Form No. 10-306 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

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RECEIVED

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- FOR FED DETERMINATION OF ELIGILITY

SEE INS... ...ISTER FORMS

TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC

High Mountain Dams and Tunnel in Upalco Unit of Central Utah Project

AND/OR COMMON

2 LOCATION

STREET & NUMBER

multiple locations (see HAER Inventory) __NOT FOR PUBLICATION

CITY, TOWN __ VICINITY OF CONGRESSIONAL DISTRICT

STATE CODE COUNTY CODE

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	X PUBLIC	__OCCUPIED	X AGRICULTURE	__MUSEUM
__BUILDING(S)	__PRIVATE	X UNOCCUPIED	__COMMERCIAL	__PARK
__STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	__RELIGIOUS
__OBJECT	__IN PROCESS	__YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
x thematic group	__BEING CONSIDERED	X YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
	x n/a	__NO	__MILITARY	__OTHER:

4 AGENCY

REGIONAL HEADQUARTERS: *(If applicable)*

Bureau of Reclamation, Upper Colorado Regional Office

STREET & NUMBER

125 South State Street

CITY, TOWN STATE

Salt Lake City __ VICINITY OF Utah 84147

5 LOCATION OF LEGAL DESCRIPTION (Special Use Permit)

COURTHOUSE, REGISTRY OF DEEDS, ETC. Roosevelt District Ranger Office, Ashley National Forest

STREET & NUMBER

244 West Highway 40

CITY, TOWN STATE

Roosevelt Utah 84066

6 REPRESENTATION IN EXISTING SURVEYS

TITLE

Upalco Unit Historic American Engineering Record Inventory

DATE

February 1986 X FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS National Park Service, Rocky Mountain Regional Office

CITY, TOWN STATE

Denver Colorado 80225

7 DESCRIPTION multiple resources (see HAER Inventory Cards)

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	__DETERIORATED	__UNALTERED	__ORIGINAL SITE
__GOOD	__RUINS	__ALTERED	__MOVED DATE______
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

This Determination of Eligibility request culminates an intensive Historic American Engineering Record survey of all high mountain dams in the Upalco Unit of the Central Utah Project. Conducted in 1985-86 the survey was composed of three components: inventory, synthesis and evaluation. The inventory began with identification of all high mountain dams in the unit. Fifteen dams were encountered in the inventory. The dams and reservoired lakes are situated within the Ashley National Forest on Forest Service land and are maintained by the private irrigation companies through special use permits issued by the Forest service. The Bureau of Reclamation has proposed stabilization of most of the dams as part of a program to consolidate water storage in the proposed Taskeech Reservoir, and the Bureau has been designated the lead agency in this limited-scope cultural resource survey.

Fieldwork - archival research and on-site HAER recordation - was conducted at each of the fifteen sites identified. The research methodology involved the collection of primary and secondary source material from a variety of archives in Utah and Colorado and the National Archive in Washington. The synthesis part of the survey involved preparation of a developmental and administrative overview (part of which has been included as an addendum in Item 8) of irrigation in the Uinta Basin. Irrigation has been linked with settlement and the construction of these dams linked to the irrigation systems. The final component was evaluation. Within the context of the overview, each structure in the inventory has been assessed for historical and/or technological significance for its representation of dam-building trends. In November 1985, The survey findings were presented to a review board made up of representatives of the Bureau of Reclamation, National Forest Service, Utah Historic Preservation Office and the National Park Service (HAER). Although HAER and the Bureau of Reclamation agreed with the consultant about the selection of these four structures, the Utah SHPO representative felt that all fifteen sites should be considered potentially eligible and the Forest Service representative had no firm opinion either way.

The retention structures in the Upalco Unit make up a heterogeneous group, built under different circumstances by different parties. Four of the fifteen sites have been selected for this thematic Determination of Elgibility. A summary table of the fifteen Upalco Unit structures is included, as are a HAER Inventory Cards for each. As a point of reference, the following is a list of the dams in the other two units which make up the Central Utah Project. Combined these three units comprise the south face of the Uinta Mountain range:

BONNEVILLE UNIT DAMS

NAME	DATE	BUILDER	STRUCTURE TYPE
Trial Lake Dam	1914	Provo Reservoir Company et al.	Earth fill
Wall Lake Dam	1914	Provo Reservoir Company et al.	Earth fill
Washington Lake Dam	1914	Provo Reservoir Company et al.	Earth fill
Crystal Lake Dam	1916	Provo Reservoir Company et al.	Earth fill
Big Elk Lake Dam	1918	Washington Irrigation Company	Earth fill
Long Lake Dam	1923	Provo Reservoir Company	Earth fill
Lost Lake Dam	1926	Provo Reservoir Company	Earth fill
Star Lake Dam	1926	Provo Reservoir Company	Earth fill
Island Lake Dam	1932	Provo Reservoir Company	Earth fill
Fire Lake Dam	1934	Provo Reservoir Company	Stone masonry
Pot Lake Dam	1934	Provo Reservoir Company	Earth fill
Teapot Lake Dam	1934	Provo Reservoir Company	Earth fill
Weir Lake Dam	1934	Provo Reservoir Company et al.	Stone masonry
Duck Lake Dam	1935	Timpanogos Irrigation Company	Earth fill
Marjorie Lake Dam	1935	Timpanogos Irrigation Company	Earth fill

UINTAH UNIT DAMS

NAME	DATE	BUILDER	STRUCTURE TYPE
Upper Chain Lakes Dam	1921	Dry Gulch Irrigation Company	Stone masonry
Fox Lake Dam	1922	Dry Gulch Irrigation Company	Earth fill
Middle Chain Lake Dam	1922	Dry Gulch Irrigation Company	Earth fill
Papoose Lake Dam	1923	Whiterocks Irrigation Company	unknown
Wigwam Lake Dam	1923	Whiterocks Irrigation Company	Earth fill
Crescent Lake Dam	1927	Dry Gulch Irrigation Company	unknown
Lower Chain Lake Dam	1929	Dry Gulch Irrigation Company	Stone masonry
Paradise Dam	1943	Whiterocks Irrigation Company	Earth fill
Atwood Lake Dam	1950	Dry Gulch Irrigation Company	Earth fill
Chepeta Lake Dam	1957	Whiterocks Irrigation Company	unknown
Cliff Lake Dam	1957	Ouray Park Irrigation Company	Earth fill
Moccasin Lake Dam	1964	Whiterocks Irrigation Company	Earth fill
Whiterocks Lake Dam	unk.	Ouray Park Irrigation Company	Earth fill

Located in a relatively isolated and remote area, the dams have retained a high degree of contextual integrity. All fifteen retain integrity of location, design, setting, material, workmanship, feeling and association, with only minor maintenance being performed since their initial construction. As modest representatives of engineering and historical trends, the four selected sites are being considered for potential eligibility on a local basis.

With none of the sites in the Upalco Unit closely associated with the lives of significant personnages, the selection of sites for eligibility hinges upon the application of Criteria A and C. These retention structures were built to store water for primarily agricultural purposes. The test for eligibility under Criterion A, therefore, is based on the effect that an individual site has had on agricultural development in the region. A dam or tunnel is considered significant under Criterion A if it has contributed substantially to the agricultural development (and consequent settlement) of an area, specifically in the creation of a significant amount of additional irrigable acreage.

For instance, the reservoirs created at the headwaters of the Swift Creek and Yellowstone River drainages by the Farmers Irrigation Company were small-scale and marginal, at best. Although they may have allowed Farmers to function as an irrigation supplier for several years, in reality they did little to increase the amount of irrigated farmland in the Basin. For this reason, they are considered nonsignificant under Criterion A. Similarly, the Milk Lake Reservoir maintained by the Hartman family provided water for an extremely small area, probably no more than the farms of the three original applicants for the special use permit. As such, its economic impact on the Basin was negligible and nonsignificant.

The three reservoirs created by the Farnsworth Canal and Reservoir Company did little more than augment that company's dry-year water storage. Although their storage capacity clearly enhanced Farnsworth's economic position in the Basin and allowed the company to increase agricultural acreage in the Mountain Home vicinity, their individual impact on the community was minor. A fourth Farnsworth dam, Twin Pots, did have a specific and individual impact on agriculture in the region. With a water storage capacity slightly less than that of all the high mountain reservoirs combined, Twin Pots helped to facilitate the cultivation and irrigation of significant additional acreage in the Mountain Home vicinity. Its impact on the community is tangible and important, as evidenced by the serious negative effect on the community after the original original dam broke. The Twin Pots Dam is therefore considered eligible under Criterion A.

The Dry Gulch Irrigation Company was by far the largest of the irrigation companies in the Basin. Although it is impossible to distinguish the individual impact of Clements Lake from the diverse and far-flung irrigation network of the immense company, it seems likely that this reservoir enhanced Dry Gulch's holdings in the Lake Fork drainage area. The reservoir is further distinguished as the only such water storage facility maintained by this regionally important entity in the Upalco Unit. As such, it is also considered eligible under Criterion A.

Criterion C has been applied sparingly, for all of the resources encountered in the inventory embody the distinctive characteristics of small-scale dam engineering and construction to some extent. Two resources stand out from the others, however, because they differ from the norm. The Milk Lake Dam is the only grouted masonry structure encountered in the inventory, and as such is considered eligible under Criterion C as the only example of this form of small-scale dam construction. Similarly, The Farmers Lake Tunnel is the only such structure which has created water storage by lowering the level of the existing lake. It is also considered eligible under Criterion C as the only example in the Unit of this form of technology. Because they are otherwise significant, Clements Lake and Twin Pots Dams have been chosen here as representative examples of typical earth-fill construction.

The Dry Gulch Irrigation Company, builder of the Clements Lake Dam, was by far the largest of the irrigation companies in the Uinta Basin. Joseph Murdock, the company's president was instrumental in the Mormon settlement of the basin as president of the Wasatch Development Company. Dry Gulch's canals and laterals extended throughout the region, opening large tracts of land to agricultural use and thus facilitating settlement in the basin. Although it is impossible to distinguish the impact of the Clements Lake Dam from the diverse and far-flung network of the immense company, it seems that this reservoir enhanced Dry Gulch's holdings in the Lake Fork drainage to some extent. Dry Gulch built five other high mountain dams in the Uintah Unit, but the Clements Lake Dam is the only representative structure in the Upalco Unit constructed by this regionally pivotal organization. As such, it qualifies as eligible for the National Register under Criterion A.

The greatest benefit from the storage reservoirs in the Upalco Unit was, without doubt, accrued by the Farnsworth Canal and Reservoir Company. As a secondary water rights holder under the shadow of the Dry Gulch Irrigation Company, Farnsworth had a tremendous amount to gain from its low-water storage capacity. The company was the first to create active storage on a viable scale in the Uinta Basin. The storage created by the Brown Duck Basin lakes and the Twin Pots Reservoir clearly enhanced Farnsworth's economic position in the Basin. With almost as much storage capacity as all of the high mountain lakes combined, Twin Pots, as the first man-made reservoir in the Unit, contributed significantly to the increase in agricultural acreage in the Mountain Home vicinity. As such, it contributed to the broad patterns of Uinta Basin history and qualifies as eligible for the National Register under Criterion A.

ADDENDUM

The source for the rivers which flow through the Uinta Basin are the Uinta Mountains. A rugged but relatively narrow range, the Uintas are unique in their east-west orientation among the typically north-south mountain ranges of the Rockies. The snowmelt running off of the north face of the mountains flows into the Overthrust Belt and the broad, arid Wyoming Basin of southwestern Wyoming. The south face of the range forms the headwaters for three major river drainage systems - Lake Fork, Uinta and Whiterocks - which flow through the valleys in the Uinta Basin. While the lower basins receive only some five to seven inches of rainfall annually, precipitation in the high Uintas averages approximately 30 inches. These mountains are an important, indeed crucial, watershed for the region.

The Indians held undisputed possession of the land from the crest of the mountains to the foothills from 1861 to 1905. By any standard the Uintah and Ouray Reservation was an extensive preserve, which comprised "the entire valley of the Uintah River within Utah Territory, extending on both sides of said river to the crest of the first range of continuous mountains on either side." The land lottery of August 1905, however, not only initiated the settlement of thousands of whites on what had once been Indian lands, but muddied the issue of water rights in the Basin, touching of decades of competition and dispute.

The white settlers came from many localities and were of diverse religious persuasions. But no single group was nearly as large or as well organized as the Mormons, and none was as foresightful or diligent in securing the irrigation water rights which would be necessary for successful large-scale farming in the Basin. Well before the lottery, church leaders had traversed the land and located the fertile and, above all, irrigable, homestead sites. Wasatch Stake President William Smart and his counselor, Joseph Murdock, served as assistants to government surveyors who mapped the Uinta Basin to establish legal descriptions of lands and water rights for the Ute Indians. With the knowledge gained from these surveys, Smart was able to file a legal application for water to irrigate acres of land that would be available for white settlement. By making these filings under the name of the Dry Gulch Irrigation Company, Smart enabled all the water users who owned stock in the company to share the same priority. The Dry Gulch filings were superceded by Indian water rights only. Subsequent filers received secondary water rights of lower priority.

The Uinta Basin was a hard country in which to prosper. While the climate was healthful and the soil productive, the growing season was short, and by the early 1900s, most diligent stream flow had already been appropriated. By midsummer in a dry year, the water flow available to newcomers - after supplying prior claims of farmers on Indian lands and Dry Gulch Irrigation Company users - diminished to the vanishing point. As the BIA Indian Irrigation Service searched for users of reservation water rights in the 1910s, it became increasingly evident to the white settlers in the Basin that if the agency could prove beneficial use on over 77,000 acres of Indian land, water would be scarce for the farmers outside the reservation allotments. All interest groups recognized that the Indian allotments had primary filings on the natural flow of the Lake Fork, Yellowstone, Uinta and Whiterocks Rivers, provided the reservation could demonstrate beneficial use. By 1921, the BIA had succeeded in its efforts to lease Indian allotments and prove up on the reservation's water rights. This left Mormon and gentile farmers outside the reservation to struggle with secondary water rights.

Friction and disputes over water followed the BIA's efforts. In the summer of 1916, a group of Lake Fork and Uinta River water users that called itself "Irrigators Against Uncle Sam" planned a united opposition against federal appropriation of reservation water to attract settlers. Earlier that year, Judge Tillman D. Johnson had established the first and exclusive water rights on the Lake Fork River for the Indians of the Uintah and Ouray Reservation against six defendant companies: the Dry Gulch Irrigation Company, the Farnsworth Canal and Reservoir Company, the Good Luck Irrigation Company, the Lake Fork Irrigation Company, the Uteland Ditch Company and the New Hope Irrigation Company. Although a formal court ruling favoring the Indians was not handed down until seven years later, the courts restrained the defendants from interfering with the flow of Indian water.

The risk that reservation and outside farmers in the Basin ran became clear two years later, during the dry years of 1918 and 1919. In 1918, about 50,000 acres of farmland required water from the Lake Fork drainage systems. With a total flow of 135,000 acre-feet during the six irrigating months, the water should have been sufficient to irrigate 53,000 acres if impounded and controlled. No means of storage had been built to hold the spring runoff, however, and the flow in August was only sufficient for 26,000 acres. During the summer of 1919, with more acreage in cultivation and less water in the streams, the situation worsened. In that year, the Lake Fork drainage delivered the lowest volume of water recorded to date and 8,000 acre-feet of storage would have been required to supply the deficiency in normal stream flow during the irrigation season. The farmers' conclusion was inescapable: unless a considerable amount of storage was developed, some of the lands that had previously been cultivated would have to be abandoned.

Because water was crucial to farming, homesteaders soon thought not only of diversion of streams, but of impounding the waters at or near their sources. Mountain runoff that would otherwise flow through the Basin could be impounded in reservoirs during the abundant weeks of May and early June and released during the dry period in July and August. William Smart and the directors of the Dry Gulch Irrigation Company fully understood the importance of water storage as a way to increase water availability and had taken steps prior to the initial homestead entry to secure storage rights. By 1905, Dry Gulch, which would ultimately become the most influential irrigation company in the Basin, had applied not only for diversion rights in the streams, but also for storage rights in many of the Uinta Mountain watershed lakes.

Ten years later, a second irrigation company began to look to the mountains for a solution to the water problem. The Farnsworth Canal and Reservoir Company, incorporated in 1908, provided water to farms around Mountain Home and Talmage near the center of the Basin. Although it was one of the larger and older irrigation companies in the Basin, Farnsworth held water filings secondary to both the allotted Indian lands' primary rights and the Dry Gulch Irrigation Company's water filings. As early as July 1915, company director George O. Lindsay suggested that Farnsworth should be investigating reservoir sites to prepare for low-water years. There had always been a degree of uncertainty among Farnsworth shareholders about the sufficiency of water supply for their secondary filings, and a means of storing water would consolidate their position and provide a measure of insurance against the drought years.

Shortly after Lindsay's suggestion, the Farnsworth board of directors employed engineer Austin G. Burton to investigate and report on potential reservoir sites. Accompanied by a guide, Burton reconnoitered the headwaters of the Lake Fork River and reported back that he had found four lakes with a total storage capacity of approximately 5,000 acre-feet of water. (An acre-foot is a measure of liquid volume equivalent to a one-foot depth over the area of an acre, or 43,560 cubic feet.)

On July 22, 1915, the Farnsworth Canal and Reservoir Company filed for storage rights on Brown Duck, Kidney and Island Lakes (permits #6353, 6354 and 6355) with the Utah State Engineer's Office. (The identity of the fourth lake identified by Burton is unclear. Perhaps it was Clements Lake, further north in the watershed, for which the Dry Gulch Irrigation Company already held the storage rights.) The three permits to store 324, 435 and 851.2 acre-feet of irrigation water, respectively, were approved on April 4, 1916, with the understanding that the dams for impounding the water would be completed by November 1, 1918. Later, the company found that Kidney Lake could provide more storage than originally thought, and on January 22, 1917, refiled for an additional 1,500 acre-feet. Farnsworth increased the capacity again the following year with yet another application for 1,700 acre-feet more.

The Indian Irrigation Service did not consider impounding irrigation water until two years later. The drought of 1918-19 prompted Supervising Engineer H.W. Dietz to order an investigation of possible high country irrigation storage reservoirs on the Whiterocks, Uintah, Yellowstone and Lake Fork watersheds. Conducted in the summer and fall of 1919, the original purpose of the investigation was to locate sites which could be developed by the Uintah Irrigation Project to supplement the low-water flow of the rivers. Before the survey had progressed very far, however, it became apparent that earlier searches by white individuals and private irrigation companies had resulted in filings on all sites that possessed "even remote possibilities." Nevertheless, the survey was completed as the Indian canals held first filings on all of the streams. Additionally, "it became desirable that the Indian Irrigation office have general information at least concerning these prospective developments."

In his "Report on the Results of Storage Investigations, 1919," Assistant Project Engineer H.R. Leach concluded that no feasible storage sites in the mountains were available for the Indian Irrigation Service. The four or five sites which, in his opinion, were large enough to interest the irrigation office, were under development or had been previously filed on. "The balance of forty or more sites filed on are obviously impractical or too small for use by the Indian Canals." Leach maintained that the Indian Irrigation Service should look below the Uinta Mountains to find storage possibilities and recommended that an investigation of the lower country be made as soon as possible.

The report was not optimistic about the feasibility of private development of most high-country reservoir sites. Leach ascertained that some of the basins were located too high on the watershed to have the drainage area necessary for a substantial water supply. Most of the lakes would require difficult construction to impound the water, he maintained, and siphons would have to be constructed or spillways excavated to store water in some. Other lakes would require extensive dams, necessitating considerable amounts of capital investment. While there was plenty of rock and timber available in the vicinity, he reasoned erroneously that earth fill in the mountains would be extremely difficult to obtain. And with no access roads into the mountains, the cost of transporting building material from the outside was "absolutely prohibitive." In light of the survey's investigations, Leach considered it probable that many of the private applications for storage rights would be allowed to lapse, or if pressed through construction, the projects would ultimately fail. He recommended that capacity curves be plotted for the natural lakes and their tributaries to prevent a loss of flow to Indian canals if storage on a number of such small feeder streams was developed. This data would be helpful, since he foresaw difficulties in the regulation and operation of future reservoirs due to their remoteness. Leach warned, "reservoirs which are failures and which destroy natural stream storage or which are improperly operated may cause serious loss to the prior filers [Indians]."

Supervising Engineer H.W. Dietz agreed that any storage scheme was bound to fail and should be discouraged from the start. Nevertheless, he stated, "We should not discourage any who desire to develop such sites as appeal to them." In his opinion, an Indian irrigation policy of cooperation and assistance would benefit the service in a number of ways. First, Dietz believed that any storage which would relieve the situation of the secondary appropriators would soothe growing tension between the outside settlers and the Indians, thus benefiting the Basin as a whole. Second, properly directed reservoirs would help regulate the normal channel flow from which both white and Indian farmers diverted, reducing loss through seepage. Even in a low-water year, the characteristic mountain snowpack produced an early summer runoff peak that exceeded the needs and capacities of the water users for their crops. This was followed by lower flows in late summer which could not satisfy irrigation needs. In so stating, Dietz, of course, was simply making the classic case for irrigation dams. Finally, he maintained, high-country water storage would decrease the amount of culinary water taken by whites from normal flow as secondary filers could not use other water while holding stored water.

Although they may have been encouraged by a supportive Indian Irrigation Service Policy, a number of irrigation companies had already filed for the mountain reservoir storage rights with the Utah State Engineer's Office. In the following two decades these companies and a handful of private individuals would venture into the high country to construct dams, cut drainage channels, and install control structures on twenty-four high-country glacial lakes on the Lake Fork, Uinta and Whiterocks drainages.

The Farnsworth Canal and Reservoir Company would be the first to begin actual construction. At the same time the company applied for water storage rights on Brown Duck, Island and Kidney Lakes, it applied with the Ashley National Forest for permission to construct dams to create the reservoirs and control the outlet flow. On May 8, 1916, the forest service issued special use permits to Farnsworth for the purpose of "constructing, using and maintaining a dam and reservoir [on each lake] for storage of irrigation water."

The three natural lakes were located in the remote Brown Duck Basin and interconnected. Kidney Lake was the northernmost and by far the largest of the three It drained into Island Lake, an irregular body of water made up naturally of two smaller lakes separated by a narrow ridge. Island in turn drained into Brown Duck Lake, the smallest of the three lakes. As the lowest lake in the basin, Brown Duck functioned as the regulation point for water released from the three lakes. From Brown Duck, the water flowed through the natural outlet on the lake's east end, into Brown Duck Creek and joined the Lake Fork River at the present site of Moon Lake Reservoir. Not far from here was the headgate for the Farnsworth Canal, which could be regulated in concert with the release from Brown Duck Lake to redivert the stream flow into the canal.

The Farnsworth Canal and Reservoir Company engaged the engineering firm of Caldwell and Sorensen to design the dams and reservoirs. The engineers completed the drawings for Kidney Lake in December 1916, and for Brown Duck and Island Lakes by the following February. The plans called for the terminal moraine on Brown Duck Lake to be excavated by nine feet, an outlet pipe installed and the dam rebuilt fourteen feet above the original level so that the total dam height would be twenty-three feet and the total water depth would be nineteen feet. Kidney Lake was to be cut ten feet below the original lake level, the outlet pipe installed and the dam built an additional fifteen feet above the original lake level. The maximum dam height would be twenty-five feet and the water depth twenty-one feet. The natural dam on Island Lake was to be lowered seven feet, at which level the outlet pipe would be installed. The dam would be built fifteen feet over and above the original lake level, making the total height of the dam twenty-two feet. The water depth would be eighteen feet.

On March 24, 1917, The Duchesne Record reported that the Farnsworth directors had rejected all bids from area contractors for the construction of the three reservoirs as too high by at least $10,000. The work instead would be carried out by hired laborers supervised by the company's management. George G. Lindsay, George O. Lindsay's son and secretary of the company, stated that Farnsworth proposed to spend about $35,000 on reservoir construction that year. The work, he said, was being undertaken so landowners served by the canal would benefit during low water season. The construction of the dams had a decidedly beneficial effect on Farnsworth stock "which is now being held at a higher price than ever prevailed in its territory."

The first major work undertaken by the Farnsworth crew was the cutting of a rough road into the lakes in the fall of 1916. Teamsters driving horse teams hauled most of the construction materials, including cement, pipe, lumber and headgates to the lakes during that and the two succeeding winters. According to ex-Farnsworth secretary Fred Lindsay "it was easier to haul the material in on sleighs because after the snow was packed down it made the road much smoother for the horses to run on."

Actual construction on the dams began in the spring of 1917. The remote location, prevailing technology and the overriding need for economy dictated that the dams would be constructed using natural materials: primarily earth and rock To excavate, move and grade the earth, the men used equipment such as plows, rollers, graders, tongue scrapers and rooters, pulled by teams of horses. Typically, after first blasting with dynamite to loosen the rock and soil, one team went over the ground with a plow or rooter to pulverize it. Then another team pulling a scraper moved the earth-fill and deposited it on the dam site. Finally, the fill was compacted and graded to a finish profile by a team pulling a grader. Hay and oats for the horses were stored by Farnsworth in the commissary at Kidney Lake and were sold to the men to feed their teams.

All three dams - and the majority of those that followed in the Uinta Basin - employed representative earth-fill construction. Among the most rudimentary of structural types, the earth fill dam typically consisted of a water barrier compacted clay core covered with tons of earth fill for height and ballast and faced with stone veneer for erosion control. The earth fill which made up the bulk of the dam's weight was scooped from nearby open pit operations, dumped over the core, compacted and graded using horse-pulled equipment. The finish-graded earth fill structure was then covered with large-scale granite stone riprap, typically laid 1 to 2 feet thick. The upstream and downstream surfaces of the dams were generally graded with a 1:1 slope. Of the three Farnsworth dams in the Brown Duck Basin, the Kidney Lake Dam was by far the largest. With a crest length of 630 feet, a maximum height of 24 feet and a crest width of 14 feet, it increased the surface area of the lake substantially to almost 200 acres. The Island Lake and Brown Duck Lake dams were similarly sized with 250-foot and 220-foot lengths, respectively.

At the base of the maximum section of each dam (usually near the center of the dam's length), an outlet pipe was placed. A steel, shovel-headed headgate typically covered the upstream face of the outlet pipe. Mounted either vertically or roughly parallel with the inclined surface of the dam on a rigid steel stem guide, the gate was connected via the steel valve stem to a gate wheel at the top of the mechanism. The flow rate through the outlet was controlled by rotating the gate wheel, which raised or lowered the gate by moving the threaded stem. All three Farnsworth dams were built using this method of construction.

To finance the dam work, the company voted in October, 1917, to issue bonds for sale at $45,000, payable in twenty years. This was done for the purpose of raising money to refund company indebtedness and to have sufficient capital to continue the construction of canals, ditches and reservoirs. None of these bonds were ever sold, however, but were instead used as collateral for various loans. Additionally, during the construction years Farnsworth levied a number of assessments against the stockholders. These ranged from five cents per share on August 9, 1917, to thirty-seven cents per share on August 16, 1918. Many of the stockholders worked off their assessments by furnishing teams and labor on the reservoirs. Others paid their assessment to the company in cash, which paid wages for the workmen. The wages varied from $5 per day for man and team and $2.50 per day for a single hand (laborer) in 1916, to $7 per day for man and team and $3.50 for a single hand in 1918.

The dam construction was proving more costly than could be funded by the levies and Lindsay turned to other avenues of funding to alleviate the company's strained finances. As the work neared completion in June 1918, Farnsworth representatives approached agents of the Church of Jesus Christ of Latter-Day Saints, asking that the church purchase some of the bonds. In September, Mormon Elders A. Ivins and R.R. Lyman inspected the company's property and water systems. Resultingly, the church made arrangements with the Banks or a Bank of Salt Lake City to furnish the $15,000. In exchange for the $15,000 loan, the church demanded that the bank be given $22,000 worth of company bonds as collateral. Although the bonds had been traded below par value, the loan appeared to solve Farnsworth's most pressing financial problems, and construction of the dams could be completed.

As the trailhead to the construction site, the town of Mountain Home - located just west of the Lake Fork River about ten miles south of Brown Duck Lake - benefited economically from the reservoir work. In 1917, the town supported two general stores, one hotel, the Farnsworth Company building (built in 1914), one pool hall and a dance - or community - hall, which was also used a church house. The irrigation company maintained a substantial payroll and purchased most supplies locally. In August of that year, the Duchesne Record's Mountain Home correspondent reported, "there have been a great many freight teams arriving during the week. The stores are getting quite well filled up and the commissary at the lakes is supplied also." Naturally, with eighty, predominantly young, "single hands" and thirty-five men and teams employed at the reservoir sites, all was not work. Numerous dances were held at the Mountain Home community hall when men came down to the town on weekends. Visitors, "all those seeking pleasure and a good time" were encouraged to visit the reservoirs and "teams coming down from the lakes reported a very nice crowd and a still better time." Construction progressed despite all the fun and, by the end of 1918, Kidney Lake was reservoired. The dams on Brown Duck and Island lakes were completed in the fall of 1919.

The Farnsworth Company released impounded water from Kidney and Brown Duck Lakes for the first time in August 1917, before completion of the dams. The company was unable to divert the flow at its canal headgate, however, because the gate had been locked closed by the water master. Apparently, Farnsworth had stored water in partially completed Kidney Reservoir for some time before the date allowed in their water application. Legally, this water belonged to the Indian lands. The matter was resolved by U.S. Court Referee Borgquist who ruled that, "inasmuch as the season has been an unusual one and the normal summer flow of the streams had been in excess of the previous years, the Farnsworth were [sic] entitled to such excess, which had been impounded." Starting at that point, Farnsworth diverted water from Lake Fork and irrigated the farmland with its canals at Mountain Home and Purple Bench. Stockholders grew crops of wheat, oats, barley and potatoes on these lands, as well as alfalfa and native grasses for livestock feed.

Two years after completion of the last of the three high mountain dams by the Farnsworth Company, the Ashley National Forest granted a special use permit to the Dry Gulch Irrigation Company for the construction of a dam on the fourth natural lake in the Brown Duck Basin. Located at an elevation of 10,3440 feet, approximately 3-1/2 miles north of Brown Duck Lake, Clements Lake was the highest of the four bodies of water and was located closest to the headwaters of the watershed in the basin. The Forest Service permit in 1921 gave Dry Gulch permission to use about 81 acres of Clements Lake surface. Later that year, the company built a small log dam across the lake's natural outlet on its east side to prove up on the water.

In 1926, Dry Gulch employed engineer Louis Galloway to survey the dam site and blaze a pack trail from the trailhead at Moon Lake. Pete Wall, a local cowboy, packer and horse trader, assisted Galloway as rodman and guide. Like Farnsworth, the Dry Gulch Irrigation Company hired its own crew to build the Clements Lake Dam. Work commenced in 1926 with the breaching of the earlier log structure. The men then cemented a new headgate in place and packed clay around the outlet pipe. The Dry Gulch crew ranged from fifteen to twenty men, mostly young. They lived in canvas wall tents and ate in a cook shack on a table crudely made of logs. To build the dam, the men used the same construction methods as had the Farnsworth crew, blasting the rocks on the surface of the ground to break them up and scoop the earth fill below. A teamster leading a four-horse hitch pulled a fresno scraper to scrape the fill and deposit it onto the dam. A slush scraper - a large steel bucket with a bail on the side - was used for short distance hauling and finish grading.

The dam resembled the others in the basin in its earth-fill construction. It featured a steel headgate centered along its length, with the upstream slope covered with a single layer of flat stones and the downstream slope with stone riprap. With a crest length of 680 feet and a height of 13 feet, it was at once the longest and lowest of the Brown Duck Basin structures. The Clements Lake Dam substantially increased the surface area of the lake from 63.9 acres to 80.5 acres and its storage volume to an active capacity of 649 acre-feet.

The Lake Fork River's water supply in the summer of 1919 proved to be the lowest it had ever been. In previous years during the high-water season - which peaked about June 15 - the Lake Fork was a torrent, discharging thousands of cubic feet of water per second. The early runoff of the Lake Fork in the spring of 1919 was disappointing and the peak runoff was simply non-existent. Again, in 1920, the river's flow was meager. Faced with the prospect of another low-water season, the stockholders of the Farnsworth Canal and Reservoir Company approved the construction of Twin Pots Reservoir. The reservoir site, located on the west bank of the Lake Fork River about four miles downstream from Moon Lake at an elevation of 7,600 feet, was situated in a large grassy natural bowl. Farnsworth purchased the land for the reservoir from the U.S. Bureau of Indian Affairs, and the Utah State Engineer approved filings to store water in it. Farnsworth contracted with Auston G. Burton, a shareholder in the company, to engineer a dam which would impound water in the two natural depressions. Completed in 1921, the dam was financed by assessments charged against shareholders. It was constructed of dirt-fill with sorted rock.

Storage held in Twin Pots Reservoir augmented Farnsworth's low-water flow through the drought years of the early 1920s, but the dam failed in 1927. Fred

Lindsay recalls riding to the dam on horseback on the Sunday before Thanksgiving and observing that the impounded water was running over the lip of the dam. Twin Pots Dam burst on Thanksgiving Day.

Apparently, the dam failed because it lacked an impervious core. Like all such retention structures, Twin Pots raised the height of the water on the upstream side, creating a greater hydrostatic pressure above the dam than below it. The original earth-fill dam was porous, and, as a result of water pressure, some water was lost by seepage. The flow was strong enough to carry fine fill particles with it, making the dam a little more porous - and the water flow a bit faster - and in turn moving larger particles. This process, coupled with the increased pressure exerted by a larger than normal volume of reservoired water, allowed the water seepage to move rapidly enough through the dam to remove progressively larger soil particles, and the dam ultimately failed.

In the fall of 1930, Farnsworth secured a loan and began the reconstruction of Twin Pots under the supervision of Nile Hughel, civil engineer. Twin Pots Reservoir application (No. 8533), filed by the company in 1930 and approved by the state engineer, called for a dam with an eight-foot-wide center clay core wall, and a 36-inch concrete valve stem shaft. The dam's rock-faced slope was 2:1 on the lake front face and 4:1 on the downstream face. The men complet-ed construction of the dam in the fall of 1931. Total cost: about $40,000.

Like the dams built in the Brown Duck Basin, the reconstructed Twin Pots Dam is a typical example of a clay core/earth fill dam - one in which an almost watertight layer was created within the center of the massive dam. Using the prevailing engineering, workers excavated below grade at the dam location and dumped and compacted a clay core wide enough and tight enough to diminish water flow through the structure. The core was protected and held in place by tons of earth fill dumped on both upstream and downstream faces, which itself was protected from surface erosion by a facing of stone riprap. The underlying core was seldom totally impervious, but was sufficiently resistant to water flow to slow the water to a velocity that it no longer carried soil particles as it passed through the dam.

Twin Pots Reservoir is fed by the main canal of the company, and the value of the stored water is obtained by releasing the water from the reservoir into the Lake Fork River and taking lieu water through the Farnsworth Canal at a higher point on the stream. Twin Pots Reservoir materially improved the condition of farmers served by the Farnsworth Canal. According to Lindsay, "things got tough" after the first Twin Pots Dam failed in 1927:

> The drouth hit hard and we derived little from our high-water rights. We had to utilize crops for our own use and tighten our belts to make it through the winter. The population of Mountain Home was reduced to about 115 families.

Today, water stored in Twin Pots Reservoir supplements the company's secondary water rights and enables farmers under the Farnsworth Canal to raise more grain and hay for livestock, which includes dairy and beef cattle, sheep and hogs. Although some orchards were planted, they are currently not producing fruit. Still subject to minor seepage, the Twin Pots Dam remains in place in structurally sound condition.

Since the creation of the U.S. Forest Service in 1905, the agency's administrators employed the Sundry Civil Act of 1897, which referred specifically to the management and protection of timber and water resources as a justification for multiple-use forest policy.13 As water use was viewed as essential to successful agricultural production in the Uinta Basin, fair use and development of this community was considered a direct benefit in the public interest. The contemporary philosophy that reservoirs diminish public value of an existing lake and that the primary benefits are accrued by a small number of water users, was, at that time, given little consideration. Although American attitudes toward nature and wilderness were changing, the value of wilderness and the beauty of natural lakes were factors which carried little weight when measured against increased agricultural production and settlement of the region. Forest Service managers pursued this policy in issuing special use permits for the four reservoirs created in the Brown Duck Basin. They would follow the same course when another irrigation company requested permission to create reservoirs in the Swift Creek and Yellowstone River drainages further east.

During the 1910s and 1920s the Farmers Irrigation Company applied for storage rights to five natural lakes along the Swift Creek drainage, an east fork tributary of Yellowstone River. Compared with the Farnsworth Canal and Reservoir Company and the gargantuan Dry Gulch Irrigation Company, the Farmers Irrigation Company was a small concern, which irrigated a relatively small farm acreage. And unlike the reservoirs created by Farnsworth and Dry Gulch in the Brown Duck Basin, the lakes controlled by Farmers were marginal, containing as little as 77 acre-feet of active storage.

The Farmers Company created its first reservoir on Water Lily Lake. Located at the head of a small creek at an altitude of approximately 9600 feet, Water Lily

Lake was the lowest of the impounded lakes in the Swift Creek drainage. Its outlet tumbled down 1300 feet of descent to Swift Creek about one-half mile north of its confluence with the Yellowstone River. On January 25, 1918, the irrigation company filed for irrigation water storage rights totaling 723 acre-feet from Water Lily Lake. The permit was approved by the state engineer the following April, but the Forest Service had already granted a special use permit to construct the dam in November 1918. By 1920, the company had completed the small-scale dam over the outlet at the south point of the lake. Only 64 feet long and 10 feet high, the Water Lily Lake Dam featured typical earth-fill construction with stone riprapping on its upstream and downstream slopes. Fed by an extremely small drainage area, Water Lily was limited in its storage capacity and never contributed much to the company's low-water program.

On October 10, 1917, the representatives of the Farmers Irrigation Company applied for 803 acre-feet of water from Farmers Lake. The application was approved by the Utah State Engineer on April 3, 1919, but it was not until September that the Forest Service issued a special use permit to impound the water. The permit carried the standard stipulation that work on the impoundment structure be completed in one year. If the intended use for the water from the lake was typical, the method of impoundment employed by the irrigation company was not. Rather than build the standard earth-fill dam, Farmers drifted a tunnel through the rock of the terminal morain on the southeast corner of the lake. Approximately 300 feet long and three feet wide, the tunnel lowered the natural lake level by 12.5 feet. As per the permit, the shaft was completed in 1920.

On June 25, 1925, and September 4, 1926, the Forest Service issued special use permits to Farmers Irrigation Company for "constructing and maintaining a dam and storing water for Irrigation purposes" in Deer Lake and White Miller Lakes, respectively. These were the third and fourth lakes in the Swift Creek drainage to be reservoired by the Farmers Company. A small - approximately 8 acres - but relatively deep lake, Deer was limited in littoral area because of its narrow confines between two ridges. The lake received water from both White Miller and Farmers Lakes and acted as a regulating reservoir for the two other reservoirs. The 140-foot long, 18-foot high dam was an earth-fill structure, with stone riprap on both the sloped upstream and downstream faces. It was drained by a 30" diameter gated steel pipe, with a small timber weir for an overflow spillway. The dam on Deer Lake increased the surface area of the lake to 11 acres and the maximum active capacity to 249 acre-feet.

White Miller Lake was a small and shallow body of water which received its flow from Farmers Lake. The 105-foot long dam that the irrigation company built across the natural outlet on the south point of the lake was a rudimentary structure consisting of stacked fieldstones and sod, with a cribbed log outlet weir. Only three feet high, it was the least substantial among those in the Uinta Basin. The small dam increased the lake's surface area minimally and impounded only 77 acre-feet of water, with a maximum drawdown of 1.7 feet.

In addition to its Swift Creek holdings, the Farmers Irrigation Company actively pursued storage rights on the natural lakes of the Yellowstone River drainage, particularly on the Garfield Basin region, west of Yellowstone Creek. On July 21, 1926, the Forest Service granted special use permits to the irrigation company for both Bluebell and Drift lakes, two small moraine lakes at the base of 12,707-foot Stone Mountain. Farmers constructed a dam on Drift Lake in 1928 and one on Bluebell Lake in 1930.

On February 2, 1927, special use permits were issued to Farmers for the purpose of water storage on Superior and Five Point lakes. Located at an elevation of 11,160 feet, Superior was the higher of the two. It was composed of two shallow bodies of water in its natural state, with an outlet stream flowing east. The 235-foot earth-fill dam that the irrigation company built in 1930 effectively doubled the lake's surface area and diverted its outlet flow into Five Points Lake. On Five Point Lake, the company built two dams, a long V-shaped primary structure with a steel pipe outlet and a much smaller secondary dike, in 1929. The dams were typically earth fill, with sloped and riprapped faces. The overflow spillway was a natural rock saddle 300 feet south of the main outlet, with a concrete crest poured to minimize erosion. With a surface area of 82.6 acres, Five Point was the largest reservoir in the Yellowstone Basin, and with a total length of almost 1,000 feet, the two retention structures were the longest.

In marked contrast with the relatively well-organized and professionally staffed irrigation companies stood Chester Hartman. In August 1931, local farmers Chester Hartman, George Rogers and S. K. Daniels filed an application for a special use permit to store irrigation water on Milk Lake. An isolated body of water high on the Yellowstone River drainage, Milk Lake was situated in a glacial cirque on the west side of the divide that separates the Yellowstone from the Swift Creek drainage. Because it was located in the newly established High Uinta Primitive Area, the lake had not been surveyed by the Forest Service for reservoirs. The Forest Service initially withheld the permit. Undaunted, Hartman proceeded with construction of a dam, despite Forest Service warnings regarding the unauthorized use. Hartman's dam on Milk Lake differed from the engineered earth-fill structures built by the irrigation companies in the 1920s in that it was neither engineered nor earth-fill. Hartman's dam was a grouted masonry structure, 218 feet long and 12 feet high, with a sloped and riprapped downstream face and a gated steel pipe outlet. Situated picturesquely on the western tip of the lake at the base of a steep mountainside, it was perhaps the most visually striking of the Uinta Basin dams.

Chester Hartman finally received a special use permit to store water at Milk Lake on July 8, 1937, two years after he had completed his dam. The Forest Service issued a second permit on November 17, 1938. The Milk Lake dam began to leak in 1939 and burst in 1940. The breach repaired, Hartmann continued its use in subsequent years, while waging a continuing battle with forest service representatives over the following decades. The Milk Lake Dam stands today as a representative of the primitive dam builder's craft.

Addendum, Item 9: Major Bibliographic References (see also HAER Inventory Cards)

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Form No. 10-300a
(Rev. 10-74)

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NATIONAL PARK SERVICE

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8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE
__1600-1699	X ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN
__1700-1799	__ART	X ENGINEERING	__MUSIC	__THEATER
__1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION
X 1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)
		__INVENTION		

SPECIFIC DATES see HAER Inventory Cards   BUILDER/ARCHITECT see HAER Inventory Cards

STATEMENT OF SIGNIFICANCE

Water storage and handling technology in the early 1900s in Utah and the West ranged from the ingenious and sophisticated, as evidenced by the Mountain Dell Dam, to the primitive, as evidenced by the numerous hand-built irrigation ditches and control structures. As relatively simple structures, built for the most part with natural materials using labor-intensive and unsophisticated construction techniques, the three dams and one tunnel in the Upalco Unit tend more toward the latter than the former. Earth and stone dams in the West are believed to have been first built during the 1849 California Gold Rush. They were commonly constructed throughout the region from the late 1800s until the 1930s. Though technologically rudimentary, the Upalco Unit dams neverthelesss exemplify the two most common types of small-scale dam construction used at remote locations in the West: the rubble masonry dam and the earth-fill dam. Although other rubbble masonry dams appear in the Uinta Mountains (see Item 7 for list), the Milk Lake Dam is the only one of its type in this administrative unit. Similarly, the Farmers Lake Tunnel is the only example in the Unit of a less common method of tapping a water storage source: digging a tunnel to lower the level of an existing lake. As such, the four structures selected from the Upalco group embody the distinctive characteristics of these types, period and methods of construction and qualify as eligible for the National Register under Criterion C.

Though all are technologically representative and eligible under Criterion C, two of the Upalco Unit retention structures selected for this Determination of Eligibility are significant as well for their representation of an historical theme crucial to western development: water storage and distribution. From the earliest settlement to the present, water has been priceless in the arid West. To the settlers and church leaders in the Provo Basin, it was crucial for successful cultivation of crops and therefore for settlement itself. The irrigation systems in the basin grew organically in response to farmers' needs, eventually intertwining the farms and communities. The last aspect of water flow to be controlled by the irrigators, these dams and tunnel marked the culmination of early water husbandry in the basin.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

See Addendum, Item 9

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY less than 1

UTM REFERENCES multiple resources (see HAER Inventory Cards)

	ZONE	EASTING	NORTHING		ZONE	EASTING	NORTHING
A				B			
C				D			

VERBAL BOUNDARY DESCRIPTION

This nomination consists of a series of noncontiguous sites, each covering less than one acre. The boundary for each dam site is defined as the dam and outlet spillway only, both above and below the water line. The boundary for the tunnel site is defined as the underground tunnel only, including both inlet and outlet portals.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

(none)

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE

Clayton B. Fraser, Principal

ORGANIZATION: Fraserdesign

DATE: 12 February 1986

STREET & NUMBER: 1269 Cleveland Avenue

TELEPHONE: 303-669-7969

CITY OR TOWN: Loveland

STATE: Colorado 80537

12 CERTIFICATION OF NOMINATION

STATE HISTORIC PRESERVATION OFFICER RECOMMENDATION

YES____ NO____ NONE____

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

In compliance with Executive Order 11593, I hereby nominate this property to the National Register, certifying that the State Historic Preservation Officer has been allowed 90 days in which to present the nomination to the State Review Board and to evaluate its significance. The evaluated level of significance is ____National ____State __X__Local.

FEDERAL REPRESENTATIVE SIGNATURE

TITLE DATE

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST: DATE

KEEPER OF THE NATIONAL REGISTER