the project exceed the benefits. The Spanish Fork area is scheduled to receive over 13.6% of the total Bonneville Unit water supply allocated to irrigation of 177,200 acre-feet. (1987 Draft Supplement to the Definite Plan Report, p. 101) Assuming that total costs allocated to irrigation are $980 million, the costs of irrigation water to the Spanish Fork area is $133 million, or $166,000 per family ($14,946 annualized at 8 7/8%). The FS should address the cost-effectiveness of this irrigation investment, as well.

Water quality reduction in the Colorado River.

Previous benefit-cost analyses of the Bonneville Unit have failed to include the reduction in water quality int he Colorado River as a result of the diversion of high quality waters from the upper tributaries of the Duchesne River. The costs of water quality reduction were estimated to be $10 million per year in the 1987 Draft Supplement to the Definite Plan Report for the Diamond Fork system. The preparers of the report argued that the reduced water quality values should not be included as a cost of the Diamond Fork system because Utah is entitled to divert the water by the terms of the Colorado River Basin Compact of 1922. The Compact does not require the Federal Government to subsidize diversions to the Bonneville Basin, it merely allows Utah to use Colorado River water. Moreover, the United States has treaty obligations with Mexico to provide moderate water quality at the border. We have had difficulty meeting our treaty obligation and are spending large amounts of money to achieve the water quality goals on such measures as the Yuma Desalinization Plant. The Bureau is presently spending $50 million to rehabilitate Fontenelle Dam to provide flows to dilute high salinity flows from the Big Sandy (Eden) Project. The Bureau is required to evaluate plans from a National Economic Development (NED) viewpoint and cannot choose to ignore certain costs. We also suspect that the annual costs of diverting 221,300 acre-feet from the Colorado River Basin are more than $10 million.

For example, the costs of retiring the land and other measures to reduce saline return flows from the Welton-Mohawk Project are at least $10 per acre-foot per year. The diversion of 221,300 acre-feet would be $21 million at $10 per acre-foot.

Value of hydropower on the Colorado River

The Oct. 1987 Draft Supplement to the Definite Plan Report failed to include as costs of the Diamond Fork system the value of the hydropower that will not be generated at Glen Canyon, Hoover, Parker, and Davis and other generating plants on the Colorado River and the All-American canal. The 221,300 acre-feet proposed annually to be diverted by the Diamond Fork system would otherwise fall over 1500 feet and generate valuable electric power at Colorado basin hydropower projects. The Principles and Guidelines at 2.12.4 states that resources required or displayed to achieve project purposes represent an NED cost and should be evaluated as such. The loss of this power would be a major resource displaced by the Diamond Fork system and should be included as a project costs.

Hydropower facilities on the Diamond Fork System

The alternative plans presented in the DS include hydropower generation facilities for project power and provision for additional facilities to be added at a later time by non-Federal interests. Neither the Western Area Power Administration nor the Bureau has been able to find a non-Federal entity which will invest in the larger Diamond Fork power project. This evidence of lack of a suitable rate of return for hydropower in the Diamond Fork system suggests that even the small power plants proposed for project purposes would be uneconomic investments. The costs and benefits of any power facilities should be evaluated. In the FS, the Bureau should evaluate whether a smaller and less costly Diamond Fork system could be formulated if it was not sized as it currently is for hydropower facilities.

4. The Draft Supplement fails to identify minimum and maximum flows and flow regimes that would be established as Reclamation environmental commitments to give assurances that fishery measures will have a reasonable chance of success.

Notably absent from the DS are identified flows and flow regimes on a seasonal basis that would be optimal targets to meet projected fishery mitigation on the Diamond Fork system. Much of the past damage to fisheries has been caused by excessive flows from the Strawberry Project releases. These have scoured the river bottom, eroded banks, destroyed cover and decreased water quality to greatly limit any fishery values. Any restoration or enhancement effort would appear to be doomed if flows and ramping rates are not adjusted fit the tolerances of the species and the substrates involved. While, for example, the Bureau commits to establishment of a 50 cfs valve on the intake to the Strawberry Water tunnel, is there a firm minimum flow and seasonal regime commitment to the upper Sixth Water fishery? What minimum flows will the Bureau commit to for the affected streams? What are the maximum projected flows (daily, weekly, monthly, yearly?) and have the Bureau or fishery agencies made recommendations along these lines? What commitments will the Bureau make? What is the likelihood of success of the mitigation proposed under these conditions? The Bureau should also address what measures will likely be taken at water intakes and in penstocks to avoid damage to fish and wildlife, and what will operations and maintenance of these facilities cost and how will they be paid for?

5. The Final Supplement should be revised to include data and information to improve public understanding of the proposal and to aid the public in evaluating the benefits and costs of each alternative evaluated.

The Draft Supplement should be revised to include better streamflow and conveyance facility flow information, including data showing not only average yearly flow volumes, but also the likely ranges of flows and flow volumes in wet and dry years and the wettest and driest years of record. Flows should be given generally in <u>both</u> cubic feet per second (cfs) and acre-feet per day (or year as the case may be) in order to make it easier for the public to understand how the project will be operated. Such information could be displayed in tabular form, based on historic natural and artificial flows. It is unclear, for instance, how much flow fluctuation in the Diamond Fork

features and the affected streams is expected on a daily, weekly, monthly, seasonal, etc. basis. Especially critical is how these flow fluctuations will relate to the protection and maintenance of fishery habitat, upon which the mitigation plans are based.

The FS could also be improved by including a water distribution graphic such as has been included in other Bonneville Unit environmental statements to better display each alternatives' expected water use distribution.

The FS should also more consistently identify the elevation of various features in the Diamond Fork system. No profile has been included in the DS as in other EIS's, which makes it much more difficult to analyze what projected flows in each alternative are likely to be. A more concerted effort should also be made in the text to identify elevations of facilities.

Specific Comments

NWF makes the following specific comments on issues raised within the text of the Draft Supplement.

p. 6 What is the evidence for the statement that additional agricultural water will reduce outmigration from rural areas to urban areas? Is it not the case, generally, that urban expansion is moving into rural portions of Utah County due to population expansion and a general trend toward in-migration to this area of the state?

p. 9 To what extent is the purpose of the 50 cfs valve on the Strawberry tunnel intake intended to maintain and to what extent enhance the Sixth Water fishery? How will its costs be allocated?

p.15 The fishery measures should include establishment of minimum and maximum flow rates in the Diamond Fork River to protect the fishery.

p. 17, 18 For the offsite wildlife mitigation plan, all parcels are to be managed either by the Utah Division of Wildlife Management or the U.S. Forest Service. What arrangements has the Bureau made to assure that funding will be assured for the habitat improvements and the operation and maintenance of these areas?

p. 20 How will the 2,800 acre-feet of Diamond Fork water be replaced from water in Utah Lake?

p. 20, 24, 28 It would be helpful if these Project Operation descriptions could be expanded beyond the "average annual diversion" with an additional description of the operations in maximum wet and dry periods and at various ranges of flows and water demand scenarios, including the effects on streamflows under these varying conditions.

p. 27 Why is the capacity of the Upper Diamond Fork pipeline rated at 350 cfs? Could this pipeline carry more water than that?

p. 27 It should probably be pointed out that the reason for the lower energy value is because of the necessity of diverting less water to meet the 1980 instream flow agreement commitment, which was ignored in Alternative A.

p. 31, 32 Why are the pipeline and tunnel sizes in Options 1 and 2 8 feet and 8.5 feet, respectively? Isn't this considerably larger than necessary? What would be the smallest diameter pipe or tunnel necessary to pass the proposed water diversion through the Fifth Water reach?

p. 33 The word "Alternatives" should be replaced with "Alternative" to be grammatically correct. We hope additional alternatives will be considered in the FS as we have suggested above.

p. 43 What is the expected average annual and maximum and minimum inflow (in periods of high and low water) to the expanded Strawberry Reservoir? What portion is due to 1) the Strawberry Collection System, and 2) other tributary sources?

p. 50, 51, 56 How, with an expected peak daily release of 880 cfs, does the Bureau expect to maintain flows for a quality fishery in the Diamond Fork in the range of 22 to 180 cfs for Alternative A and for similar values for the other alternatives? Obviously the instantaneous flows will rise much above that. How much? How often will major fluctuations be experienced? What is the tolerance for such higher flows by both the trout and their progeny and their food sources and streambanks? This illustrates the weakness of presenting only "average long term monthly flows".

p. 54 For the Diamond Fork below Monks Hollow, while maximum summer flows for Alternative B are similar to current maximum flows, minimum flows are extremely low and likely to seriously damage any fishery. The Bureau should address how with such flows for months on end it expects to maintain significant fishery benefits.

p. 58 What would be the constraints to provision of "adequate project water" that is said to be necessary to provide for higher than historical levels in Utah Lake?

p. 67 What is the current level of uncertainty in the Bureau's water quality model for the Monks Hollow Reservoir that requires the Bureau to wait on a study of at least five to ten years after construction in order to decide on the necessity of providing for multi-level outlet works at Monks Hollow Dam? What are the recommendations of the state and federal fishery agencies? What are the estimated costs of such measures, and what would be the cost savings in installation during construction instead of retrofitting them in the future?

p. 67, 70 The FS should provide a comparison of water quality impacts on Utah Lake between Alternatives A & B and Alternative C. It is not acceptable to defer comment on the salinity and other water quality effects of Alternatives A & B to the upcoming I & D EIS, while presenting the impacts of Alternative C. Recent press reports have indicated a prediction that the Bonneville Unit as planned may result in a 25% increase in salinity in Utah Lake, which would be damaging to crops now irrigated from lake waters. The Bureau should present the water quality impacts for all alternatives under consideration in the same environmental impact statement to allow for comparison.

p.108, 110 The DS predicts that the net farm income increase for each of the 195 Spanish Fork area farmers that would receive supplemental irrigation water would be $1,769,000, or approximately $9,072 per farmer (or $37.00 per irrigated acre). The FS should indicate whether the farmers' ability to repay the construction costs under these circumstances would be greater than the predicted $1.33 per acre per year repayment ability identified in the Bureau's FY 1990 Project Data Sheet. For these farmers, what is the Bureau's estimate of ability to repay construction costs?

p. 140, 141 The Bureau's response to the Fish and Wildlife Service's recommendations regarding plans to meet the Secretary's 44,400 acre-foot Uinta basin instream flow agreement are troubling for two reasons: 1) the Bureau suggests that it does not know if the Secretary's agreement is feasible, and 2) it also implies that the Bureau does not know if Alternatives B and C are feasible. At what point will the question of feasibility be resolved, if not in the Environmental Impact Statement?

p. 142 Regarding the 50 cfs valve the Bureau has committed to install to connect the Syar Tunnel with the existing Strawberry Tunnel to provide fishery flows in the Sixth Water Creek, the Bureau states: "This valve will allow the release of up to 50 cfs into Sixth Water Creek to support a stream fishery if flows are available" (emphasis added). The FS should identify what factors will determine "if flows are available"? Is there a Reclamation commitment to a minimum flow to protect the Sixth Water trout fishery?

Conclusion

Once again, NWF appreciates the opportunity to comment on this Draft Supplement. We hope the Bureau of Reclamation will find these comments helpful in developing an environmental statement on the broader range of concerns we have identified regarding the the Bonneville Unit conveyance and water supply systems.

Respectfully submitted,

David R. Conrad
Water Resources Specialist

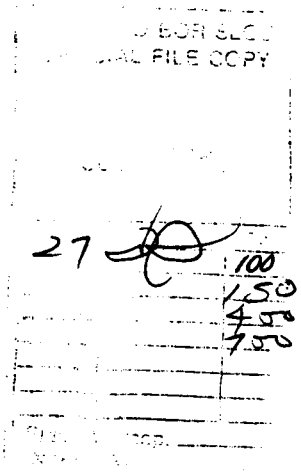
cc: Hon. Bill Bradley
Hon. George Miller
Hon. Wayne Owens
Verl Davis, President, Utah Wildlife Federation

PROVO RIVER WATER USERS ASSOCIATION

DEER CREEK PROJECT

750 NORTH 200 WEST #201-B

PROVO, UTAH 84601



June 28, 1989

Weston Hirschi
Acting Regional Director
United States Department of the Interior
Bureau of Reclamation
Upper Colorado Regional Office
P. O. Box 11568
Salt Lake City, Utah 84147

Re: Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project

Dear Mr. Hirschi:

The Provo River Water Users' Association (the "Association") is a Utah nonprofit corporation organized and existing under the laws of the State of Utah. The Association was incorporated on May 4, 1935, to contract with the United States for the repayment of the construction costs of the Provo River Project and to ultimately be responsible for the operation and maintenance of the Project works. The construction of the Provo River Project was approved by the President on November 16, 1935. On June 27, 1936, the Association entered into a contract with the United States for construction of the Deer Creek Division of the Project, and thereby agreed to repay, over a 40 year period, up to a maximum of $7,600,000.00. By supplemental contract dated December 20, 1946, the Association's repayment obligation was increased to $11,400,000.00, to cover the increased construction costs of the Deer Creek Division. Pursuant to a second supplemental contract dated February 2, 1949, the Association agreed to repay the construction costs of the Deer Creek Division in excess of $11,400,000.00. This excess amounts to approximately $12,000,000.00, with the repayment thereof occurring over a 35 year period. Pursuant to paragraph 18 of the June 27, 1936 Repayment Contract, and a series of notices, with the last being dated May 22, 1958, the care, operation,

maintenance and administration of all features of the Deer Creek Division have been turned over to the Association.

A major feature of the Deer Creek Division is the Deer Creek Dam and Reservoir. The Deer Creek Reservoir has a storage capacity of 152,564 acre-feet and an estimated yield of approximately 100,000 acre-feet of water annually. The entire cost of lands acquired for the dam and reservoir are included in the Association's $7,600,000.00 repayment obligation under the June 27, 1936, Repayment Contract.

In the Draft Supplement to the Final Environmental Statement on the Diamond Fork System, Reclamation states that its preferred wildlife mitigation option is an offsite mitigation plan that incorporates and involves the administrative transfer of Provo River Project lands. The offsite mitigation proposal contemplates the taking of 1,030 acres of lands acquired for the Provo River Project to compensate for wildlife habitat losses caused by the Bonneville Unit. The Association strongly opposes this proposal.

The 1,030 acres are a part of approximately 1,400 acres of land acquired for the Provo River Project. With the exception of about 80 acres of land which were withdrawn, the entire costs of these lands were included in the Association's Repayment Contract dated June 27, 1936.

The sum and substance of it all is that while title to the 1,030 acres of Project lands is in the name of the United States, those lands are not public lands per se since they are to be held in trust by the Secretary for the benefit of the Provo River Project. The lands in question were acquired for Provo River Project purposes, not Bonneville Unit Project purposes, and the lands cannot be severed from the Provo River Project without constituting a material breach of the Association's Repayment Contract.

Reclamation does not have the authority to sever and transfer lands from one project to another. The only provision of Reclamation law that provides for the disposal of Provo River Project lands is the Sale of Surplus Acquired Lands Act of 1911. According to that Act, lands acquired for the Provo River Project can be severed only if the Secretary determines that it would be in the <u>best</u> interest of the Provo River Project. The Act also

makes it clear that if divested of Project lands, the Association is entitled to the full fair market value of such lands. Reclamation's preferred option of mitigation violates the Act since Reclamation has not made this determination. In fact, Reclamation's only concern seems to be for the Bonneville Unit.

Subsection (I) and (J) of the Fact Finders Act of 1924 also bears on Reclamation's proposal to have the Association mitigate for Bonneville Unit wildlife impacts. By these two provisions, Congress made it clear that all profits derived from Reclamation Project lands must be kept separate. Reclamation has no discretion to compel one project to subsidize another. That is precisely what Reclamation is suggesting the Association do here, unless Reclamation intends to credit the Association's Repayment Contract with the full fair market value of the 1,030 acres.

Finally, the Association would remind Reclamation that mitigation is governed by Section 8 of the Colorado River Storage Project Act. The only lands that can be used for mitigation purposes are those which were acquired specifically for the purpose of mitigation. Section 8 does not give Reclamation the authority to divest one project of its lands for the benefit of another.

In sum, the Association urges that Reclamation follow its onsite mitigation plan as described on page 18 of the Draft Supplement to the Final Environmental Statement, Diamond Fork System. This onsite option meets the obligations of the Bonneville Unit to mitigate its wildlife impacts without interfering with the Provo River Project and the Association's vested contractual rights thereunder. If, however, Reclamation decides on the offsite option, the Association must be compensated at the fair market value for the taking of the 1,030 acres of Provo River Project lands.

Sincerely,

Jack M. Gardner, Superintendent
Provo River Water Users'
Association

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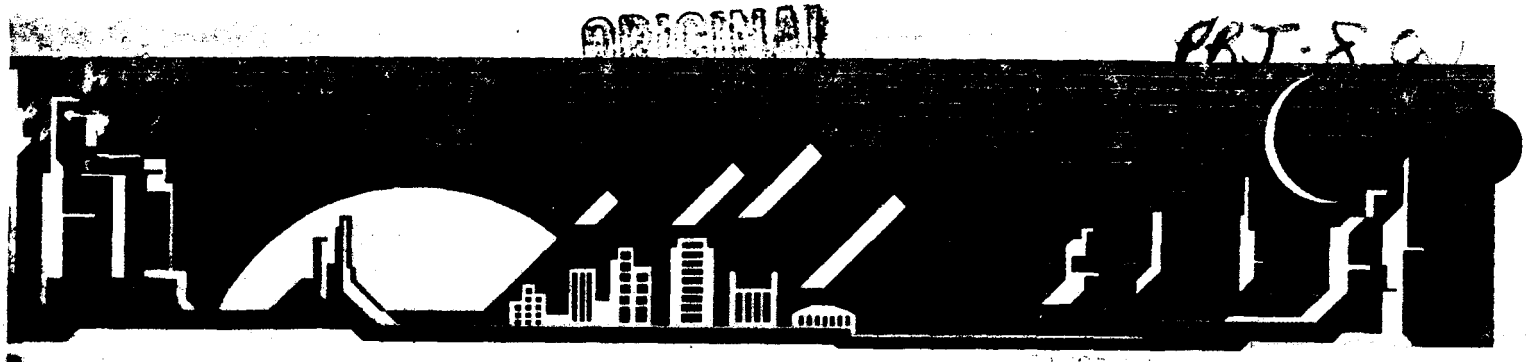

UTAH CHAPTER SIERRA CLUB
177 EAST 900 SOUTH, SUITE #102
SALT LAKE CITY, UTAH 84111
(801) 363-9621

FOUNDED IN 1959 BY CITIZENS OF UTAH

Chapter Chairs,
Utah Chapter of the Sierra Club

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Paul Salisbury	1979
Brian B. Beard	1980-1981
Alan Miller	1982-1984
Jean Binvon	1984-1985
Gibbs M. Smith	1986-

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June 29, 1989

XWTO 300 Cu

U. S. Department of Interior
Bureau of Reclamation
Upper Colorado Region
125 South State
P. O. Box 11568
Salt Lake City, UT 84147

Re: DRAFT SUPPLEMENT TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT
DIAMOND FORK SYSTEM
BONNEVILLE UNIT, CENTRAL UTAH PROJECT

Gentlemen:

It is illogical for the Bureau of Reclamation to prepare this draft supplement to the Final Environmental Impact Statement because the project has been so radically changed that the FEIS no longer described the project being constructed. Further, it appears to be illegal to proceed with construction, as the BOR is now doing with portions of the Diamond Fork System. That "system" has undergone major changes, and is yet to be finalized.

A glaring deficiency of the draft supplement is the absence of any mention of the Sevier River Basin and of the plan to deliver water to that area. It should be recalled that in the hearing of September 1972 on the final environmental statement, busses of high school students were brought from Delta. Large signs on the sides of the busses said: "People Are More Important than Fish." Despite such display of local enthusiasm, there is little indication that farmers from that area will subscribe to purchase project water.

There is no evidence in the subject draft supplemental to support the claim that this is a compliance document for Section 404 permits under the Clean Water Act, (Public Law 95-217), or that it complies with Executive Order 11988, Floodplains Management; or with Executive Order 11900, Protection of Wetlands. Nowhere in the document are these matters addressed. Merely making claims of compliance does not establish compliance.

Of the approximately one million people in the Central Utah Water Conservancy District, only about seven people expressed their views at the public hearings on this DS held on June 20 and 21, 1989. Clearly, there is little public involvement in the important matters considered. Further, no cooperating agencies presented statements as to their positions and responsibilities relating to the project.

We call attention to the need to make public the 1988 Definite Plan Report, the existence of which we have become aware through statements made by BOR officials. The original 1964 DPR is long out of date. We believe that it is illegal for this project to proceed before a revised definite plan report has been adopted by the proper authority.

The environment of Diamond Fork Canyon has not been adequately studied. It is known that one inhabitant of Diamond Fork is the Western milk snake, which is protected by the State of Utah. The desert ecology of the canyon should not be disrupted by a project which has not been clearly defined.

In conclusion, we believe this supplement should be rejected by the Secretary of the Interior.

Please include these comments in the Final Supplement to the Final EIS for the Diamond Fork System.

Very truly yours,

Lillian Hayes

Lillian Hayes
Prepared for the Utah Chapter
Sierra Club

S T O N E F L Y S O C I E T Y
Member Club, Federation of Fly Fishers OF THE WASATCH and Trout Unlimited

June 20, 1989

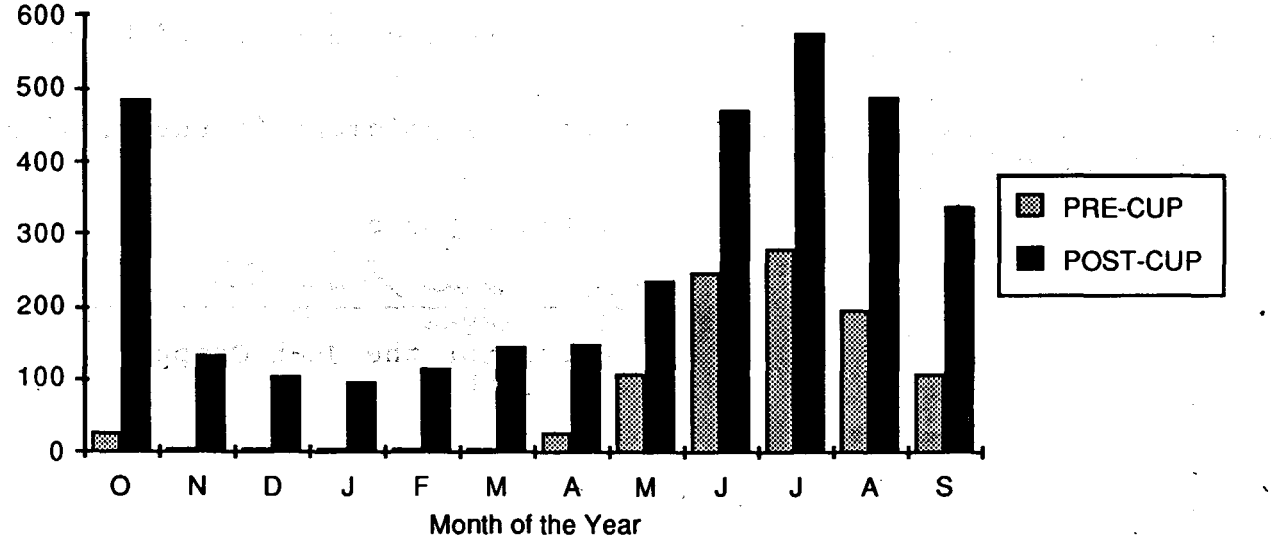
Regional Environmental Officer
Bureau of Reclamation
125 South State Street
Salt Lake City, Utah 84147

Dear Sir,
I appreciate the opportunity to comment on 4 concerns regarding the Draft Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project.

(1) Piecemeal Project Planning
This document represents a piece meal approach to project planning. It indicates that the Diamond Fork Facility will transport an unspecified amount of water to an unspecified location for unspecified uses. After approval of this document by the EPA and Army Corps of Engineers, the US Bureau of Reclamations will fill in these blank spots as they desire. Resolution of the Uintah Basin streamflows issue, the Ute Indian water conflict, and the fate of the Bonneville Irrigation and Drainage System will all have a significant impact on the Diamond Fork System. Approval of the Diamond Fork System should be combined with an EIS document addressing these issues together rather than in isolation.

(2) Massive Increase in Sixth Water Flows
A major project alteration is the deletion of the 3 mile long pipeline connecting the Last Chance Power Plant with the Monks Hollow Dam. This will produce large increases in streamflow on Sixth Water Creek. The following chart presents these flow changes.

Flow of Sixth Water Creek Below the Last Chance Power Plant
in Cubic Feet Per Second



5968 South 4000 West Kearns, Utah 84118 (801) 967-2834

Instead of constructing this pipeline, the entire outflow of the Last Chance Plant will be dumped into Sixth Water Creek. The current flow of Strawberry Project Water through the Sixth Water-Diamond Fork System is producing massive erosion and turbid water conditions. How this channel can withstand these increases is completely ignored in the compliance document. I regard this as a very significant oversight which should be dealt with before final approval of this document.

(3) Stream Sediment on the Diamond Fork-Spanish Fork

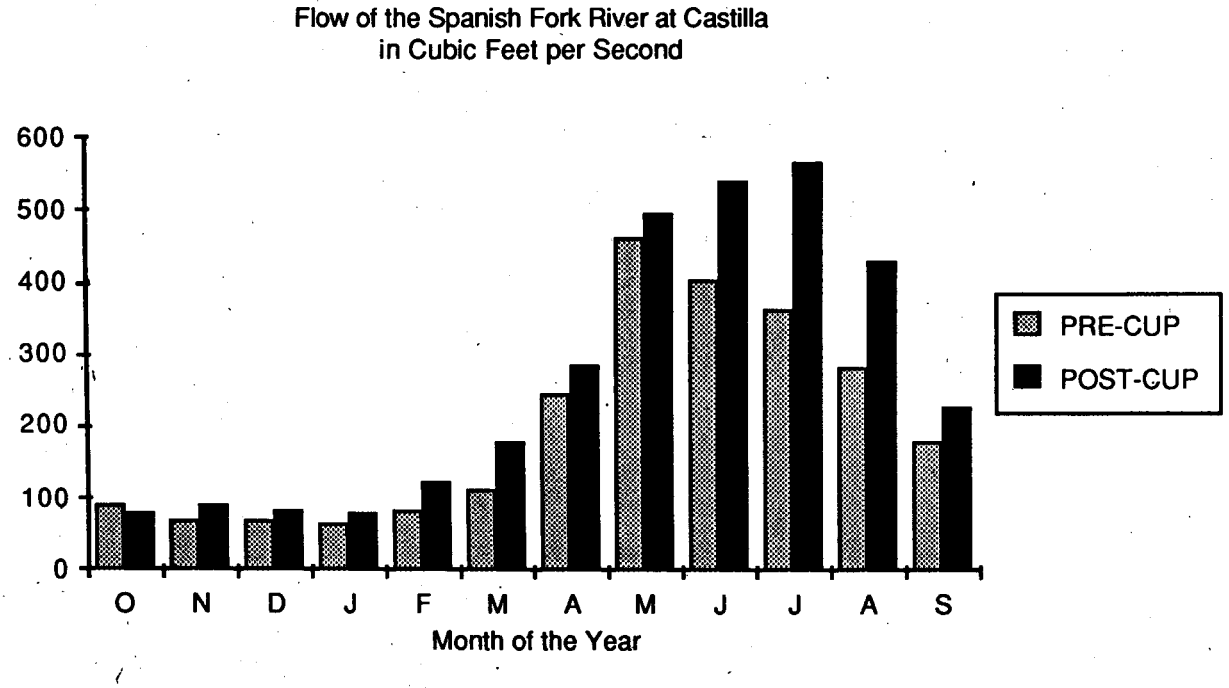
The muddy turbid flows produced by the operations of the Strawberry Project almost completely destroy the value of this river system. There are indications that instead of rectifying this situation, that even with the Bureaus optimistic figures these turbidity problems might be made worse by operations of the Diamond Fork System. For instance under alternative C, the Diamond Fork would carry yearly 32,840 tons of silt, a 3% reduction from the present operation. However, this silt would be carried by 40% less water.

Thus, under alternative C, each acre foot of would would actually carry about 70% more silt than at present (.67 ton of silt per acre foot as opposed .41 tons of silt per acre foot of water). With alternatives A and B, there is a projected 35% decrease in silt being carried by the stream, but there is reason to believe that this is not actually the case. The supplement claims the same silt flow figures as in the 1984 EIS even though pipeline above Monks Hollow Dam has been deleted. In either event it is not clear that the Diamond Fork can carry .26 tons of silt per acre foot of water and still be a viable trout stream.

This point has important financial and perhaps legal aspects. If these figures are accurate and the Diamond Fork can not be rehabilitated as a trout stream, then claiming the cost of the cost of the Diamond Fork Pipeline as a fish and wildlife expense is fraudulent.

(3) Operation of the Spanish Fork River

The CUP proposes to further magnify the destructive high flows produced on the Spanish Fork River by the earlier Strawberry Project. These flows are shown on the figure below:



Neither this document nor the earlier 1984 EIS adequately described the destructive consequences of these high flow. The lower Spanish Fork has both low flow and water quality problems which should be addressed in considering water flow changes produced by the CUP. This canyon and river system could easily rival the value of the Provo Canyon System to the state of Utah, but implementation of this present plan promises to doom forever this potential beautiful area.

The US Bureau of Reclamation recently announced a new policy direction implementing a multiple use planning approach is new projects. There is very little evidence of this new Reclamation policy in the Diamond Fork Supplement.

Yours,

Fred Reimherr
Conservation Chairman, Stonefly Society

The enclosed charts are based on the following fiures:

Average Flow in Cubic Feet Per Second
(Alternative B)

At West Portal	O	N	D	J	F	M	A	M	J	J	A	S	Acre Feet
Flow PRE-CUP	27	5	4	4	4	4	18	93	244	279	195	108	58,608
Flow POST-CUP	5	5	4	4	4	4	9	15	5	5	5	5	4,165
Sixth Water below Last Chance	O	N	D	J	F	M	A	M	J	J	A	S	
PRE-CUP	29	7	6	6	6	7	27	107	249	281	196	110	61,345
POST-CUP	486	136	106	97	117	144	148	236	472	577	489	341	199,266
Sixth Water below Fifth Water													
Elow PRE-CUP	33	11	10	10	9	12	45	136	259	286	198	114	66,819
Flow POST-CUP	490	140	110	101	120	149	166	264	482	582	491	344	204,621
Diamond Fork below Monks Hollow													
Flow pre CUP	38	16	14	12	14	18	67	180	274	294	208	120	74,673
Flow post CUP	17	22	18	21	30	37	56	78	130	183	106	71	45,756
Diamond Fork near Thistle													
Flow pre CUP	41	16	16	15	18	26	100	239	290	298	209	119	82,527
Flow post CUP	18	18	19	16	18	24	44	89	139	215	143	83	49,147
Spanish Fork at Castilla	O	N	D	J	F	M	A	M	J	J	A	S	
PRE-CUP	93	70	68	67	82	113	246	463	404	363	282	178	144,526
POST-CUP	80	93	85	81	123	178	286	498	541	567	429	228	189,746
Spanish Fork below power canal													
Flow PRE-CUP	6	0	0	0	1	3	12	45	56	38	27	17	12,198
Flow POST-CUP	14	11	5	1	0	5	43	126	111	121	96	56	35,046
Spanish Fork below E.Bench Canal													
Flow PRE-CUP	1	0	0	0	0	0	5	0	2	0	0	0	476
Flow POST-CUP	7	11	7	4	4	9	40	101	57	57	54	35	22,967
Spanish Fork at Lake Shore													
Flow PRE-CUP	30	67	77	79	98	129	201	141	22	3	3	8	51,051
Flow POST-CUP	42	97	94	86	121	185	267	177	72	13	135	213	89,369

ORIGINAL

Strawberry Water Users Association

USS NIELSEN
President

745 North 500 East • P.O. Box 70 • Phone 465-9273
Payson, Utah 84651

MILTON V. THEOBALD
Secretary - Treasurer
Manager

June 28, 1989

Mr. Wes Hirschi
Bureau of Reclamation
P.O. Box 11568
125 South State - Federal Building
Salt Lake City, Utah 84147

Dear Mr. Hirschi:

The Strawberry Water Users Association (Association) is a Utah non-profit corporation and currently has approximately 1,500 stockholders, including the cities of Payson, Salem, Spanish Fork and Springville, comprising approximately 42,000 people. The Strawberry Valley Project was one of the first reclamation projects constructed by the U.S. Bureau of Reclamation (Reclamation). The Association contracted with Reclamation to repay the Project construction costs and to operate, maintain, repair and rehabilitate designated Project Facilities in perpetuity. Construction on the Project began in 1906 and the irrigation portion was substantially completed in 1915. The first Project water was used in 1916.

The Project consists of a 283,000 AF reservoir on Strawberry River, which has since been enlarged to over 1,000,000 AF as a feature of the Bonneville Unit of the Central Utah Project. The Strawberry Project works included the Strawberry Tunnel through the mountain into Sixth Water Creek a tributary to Diamond Fork

Creek and Spanish Fork River, three hydroelectric power plants and two major canals. The Project supplies approximately 75,000 AF of water annually for full service irrigation of approximately 20,000 acres of land and supplemental irrigation of approximately 25,000 acres of land in South Utah County. In addition, the Project supplies water to its member cities and electrical energy to the Strawberry Electric Service District. Needless to say, the economy of South Utah County is vitally dependent on the Strawberry Project for water and power.

The initial Project costs of approximately $3.5 million dollars were repaid to the United States in 1974. The Project is some 80 years old and is in need of extensive rehabilitation due to aging in spite of continuous maintenance and repairs. The Association commenced rehabilitation of a portion of the Project works by reconstructing the Project's major diversion dam on Spanish Fork River and a portion of the service canal at a cost of approximately $7.5 million dollars. In addition, the Association reconstructed the Project's power plant on Spanish Fork River and associated power transmission lines at a cost of approximately $5.5 million dollars. Thus, the Association has already incurred an indebtedness of $13.0 million dollars for rehabilitation and has identified an additional $42.0 million dollars for rehabilitation of water conservation facilities and power facilities which must be constructed in the near future.

The Strawberry Valley Project power rights in the Diamond Fork System were confirmed in July, 1986, by the Regional

Solicitor, Intermountain Region. Those confirmed power rights were quantified by agreement in March 1987, between the Association and Reclamation based upon 74,300 AF of Strawberry Valley Project power water out of a total of 196,500 AF of power water to be delivered through the Diamond Fork System. It would follow that if the total power water delivered through the Diamond Fork System is reduced, the Association's entitlement would still be based on 74,300 AF.

Referring to the Draft Supplement to the Final Environmental Impact Statement (Draft Supplement), the Association respectfully submits the following specific comments:

Purpose of the Diamond Fork System (pp 1, 2) On page 2, the last sentence in the first paragraph should read "The potential also would exist for further hydroelectric development by other non-federal funding." to specifically provide for non-federal funding of the hydroelectric development.

Strawberry Valley Project (pp 2, 3) On page 2, the first sentence of the first full paragraph should read "The Strawberry Valley Project is a forerunner of the Central Utah Project." since the phrase "completed in 1922" is inaccurate.

Location and Setting (pp 4, 5) The first sentence of the last paragraph on page 5 should add the cities of Mapleton, Elk Ridge and Woodland Hills, and the population ("28,374") should be adjusted accordingly (currently approximately "42,000").

Syar Tunnel (p 9) It is noted on page 9 under "Syar Tunnel" that a 50 cfs by-pass valve will be installed in the

tunnel to divert flows to the existing Strawberry Tunnel to provide a capability for maintaining a fishery in Sixth Water Creek. The Draft Supplement does not discuss or evaluate the impacts from such diversion on the power generation of the Diamond Fork System. It appears that such bypass diversion would constitute major federal action which would require a further environmental Impact Study so that all impacts on the Diamond Fork System are disclosed in accordance with the law.

Table 1 (p 10) Footnotes 1 and 2 under Table 1 should be changed from non-Federal development to non-Federal Funding, to be consistent throughout the Draft Supplement.

Project Operation (pp 19, 20) The last sentence of the paragraph at the top of page 20 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

Alternative B (pp 22 - 25) The third to last sentence of the Paragraph at the top of Page 24 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

Alternative C (pp 25 - 30) The third sentence of the first paragraph on page 25 should specify non-federal funding instead of non-federal development to be consistent throughout the Draft Supplement.

Table 5 (p 26) In Table 5 on Page 26, the 60 MW capacity should be in line with Last Chance Powerplant instead of with Fifth Water Penstock.

Alternative C (pp 25 - 30) The last sentence of the first full paragraph on page 28 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

Option 2 (pp 31 - 32) Option 2 reduces the power potential of Last Chance Power Plant from 60 MW to 48 MW which is not in the best interests of developing the power potential of the Diamond Fork System. The Fifth Water tunnel should be lined to provide for power development and to reduce the risks of tunnel failure.

Diamond Fork (pp 43 - 44) The second sentence of the last paragraph on page 43 should designate 61,500 acre feet instead of 56,700 acre feet to be consistent with current negotiations.

General Geology Map (between pp 94 - 95) The map of General Geology of the Diamond Fork area should include the location of the powerplant shown in Option 2 and should also show the Strawberry Tunnel.

In conclusion, the Association prefers Alternative A and Option 1 covered by the Draft Supplement to the Environmental Impact Statement. The Association also supports the 18,000 acre feet of project water discharged into the river for supplemental irrigation for the 47,880 acres presently irrigated lands in the Spanish Fork area as indicated on page 20.

In December, 1987, the Western Area Power Administration and Reclamation approved the Association's proposal for an allocation of 11.75 megawatts of power and energy prior to construction of

the Diamond Fork Power System with provision for the Association to non-federally finance the Diamond Fork Power System if not otherwise constructed. The Association still desires to construct hydropower generating facilities in the Diamond Fork System and suggests that Alternative B or C and the 50 cfs diversion to the Strawberry Tunnel would substantially reduce that hydropower generation potential. As noted above, it is essential that the Association develop revenues to rehabilitate its 80 year old project. Revenues from hydroelectric power generation in the Diamond Fork System are essential for that purpose.

Respectfully Submitted,

STRAWBERRY WATER USERS ASSOCIATION

J. Ross Nielsen, President