Ice Harbor

Ice Harbor

A MASTER PLAN FOR THE MANAGEMENT OF ALL NATURAL and MANMADE RESOURCES OF ICE HARBOR LOCK and DAM

U.S. ARMY CORPS OF ENGINEERS
Walla Walla District April 1977

8 June 1976

REAL ESTATE DIVISION VALIDATION

The updated Ice Harbor Master Plan has been coordinated with this office.

HAROLD BUERSTATTE
Chief, Real Estate Division

8 June 1976

ENGINEERING DIVISION VALIDATION

The updated Ice Harbor Master Plan has been coordinated with this office.

W. E. SIVLEY
Chief, Engineering Division

16 June 1976

OPERATIONS DIVISION VALIDATION

The updated Ice Harbor Master Plan has been coordinated with this office.

for DUANE M. DOWNING
Chief, Operations Division

SUMMARY

This master plan has been prepared to serve as a guide for development and management of the Ice Harbor Lock and Dam Project, Lake Sacajawea. It cites the laws authorizing and governing development and management of the natural and man-made project resources - recreational, fish and wildlife, industrial, and other. It describes the physical characteristics of the dam, the reservoir, and other project features. It enumerates the various factors which influence or constrain resource development and management. It summarizes the rather extensive and long continuing dialogue and coordination with other governmental agencies and interests.

Section 8 delineates the criteria used for allocation of project lands to the various categories of land use. The basic categories follow those set out in ER 1120-2-400. Extensions and modifications are included to fit the specific needs and situations of Lake Sacajawea.

In Section 9, the development program is described. It deals largely with recreational development. Specifics on wildlife development are presented in Section 15 and in the recently completed Wildlife Habitat Development Design Memorandum.

In Section 10, design criteria are discussed. Some special problems are noted in Section 11. Resource management problems to be addressed in detail in master plan appendices are treated briefly in Sections 12 through 16. Section 17 tabulates estimated development costs.

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1 INTRODUCTION

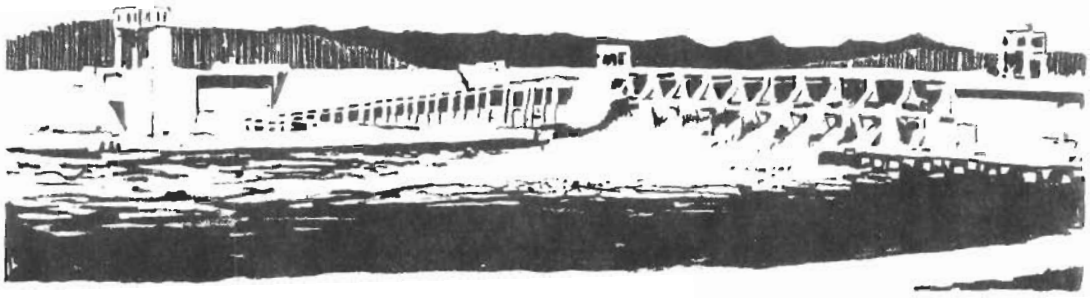
INTRODUCTION

1.01. PROJECT AUTHORIZATION

Construction began on Ice Harbor Lock and Dam in December, 1955, as a result of Congressional action which began as early as 1902 when Congress proposed Snake River improvements. Other actions, notably in 1910 and 1935, led to the River and Harbor Act of 1945. This act authorized construction of a series of dams on the Snake River upstream from the confluence with the Columbia River and downstream from Lewiston, Idaho. House Document 531, Eighty-First Congress, Second Session, dated 20 March 1950, proposed four dams on this stretch of the river, with Ice Harbor as the first or most downstream of the four. The updated master plan follows the requirements prescribed in ER 1120-2-400. A more detailed legislative history is furnished as Item No. 1 of "Supporting Data".

1.02. PROJECT PURPOSES

The purpose of the Ice Harbor Project, as originally authorized, was to improve navigation, irrigation, and power production on the Snake River. Ice Harbor Reservoir provides slackwater navigation to Lower Monumental Lock and Dam, the next authorized upstream unit. This slackwater navigation route facilitates the movement of the large tonnages of wheat grown in the region. The



impounded water also has provided improved irrigation and hydroelectric power. The project also includes incidental recreational, wildlife, and flood control purposes.

1.03. PURPOSE OF MASTER PLAN

ER 1120-2-400, Change 3, states that District Engineers are responsible for scheduling, reevaluation, and updating of master plans for completed projects. Division Engineers approve District updating schedules. In keeping with that schedule, this updated master plan is meant to review all aspects of the Ice Harbor Design

Memorandum No. 25B. The updated master plan also takes into account the changes that have occurred since the plan was developed and approved, reflecting any changes in the number of users, preferred activities, facilities, access routes, and needs not anticipated in the previous plan. This reevaluation and updating provides an opportunity to make adjustments in the plan of development to meet present and currently projected needs. Primary objectives are to assure preservation of the scenic, biological, and recreational resources of the project for maximum public benefit while maintaining maximum operational functions. The updated plan is intended to be flexible to allow for future adjustments to meet changing conditions.

1.04. PRIOR DESIGN MEMORANDA

A list of all design memoranda is provided by Item No. 2 in "Supporting Data".

1.05. LAWS APPLICABLE TO RESOURCE DEVELOPMENT AND MANAGEMENT

a. Public Law 534, Seventy-Eighth Congress, Enacted 22 December 1944

Section 4 of this law, the 1944 Flood Control Act, as amended in 1946 and 1954 and by Section 207 of the 1962 Flood Control Act (Public Law 87-874), sets forth the basic departmental authority for the administration and development of project land and water access.

b. Public Law 85-624, Enacted 12 August 1958

The terms of this law, the 1958 Fish and Wildlife Coordination Act, apply to the construction and development of the Ice Harbor Project. Under the guidance of this law, the various proposals and concepts set forth in this plan have been and will continue to be coordinated with fish and wildlife agencies.

c. Public Law 89-72, Enacted 9 July 1965

This is the Federal Water Projects Recreation Act. Though its terms and provisions are not applicable to any of the initial development or related administration of recreational and fish and wildlife resources of Ice Harbor, the policies which do govern future recreation development as set forth in Appendix I, ER 1120-2-404, are derived from provisions of this public law.

d. Public Law 93-205, Enacted 28 December 1973

This law is also cited as the Endangered Species Act of 1973. This law repeals the Endangered Species Act of 1969. It is applicable to the protection and management of any endangered species

of fish, wildlife, or plant in the project area. Proposed development in the updated master plan allows for the protection of threatened species and species having a wide range of influence, such as migratory waterfowl and fish.

e. Public Law 91-190, Enacted January 1970

This is the National Environmental Policy Act of 1969 (83 Stat. 852).It defined a national policy for protection and enhancement of the environment, established a Council on Environmental Quality, and set forth the requirement for an environmental impact statement on any Federal action significantly affecting the environment.

f. Public Law 89-665, Enacted in 1966

The National Historic Preservation Act of 1966 declared that the historical and cultural foundations of the nation should be preserved as a living past of our community life and development. It provides for Federal assistance to state and local governments, private organizations, and individuals in historic preservation.

g. Public Law 59-209, Enacted June 1906

Public Law 59-209, the Antiquities Act of 1906 (34 Stat. 225), 8 June 1906, provided for the preservation and protection of antiquities on public lands, including archeological remains and historic sites.

h. Executive Order 11593

Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971 (36-F.R.8921, 15 May 1971) directs Federal agencies to institute procedures to protect and enhance both Federal and non-Federal properties of cultural significance. Agencies are directed to inventory their lands and nominate worthy items for inclusion to the National Register. It protects such lands from being sold, demolished, or altered until proper review for cultural significance.

i. Public Law 93-291, Preservation of Historical and Archeological Data, Enacted 24 May 1974

Under the provisions of this law, the Corps can contract with outside experts for inventories and recovery of the historic and cultural aspects of areas of authorized projects. Corps' funds may be used for this work, or the funds may be transferred to the National Park Service for archeological and survey activities.

j. EC 1105-2-37, Identification and Administration of Cultural Resources: Proposed Regulation

Supersedes ER 1105-241 and ER 1105-2-12. This proposed regulation outlines the responsibilities of the District in implementing the cultural resource program. The regulation also indicates proper coordination procedures with other agencies.

1.06. SCOPE OF UPDATED MASTER PLAN

In reevaluating and updating the original master plan, the review attempts to consider all aspects of conservation,development,management, and the use of the natural and man-made resources offered by the project. Careful attention is paid to the interrelationships of these separate concerns in order to assess past, present, and future projected development and use of Ice Harbor water and land. Both qualitative and quantitative considerations of the various resources of Ice Harbor underlie the field and office studies leading to this updated master plan. These studies include numerous on-site field examinations of the project lands; careful analysis of topographic maps, aerial photographs, hydrologic, climatic, and other engineering data; the screening of economic, demographic, sociological, and other statistical data; and continued consideration of the desires of local interests and other governmental agencies.

PROJECT DESCRIPTION 2

PROJECT DESCRIPTION

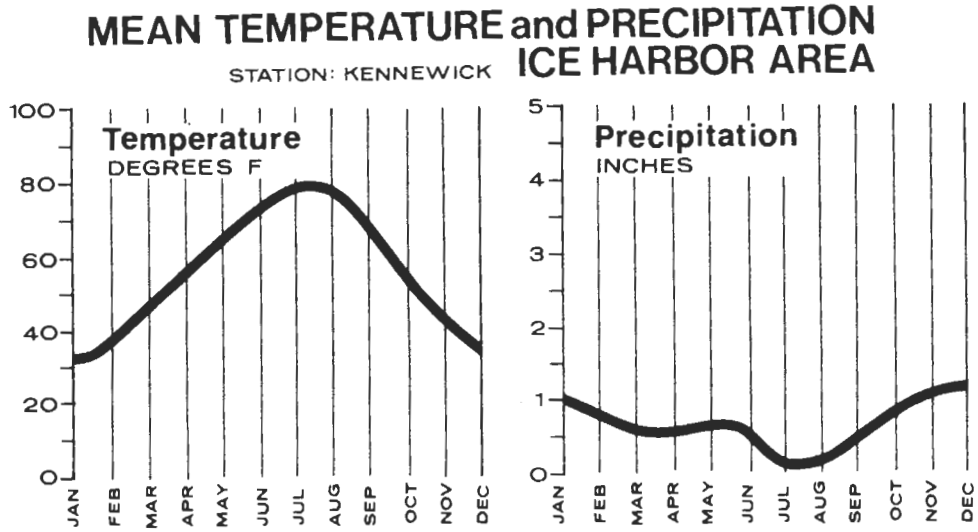
2.01. PROJECT LOCATION

Ice Harbor Lock and Dam and Lake Sacajawea are located on the Lower Snake River in Walla Walla and Franklin Counties, near the confluence of the Snake and Columbia Rivers in southeastern Washington. The dam is 9.7 miles above the mouth of the Snake River, which enters the Columbia River at River Mile 324. Lake Sacajawea is the downstream unit of a series of four impoundments authorized for the development of slackwater navigation on the Lower Snake River, extending from the head of Lake Wallula to the vicinity of Lewiston, Idaho. Construction of Ice Harbor Lock and Dam was initiated in December 1955. The initial impoundment occurred in two stages; to elevation 400 during November 1961, and to full pool, elevation 440, on 27 April 1962. The pool extends upstream approximately 32 miles to Lower Monumental Lock and Dam.

2.02. PROJECT DATA

a. Basin Hydrologic and Climatic Summary

The climate of the Lake Sacajawea area is arid. Precipitation averages 10 inches or less annually, with much of it occurring as light, intermittent rains and cold drizzles during winter and spring. During these seasons, extended periods of cloudiness are common, but effective precipitation is barely adequate for dryland wheat production.Infrequent shower activity and a few regional storm systems also occur during the remainder of the year, but severe storms with heavy precipitation are rare.



Summers are generally very dry with abundant sunshine and maximum temperatures averaging near 90° F. There are days with temperatures in excess of 100°, but the low summer humidity reduces the impact from the heat.

Winter temperatures are relatively mild for the latitude with January minimum temperatures averaging near 30° F. Extended cold spells of a week or more and temperatures below 0° F are uncommon, although rather large diurnal temperature changes do occasionally plunge the mercury well below freezing overnight. Snowfall is infrequent and is usually light, with accumulations rarely lingering for more than a few days except in drifts.

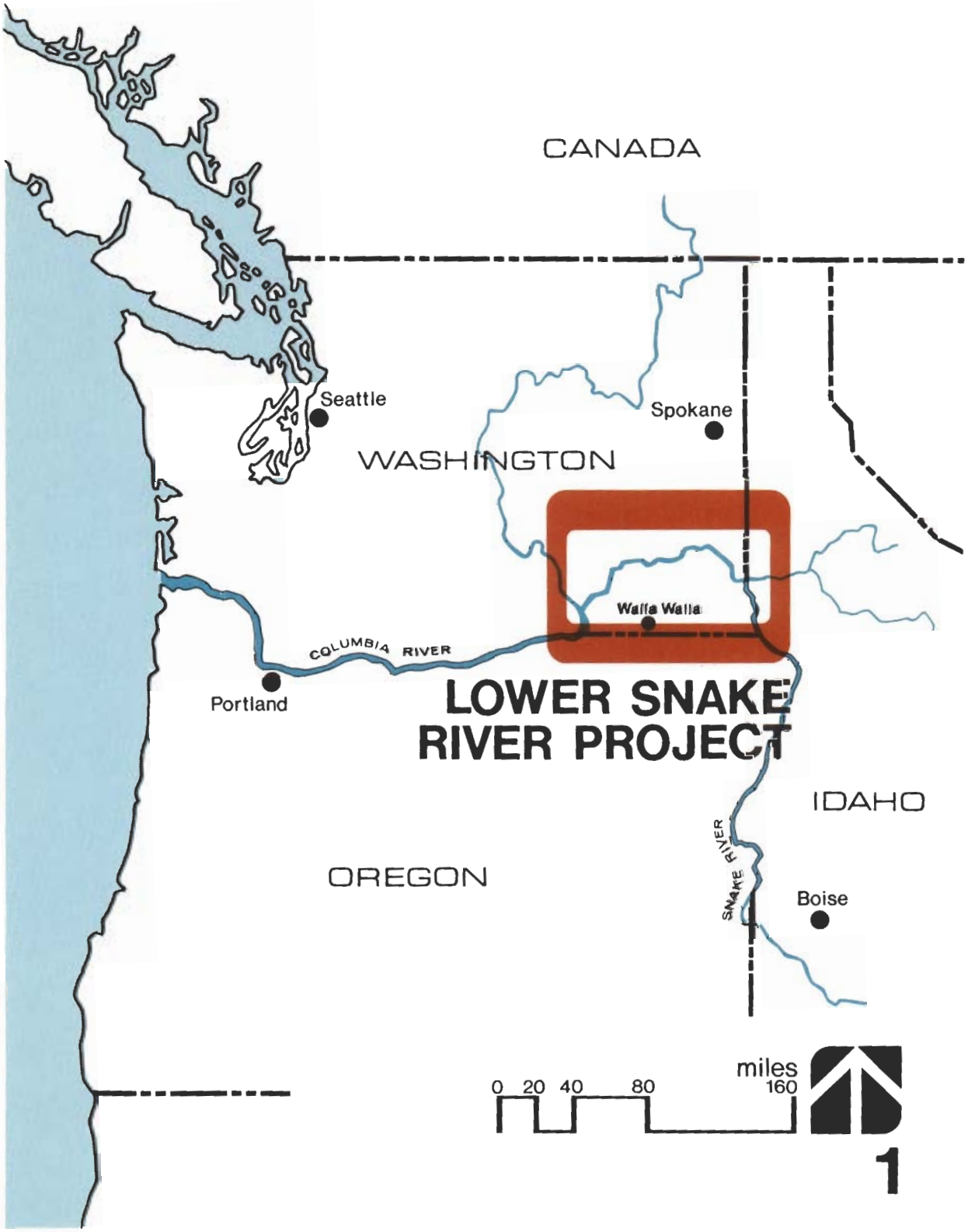
Winds averaging less than 10 m.p.h. usually occur in the area, with a prevailing direction from the southwest. Blowing dust is not unusual,although sustained wind velocities rarely exceed 30 m.p.h. However, dust storms of severe proportions have occurred on the open plateau, and gusty, shifting winds occasionally arise, particularly within the confines of the gorge. Such winds occur most frequently in spring.

b. The Reservoir and Its Shoreline

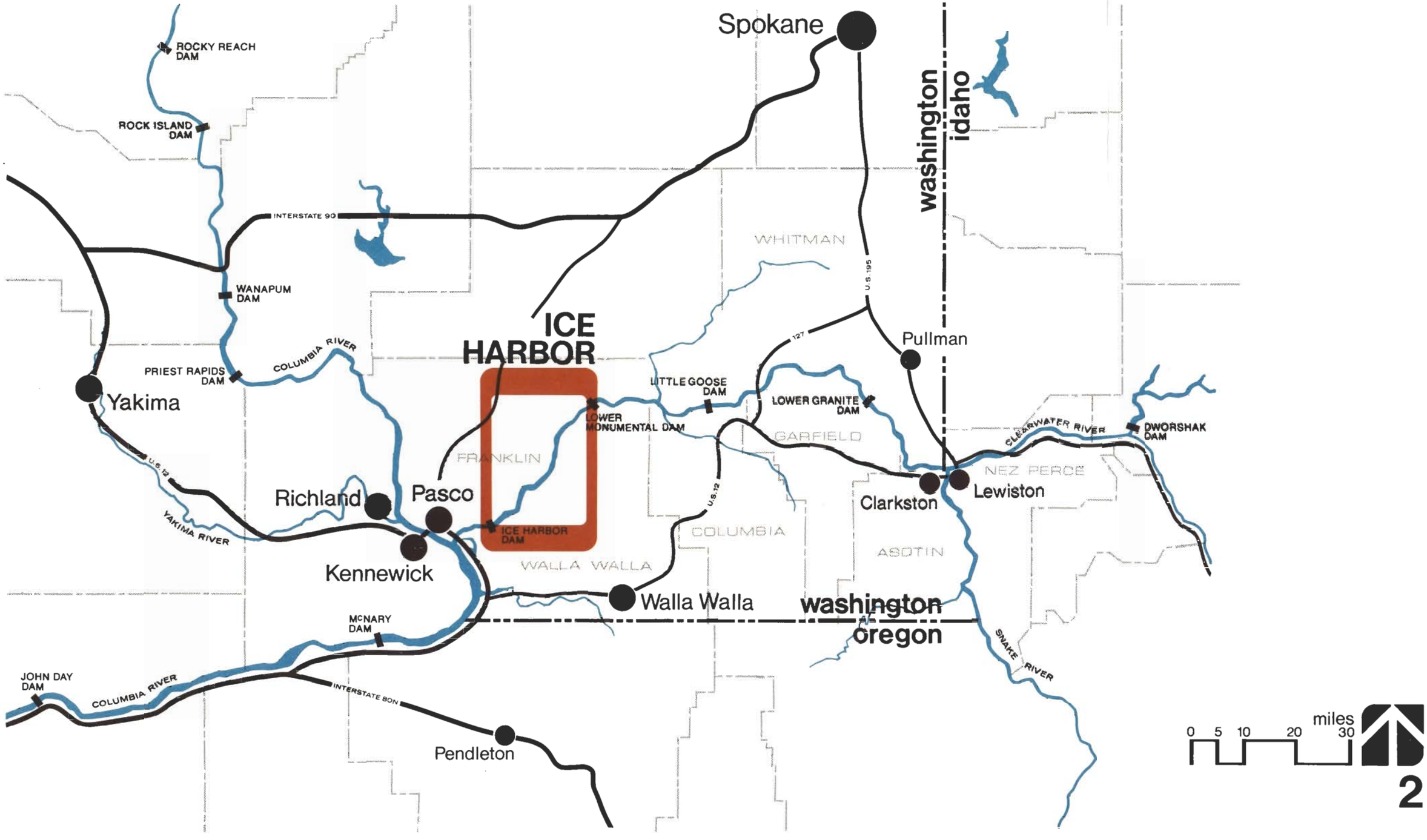
Cliffs and rounded basalt bluffs predominate along the 32-mile length of Lake Sacajawea. These high, rugged features are created by the downcutting action of the Snake River through the layers of basalts and other lava-derived materials that underlie the Columbia Plateau. Thus,the reservoir lies at the bottom of

a gorge entrenched within the grain fields and dryland pasture of the plateau uplands. Because of the angularity of much of the shoreline terrain, the main line railroads follow closely along the

Ice Harbor
REGIONAL MAP



Ice Harbor
LOCATION MAP



LOWER SNAKE RIVER PROJECT

length of both shores. As the shoreline progresses downstream, the gorge loses some of the abruptness that characterizes the upper reaches of the reservoir. Though the topography does flatten somewhat near Ice Harbor Dam, it never fully opens onto the rolling, loess-covered "Palouse Hills" topography. Numerous steep angular side canyons or coulees intersect the gorge, and some of the alluvial deposits or deltas associated with them extend into and along the gorge above the level of the reservoir. The stark quality of this steep, often rugged terrain is visually softened with an interspersing of dryland grass between the cliffs and talus slopes of black basalt. The subirrigated areas within the gorge support small patches of riparian vegetation.

c. Project Structures

The principal structures associated with the Ice Harbor Project are the dam and its immediate appurtenances. The dam is a straight-line, concrete-gravity structure. The various features of the dam starting at the left bank include the following: a concrete gravity non-overflow section with south shore fish passage facilities; a six-unit,671-foot-long powerhouse; a ten-bay spillway section; a concrete-gravity non-overflow section, North Shore fish passage facilities, 86-foot by 675-foot navigation lock, and earth fill abutment section. The overall length of the dam is 2,822 feet and the effective height is 100 feet. Other pertinent data on the dam are presented in Item No. 3 of "Supporting Data." An illustration of the layout of the dam is presented in Section 9.

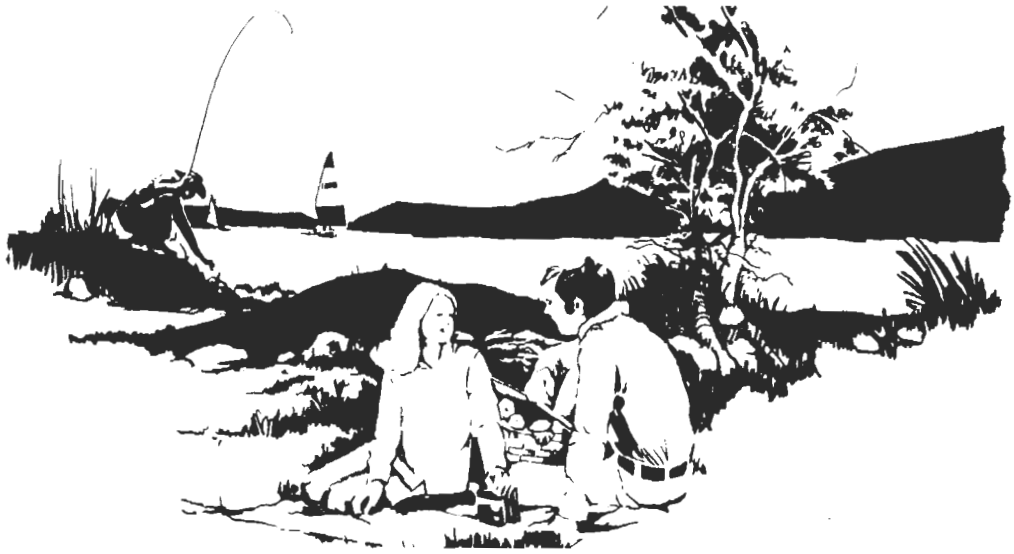
2.03. RESERVOIR OPERATION

The Ice Harbor Project is operated to provide optimum navigational and power generating conditions without creating unnecessary detriment to other project uses such as fish and wildlife management and recreation. The pool level elevation at the dam is normally held between 437 and 440 msl. Daily and weekly fluctuations occur for operation in accordance with power demands. A maximum drawdown of three feet to elevation 437 msl has been provided for. The more constant pool levels during the summer months favor general public use, though the maximum drawdown of three feet has had, in most cases, little adverse effect on public use facilities. The backwater effect of higher river flows results in some significant fluctuation in pool levels in the upper reservoir. A flow of 165,000 cfs when the pool elevation at the dam is 440 can cause backwater elevations at Snake River Junction,Walker, Windust, and Matthews of 440.4, 440.5, 441.8, and 442.5 feet, respectively.

2.04. VISITOR USE

Estimates of visitor use have been made and are discussed in Item No. 6 of "Supporting Data".

Total potential recreation demand on Lake Sacajawea was projected from base data obtained from a study sponsored by the Pacific Northwest River Basins Commission (PNRBC). Although sponsored by the PNRBC, the initial program development work was accomplished by the Bureau of Outdoor Recreation, Washington Interagency Committee for Outdoor Recreation, Washington State Department of Ecology, Idaho Department of Parks and Recreation, U. S. Forest Service, and U.S. Economic Research Service, with staff liaison from the PNRBC.



Many factors, such as population projections, leisure time,family income, and mobility were used in the study to determine visitor use projections for the 144 planning areas included in the study.A gravity model was used to distribute recreation trips from the production areas (visitors' place of residence) to the attraction area(the site where the recreation experience occurs). The results of the study were tabulated on approximately 1,600 pages of computer printouts which projected the annual occasions for the years 1980, 2000,and 2020.An occasion is defined as the participation in any single activity by one individual. One person may very likely participate in several recreation occasions during one visit to a park. By comparing the recreation occasions projected by the commission study with the actual visitation data from Ice Harbor, a projection was made for the number of occasions which will occur at Ice Harbor during the year 1985. The distribution of the estimated

annual occasions was based on actual visitation data supplied by the project office. It is recognized that these figures are not exact, but they do provide an indication of the present level of visitation and the activities people are engaging in while at the Ice Harbor parks.

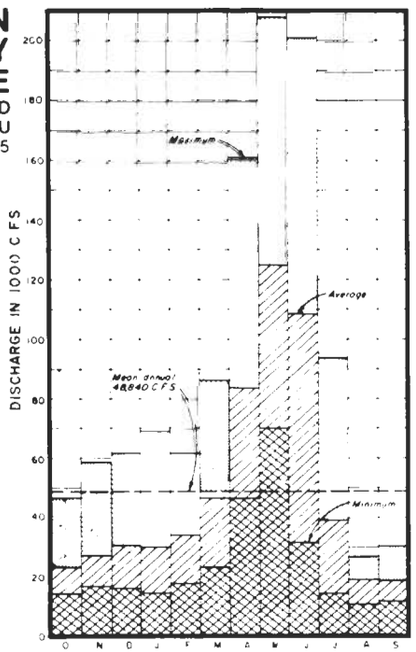
The following table illustrates the projected number of recreational occasions per type of activity in 1985:

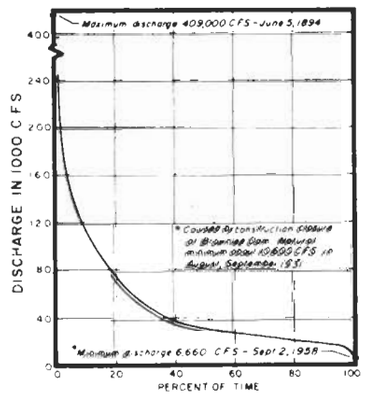
RECREATIONAL OCCASIONS BY ACTIVITY - 1985

Activity	Occasions
Camping	16,881
Picnicking	114,588
Boating	48,596
Fishing	41,435
Hunting	1,535
Sightseeing	162,670
Water Skiing	27,623
Swimming	84,404
Other	13,812
Total	511,541

MEAN MONTHLY DISCHARGE

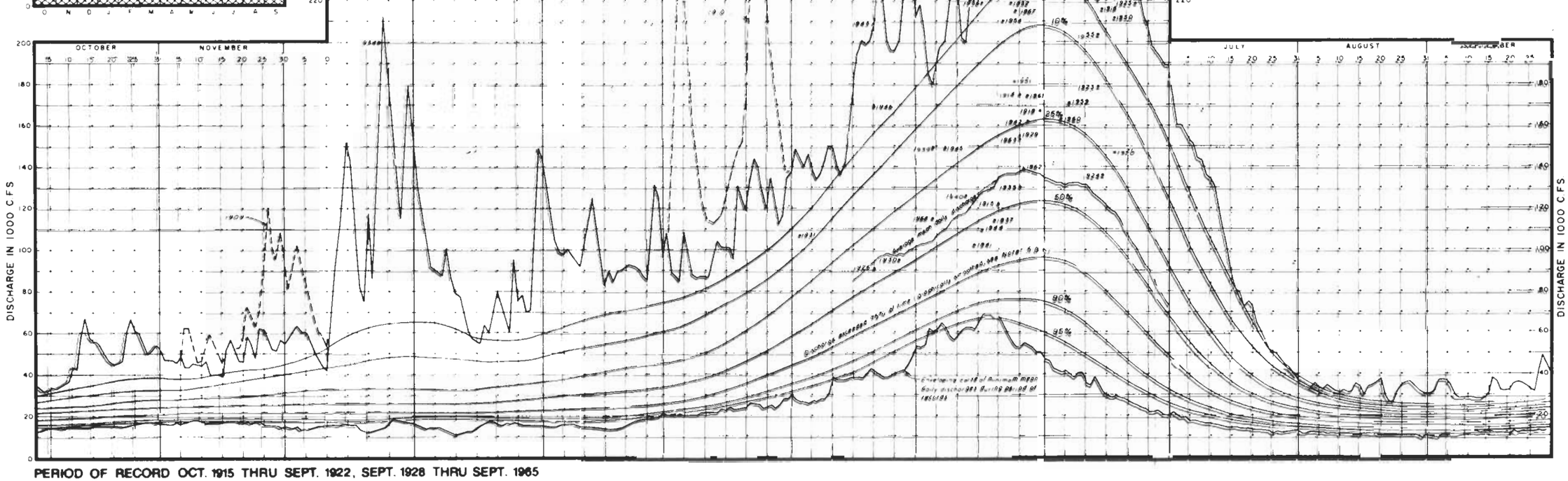
PERIOD OF RECORD
OCT. 1915 THRU
SEPT. 1965





FLOW DURATION CURVE

PERIOD OF RECORD
OCT. 1915 THRU SEPT. 1922,
SEPT. 1928 THRU SEPT. 1965



PERIOD OF RECORD OCT. 1915 THRU SEPT. 1922, SEPT. 1928 THRU SEPT. 1965

NOTES

1. RECORDS USED:
   1916 to 1922 incl. and 1929 to 1938 incl. = RECORDED discharges at Ripariа, Washington. Drainage area = 104,000 sq. mi.
   1938 to 1965 incl. = RECORDED discharges at Clarkston, Washington. Drainage area = 103,200 sq. mi.
   Discharge records used are from data published by U.S.G.S.

2. Discharge records at Clarkston and Ripariа have been considered comparable and have been used without corrections for incidental inflow between these stations.

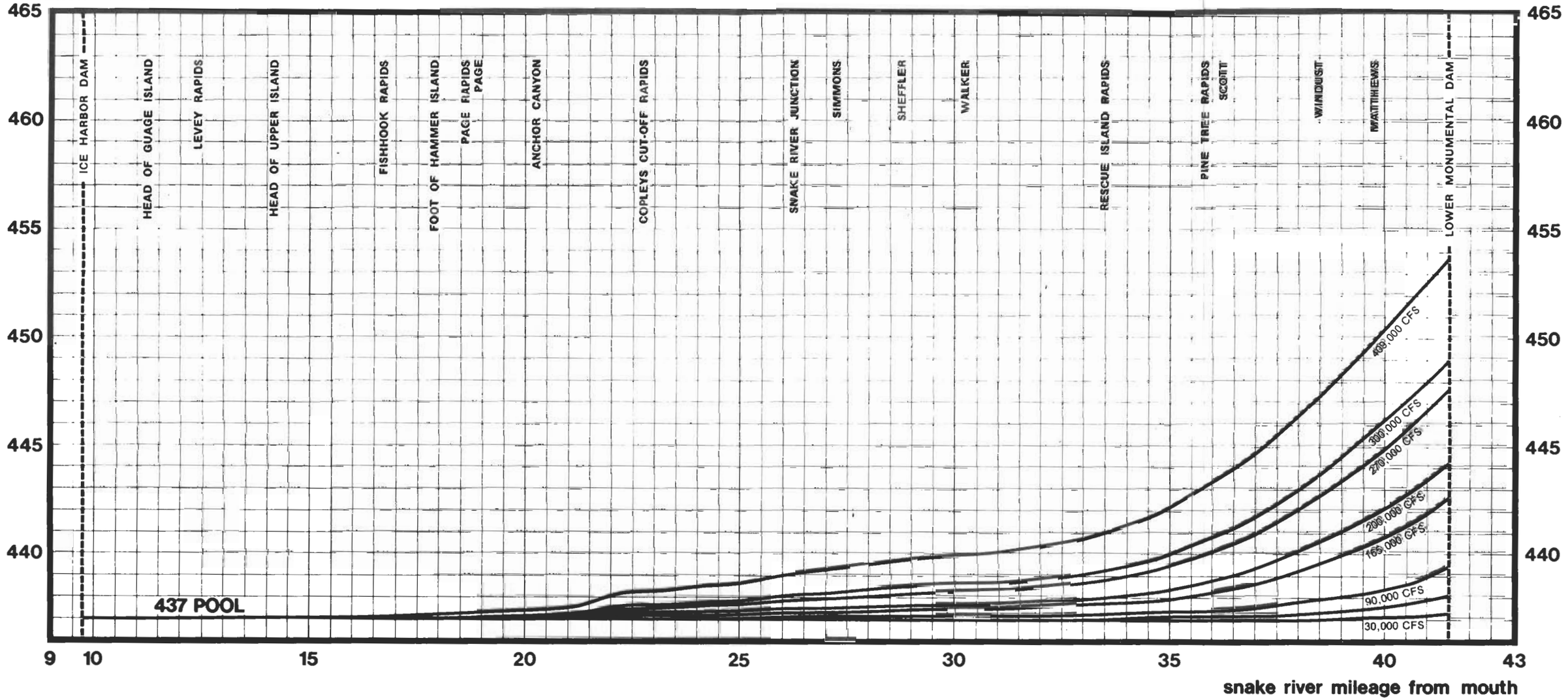
3. The maximum known stage occurred June 5, 1894. Gage height from flood mark, 24.7 feet at Ripariа. Estimated discharge, 409,000 C.F.S.

4. Discharges used are those observed at the time and reflect varying effects of progressive irrigation and reservoir storage development.

5. A point on an exceedence curve represents the discharge which has been exceeded the given percentage of time in a 30-day period centered on the point (date) of interest.

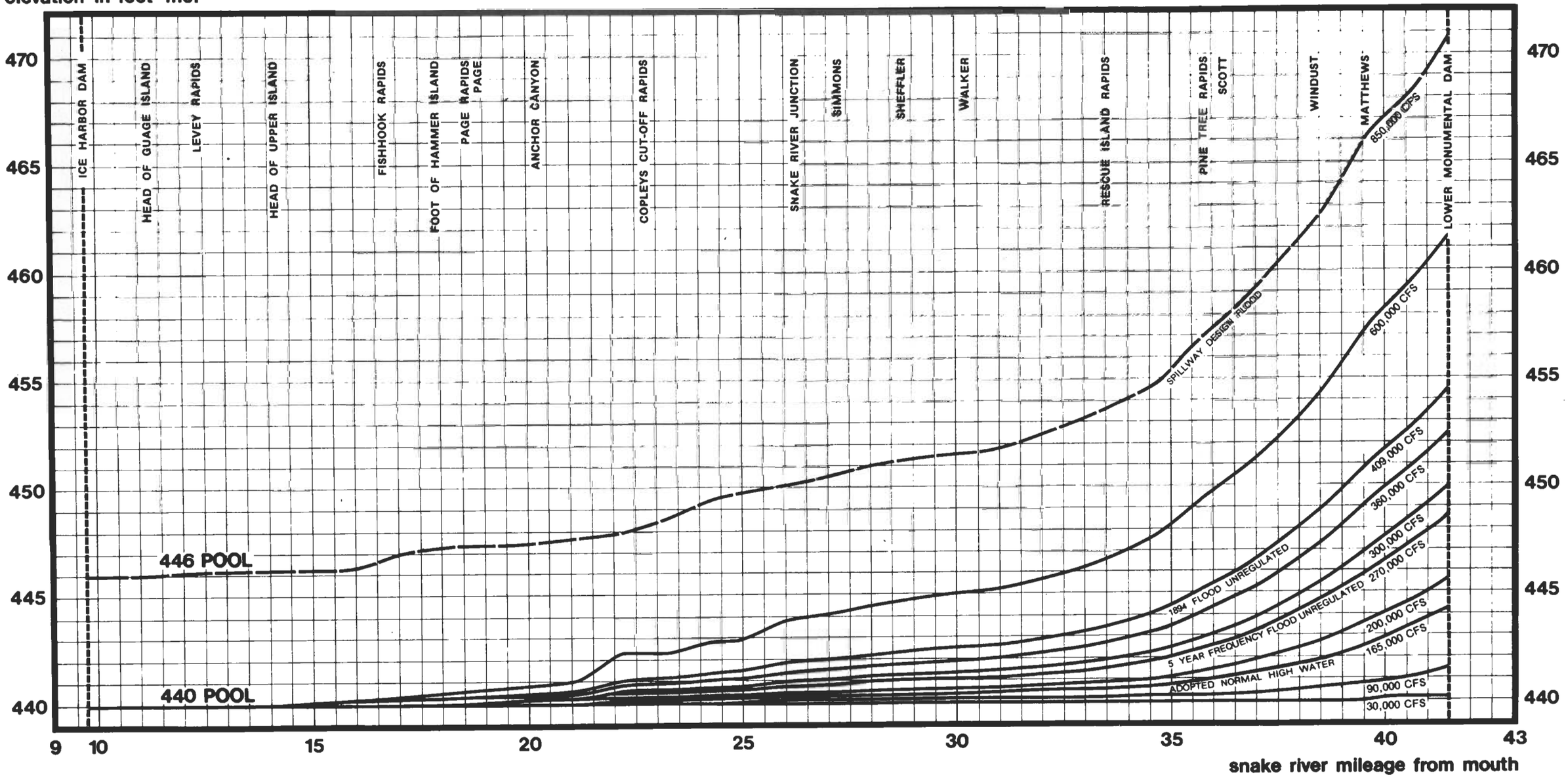
6. The relationships between discharge and percent of time exceeded were computed from 10-day periods (1-10, 11-20, 21-end of month). Exceedence lines were smoothed by computing 30-day moving means plotted on midpoint of 30-day period. Plotting dates were the 5th, 15th and 25th of each month. From 15 May to 15 June 10 30-day moving means were computed from 2-day periods instead of 10-day periods.

Ice Harbor
SUMMARY HYDROGRAPHS



Ice Harbor
BACKWATER PROFILES

elevation in feet msl



Ice Harbor
BACKWATER PROFILES

OPERATING PROJECTS

STATUS OF OPERATING PROJECTS

3.01. PROJECT DEVELOPMENT AND OPERATION CHRONOLOGY

Under the authorizations cited in Section 1, construction of Ice Harbor Lock and Dam and Lake Sacajawea, the first in a series of four impoundments on Lower Snake River, was initiated in 1955. Reservoir impoundment and first power on the line came in 1962. Basic facilities at the dam are the powerhouse, navigation lock, multi-gated spillway, and two fish ladders. Initial development of three major recreation areas and minor development at two launching ramp sites were accomplished principally in two phases - one in 1962 and one in 1964. Further improvement at these sites and early-phase development of Charbonneau were accomplished in subsequent years; principally in 1973 and 1974. Development and operation of grain terminal facilities on the reservoir have been undertaken by local port authorities.

3.02. EXPENDITURES

a. Federal

Of a total of $129,600,000, exclusive of O and M funds, authorized for the Ice Harbor Project, 100 percent has been spent on construction and development as of 1 October 1974. This amount does not include interest during construction.

A total of $748,937.52 in general construction funds has been spent on recreation construction since 1961. Initial development at Fishook and Windust began in 1962 with an expenditure of $94,242. Levey Landing was also begun in 1962 with an expenditure of $124,870. Additional development at Fishhook and Windust in 1964-65 totaled $185,611. Also in 1964-64, $289,656 was spent for construction of the Indian Memorial and visitor facilities at the dam.

A total of $270,150 of 710 and 711 funds has been spent since 1966 for recreation area construction under the old 710 program where a local sponsor was not required for cost sharing. The most notable of these projects is Charbonneau Park. In 1972, $71,711 of 710 funds was used for initial construction of the park. In 1974, $190,334 was used for improvements at Charbonneau. In 1975, primitive camping areas were provided at Levey and Charbonneau.

Initial construction of Ice Harbor Lock and Dam included fish ladders and related facilities at a cost of $13,472,000, navigation lock and accessories at a cost of $29,073,000, and generating units 1 through 3 and powerhouse at a cost of $43,386,000.

Three additional generating turbines have been installed for a cost of $7,538,608. Ice Harbor is the first dam on the Snake River to receive a full complement of six generating turbines. The construction was completed in January of 1976.

$1,657,103 has been spent since 1963 for recreation and other shoreland operation and maintenance of the Ice Harbor project. This cost includes boundary monumentation and trespass notices at recreation areas, wildlife control,health and safety hazard control, and pest control.

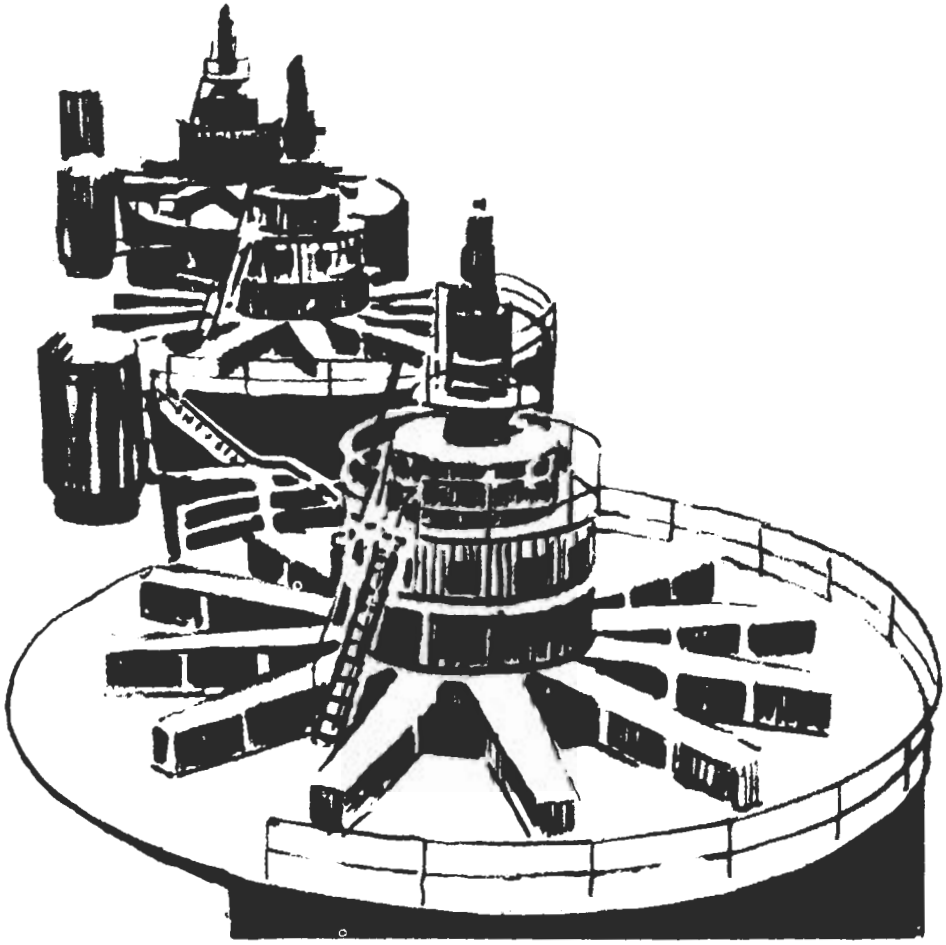
b. Non-Federal Public

There have been no non-Federal expenditures for recreation on the Ice Harbor project. All recreation development has been done by the U. S. Army Corps of Engineers.

The only non-Federal expenditures on the Ice Harbor project have been by local port authorities who have developed and are operating grain terminal facilities at Sheffler and Windust.

CONSTRUCTION PROJECTS 4

STATUS OF CONSTRUCTION PROJECTS



4.01. GENERAL

Ice Harbor Lock and Dam project is not in a construction status; however, there are two recently completed additions which should be mentioned.

4.02. POWERHOUSE PROJECT

Under authority of Public Law 91-439, approved in 1970, construction was started in February 1973 on three additional generators. Unit number 4 was completed and was put on the line on 26 November 1975, number 5 on 18 November, and number 6 was completed 7 January 1976.

4.03. RECREATION DEVELOPMENT

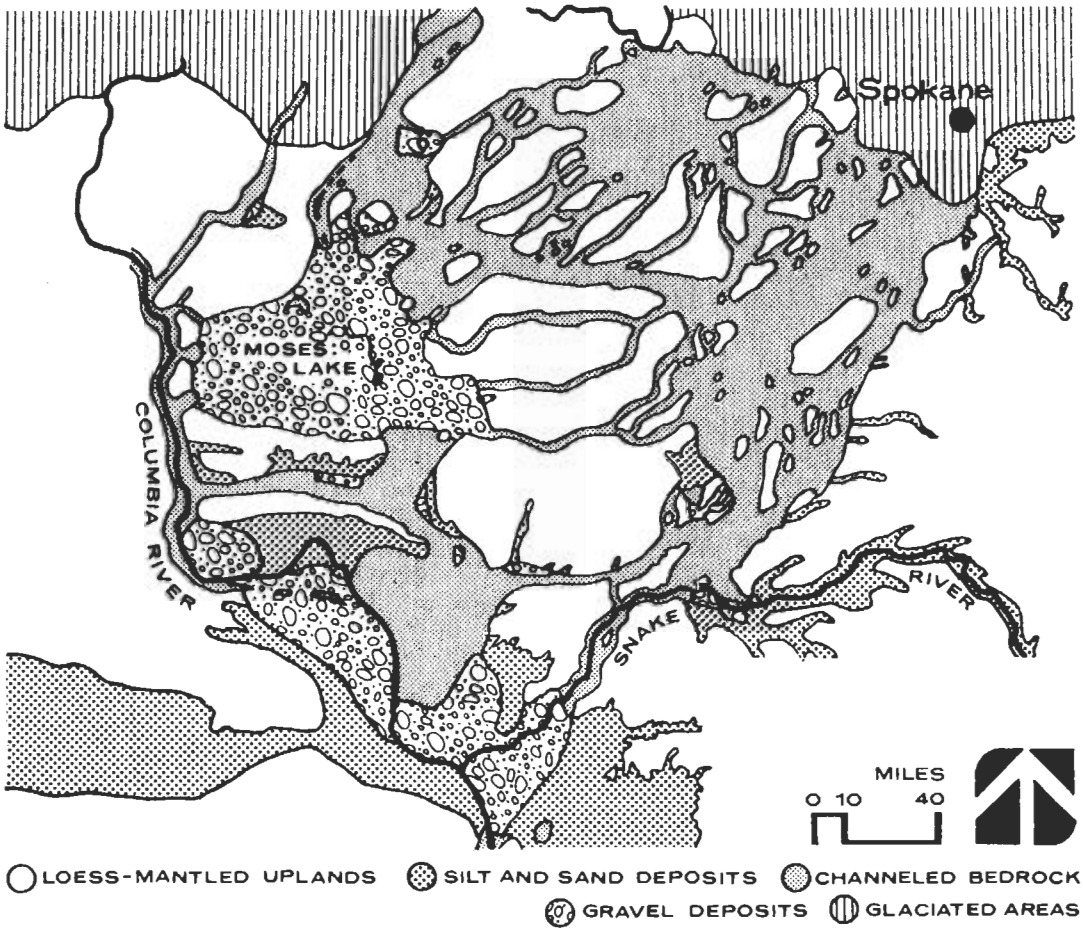
Development of sanitary facilities at the Charbonneau area with Code 710 funds is proceeding. Development of camping and other later phases of this unit is treated in Section 9.

RESOURCES 5

RECREATIONAL and ENVIRONMENTAL RESOURCES OF THE PROJECT AREA

5.01. GEOLOGIC RESOURCES

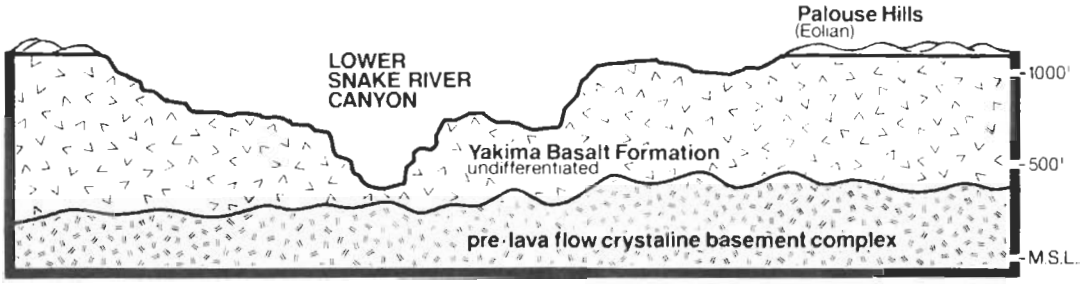
The rocks within the study area are entirely derived from extruded lavas of middle to late Tertiary Age, collectively called the Columbia River Basalts. Thin, irregular sedimentary strata and paleosols occur infrequently between flows. The more resistant flows form the angular, vertically fronted succession of terraces that are conspicuous throughout the Lower Snake River gorge. Steeply sloping colluvium, in a few places broken out to form scree, is often found between flows. Where the reservoir level has coincided with colluvial slopes, mass wasting or slumping resulting from beach erosion and water saturation has occurred and may be expected to continue if equilibrium is not established or maintained.



SCABLAND AREA OF EASTERN WASHINGTON

GEOLOGIC CROSS SECTION

SNAKE RIVER CANYON...RIVER MILE 20



Throughout the reservoir at all elevations, scattered pods and veneers of alluvial material occur atop water-scoured bedrock. The alluvial deposits thicken and become more extensive toward the lower portion of Ice Harbor Reservoir. They are associated with Pleistocene glacial outwash and lacustrine sedimentation of the Pasco Basin,a structural basin in the confluence area of the Walla Walla, Snake, Yakima, and Columbia Rivers.

Geologic features are more prominent at Lyons Ferry on Lower Monumental Reservoir and,for this reason, interpretive facilities concerning the subject of geology would be most effective at Lyons Ferry.

5.02. ARCHEOLOGICAL RESOURCES

A site known as Windust Caves Archeological District was proposed for the National Register of Historic Places in May of 1976. The location of this site is shown on Plate number 5. Extensive examination and inventory were undertaken by the Smithsonian Institution, Washington State University, and others in the Lower Snake River region prior to flooding which revealed several significant archeological sites and a wealth of artifactual material. It is known that the Lower Snake River was utilized as a transportation route and as a basic source of food by the pre-white inhabitants in the region. While the truly significant sites found during the investigation were found upriver from the Ice Harbor project area, it is understood that the entire area in proximity to the Lower Snake River possesses an extensive history of river-oriented culture.

Within the reservoir area, petroglyphs were located in the vicinity of the dam. They have been excavated and utilized in construction of the Indian Memorial at the damsite. The memorial commemorates the Indian tribes whose family burial grounds have been inundated. No other significant archeologic resources were reported to have been salvaged from the project area prior to impoundment of the reservoir.

If it is determined that interpretation of Indian history and prehistory of Ice Harbor is necessary, this interpretation should be accomplished at Sacajawea State Park. This area is outside of the project boundary, but the area is closer to a larger visitation source and there is already a State Interpretive Museum there displaying Indian artifacts and culture.

5.03. HISTORICAL RESOURCES

The historical resources of the area surrounding Lake Sacajawea include events of both regional and national significance. As can be seen from the following chronological summary of some of the more significant events, the Lower Snake River itself and more recently the reservoir have played important roles in area history.

At the start of the historic period in this region, the Lower Snake River was occupied by tribes of the Sahaptin language group. Of these tribes, the Palouse inhabited most of the course of the river in the area. Other tribes nearby included the Walla Walla, who dwelt around the mouth of the river later bearing their name, and the Nez Perce upriver to the east.

The Sahaptin maintained fairly steady raid and reprisal hostilities with the Shoshonean tribes of the desert to the south. They also journeyed on occasion to the great Indian trading center at The Dalles on the Columbia, utilizing the river as a transportation route.

The earliest recorded contact with white explorers in the project area occurred when the Lewis and Clark Expedition floated down the Snake in 1805. Nearing the goal of their long journey, Lewis and Clark took little detailed note of what they regarded to be an especially unattractive piece of country. Two campsites of the Lewis and Clark Expedition are located in the project area; one in the vicinity of Walker and the other approximately one-half mile below the site of the dam.

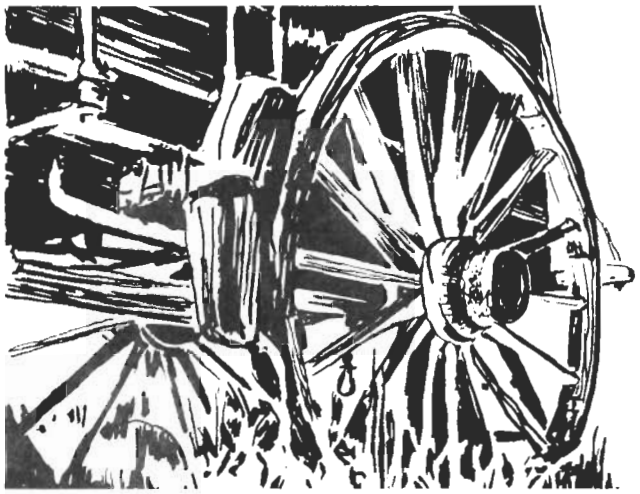
The names of Charbonneau Park and Lake Sacajawea are derived from two members of the Lewis and Clark Expedition.

Toussaint Charbonneau was of French descent. Lewis and Clark describe him as a "French Canadian" in writing of him when they hired him as an interpreter on November 3, 1804. They indicate he had spent the summer in the Black Hills with the Cheyenne Indians. He brought with him two Shoshone (Snake) Indian women he had purchased from the Hidatsa. One of these was Sacajawea, then about 17 years old. She bore her first child on February 11, 1805 at Lewis and Clark's camp. She and the child accompanied the expedition on its round trip to the Pacific.

Her role in the expedition has best been summarized by Walter O'Meara, who says:

> "Sacajawea, it seems necessary to add, was not a guide. Contrary to popular belief, she did not show the Americans the way through the mountains. Even when the party had reached her own country, she was not always sure of the trails and passes. The mountain men were pretty well able to find their own route to the Pacific; what Sacajawea offered was something even more important. In the midst of warlike, perhaps hostile tribes - although not a single Indian had yet appeared - she alone would be able to communicate with the chiefs and win their friendship for the intruding whites. Her very presence was proof enough of the party's peaceful intentions; for Indian women with infants on their backs did not,as John C. Ewers has said, accompany war parties."

In 1811, David Thompson of the Northwest Company came up the Snake River through this area. In August of that year he left his canoe at the site of a Palouse encampment of about 350 persons near the mouth of the Palouse River and followed a trail up that river and out across the plain to Spokane Falls.



In 1841 and 1842, immigrants began to move to the "Oregon Territory." However, this initial wave of settlers bypassed the Lower Snake River area in favor of the "Oregon Trail," a branch of which reached the Columbia via Walla Walla Valley. Several events over the succeeding two decades finally acquainted the early frontiersmen with the potential of the region.

14 May 1804

LEAVING ST. LOUIS, THE LEWIS AND CLARK EXPEDITION TRAVELED UP THE MISSOURI RIVER, ACROSS THE CONTINENTAL DIVIDE AND DOWN THE CLEARWATER RIVER BEFORE REACHING THE SNAKE RIVER IN OCTOBER OF THE FOLLOWING YEAR.

8 November 1805 to 23 March 1806

THE WINTER WAS SPENT NEAR THE MOUTH OF THE COLUMBIA RIVER AT FORT CLATSOP.

23 September 1806

THE EXPEDITION RETURNED TO ST. LOUIS.

13 October 1805

MORNING WAS WINDY, DARK, AND RAINY. THE PARTY PROCEEDED OVER DANGEROUS RAPIDS. THE RIVER SOON BECAME CROWDED WITH ROUGH BLACK ROCKS. THE EXPEDITION STOPPED AT A LARGE FISHING ESTABLISHMENT BELOW THE MOUTH OF DREWYER'S RIVER (PALOUSE RIVER) NAMED IN HONOR OF A MEMBER OF THE PARTY. CONTINUING DOWNSTREAM, THEY CAMPED NEAR A COLLECTION OF GRAVES ON THE RIGHT BANK OF THE RIVER.

12 October 1805

THE PARTY PROCEEDED PASSING A NUMBER OF RAPIDS, MAKING THIRTY MILES, AND CAMPING AT THE HEAD OF A DANGEROUS RAPID. FUEL WAS SCARCE.

11 October 1805

MORNING WAS CLOUDY WITH WIND FROM THE EAST. THE PARTY STOPPED FOR BREAKFAST AT INDIAN VILLAGE NEAR A BROOK ON THE LEFT BANK (ALPOWA CREEK) AND HERE BARGAINED FOR DOGS AND FISH, CONTINUING DOWNSTREAM, THEY CAMPED AFTER MAKING THIRTY-ONE MILES FOR THE DAY.

10 October 1805

AFTER COMING DOWN THE KOOSKOOSKEE (CLEARWATER RIVER), THEY CAMPED AT THE MOUTH OF A LARGE STREAM FROM THE SOUTH (SNAKE RIVER). ARRIVAL ATTRACTED ATTENTION OF THE INDIANS FROM WHOM THEY PURCHASED DOGS FOR FOOD WHICH BROUGHT THEM RIDICULE AS BEING DOG-EATERS.

14 October 1805

THE PARTY SET OUT EARLY, AND SOON PASSED A ROCK OF SINGULAR APPEARANCE (MONUMENTAL ROCK). FURTHER ON, ONE OF THE CANOES SANK WHILE DESCENDING A RAPID. THE MEN WERE RESCUED AND MOST OF THE ARTICLES SALVAGED. THEY CAMPED TO DRY THE BAGGAGE.

15 October 1805

THE MORNING WAS FAIR. HUNTERS WERE SENT OUT BUT RETURNED WITH ONLY THREE GEESE AND TWO DUCKS. THE PARTY SET OUT IN EARLY AFTERNOON, MAKING TWENTY MILES FOR THE DAY.

16 and 17 October 1805

AFTER TRAVELING DOWNRIVER ABOUT FOURTEEN MILES, THE PARTY WAS FORCED TO PORTAGE THREE-FOURTHS OF A MILE AROUND A FALL OF IMPOSSIBLE DESCENT. WHEN THEY REACHED THE JUNCTION OF THE RIVERS A GREAT NUMBER OF INDIANS HAD COLLECTED TO RECEIVE THEM.
NEXT DAY THEY WERE OCCUPIED IN CELESTIAL OBSERVATIONS, AND VISITED WITH THE INDIANS.

30 April 1806

THE PARTY NOW HAS TWENTY-THREE HORSES. AT A DISTANCE OF FOURTEEN MILES FROM THE GREAT RIVER THEY CAMP. THE ABUNDANCE OF FIREWOOD AND THE ADVANTAGE OF A COMFORTABLE FIRE INDUCED THEM TO STOP AT THIS PLACE.

1 May 1806

AT AN EARLY HOUR THE PARTY COLLECTED THEIR HORSES AND SET OUT. THE TIMBER IS NOW MORE ABUNDANT AND THE INDIAN GUIDE ASSURES THEM THAT THEY WILL NOT WANT FOR WOOD OR GAME FROM THIS PLACE AS FAR AS THE KOOSKOOSKEE.

2 May 1806

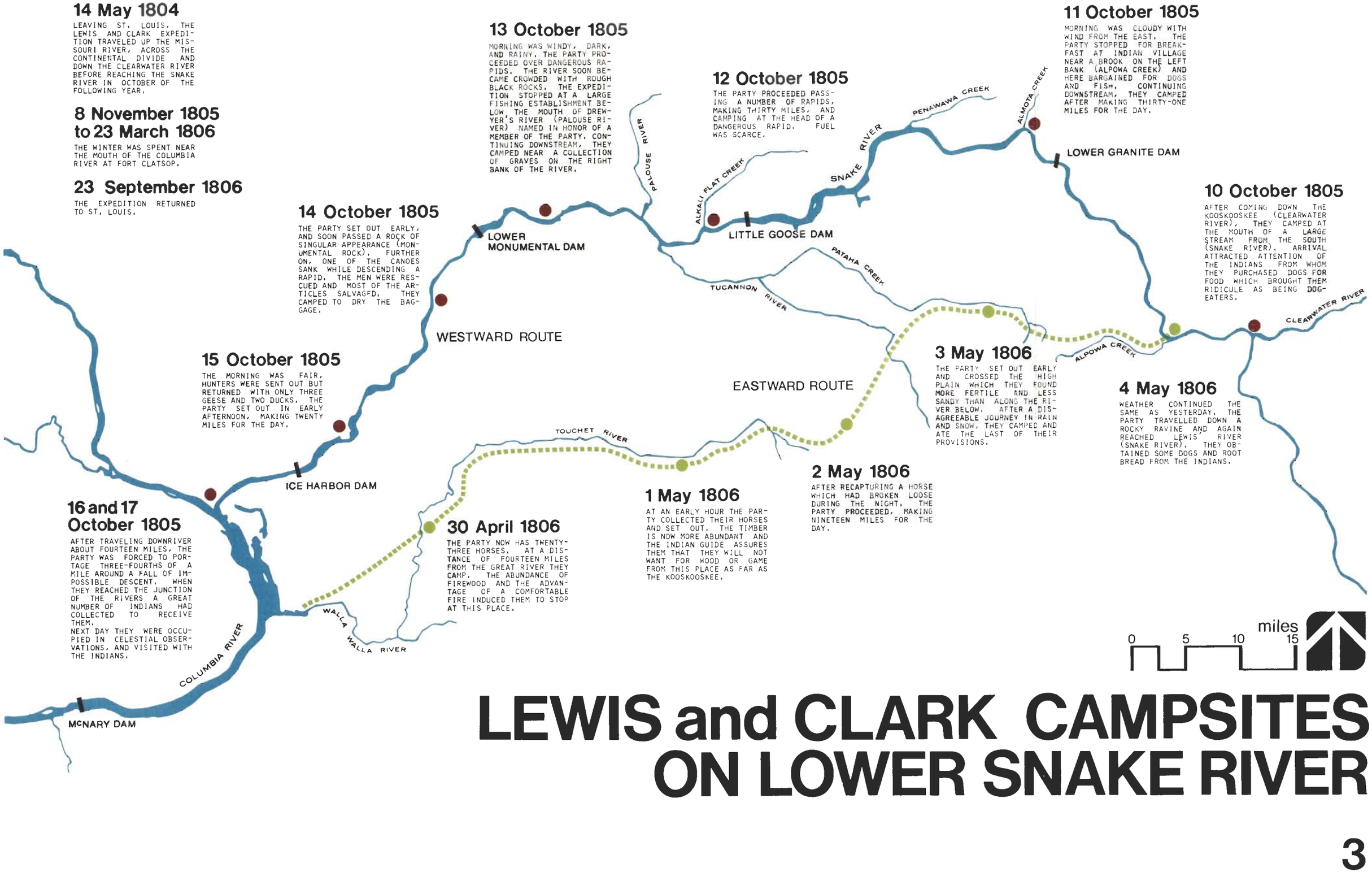
AFTER RECAPTURING A HORSE WHICH HAD BROKEN LOOSE DURING THE NIGHT, THE PARTY PROCEEDED, MAKING NINETEEN MILES FOR THE DAY.

3 May 1806

THE PARTY SET OUT EARLY AND CROSSED THE HIGH PLAIN WHICH THEY FOUND MORE FERTILE AND LESS SANDY THAN ALONG THE RIVER BELOW. AFTER A DISAGREEABLE JOURNEY IN RAIN AND SNOW, THEY CAMPED AND ATE THE LAST OF THEIR PROVISIONS.

4 May 1806

WEATHER CONTINUED THE SAME AS YESTERDAY. THE PARTY TRAVELLED DOWN A ROCKY RAVINE AND AGAIN REACHED LEWIS' RIVER (SNAKE RIVER). THEY OBTAINED SOME DOGS AND ROOT BREAD FROM THE INDIANS.



LEWIS and CLARK CAMPSITES ON LOWER SNAKE RIVER

The first event was an Indian war sponsored by a small force of "Oregon Volunteers" in 1848, in response to the Whitman Massacre the year before. The volunteers were defeated by a sizable force of Cayuse at the mouth of the Tucannon River.

This event was followed by several years of intermittent hostilities. During this time, Territorial Governor Isaac I. Stevens initiated a number of surveys of the region, including the preliminary study for the western end of a projected northern route transcontinental railway. Other surveys were related to Stevens' travels in his dual role as governor and prime negotiator between the Federal government and the Indians of the region.

Due to hostilities with the Indians, the regular army moved into the area in 1850. The initial effort was a small force led by Lt. Colonel Edward J. Steptoe,who was soundly defeated within sight of the butte north of Pullman, Washington,that bears his name.

The next event was a successful punitive expedition against the Indians by Colonel George Wright. They laid out two good trail alternatives from the strategic Tucannon River crossing to the top of the plateau along the Palouse River. By 1861, a member of the expedition, Lt. John Mullan of the U. S. Corps of Topographic Engineers, established a practical wagon road from Walla Walla across the continental divide to the northern plains. The old crossing of the Snake River, near short-lived Fort Taylor near the mouth of the Tucannon, was the main Snake River crossing of the Mullan Road.

In 1859, the new river steamboat, Colonel Wright,plied up the Snake as far as the mouth of the Palouse River. A second Columbia River boat, the Tenino, went into service in 1860. These boats could not have been built at a better time, for that year rumors of gold in the mountains to the east were confirmed by discoveries on the Upper Clearwater River. Miners flocked in from all the older gold-mining areas of the far west and spread out over the region. By 1862, a full scale gold rush was in progress.

It was during this gold rush time that the stretch of river within the project area realized some historic prominence. A cove located at the site of the present Ice Harbor Dam came to be known as Ice Harbor,as it remained clear of ice during winter. Miners who would make it overland to Ice Harbor were able to realize a 20-day head start in the spring on miners who began their journey at The Dalles.

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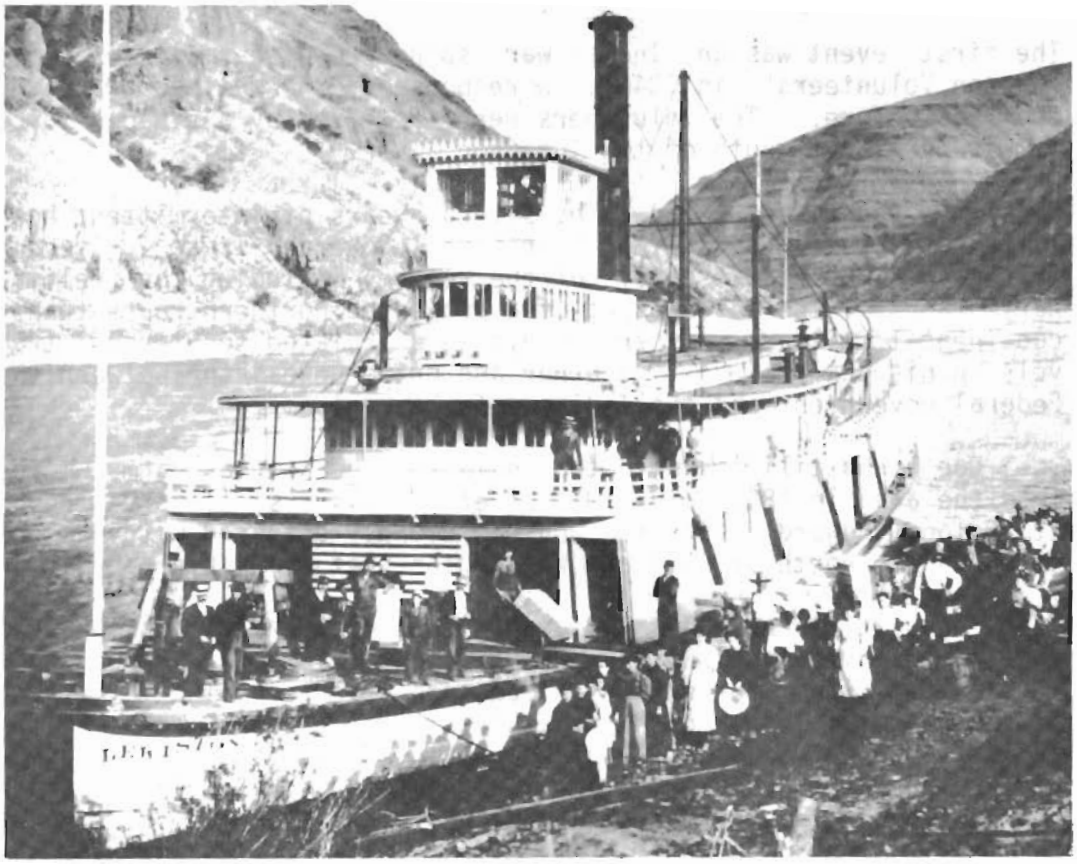
[1]Lawrence Kip, "Army Life on the Pacific", A Journal of the Expedition Against the Northern Indians in the Summer of 1858(N.Y., 1859), and John Mullan, "A Military Road from Fort Benton to Fort Walla Walla," House Executive Document 44, Thirty-Sixth Congress, Second Session, 1860-1861.



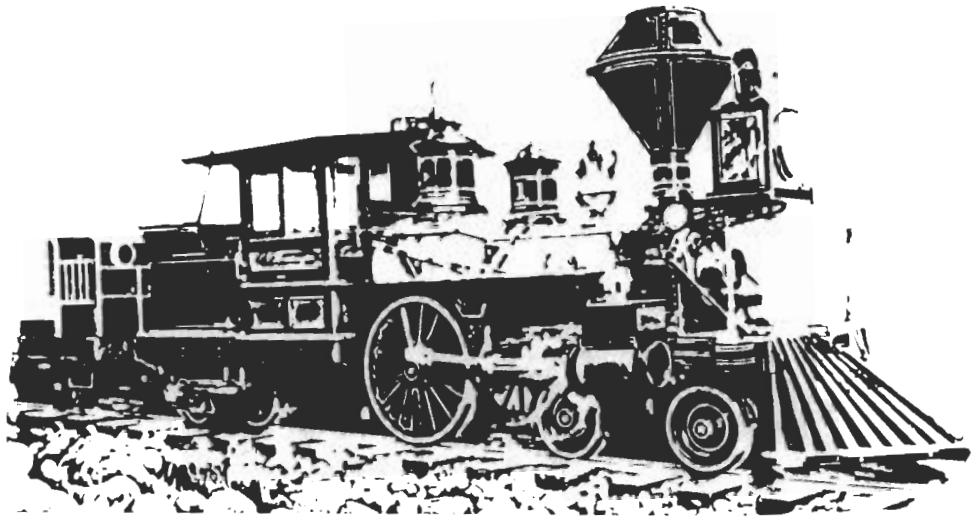
Gradually the Snake River lost out to competition in the most important business of supplying the major mining camps in Montana. After 1866, a steamboat service on the Snake soon dropped to one run a week.

Around 1870, stockmen began moving in to utilize the open range country of the plateau. They used the old trails and such

river traffic that still existed. Two ferries served in livestock transfer across the Snake at what is now the upper end of Lower Monumental Reservoir.

Through the 1870's, farmers discovered that wheat could be grown on the better lands of the plateau, and a new wave of settlement resulted. Demand for a better transportation network brought railroads to the region.

From 1884 into the 1890's a wheat farming boom developed. In 1885 the Northern Pacific ran a branch line through Washtucna Coulee to Connell. In order to compete, the Oregon Railroad and Navigation Company in 1887 bridged the Snake near Riparia. In the early nineties, new grain boats were built, but they served principally the new farming region south and southeast of Lewiston by bringing grain down to be loaded on the railroad at Riparia. This traffic continued until 1919. New and smaller boats entered the grain trade in 1923 and continued to serve in a rather desultory way until 1940, the end of the second period of river navigation.



With the coming of the Lower Snake Project with its long-season,slackwater navigation, there has been a revival of the river trade, as well as a boom in the recreational use of the river.

5.04. ECOLOGIC RESOURCES

The relatively arid climate, the rugged topography, and the reservoir are prime factors in area ecology. The various ecologic resources are discussed in more detail in Item No. 4 under "Supporting Data." These resources are summarized under three major headings: vegetation, wildlife, and aquatic life. The discussion of Ice Harbor flora includes a description of vegetation types and distribution. The wildlife discussion considers species of birds, mammals,and reptiles. Wildlife habitat also is generally surveyed.

The discussion of aquatic life in the reservoir focuses primarily on anadromous and resident species of fish, with attention paid to the influence of the dam on fish migration and mortality and the influence of pool fluctuation on fish spawning habits. Lists of specific species of flora and fauna for the Ice Harbor area may be found in the "Fish and Wildlife Management Plan" appended to the updated master plan.

There are no serious insect or vector problems on the Ice Harbor project that warrant discussion in this section. Insect and vector problems are discussed in the appendices.

5.05. ENVIRONMENTAL AND SCENIC QUALITIES

The aesthetic and visual qualities of Ice Harbor Reservoir are derived primarily from the natural features of the alternately steep to sloping walls of the gorge embracing the reservoir. It is the massiveness of the gorge that dominates and creates a feeling of boldness and scale to the landscape. Most of this long,narrow reservoir appears as a wide,slow-moving river. Trees are scarce and the vegetative cover consists mainly of grasses, forbs,and low shrubs. The natural scene is amended but not seriously diminished

by man-made objects such as railroad cut slopes and fill embankments, roads, power lines,and an occasional grain elevator. The open space of the developed recreation areas tends to improve the natural scene, especially during the dry season.

There are no pristine areas where the effects of man are not readily apparent. The two railroads that extend the length of the

reservoir on both sides tend to create a continuity of visual experience. Cut slopes, sometimes drastic, sometimes minor, and land fills protected from shoreline erosion by basalt riprap have largely established the general character of the view within the gorge. The riprap, being comprised of indigenous basalt, is not as visually conflicting as foreign material would be.

Departures from the linear reservoir by such features as embayments, vertical man-made structures, side canyons, and cliffs provide refreshing visual contrast.

a. Natural Features

The most significant visual feature is the gorge itself. Broad rounded canyon slopes drop gently from the surrounding farm lands to the expanse of river water backed up by the dam. To both casual and frequent visitors it is the contrast between vast farm lands and river valley that lingers in the memory.

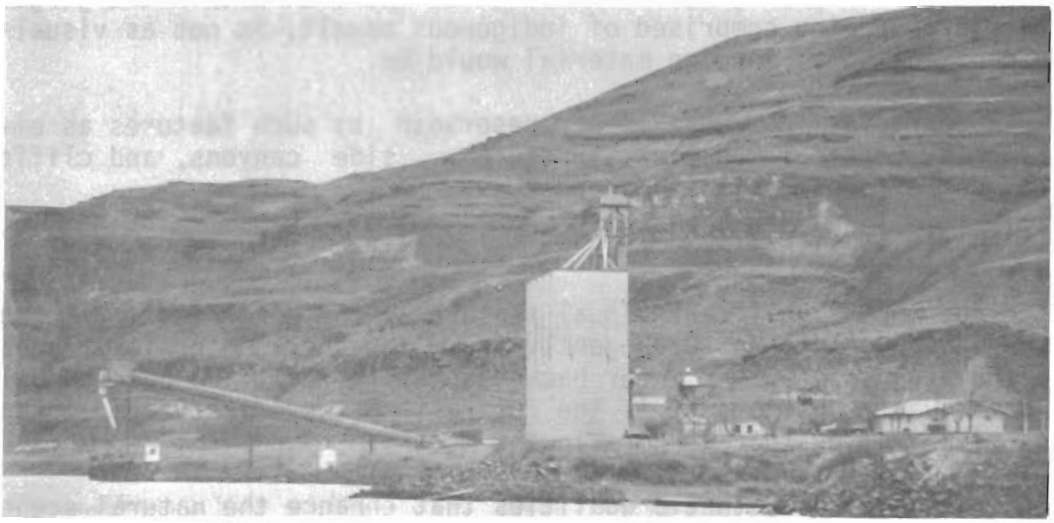
Visual and aesthetic qualities that enhance the natural scene are rugged,basalt bluffs, characteristic of the Snake River Canyon, with many talus slopes at their base. In places bluffs rise almost sheer from the shoreline while in others they recede into soft, grass-covered slopes. In other areas they are sometimes square and blocky, sometimes rounded, or sometimes ascending in a series of well-defined terraces.

Sparse vegetative cover clothes the hillsides where soils permit, enhancing the visual contrast of hill slopes, shoreline,and reservoir waters. For a fleeting period in the spring the cheatgrass provides a mantle of green which soon turns to brown and dusty lavender, the dominant color of the landscape for most of the year.

Many of the formations are visually interesting themselves, but the unfolding panoramic view of the gorge,contrasted by the waters of the reservoir,constitutes the river's primary scenic attraction. The grand scale of these views tends to reduce the effect of man-made intrusions on the scene.

b. Cultural Features

Some of man's works along Lake Sacajawea add interest and diversity to the scene. For the river boater, the occasional



contrast between the natural scenery and man-made objects provides visual excitement to a journey along the reservoir. Interesting man-made features include the dam, roads, railroads, developed parks, grain elevators, docks, commercial traffic on the reservoir, and even some power lines. All provide interest and visual qualities intrinsic to the functions they serve.

Aside from the functions they serve, dams are visually imposing and interesting structures. Water pouring over spillway gates, turbulence below the dam, the operation of the locks and the fish ladders are all fascinating to the average visitor. Locking through the dams, routine and commonplace for barge captains, can be an exciting experience for many pleasure boat-operators.

The Lower Snake River is developing an ethos, a character of its own, as an artery of commerce. The production and transmission of power, the movement of trains and barges carrying grain and other commodities, the grain elevators and attendant port facilities,

and pleasure boats cruising the reservoir all contribute visibly to the stimulating feeling of progress and action.

5.06. RECREATIONAL RESOURCES

Lake Sacajawea provides largely water-related recreational opportunities. Major recreation areas along the reservoir include Ice Harbor Dam, Charbonneau, Levey Park, Fishhook Park and Windust. Other areas are available for recreational purposes but they have little or no development or access.

Visitation to these areas is included for the years 1971 to 1975 in the table on the following page. The table indicates that aside from the dam the most popular areas are Charbonneau and Fishhook Park. This popularity is due to the accessibility, the proximity to urban areas, and the developed facilities of the two sites.

The decline in attendance at Levey Park is due to a redistribution of visitors. As new recreation areas such as Lyons Ferry and Central Ferry have been developed, a competitive impact to Levey Landing has resulted.

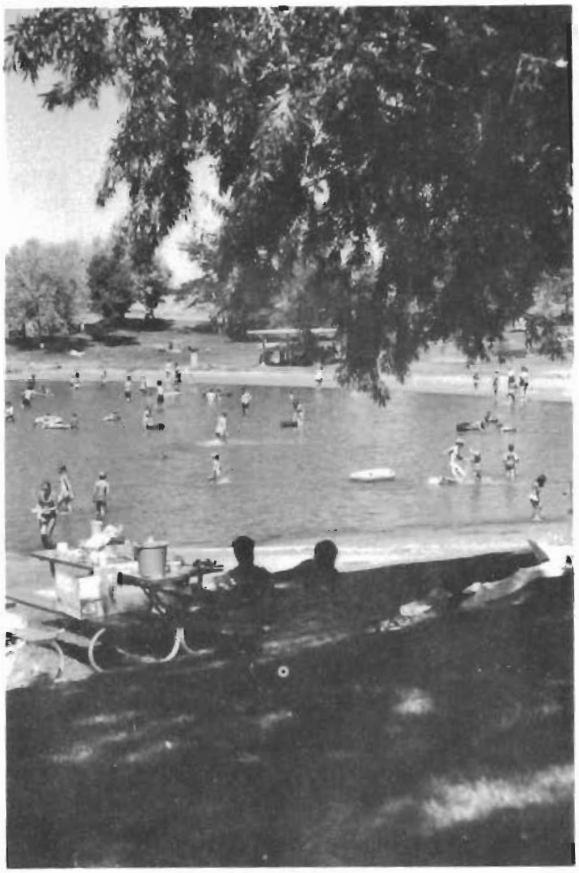
VISITATION

SITE	1971	1972	1973	1974	1975
Ice Harbor Dam	73,264	60,750	52,065	71,062	111,780
Levey Park	35,715	34,436	25,476	40,192	29,881
Fishhook Park	55,725	57,409	51,758	59,639	53,167
Charbonneau	4,562	3,269	8,058	31,242	43,593
Windust	16,622	17,261	15,933	15,506	26,611
Dalton Lake	3,981	2,154	2,932	4,002	7,382
Other Areas	5,173	5,875	14,501	15,950	18,434
TOTAL	195,042	181,154	170,723	237,682	290,848

The recreational areas are used for a variety of activities. A breakdown of visitation figures averaged from 1972-1975 into types of activities shows the varying use in the table below.

TYPES AND DISTRIBUTION OF ACTIVITIES

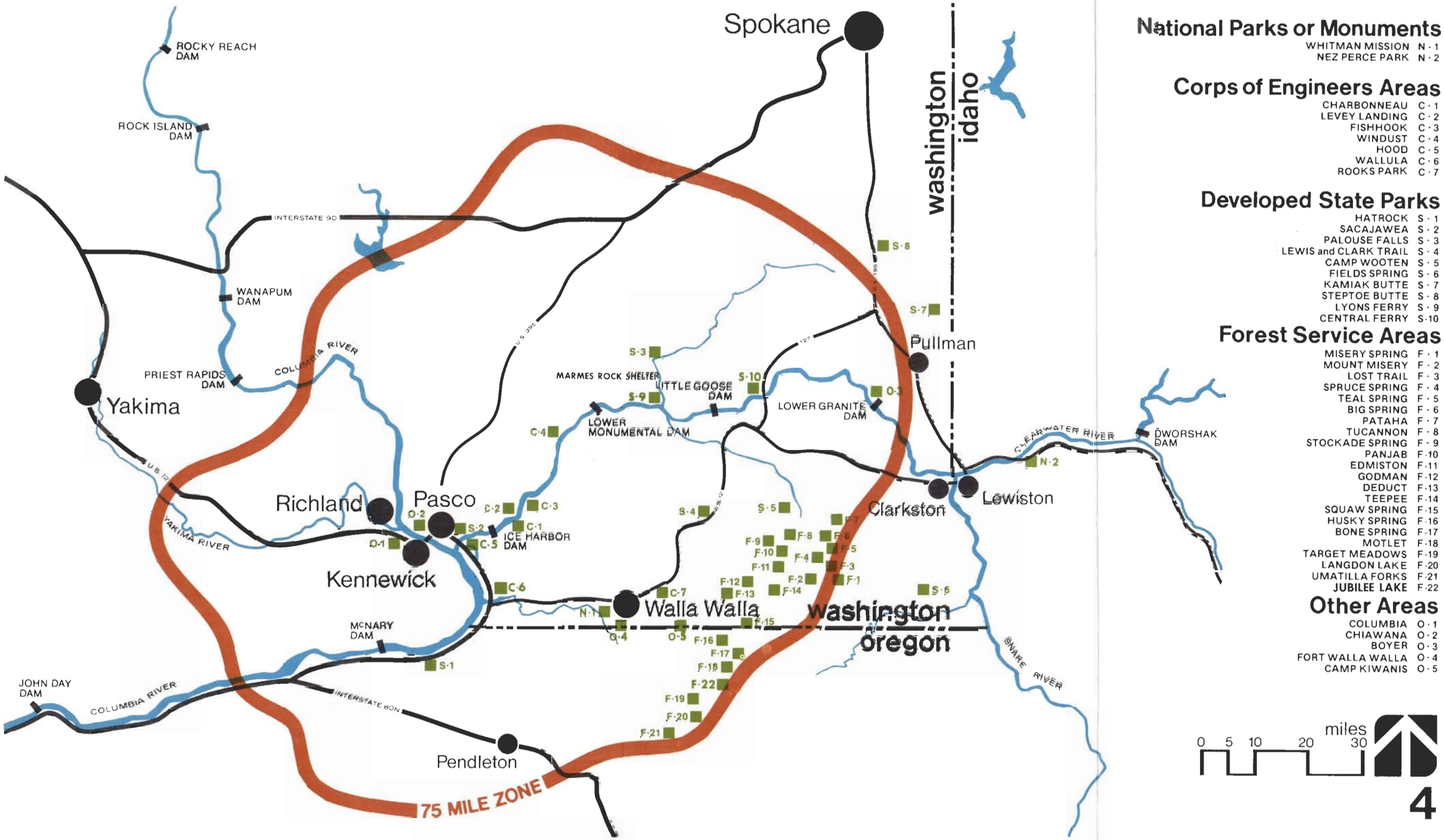
Camping	3.3%
Picnicking	22.4%
Boating	9.5%
Fishing	8.1%
Hunting	.3%
Sightseeing	31.8%
Water Skiing	5.4%
Swimming	16.5%
Other	2.7%
TOTAL	100.0%



The most popular activities are sightseeing, picnicking, swimming, and boating, in that order. Hunting and camping use is negligible. The lack of facilities for these activities and competition from other areas, particularly mountain areas, mainly account for this situation. The preceding table suggests that the reservoir is used primarily for day-use activities.

INFLUENCING FACTORS

RELATED FACILITIES



National Parks or Monuments

WHITMAN MISSION	N · 1
NEZ PERCE PARK	N · 2

Corps of Engineers Areas

CHARBONNEAU	C · 1
LEVEY LANDING	C · 2
FISHHOOK	C · 3
WINDUST	C · 4
HOOD	C · 5
WALLULA	C · 6
ROOKS PARK	C · 7

Developed State Parks

HATROCK	S · 1
SACAJAWEA	S · 2
PALOUSE FALLS	S · 3
LEWIS and CLARK TRAIL	S · 4
CAMP WOOTEN	S · 5
FIELDS SPRING	S · 6
KAMIAK BUTTE	S · 7
STEPTOE BUTTE	S · 8
LYONS FERRY	S · 9
CENTRAL FERRY	S·10

Forest Service Areas

MISERY SPRING	F · 1
MOUNT MISERY	F · 2
LOST TRAIL	F · 3
SPRUCE SPRING	F · 4
TEAL SPRING	F · 5
BIG SPRING	F · 6
PATAHA	F · 7
TUCANNON	F · 8
STOCKADE SPRING	F · 9
PANJAB	F·10
EDMISTON	F·11
GODMAN	F·12
DEDUCT	F·13
TEEPEE	F·14
SQUAW SPRING	F·15
HUSKY SPRING	F·16
BONE SPRING	F·17
MOTLET	F·18
TARGET MEADOWS	F·19
LANGDON LAKE	F·20
UMATILLA FORKS	F·21
JUBILEE LAKE	F·22

Other Areas

COLUMBIA	O · 1
CHIAWANA	O · 2
BOYER	O · 3
FORT WALLA WALLA	O · 4
CAMP KIWANIS	O · 5

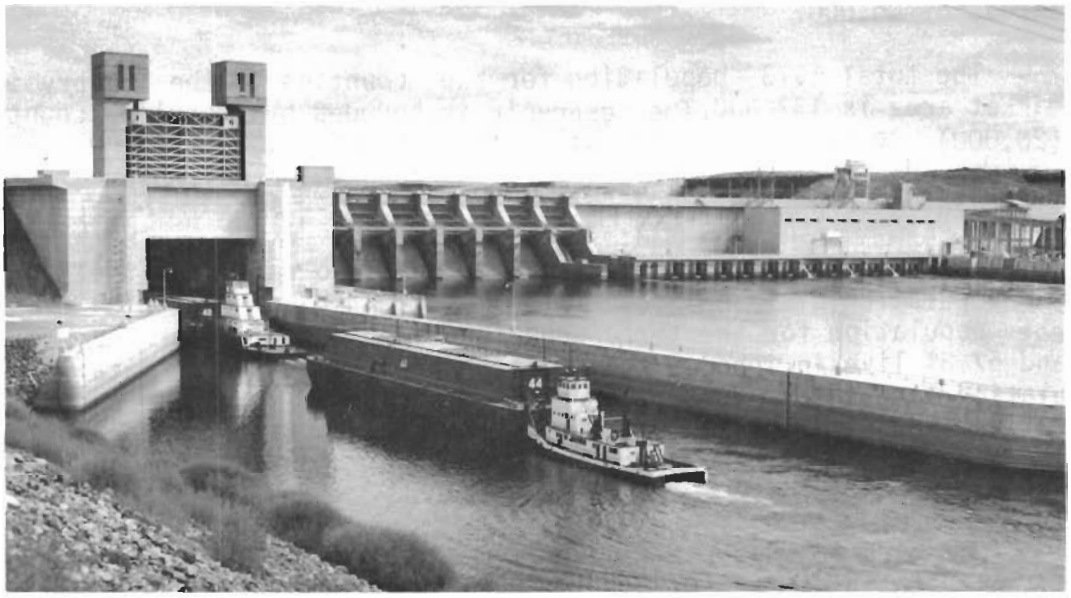
LOWER SNAKE RIVER PROJECT

FACTORS INFLUENCING and CONSTRAINING RESOURCE DEVELOPMENT and MANAGEMENT

6.01. GENERAL

The many factors bearing directly on resource development and management to provide the greatest sustained benefit to the public will be considered separately. These factors generally fall under feature and conditions headings, including demographic features; topography and geology; accessibility; area of influence; related recreational, historical and scientific areas; reservoir plan of operation; siting and relocation of facilities; off project siting; water quality; adaptability of project structures for public use; the effect of pre-project exploitation of mineral resources; anticipated attendance; cost sharing requirements; and environmental and ecological factors.

It should be kept in mind that these factors are contained within the overall framework of influence and constraint provided by the legislative authorities under which the Corps develops, operates and maintains the Ice Harbor Lock and Dam Project. Thus the



original priorities of developing and maintaining navigational, hydroelectric power and irrigational features provide the general parameters for any updating of the master plan. When project lands or waters or other project resources are needed for (1) production and transmission of hydroelectric power, (2) utilization of water for irrigation purposes, or (3) on-loading, off-loading, handling, storage, and transport of waterborne freight, these needs must have

a considerably high priority. This priority does not extend to indirect or associated needs or activities, such as manufacturing activities which may incidentally utilize or benefit from the Ice Harbor power production or navigational features. Beyond those three priorities, the Corps is authorized to develop and maintain recreation and fish and wildlife resources, particularly under provisions of Section 4 of the 1944 Flood Control Act, as amended, and the 1958 Fish and Wildlife Coordination Act, as amended. These authorities are broad and emphasize protection of the rights and privileges of the general public, as contrasted to the interests of individuals, special groups, commercial entities, or other non-public factions.

6.02. DEMOGRAPHIC FACTORS

The numbers and distribution of population in the region of the reservoir are major influences upon land use classification and the use of water resources. The most visible demographic feature is the very low population density in the immediate area of the reservoir. However, a significant urban center, the Tri-Cities area, which includes Richland (26,600), Kennewick (15,580), and Pasco (14,050), lies within a 25-mile driving distance of the reservoir. This urban area is located on the Columbia River to the west of the reservoir. The combined 1973 population of the three cities is in excess of 56,000.

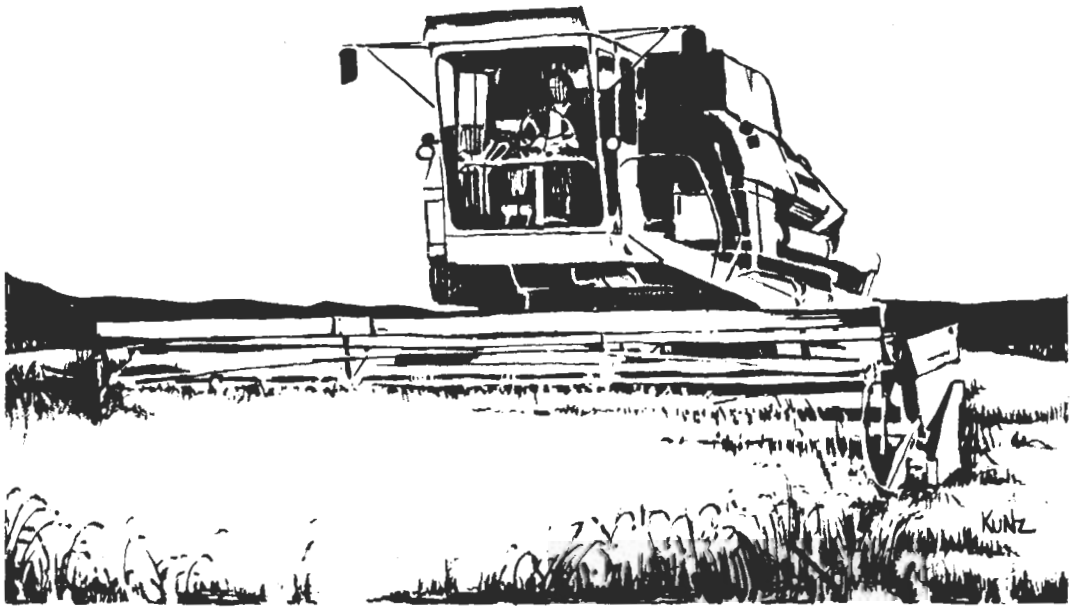
The total 1973 population for the counties in the reservoir market area is 132,900. The reservoir is bounded by Franklin County (26,000) to the north and Walla Walla County (38,700) to the south. West of the confluence of the Snake and Columbia Rivers lies Benton County (61,200).

The significance of the urban areas also reflects itself in the population distribution. Approximately 32.2% of the total present population for the three counties live in unincorporated areas and 67.8% live in incorporated cities and towns. Of the total population living in incorporated areas, almost 90% live in the Tri-Cities and Walla Walla. Underlying these percentages and population projections is a trend towards population decline in unincorporated areas.

Demographic characteristics reveal a predominantly white population of approximately 98% in Franklin, Walla Walla and Benton Counties. The age structure of the aggregate population compares similarly with the state structure, with 29.2% of the population under 14; 62.3% of the population 15-64; and 8.5% over 65. Per capita personal income in 1971 was $4,130 which is slightly below the state's per capita personal income of $4,178 but higher than the $4,073 average for the eight county region of Franklin, Walla Walla, Benton, Columbia, Garfield, Asotin, Whitman, and Adams Counties.

The economic activity of the population in the project area is also a factor influencing resource development and management. An example of this economic influence may be seen in a consideration of recreational demand. Like similar areas in Washington and western Idaho, the recreational demand characteristics of the Lake Sacajawea region are affected by the comparatively young population in the urban areas. The Tri-Cities' population enjoys a somewhat higher income and more leisure time than the region as a whole. The opportunity for recreation and the lack of major competing recreational areas nearby highlight the recreational appeal of Ice Harbor project and other Columbia and Lower Snake River reservoirs.

Likewise the wheat farming population has a higher income and more leisure time than many other population subgroups. This is particularly the case in Walla Walla County which ranks as a major producer of winter wheat. This population subgroup is free to boat on the reservoir at various times other than during planting and harvesting throughout the year.



The population of the project area realizes an economy which combines both agriculture and urbanization. Franklin and Walla Walla Counties which bound the reservoir are situated in the foremost wheat producing region of Washington. In addition to winter wheat, Walla Walla County is also a major producer of sugar beets, barley, and fresh vegetables. Franklin County is a leading producer of alfalfa hay, sugar beets and potatoes.

The greatest number of manufacturing workers are engaged in the food processing industry in these two counties, whereas Benton County and the Tri-Cities area offer a more diversified economy. Urbanization in the Pasco-Kennewick-Richland area was stimulated by the location of the Hanford nuclear power project here in 1943. Research associated with the project has helped to create an industrial-commercial complex. The printing and publishing industries, along with the production of machinery and fabricated metals, are important sources of development.

This economic diversity may be seen in employment data for the three counties. The table below shows the 1972 employment by industry for Franklin, Walla Walla and Benton Counties.

EMPLOYMENT

Agriculture, forestry, fisheries	4,760	(8.8 %)
Mining	71	(.13%)
Contract construction	3,994	(7.4 %)
Manufacturing	7,861	(14.5 %)
Transportation, communications and public utilities	3,714	(6.8 %)
Wholesale and retail trade	10,556	(19.5 %)
Finance, insurance, real estate	1,736	(3.2 %)
Services	21,578	(39.8 %)
TOTAL	54,270	100.13%

Total not equal to 100% due to rounding

From the table, the effect of the urbanization of the area on the economy is apparent. This is reflected in the relative importance of services, wholesale and retail trades, and manufacturing in the distribution of employment. This distribution differs significantly from the more agricultural southeastern region of the state.

Of the economic factors directly influencing and constraining Ice Harbor resource development and management, industrial developments along the reservoir are the most visually obvious. These include the Union Pacific Railroad which runs along the south shore, the Burlington Northern Railroad which parallels the north shore, the storage facilities for the shipment of grain, irrigation pumping stations, and an electrical substation.

The Port of Kahlotus operates grain storage facilities at Windust (River Mile 39). The site covers approximately eleven acres with no plans for future expansion. Wheat shipments from the Windust elevator amounted to 149,254 tons in 1973-74.

Another grain shipping and storage facility exists at Sheffler. The Walla Walla Grain Growers Association leases 1.92 acres of this site from the Port of Walla Walla. The facility has recently been expanded in capacity, but there are no further expansion plans. Grain shipments totaled 100,000 tons in 1973-74.

Six irrigation pumping plants on the reservoir provide water to farming lands. These are important, given the dry climate of Franklin and Walla Walla Counties.

No port districts have any expansion plans for the Ice Harbor project. Any expansion is likely to occur upstream or downstream of the reservoir. A more detailed industrial survey is presented in Item No. 5 in the "Supporting Data".

6.03. TOPOGRAPHY, SOILS AND GEOLOGY

The precipitous, rugged,basalt formation of much of the land bounding the reservoir is a significant parameter entering into most considerations for development. For example, the steep sloping of much of the reservoir shoreline obviously constrains the shoreline acreage available for agricultural, industrial, recreational,and other uses. The terrain also limits accessibility and relocation.

The use of soils of the Ice Harbor project vicinity is limited by their texture, depth, and the effect of climatic conditions on them. For convenience in presentation, these soils may be grouped under three general headings according to physiographic areas: soils of the uplands, soils of escarpments and steep canyons, and soils of bottom lands and low terraces.

The soils of the uplands, which lie above the reservoir and outside the project boundary, are formed from loess and are mostly deep, well drained, and medium textured. Also included in this group are soils that contain enough volcanic ash to be highly susceptible to wind erosion. These soils often develop blowouts. Climatic conditions limit the use of these soils mainly to a winter wheat - summer fallow cropping system. The hazard of water erosion is medium to high in the winter and spring following summer fallow operations.

The shallow, rocky soils of escarpments and steep canyons are formed in a mixture of loess and fragments of basalt that overlay basalt bedrock. The surface is broken by numerous outcrops. These soils are too rocky for cultivation and are used for pasture. Included in this group are the old terraces in the Snake River Canyon that have developed from alluvium over glacial outwash. The soils are well drained and have fair to good water-supplying capacity which makes them suitable for wheat in a winter wheat - summer fallow rotation. The hazard of wind erosion is moderate to high, especially in the summer when the soil is bare of vegetative cover.

The soils of bottom lands and low terraces are formed from alluvium that has been washed from the uplands or from colluvium. Some of the areas classified as riverwash and alluvial land are below the high-water line and are subject to flooding in the spring. They are also subject to shore erosion. Soils that occupy the broad, gently sloping terraces are excessively drained and coarse textured. They are derived from reworked eolian sand. The soils are somewhat excessively drained and are too droughty for dryland farming. When irrigated and fertilized they produce alfalfa and pasture. The hazard of wind erosion is moderate to high.

From the preceding discussion of the three soil categories, it can be seen that soil erosion must be considered in the development of any management plan. Both wind and water erosion warrant attention. For instance, sprinkler irrigation as opposed to a surface distribution system should be used on slopes greater than 8%; otherwise the hazards of erosion are very high. The overgrazing of native forage plants on the shallow soils of the steeper (30-60%) slopes could greatly accelerate wind and water erosion,as could construction and other agriculture activities that could remove soil-holding cover.

Erosion can influence the reservoir activity in a variety of ways. Sediment carried by erosion can silt portions of the reservoir,reducing power production efficiency. Boating, swimming, and other water-related activities become less attractive if erosion occurs,such as it has at Charbonneau and Fishhook.

6.04. ACCESSIBILITY

Road access affects use of the reservoir. Good roads parallel much of the shore at a distance, and where topography permits, various access roads, public and private, lead to strategic points along the reservoir. On the south side, State Highway 124 parallels half the reservoir at a 3 to 5 mile distance before turning east to Waitsburg. Paved roads run from this highway to sites along the reservoir (Page, Sheffler,and Matthews). Daily traffic on Highway 124 is 1,000 to 4,999 vehicles. Farther south is U.S. Highway 12, the major route between the Richland-Kennewick-Pasco Tri-Cities area and Lewiston-Clarkston.

On the north side, access roads from the paved Pasco-Kahlotus road lead to the reservoir at various points. Farther north U.S. 395, the main connecting route between the Tri-Cities and Spokane, parallels the reservoir.

These roads are capable of handling any future needs as far as project facilities are concerned.

6.05. AREA OF INFLUENCE

The major use demand on the reservoir will originate in a 25-mile zone around the reservoir, including the Tri-Cities area of Richland, Kennewick,and Pasco. However, it should be noted that Walla Walla County also contains the City of Walla Walla (pop. 23,450) within moderate driving distance of the reservoir. The 1973 population for the three counties included in the 25-mile zone totals 132,900.

Continued growth in the urban areas is expected to yield some population increase in these counties over the next decade. The Washington State Office of Program Planning and Fiscal Management indicates a population of 135,640 for the three counties in 1975;

141,700 in 1980; and 147,850 in 1985. Most of the growth is projected for Benton County rather than the counties immediately bounding the reservoir. Walla Walla County may experience a slight dip in population in the next decade.

6.06. RELATED RECREATIONAL-HISTORIC-SCIENTIFIC AREAS

Resource development on Lake Sacajawea is influenced by similar resources located outside the project area. Competing recreational facilities in the three counties within the 25-mile zone of the reservoir include eight county parks and two state parks. Within the 75-mile zone are six more competing state parks and several other recreation areas, including Umatilla National Forest. A more detailed comprehension of these recreational facilities may be derived from the Related Recreational Facilities Map (Plate 4).

Competing industrial development is minimal since most area facilities relate primarily to the handling and transport of locally grown grain for export. Heavy industrial development is concentrated in the Tri-Cities area along the Columbia River and also south of the confluence of the Lower Snake and Columbia Rivers at Wallula and Burbank. Any future industrial growth will occur primarily in these areas. However, they provide little competition with the Ice Harbor resources since the project industrial resources are limited out of necessity by the topography, the lack of adequate labor and consumer markets, and the insufficiency of complementary transportation systems.

6.07. RESERVOIR PLAN OF OPERATION

A description of reservoir operation was given in Section 2.03. Although some significant pool fluctuation may be experienced during periods of higher river flows, particularly at the upper end of Lake Sacajawea, the pool has a relatively stable water level.This stability is conducive to navigation, irrigation, hydroelectric power production and, especially, water-related recreation activities. Some minor problems are created at swimming areas when the pool elevation is drawn down, in that the beach areas are exposed to greater extents and the size of the protected swimming areas is reduced. Facilities for boat launching and mooring are constructed to function properly with the change in pool elevation. Maximum fluctuations should be considered in future siting, but no great developmental or operational problems are anticipated.

6.08. TYPE, LOCATION, AND EXTENT OF EARTH BORROW AND DISPOSAL AREAS AND POLLUTED SITES ON OR ADJACENT TO PROJECT LANDS

Numerous sand, gravel, and rock operation sites occur along Ice Harbor project. These more than two dozen sites were created wherever and whenever construction material was needed. Future reclamation of the sites is unlikely due to the paucity of soils

ICE HARBOR
BORROW SITES

	River Miles	North Shore	South Shore	Active*	Inactive	Restorable
Riprap						
	10.2	-	X	-	X	X
	15.1	X	-	-	X	X
	20.1	-	X	-	X	X
	20.7	X	-	-	X	X
Gravel						
	11.5	-	X	X	-	X
	15.0	X	-	-	X	-
	17.4	-	X	-	X	-
	19.2**	-	X	X	-	-
	20.0	-	X	-	X	-
	21.5	-	X	-	X	-
	30.0	-	X	X	-	-
	39.2**	X	-	X	-	-
	39.9**	-	X	X	-	X
	40.5**	-	X	-	X	X
	41.0	-	X	-	X	X

*This means still used occasionally.

**Indicated as Project Operations Land on Plate 5.

around the sites. Some areas, however, merit study to see if reclamation is by some means feasible. An example of an area which could possibly be improved through future use is the large borrow pit near Walker(R.M. 30).This area is still being used by the railroad. Future extraction of material could be tailored in a restorative manner that would smooth the present harsh appearance to blend more with the natural landscape.(See chart on page

6.09. WATER QUALITY OF POOL AND TAILWATER, INCLUDING SUITABILITY FOR DRINKING WATER SUPPLY

Water quality is of concern, particularly as it relates to the development and continued management of the wildlife and recreational resources of Ice Harbor Project. Increased water pollution, for example, could affect aquatic life as well as decrease the attractability of water-related recreational activities. Drinking water at the developed sites along the shore is obtained from wells conforming to the Rules and Regulations of the State Board of Health (WAC 248-54).

Water quality in Lake Sacajacea is determined by conditions in the Snake River and its tributaries upstream from the reservoir and by local conditions within the reservoir. In 1970, the University of Idaho and Washington State University, under contract to the U.S. Corps of Engineers,conducted a water quality investigation of the Snake River with particular emphasis on the Lower Granite Reservoir area.

This study, completed in 1973, concluded that the Snake River water has a relatively good biological, chemical,and physical quality overall but with significant seasonal quality fluctuations. Water in the Snake River is a calcium-bicarbonate type, moderately hard, with a low to moderate concentration of dissolved minerals. Spring and summer flows,predominantly derived from runoff from snow melt and rainfall, have low concentrations of dissolved minerals. Winter flows are derived principally from ground water and contain higher concentrations of dissolved minerals.

Pollution enters the Snake River from a variety of sources and influences water quality in the entire river. Pollution sources include feedlots above Lewiston, Idaho; municipal sewage from the community of Asotin, Washington (RM145); municipal sewage from the communities of Lewiston, Idaho, and Clarkston, Washington (RM139); and industrial effluents from Potlatch Corporation, Smith's Frozen Foods,and Twin Cities Foods in the Lewiston-Clarkston area.Municipal sewage effluent adds a significant concentration of nutrients and organics to the river. Industrial discharges also add considerable nutrients and oxidizable organic matter. Treatment facilities for both municipal and industrial discharges have been added since the completion of the Lower Granite Project. Additional pollution has also been traced to urban runoff and a variety of pollutants contributed by tributary streams that enter the Snake River near

Lewiston, Idaho, and from the Palouse River, which enters Lower Monumental Reservoir.[1]

The major pollution sources are located upstream from Ice Harbor Dam and the river is able to assimilate much of the organic load as it proceeds downstream; thus, detrimental quality effects become less and less. Nutrient loads, however, influence stream quality in the entire Lower Snake River. Existing point and nonpoint sources cause water degradation, but are not as yet a major threat to the stream system. Conclusions from the Snake River Water Quality Study, prepared by the Walla Walla District in 1973, indicate that there is abundant algae in the system and biological productivity is high. Rooted aquatic vegetation has also been identified as a problem in some stream sections but is not a problem in Lake Sacajawea. Biological quality, as measured by coliform concentrations, is generally good except in localized areas. A study of water quality in five swim areas on the Lower Snake River generally showed much higher coliform concentrations than in the main river.[2] Concentrations of coliform organisms in the reservoir, however, decline to lower levels by the time the river reaches Ice Harbor Reservoir. Coliform counts varied both seasonally and daily and are thought to be primarily the result of man's activity in the drainage areas. Local turbidity problems have been identified in recreation areas along the Snake River, including Fishhook Park (RM 17) in the Ice Harbor Reservoir.

Dissolved oxygen concentrations at Ice Harbor do exceed the Washington Water Quality Standards during the summer months;however, as yet this has caused no significant problems. Nutrient concentrations in river water are high and nitrogen has been identified as a very important parameter in the system due to its stimulating effect on growth of aquatic organisms.

There is considerable interest in water quality in the Snake River and there has been and will continue to be effort directed toward elimination of abatement of water pollution.

6.10. ADAPTABILITY OF PROJECT STRUCTURES FOR PUBLIC USE

Ice Harbor Lock and Dam is adaptable for inclusion in an overall interpretive program for the entire Lower Snake River project. Facilities for interpretation will include visitor parking space,a visitor center composed of a lobby exhibit space, restrooms, and

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[1] Buettner, Mark R., Water Quality of the Palouse River Drainage, 1973, University of Idaho, Moscow, Idaho.

[2] Johnstone, Donald L., and Hesser, Ernest F., Water Quality of Swim Areas on Snake and Columbia Rivers, Washington State University, Pullman, Washington.

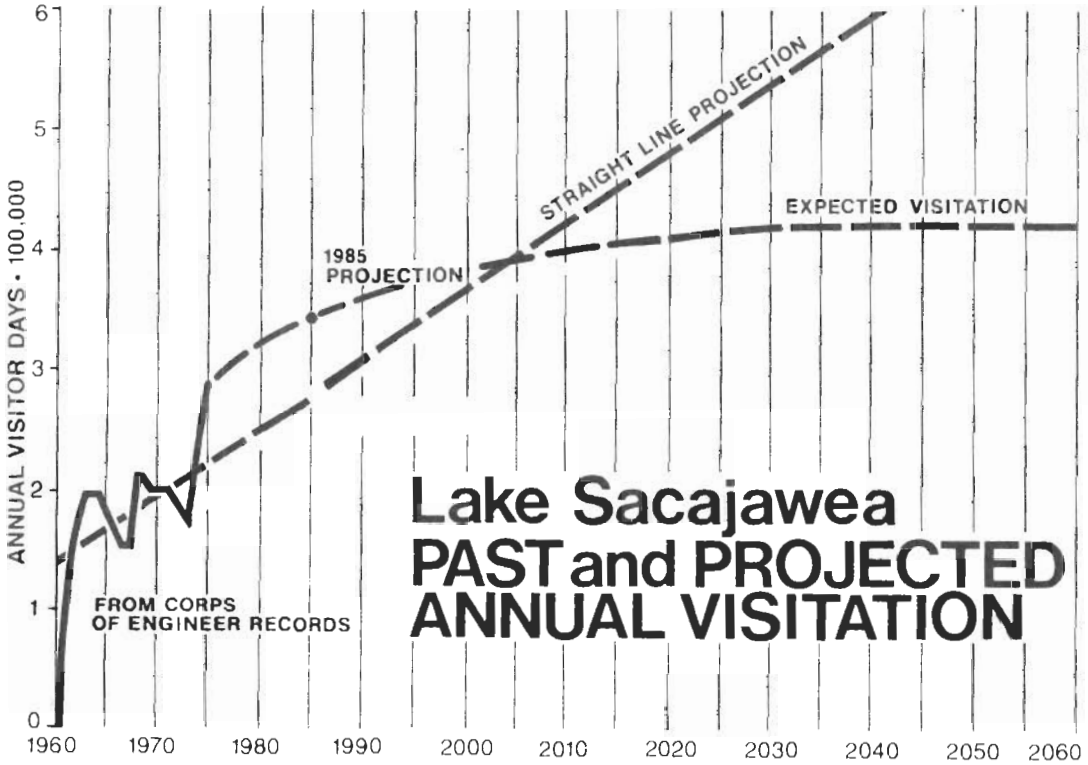
administrative space. In addition, interpretive panels located at the anadromous fish facilities and navigation locks and both a self-guided and a guided tour of the powerhouse,with emphasis on power production and distribution, will be provided.

6.11. PRE-PROJECT EXPLOITATION OF MINERAL AND TIMBER RESOURCES, EFFECT ON PUBLIC USE AND ENJOYMENT

Given the topography and geologic features of the project area, few pre-project mineral extraction areas could influence or constrain further development of project lands. Since there are no indigenous trees, the same holds true for the exploitation of timber resources. Development and management of the water-related recreational activities (boating, swimming, fishing, and water skiing) and other activities (sightseeing, picnicking, hunting, and camping) will continue relatively uninfluenced by these considerations.

6.12. ANTICIPATED ATTENDANCE

As pointed out in 2.04,"Visitor Use", the recreational demand at Ice Harbor project is expected to grow. This growth has to be a prime influence in any development plans. The projected 1985 annual visitation (people visiting the project, not activities participated in) total of 343,316 places a demand on developing certain facilities to match future public uses. The greatest use



is projected in the activities of picnicking, swimming, sightseeing, and water skiing. Increases are projected in all activity categories, leading to increased facility needs.

The increase in recreational activities also influences the development and management of the other project resources. Increased visitation may affect the environment in a variety of ways. Wildlife, vegetation, and aesthetic factors of the reservoir are affected by increased recreational use. How increased use influences development and management of the other resources is considered in this updated master plan, as is the effect of anticipated attendance on project safety.

6.13. APPLICATION OF PUBLIC LAW 89-72

Any further development program undertaken at the Ice Harbor project with Code 710 funds must adhere, not by law, but by current administrative policy, to the provisions of Public Law 89-72, the Federal Water Projects Recreation Act. Though this law was not applicable to the initial development or management of the recreational or fish and wildlife resources of the reservoir, policies set forth in ER 1120-2-404, derived from Public Law 89-72, do govern future recreational development.

This policy provides for cost sharing and affects Corps' projects principally in two ways: (1) on areas to be managed by the Corps, future development by the Corps is precluded without cost sharing, and (2) on areas to be managed by non-Corps interests, the local agencies are understandably anxious to have a high-quality development.

6.14. QUALITY AND CHARACTER OF ENVIRONMENTAL AND ECOLOGICAL RESOURCES

Unlike many of the recreational areas in the Pacific Northwest, Ice Harbor does not have the inherent recreational qualities of timbered mountain slopes, clear, flowing streams, and colorful scenery. But the dry climate of the area does place a premium on the water in the reservoir. Thus, the attractiveness of the reservoir for the public is heavily dependent on quality recreation facilities which are largely water-related and offer a contrast to the hot, dry summer weather of the region. With adequate consideration for fish and wildlife and other environmental factors, attention can be given to providing well-developed recreation facilities that enhance the landscape.

Construction of the project has profound impacts upon many existing resources and activities, especially resources relating to or comprising the natural environment of the reservoir region. A major design objective is to mitigate adverse impacts whenever this is reasonably possible. Thus, where a choice exists, priority must be accorded to possible mitigative measures ahead of many, if not most, other resource development possibilities.

Of all the factors which bear on and influence development potential, the nature of the topography is probably the most limiting. The steep, rugged terrain characteristic of more than two-thirds of the reservoir shoreline effectively limits development of major public recreation facilities and shoreline industry or preservation and enhancement of wildlife habitat.

The severely limiting effect of the project topography is greatly extended by necessary road and railroad relocations. The steep terrain dictates the location of relocated railroads and roads within extremely narrow corridors paralleling the reservoir shoreline. These transportation arteries effectively isolate small land areas from the reservoir and, of course, occupy many small, otherwise attractive shoreline reaches which could possibly have been developed for recreation purposes or for riparian wildlife habitat. The heavily revetted waterside slopes in many cases preclude foot traffic or other activities along the water's edge.

COORDINATION 7

COORDINATION WITH OTHER AGENCIES

7.01. NEED FOR COOPERATION

Comprehensive planning takes into account the active participation and needs of all parties having interests touching on reservoir resources. A goal of the updated master plan is to continue coordination with these parties to gain their cooperation in wise use or preservation of reservoir resources. Drafts of this report were sent to all local, state, and Federal agencies who have interests in the project. Their comments are included as an exhibit in this report.

7.02. FEDERAL AGENCIES, INTRODUCTORY STATEMENTS

a. Recreation

(1) Bureau of Outdoor Recreation

The Bureau of Outdoor Recreation was furnished information relative to the project development in connection with their initial inventory studies. Field trips of the reservoir were conducted in the early phases of the project for the Bureau of Outdoor Recreation to acquaint them with our development proposals. Their comments regarding this report are included as an exhibit.

(2) National Park Service

Representatives of the National Park Service visited the Ice Harbor Reservoir area and considered its recreational values and development possibilities. It was determined that the area holds no recreational attractions of national significance, but that there are important values of local and state significance.

b. Fish and Wildlife

Fish and Wildlife Service

Coordination with both state and Federal wildlife agencies has been carried out since 1959. Given the fish and wildlife resources of the reservoir, extensive coordination is expected to continue in this area.

c. Archeological Investigations

National Park Service

Through contracts with Washington State University, the National Park Service has arranged for investigation of archeological sites as recorded by the Smithsonian Institution study

of the Lower Snake River in 1948. As of 1966, all the data collected, most of which came from areas upstream from the Ice Harbor project, have been or are being appropriately recorded, analyzed, and written up in accordance with the contract agreements. The artifacts are being preserved by the University museum.

d. Navigation Aids

Since impoundment of Lake Sacajawea in 1962, the Corps has cooperated with the U. S. Coast Guard, particularly with regard to installation of navigation aids on the reservoir. Map and engineering data have been supplied and consultation furnished regarding areas where aids are needed and possible conflicts with other reservoir features and uses might occur. A full set of navigation aids is now complete and in operation on Lake Sacajawea.

7.03. STATE AGENCIES, INTRODUCTORY STATEMENTS

a. Recreation

Washington State Parks and Recreation Commission

The Commission has reviewed a draft of this report and their comments are included as an exhibit to this report.

b. Fish and Wildlife

Washington State Department of Game

The State Game Department has been coordinating programs with Federal agencies in the Lower Snake River project area since 1959. Of particular interest are the provisions for maintaining anadromous fish populations and the efforts of the Corps to mitigate riparian wildlife habitat lost to reservoir inundation.

A draft of this report was coordinated with the Washington State Department of Fisheries.

c. Archeological Investigations

Washington State University

Washington State University and the National Park Service have been coordinating investigations of the area's archeological resources since the 1940's.

d. Fire Suppression Coordination

State Fire and Safety Commission

A program of coordinated Federal, state, and local fire suppression efforts is essential to a successful wildfire protection and suppression program.

7.04. COUNTY AGENCIES

a. Port Commissions

(1) Port of Walla Walla

Walla Walla County's interest in Ice Harbor Reservoir is involved with Sheffler.

(2) Port of Kahlotus

The Port of Kahlotus maintains Windust on the upper portion of the reservoir. Coordination between the Corps and the Port is maintained regularly.

b. Recreation

County Park Boards

The County Commissioners, who are responsible for local Park Boards from both Walla Walla and Franklin Counties were furnished draft copies of this report. However, neither county has established parks in the immediate vicinity of Ice Harbor project lands.

c. Fire Suppression

Fire suppression efforts of the Burbank Rural Fire District Number Five and the Franklin County Rural Fire District Number Five will be coordinated with the Federal and state programs. Continuous coordination between the Corps of Engineers and these two districts is essential.

d. Air Pollution Control

The Tri-County Air Pollution Control Authority (Franklin, Benton, and Walla Walla Counties) has responsibility for controlling burning and other air pollution problems in the Ice Harbor project area. Coordination with this agency will continue.

LAND ALLOCATION

8

ALLOCATION OF PROJECT LANDS

8.01. BASIS OF CLASSIFICATION

The project owned lands around Lake Sacajawea are extremely inadequate to satisfy all collateral uses. This is particularly true when considering possible long-range future demands. This limitation does not result directly from restricted land acquisition but rather is imposed by the steep, rugged terrain along the reservoir and the relocated roads and railroads which lie at the water's edge throughout the total length of the shoreline. This extreme paucity of usable project land emphasized the need for a sound and judicious plan for allocation of lands to the various uses. The categories of land classifications, as used on the Land Use Map, Plate 5, conform to Change 3 to ER 1120-2-400, Investigations, Planning and Development of Water Resources,dated 12 February 1976 with some adjustment to meet project needs. Full consideration has been given to the guidance in Engineer Manuals and supplemental instructions and to all Federal laws governing development and management, as cited in Section 1. Land use assignments have been determined with a view to assuring utilization of the various resources of the project area under the objective of maximum sustained benefits to the greatest number of people.

8.02. LAND USE ALLOCATIONS

Descriptive criteria and conditions pertaining to each category of land use are given in the following paragraphs.

a. Project Operations

Project operations lands are acquired directly or incidentally for project construction and operation. They are allocated to provide for safe, efficient operation of the project. Recreation and wildlife uses will be permitted on an interim basis.There are three subcategories in this allocation.

1) Project Structures

This category allocates lands for operation and maintenance of project structures or for care and management of the project. Low-density recreation or wildlife habitat management, either intensive or moderate, will be permitted when not in conflict with the basic project requirements.

2) Public Port Terminal

These are shoreline frontage areas determined to be essential to utilization of the navigational resources of the project. Their prime purpose is to afford space for on-loading, off-loading, handling, storage, and the transfer of waterborne freight.

The lands are reserved for public port terminal sites at appropriate intervals along the shoreline, at points strategically located, in relation to established communities and existing and potential industrial tributary production areas and logically related to the road system serving these areas. With appropriate restrictions to satisfy project operational requirements and site limitations, these lands may be made available for conveyance to states, political subdivisions thereof, port districts, or port authorities, under provisions of Section 108 of Public Law 86-645 (74 Stat. 486) for development of public port facilities. The conveyance deed will provide for reversion of title to the government in case the land is used for other than intended purposes. Low-density recreation use or wildlife habitat management, either intensive or moderate, will be permitted on an interim basis on public port terminal lands, provided such interim use will not adversely affect the basic public port terminal values and so long as title to such lands remains with the government. Lands designated as retained are presently owned by the Federal government. Conveyed lands have been sold under the provisions described above.

3) Industrial Use and Access

These are areas of project lands determined by the Corps to be not required or not suited for project operation, and not required or not suited for public recreational use or access, public port terminals, natural areas or fish and wildlife purposes. With appropriate restrictions as required to satisfy project operational requirements and site limitations, they may be made available for conveyance to states, political subdivisions thereof, port districts, or port authorities, under provisions of Section 108 of Public Law 86-645, for development of private terminal facilities or industrial uses requiring close association with the water area of the reservoir; or they may be leased directly to such industrial users in those instances where conveyance under referenced Section 108 of Public Law 86-645 is not practicable or feasible. The conveyance deed or lease will provide for reversion of title or cancellation of lease in case the land is used for purposes other than intended. Low-density recreation use, or either moderate or intensive wildlife habitat management will be permitted on an interim basis on these lands. Agricultural use may be permitted on an interim basis when not in conflict with use for aurhotized purposes,industrial use,recreation use.or wildlife habitat management. All interim uses will terminate when industrial development becomes imminent after conveyance or outlease. Lands designated as conveyed have been sold to a non-Federal entity by the process described above. Retained lands are presently owned by the Federal government.

b. Operations: Recreation

These lands have been acquired for project operations (generally within 300 feet of full-pool shoreline) and allocated for use as developed public use areas for recreation activities

by the visiting public, including areas for concession and quasi-public development.

1) Intensive Use

These are lands on which facilities now exist or will be developed during the next five years to an extent adequate to meet the recreation visitor needs. Except for wildlife habitat improvement measures, no joint use of these lands is to be permitted. Intensive use recreation areas are defined as lands on which facilities have been or will be provided to accommodate for recreation needs of visitors in concentrated numbers and such adjacent or associated lands without facilities as required for open space purposes to make a whole recreation unit. These lands, including developed facilities thereon, will be administered by the Corps of Engineers or will be administered under lease agreements by state or local agencies or commercial concessionaires. Private or long-term, exclusive group use of these public recreation lands, will not be permitted. Licenses, permits, or easements will not be issued on intensive use recreation lands for such non-compatible,man-made intrusions as pumping plants,underground or exposed pipelines or cables,overhead transmission lines, non-project roads,or dredging or filling operations.Exceptions to this restriction may be made where necessary to serve a demonstrated public need in those instances where no reasonable alternative is available. Measures leading to habitat improvement for benefit of wildlife may be accomplished on operations recreation lands not actually occupied by formal facility development.

2) Intensive Use-Future

These are lands having similar capabilities and development potentials as intensive use lands, but which are reserved for future development as recreation needs warrant. Wildlife habitat improvement will be permitted as a joint use. Low-density recreation and fish and wildlife management may be permitted on an interim basis, provided such use will not adversely affect the basic recreation values. This interim use must be of such a nature that it can be terminated and the land be made available for the purpose for which it is reserved. No agricultural uses are permitted on these lands except on an interim basis for terrain adaptable for maintenance of open space and/or scenic values.

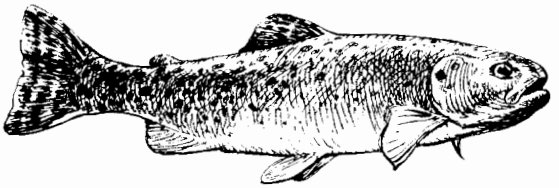
c. Operations: Recreation - Intensive Use - Off-Road Vehicle

These are lands acquired for project operations (normally within 300 feet of full-pool shoreline) and allocated specifically

and exclusively for recreational use by off-road vehicles. They are not suitable for and are not particularly required for other types of recreational activity or for wildlife habitat management. Development on ORV lands will be limited to enclosure fencing, automobile parking, vault toilets, regulatory and directional signing, benches, sun shelters, and any minor structures appropriate to the ORV activities.

d. Operations: Recreation - Low-Density Use

These are lands acquired for project operations (normally within 300 feet of full-pool shoreline) and allocated for low-density recreation activities by the visiting public. They are required to provide open space between intensive recreational developments or to provide buffer zones between intensive recreational developments and land which, by virtue of its use, is incompatible with the recreational development and would detract from the quality of the public use. Such imcompatible land may be located either on the project or adjacent to the project. Development of low-density lands will be kept to the minimum necessary to allow a dispersed visiting public, with non-motorized access through the area, to participate in nature-related activities. These activities will include, but not be limited to, ecological workshops and forums, hiking, horse and bicycling trails, primitive camping, or similar low-density activities which play a significant role in shaping the public understanding of the environment. Limited facilities, such as benches, tables, sun shelters, vault toilets, and waste receptacles will be allowed. Except possibly in urban areas utilities (electricity, water,and sewer) will not be provided for these facilities in low-density areas. All such facilities will be in harmony with the natural surroundings, so as not to be intrusive to the environment. Landscaping or restoration when necessary will utilize plants native or naturalized to the area. Man-made intrusions -- pumping plants, pipelines, transmission lines, non-project roads,or dredging or filling operations -- will be permitted with appropriate controls as necessary to minimize the adverse visual or other impact upon the natural character of the areas. No agricultural uses are permitted on these lands except on an interim basis for terrain adaptable for maintenance of open space and/or scenic values. Measures leading to habitat improvement for benefit of wildlife will be a management objective. Hunting and fishing on and from these lands will be permitted. All low-density lands will, as a general rule, be administered by the Corps of Engineers.



e. Fish and Wildlife

In accordance with the provisions of Section 3 of the Fish and Wildlife Coordination Act of 1958 (Public Law 85-624), selected areas of project lands may be reserved for development and management of the fish and wildlife resources of the project.

1) Operations: Wildlife Management - Intensive

These lands have been acquired for project operations (generally within 300 feet of full pool shoreline) and allocated for development and management of habitat for fish and wildlife or for propagation of such species. Intensive wildlife management lands are defined as lands which are set aside for wildlife management because of their inherent value as wildlife habitat or because of their potential for specific management practices of an intensive nature which have been or will be implemented to improve and/or maintain habitat beneficial to desirable forms of wildlife - both game and non-game. These lands, including developments and improvements thereon, will be administered by the Corps of Engineers or will be administered under cooperative agreements or license agreements by Federal or state fish and wildlife agencies. Private or exclusive group use of these wildlife lands will not be permitted. Licenses, permits, or easements will not be issued on intensive management wildlife lands for such non-compatible man-made intrusions as pumping plants, underground or exposed pipelines or cables, overhead transmission lines, non-project roads, or dredging or filling operations. Exceptions to this restriction may be made where necessary to serve a demonstrated public need in those instances where no reasonable alternative is available. Intensive management lands will be available generally on a continuous basis for selected non-consumptive, low-density recreation activities such as hiking, primitive camping, nature study, nature photography, bird watching, and other related activities. Consumptive activities such as hunting and fishing will be allowed only as commensurate with management objectives and state management regulations.

2) Operations: Wildlife Management - Moderate

These lands have been acquired for project operations (generally within 300 feet of full-pool shoreline) and allocated for development and management of habitat for fish and wildlife or for propagation of such species. Moderate wildlife management lands are defined as lands which are valued for fish and wildlife management but which will not sustain intensive management practices. Moderate management practices have been or will be implemented to improve and/or maintain habitat beneficial to desirable forms of wildlife - both game and non-game. These lands, including developments and improvements thereon, will be administered by the Corps of Engineers. Private or exclusive group use of these wildlife lands will not be permitted. Licenses, permits, or easements may be issued on a case-by-case basis on moderate management wildlife lands for such man-made intrusions as pumping plants, underground or exposed pipelines or cables, overhead transmission lines, non-project roads, or dredging or filling operations. Such outgrants will include appropriate controls as required to preclude or minimize the adverse visual or other impacts upon the natural character of the areas. Moderate management lands should be continuously available for low-density recreation activities such as hiking, primitive camping, hunting, fishing, nature study, nature photography, bird watching, and other related activities.

g. Operations: Natural Areas

These lands are acquired for project operations and allocated for preservation of scientific, ecological, botanical, historical, archeological, or outstanding visual values. Lands managed to protect rare and endangered species of flora and fauna will be allocated as natural areas. Normally, limited or no development is contemplated on land in this allocation. Hiking and bridle paths, properly placed, should not have any adverse impacts on rare and endangered plants and animals.Since public access must be available on Federal lands, these paths would direct foot and horse traffic away and around these species. Vehicles will not be allowed, nor benches, shade shelters, waste receptacles, utilities, or other structures not directly related to access or control of access through the area. Interpretive facilities and signs should be restricted to the periphery of the area or subdued and kept to a minimum. Preservation will be the primary objective in management of these lands, with all other uses being regulated to serve this end. Narrow bands of project land located between the normal recreation pool and the project boundary may fall within this category.Project operational lands may be dual allocation. No agricultural uses are permitted on this land.

8.03. COMMERCIAL MARINA CONCESSIONS

The number and location of commercial small-boat marinas to be permitted on the project are to be deliberately limited and

controlled by the government. The objective of this control is to achieve quality, dependable boating services for the public. Such services will be available on a dependable, continuing basis with use of commercial operators only if the operations are financially viable.

8.04. IRRIGATION PUMPING PLANTS AND PIPELINE EASEMENTS

A valid need continues for irrigation pumping plants and pipeline easement rights by adjacent landowners on the project. In selecting a pumping plant location, consideration is given to fish and wildlife and environmental impact of the selected area. The Walla Walla District prohibits pumping plants on intensive recreation and intensive wildlife management areas. Pipeline easement lands will be granted on a case-by-case basis and their use will be managed in a manner prescribed in the terms of the easement.

8.05. SHORELINE MANAGEMENT ACT OF 1971

The Washington State Shoreline Management Act of 1971 does not conflict with existing project policies or activities. This policy is designed to insure the development of the shoreline in a manner which will promote and enhance the public interest. Provisions are also made concerning protection against adverse effects to the public health, the land and its vegetation and wildlife, and the aquatic life of the waters.

8.06. ALLOCATION OF PROJECT LANDS BY ACRES

The 3,569.2 acres of project lands above normal full pool, excluding railroad and road rights-of-way, are allocated among the several categories of use as shown by color symbols on Plate 5. The acreages by area, with totals by category, are tabulated as follows:

ALLOCATION CATEGORY			Acres
PROJECT OPERATION:			760.2
Project Structures		699.4	
Lock and dam site	524.3		
Fishhook	19.7		
Windust	84.9		
Mathews	70.5		
Public Port Terminals		44.8	
RM 11	30.0		
Sheffler	4.1		
Windust	10.7		

ALLOCATION CATEGORY			Acres
Industrial Use and Access		16.0	
Sheffler	1.8		
Windust	14.2		
RECREATION:			837.3
Operations - Recreation - Intensive Use and Intensive Use-Future		497.9	
RM 9	56.2		
Charbonneau	243.5		
Levey	51.1		
Fishhook	45.8		
Windust	53.5		
Matthews	47.8		
Operations - Recreation - Intensive Use - ORV		115.0	
Operations - Recreation - Low-Density Use		224.4	
RM 10	5.5		
RM 10.5	12.8		
RM 12	56.8		
Fishhook	34.3		
Windust	105.6		
RM 38.5	9.4		
WILDLIFE:			1852.1
Operations - Wildlife Management - Intensive		1609.0	
Big Flat	832.6		
Fishhook	206.0		
Lost Island	181.3		

ALLOCATION CATEGORY			Acres
RM 25	246.8		
Snake River Junction	25.7		
Walker	116.6		
Operations - Wildlife Management - Moderate		243.1	
RM 16	82.6		
RM 19	25.0		
RM 21	37.0		
RM 22	5.4		
RM 29 - RM 34	93.1		
Operations: Natural Area			119.6
Anchor Canyon	119.6		
TOTAL			3569.2

Ice Harbor
LAND USE · MASTER PLAN

PROJECT BOUNDARY

ROADS

RAILROADS

NORMAL POOL
440 m.s.l.

20 * RIVER MILE

Project Operations

PROJECT STRUCTURES

PUBLIC PORT TERMINAL

INDUSTRIAL USE and ACCESS

Operations · Recreation

INTENSIVE USE

INTENSIVE USE · FUTURE

LOW DENSITY USE

Operations · Fish and Wildlife

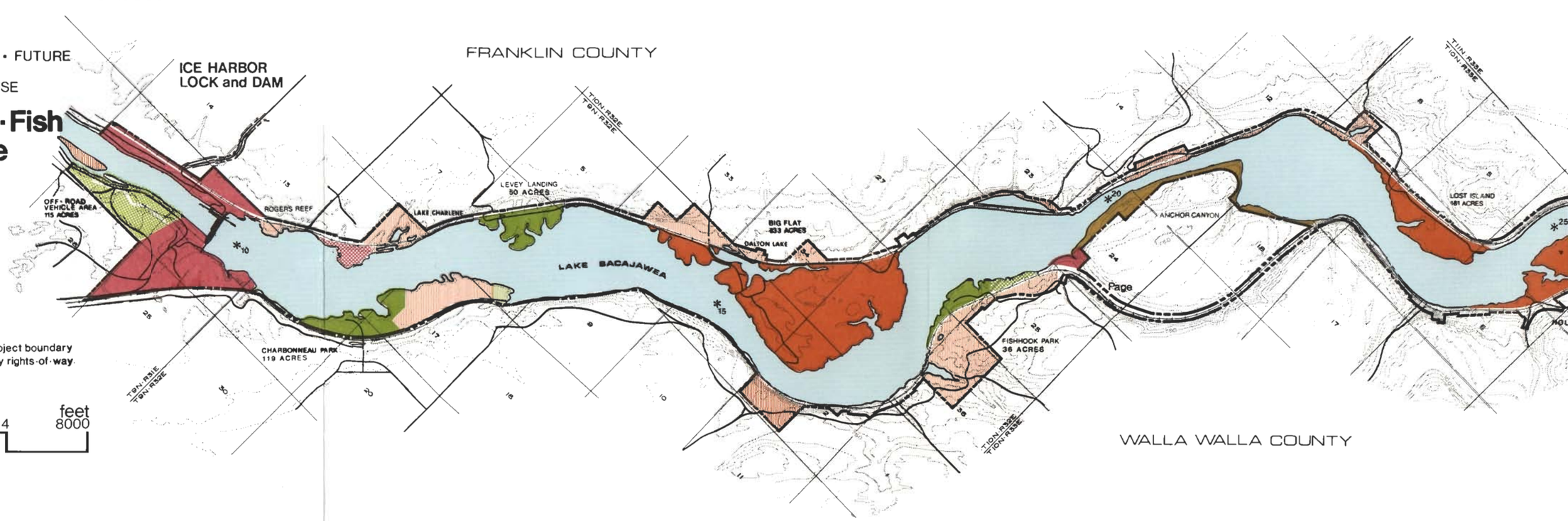
INTENSIVE MANAGEMENT

MODERATE MANAGEMENT

Other

OPERATIONS · NATURAL AREA

uncolored areas within the project boundary are either railroads or highway rights-of-way.



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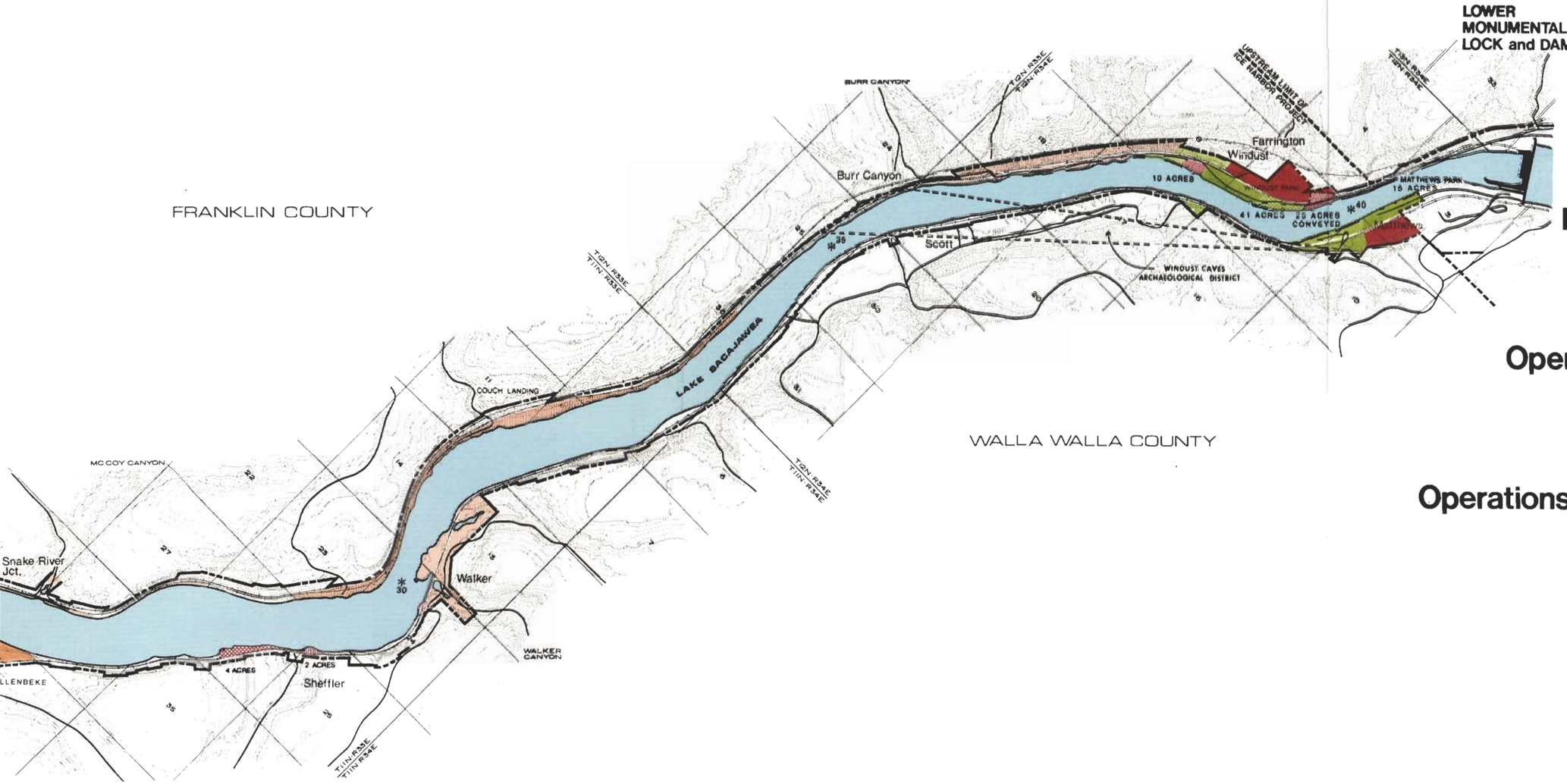
1981

LOWER SNAKE RIVER PROJECT

U.S. ARMY ENGINEER DISTRICT
Walla Walla, Washington

Ice Harbor
LAND USE · MASTER PLAN



PROJECT BOUNDARY
ROADS
RAILROADS
NORMAL POOL 440 m.s.l.
RIVER MILE *20

Project Operations

PROJECT STRUCTURES
PUBLIC PORT TERMINAL
INDUSTRIAL USE and ACCESS

Operations · Recreation

INTENSIVE USE
INTENSIVE USE · FUTURE
LOW DENSITY USE

Operations · Fish and Wildlife

INTENSIVE MANAGEMENT
MODERATE MANAGEMENT

Other

OPERATIONS · NATURAL AREA

uncolored areas within the project boundary are either railroads or highway rights-of-way

0 1 2 4 feet 8000

5

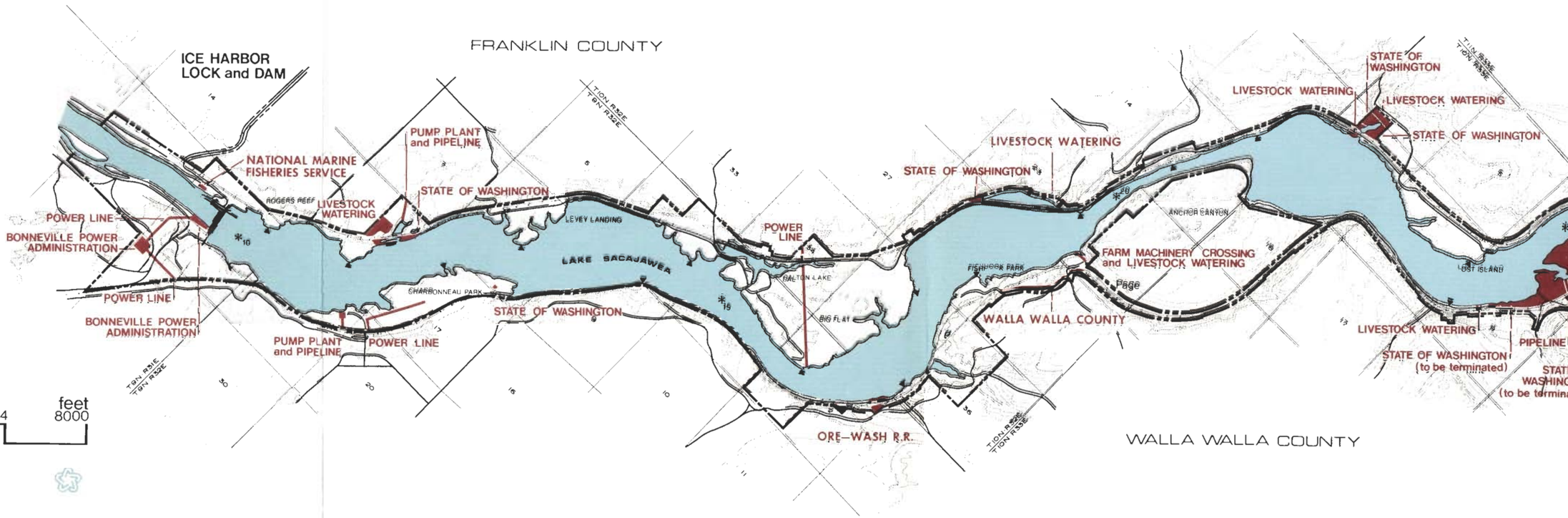
1981

U.S. ARMY ENGINEER DISTRICT
Walla Walla, Washington

LOWER SNAKE RIVER PROJECT

Ice Harbor
OUTGRANTS

- PROJECT BOUNDARY
- ROADS
- RAILROADS
- NORMAL POOL 440 m.s.l.
- 20 * RIVER MILE
- OUTGRANTS
- ▲ U.S. COAST GUARD NAVIGATION AID (OUTGRANT)



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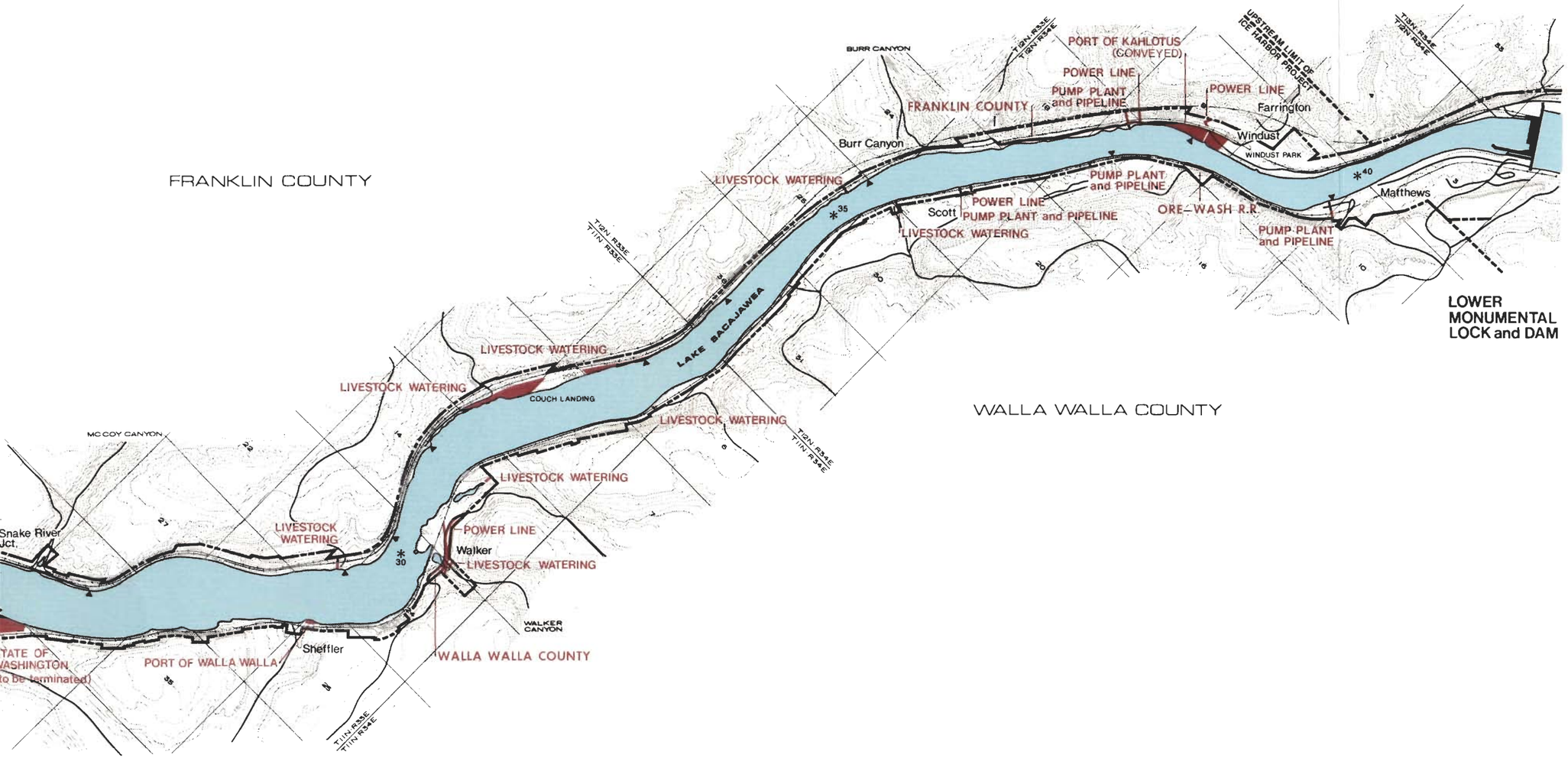
JUNE 1976

LOWER SNAKE RIVER PROJECT

U.S. ARMY ENGINEER DISTRICT
Walla Walla, Washington

Ice Harbor
OUTGRANTS



PROJECT BOUNDARY

ROADS

RAILROADS

NORMAL POOL
440 m.s.l.

RIVER MILE *20

OUTGRANTS

U.S. COAST GUARD
NAVIGATION AID
(OUTGRANT)

0 1 2 4 feet 8000

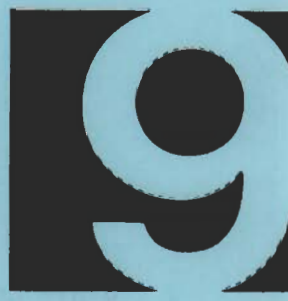
6

JUNE 1976

U.S. ARMY ENGINEER DISTRICT
Walla Walla, Washington

LOWER SNAKE RIVER PROJECT

PLAN OF DEVELOPMENT



PHYSICAL PLAN OF DEVELOPMENT

9.01. GENERAL

Allocation of Ice Harbor project lands reflects judgments that were strongly influenced by controls of environmental and socio-economic elements. Based upon a consortium of professional decisions regarding the environmental requirements as they relate to the authorized project purposes and development capabilities of the project lands, all property administered by the Corps of Engineers around Lake Sacajawea has been classified. Supporting Data Items 4, 5, 6, and 7 provide discussions on a portion of the controlling elements.

The following paragraphs provide descriptions of development included in the physical plan of development for the Ice Harbor project.

9.02. PROJECT DEVELOPMENT

In Section 8, the basis for allocation of project lands to various uses was explained. Those allocations are shown on Plate 5. This section explains the plans for development on lands throughout the project, treating Corps' development in some detail and outlining non-Corps development in general terms. Corps' developments involve principally recreation facilities and fish and wildlife habitat improvement. All port terminals and industrial access facilities will be or have been developed by local port authorities with Corps' approval of development plans.

9.03. INTERPRETIVE PROGRAM

a. Interpretive Theme

The overall theme for North Pacific Division, Corps of Engineers' projects is "Man and the River". The sub-theme for interpretation of the Lower Snake River projects will be "The Lower Snake River: A Corridor and a Barrier". All interpretive text will relate individual topics to this theme. Each interpretive device or facility will discuss a single topic, such as Indian history, power production, or navigation.

Printed pamphlets will also be necessary for free distribution at points of public contact. There will be a general pamphlet for each reservoir, with a map of recreational facilities, explaining the project purpose.This would be a map of trails and attractions of the area on one side, with interpretive information on the other. Pamphlets provide the opportunity to present more lengthy and detailed information than is possible in exhibits, as the visitor can take the pamphlet with him and read it at his leisure. It also provides a souvenir that will stimulate recall, extending the enjoyment derived from the visit.

b. Goals

The goals of the interpretive program at Lake Sacajawea are: (1) to increase visitor satisfaction, (2) to increase visitor understanding, and (3) to modify visitor impact. These goals serve both the visitor and the resource manager.

The first goal of satisfaction can be accomplished in several ways. Most recreationists seek social interaction and a change in their environment. Any person can be expected to feel uncomfortable in an unfamiliar environment. The proper kind of interpretation should be able to increase social interaction and understanding and, therefore, enjoyment. Both knowledge and interpretive media can be rewarding in themselves.

The second goal of interpretation at the project is to increase understanding or provoke interest in natural resources. The people visiting the project form a portion of the voting public on which our democratic system depends. In order to make proper decisions, people must have correct information on which to base their decisions. Interpretation is one method of dispersing reliable information to the public to help them evaluate the effectiveness of the agencies managing their resources.

As a third goal, interpretation can be used to accomplish some management objectives. By using certain interpretive devices, visitors can be dispersed; in other words, manipulated to reduce visitor impact on various sites. The interpretive facilities can modify behavior. As an example, a visitor center can make a brief introduction of a resource to a visitor who is in a hurry. As a result, the visitor may decide to return at a later date and may even stay for an extended visit. Facilities such as interpretive trails provide visitors an opportunity for closer contact with the resources without causing damage to an area.

c. Objectives

By the time the visitor leaves any of the major developed areas of the project, he should be able to explain why the lock and dam were built and list the benefits. He should be able to give examples of how the Snake River acts or has acted as a corridor and a barrier.

d. Lower Snake River Information Center

Some time in the future an information center will be constructed at the junction of U. S. Highway 12-395 and State Highway 124. This location is at Hood Park on McNary project lands and, although removed from the Lower Snake projects, the site has two distinct advantages. It will intercept a great many visitors, making it effective in dispensing information. A facility at this site will

remove attention somewhat from any single dam and allow consideration of all of the projects on the Snake River as a functional unit. All four dams were constructed to achieve the same basic goals. It is not intended that the information center detract from, or substitute for, the individual visitor centers and interpretive displays at each of the Lower Snake dams. Rather, it will serve to introduce and direct visitors to the various projects and parks. For the short-term visitor, an introduction to the history of navigation on the Columbia-Snake River system can be given at the information center. The story can cover the entire Lower Snake River as a unit, moving from the Lewis and Clark journey through steam navigation to the present barge traffic. Since it is uncertain if the interstate highway will be routed along Highway 12-395, the next updating of this Master Plan will provide more detail regarding the development of this information center.

e. The Dam

Design Memorandum No. 4.1, South Shore Fish Viewing and Visitor Facilities, presents a plan for the development of a new visitor building and a replacement fish viewing and counting facility. Interpretation should be limited to the functioning of the locks, dam, and fish ladders; the project purpose; and fish passage. The existing fish viewing and counting facility consists of a horizontal board in the fish ladder. For automated fish counting a vertical window is more suitable; there is less reluctance by the fish to pass in front of a vertical window. A vertical window also displays fish more clearly to the viewing public. There are now no adequate existing displays or indoor visitor accommodations on-site.

On top of the dam, two exhibit panels will be added at the fish ladder. One panel would discuss the life cycle of anadromous fish and the other would explain the fish ladder. The speaker for the audio station should be placed closer to the visitor so that lower volume could be used and higher clarity could be obtained. The length of the tape should not be over 90 seconds.

Two exhibit panels will also be added at the navigation locks. One panel would explain the functioning of the locks. The second would identify the common types of vessels and cargo that pass through the locks.

A short,self-guided tour of the powerhouse should be developed.

Exhibits at the powerhouse will explain how the turbines and generators work. The control and network flow of electricity in the Pacific Northwest should also be explained.

f. Recreation Sites

Interpretive markers will be placed at Levey Park, Fishhook, Charbonneau, and Windust. These will be permalloy or other outdoor panels. As most of the visitors are local, repeat visitors, expensive, permanent interpretive facilities would not be appropriate.

Levey Park should have a panel explaining the Ringold Formation as the likely source of the material that formed the Palouse Hills during a windier and drier period. A second panel will interpret the Lewis and Clark activity in this area and their campsite of 15 October 1804.

Charbonneau will have a marker interpreting the nearby wildlife habitat improvement efforts of the Corps. This marker will identify the important game species, primarily Canada geese. A Lewis and Clark exhibit will also be included.

At Fishhook Park, with overnight camping, an interpretive trail should be well used. The trail would be a short, one-way loop. Vegetation, climate and microclimate, and wildlife will be interpreted. An exhibit panel discussing Lewis and Clark should be constructed here.

Windust will receive a Lewis and Clark exhibit discussing their campsite of 14 October 1805 and their activities in the area.

9.04. RECREATION - DEVELOPMENT PROGRAM

a. Work Accomplished

Essentially all major development at recreation areas is complete; however, some expansion is required to satisfy present recreation demands. All areas are predominantly day use and generally include access roads, boat tie-up facilities, beaches, picnicking areas with shelters, and restroom facilities. Fishhook, Charbonneau, and Levey have facilities for overnight camping. Layout drawings showing facilities at each recreation area are shown on Plates 7 through 12. Elements of the development are color coded to differentiate existing facilities from recommended improvements to satisfy future demands.

b. Summary of Proposed Recreation Development

Recreation expansion discussed herein is proposed either in a five-year or future development program. A recreation use analysis is attached (Number 6 in the Supporting Data) which projects what visitor-use demands will be and the facility requirement at that time. At the present time, all recreation areas are administered by the Corps of Engineers. However, discussions have been held with the State of Washington to transfer administrative responsibilities for the majority of all recreation areas on Ice Harbor to the State. It appears that this agreement will not be consummated in the immediate future. A full description of planned development at each site is provided in later paragraphs of this section.

c. Summary of Future Recreation Sites

The objective of long-range recreational planning is to assure that ample land is available to permit expansion of areas and facilities commensurate with projected future use throughout the project life. Acreage requirements for various recreation

facilities should not fail to include ample open space to add to the quality of the entire area. Based on past, present, and projected future use, areas allocated for recreational use on Ice Harbor project satisfy requirements for future expansion and open space for the project life. Therefore, no new sites are anticipated without a major change in recreational habits in the area. Improvements are required, however, at the majority of the existing recreation sites in order to maintain adequate facilities to satisfy projected future needs. Improvements, for the most part, reflect a need to improve boat and boat-trailer facilities. All of the recreation facilities will be utilized under the annual 343,316 visitor days projected for 1985. To accommodate additional increases in use beyond 1985, expansion of existing areas to provide adequate facilities is possible.

9.05. SPECIFIC RECREATION DEVELOPMENTS

a. The Dam, Plate 7

In addition to the interpretive facilities mentioned in paragraph 9.03.e., there are several improvements required in the vicinity of the lock and dam. A small boat dock is required at the tailwater area and another near the launching ramp on the north shore to moor small craft while awaiting lockage. Landscaping of the existing Indian Memorial site, using native plant materials, is necessary to improve its appearance and make the Memorial a more impressive attraction. General landscaping work is also required in the tailwater area on both the north and south shore and at the launching area.

In response to an increasing demand for an off-road vehicle area on the Lower Snake River project, a 115-acre site is proposed on the south shore just below the dam for this purpose. The only improvements at this site will be a perimeter four-strand wire fence, a small, all-weather parking lot, and access road.

A vault-type comfort station is recommended at the existing boat-launching facility at the north shore, within five years. Tree planting over the general area and landscaping at the south shore are also included in the five-year plan.

b. Charbonneau Park, Plate 8

This 243-acre site is situated on the south side of the reservoir about a mile upstream from the dam. It is a day-use and camping facility with paved access from State Highway 3D. The topography is gentle and rolling. Soils are sandy and subject to wind erosion when disturbed.

(1) Present Development

Approximately 30 acres in the center portion of the site are developed with established lawn and tree planting. Present

facilities include two boat ramps and a related crib wall which will accommodate approximately 40 boats; 48 paved car-trailer parking spaces and 150 paved car parking spaces; a large comfort station with potable water and flush-type toilets; a sanitary dump station; one group shelter; and six picnic shelters. There is also a beach area adjacent to the picnic area. A complete irrigation system has recently been installed to water plantings within the 30-acre area. A caretaker's residence was recently placed on the site. Camp loop roads are gravel surfaced.

(2) Five-Year Development Program

Improvements at Charbonneau Park with Code 714 funds will include completion of the 54-unit campground with comfort station. A service road to the upper end of the park will also be included in the five-year plan. Tree and shrub plantings are sparse and require augmentation to improve the overall quality of the area for public enjoyment. Also required is a project to control erosion and maintain the shoreline adjacent to the camping area.

(3) Future Work

Two additional camp loops - one containing 27 units and another with 69 units - will be developed with Code 714 funds in phases as visitor use warrants and funds are available. Automobile-trailer parking will also require expansion. Charbonneau is the most likely place on Ice Harbor project to provide, by concession contract, a boat marina and public restaurant, should the demand arise. A boat cleanout station will also be provided in conjunction with these facilities, as well as a breakwater at the entrance to the boat basin.

c. Levey Landing, Plate 9

This is a 51-acre site on the north shore, three miles upstream from the dam. Access is afforded over two miles of asphalt-surfaced county road which connects with a paved county road known locally as the Pasco-Kahlotus Highway. The topography is generally gentle and rolling. Soils are sandy loam and are subject to wind erosion. The upstream portion of the site is too steep for intensive shoreline erosion. As a result of these conditions, only 24 acres on the downstream portion have been developed.

(1) Present Development

The 24-acre portion of this site is well established with lawn, shrubs, and trees. Present facilities include two boat ramps, 22 paved car-trailer parking spaces, 68 paved car parking spaces, one comfort station with potable water and flush-type toilets, seven picnic shelters, a sanitary dump station, and 18 acres of sandy beach. There is presently nothing in the way of permanent boat mooring facilities. The area is presently used as a day-use facility.

(2) Five-Year Development Plan

A primitive camping area will be developed at Levey Landing. These facilities will include a gravel loop road, landscaping, and tables and grills. A comfort station and additional trees are planned for the day-use area. A domestic water line will be run to the trailer dump station in the five-year program. The nature interpretive area will also be landscaped.

(3) Future Work

Three additional picnic units will be installed in the day-use area to meet future demands. Additional automobile parking will also be required. Improvements and additions to the boat tie-up docks will be included in the future work.

d. Fishhook Park, Plate 10

This site is situated on the south shore, at River Mile 18, and contains about 45.8 acres on the reservoir side of the railroad. It is accessible by paved road. The topography is gentle and rolling, with gentle and moderate slopes along most of the shoreline area. Soils are sandy and vulnerable to both wind and water erosion.

(1) Present Development

About 24 acres of land have been intensively developed at Fishhook Park. Two boat ramps,temporary mooring space for approximately 20 boats, .2 acre of sandy beach, 57 paved car-trailer parking spaces, 150 paved car parking spaces, 39 campsites, seven picnic shelters, and two comfort stations with potable water and flush-type toilets are the major facilities presently provided. Access to the area is afforded by paved road from State Highway 3D.

(2) Five-Year Development Program

Development at Fishhook Park will include tree planting and required improvement to the potable water supply system. The water from the present system is unsuitable for domestic uce and will require some type of corrective action.

(3) Future Work

Future work includes further general expansion of the picnic area, establishment of an interpretive trail, and installation of an irrigation system in the camping area.

e. Windust, Plate 11

This 51-acre site is located on the north shore, at River Mile 38.5, near the upper end of the pool. It is suited as a county-type park and a boat access point. A paved county road borders the landward side of the area. Soils are sandy loam and generally not subject to wind erosion. The topography slopes gently upward from the shoreline to the county road.

(1) Present Development

The development provided by the Corps of Engineers was completed in 1964. Facilities include a single boat ramp and a small mooring dock, 15 paved car-trailer parking spaces, 20 paved car parking spaces,40 overflow gravel parking spaces, a comfort station with potable water and flush-type toilets, several picnic shelters, and .7 acre of sandy beach. A total of 12 acres have been intensely developed to include lawn with irrigation and trees and shrubs.

(2) Five-Year Development Program

Improvements included in the five-year plan are paving of the overflow car parking area and general landscaping for enhancement of the area.

(3) Future Work

Future work includes an additional launching lane, car-trailer parking, expansion of the lawn and picnic area,and a floating breakwater.

f. Matthews, Plate 12

Matthews is situated almost directly across the reservoir from Windust on the south shore. The 48-acre site is presently a boat-launching site.

(1) Present Development

A single-lane boat ramp, 20 paved car-trailer parking spaces, and vault toilets are presently provided.

(2) Five-Year Development Program

This area is suited as a game fishing area. The existing boat access and parking are adequate for this purpose.

Tree planting is required to improve the quality of this site as a fishing access point.

(3) Future Work

Twenty additional car-trailer parking spaces and another launching lane will be required in the future.

9.06. POTENTIAL FOR TRAIL SYSTEM

Future development will include the establishment of a trail system that would interconnect major recreation areas on the project. This system could connect with systems of the other projects to form a continuous trail the total length of the Lower Snake River project. The trail would vary in character and construction, depending on the location. For example, a trail that cuts across a developed recreation area would be wide and paved with minimum grades, while in remote areas it could be narrower and would not necessarily have to be paved. Steeper grades would be acceptable. The trail should be designed to accommodate bicycling, horseback riding, and hiking.

9.07. WILDLIFE CONSERVATION AND MANAGEMENT

Important wildlife resources have been lost or adversely affected by the formation of Ice Harbor Reservoir. Approximately 1,069 acres are being used for intensive wildlife management.These areas are located at Levey Landing, Charbonneau, Lost Island,River Mile 25, Big Flat, Walker, Couch Landing, Snake River Junction,and below Fishhook Park. Levey Landing and Charbonneau are interim use areas. Intensive management will include such practices as boundary fencing to restrict livestock from destroying habitat in the areas, production of food crops using permanent irrigation systems,establishing woody plantings to provide cover, and the installation of artificial nesting structures. Maximum advantage will be taken of areas which are presently suited to support wildlife populations. Studies are underway and plans are being formulated to implement the wildlife management program outlined in the recently completed Wildlife Habitat Development Design Memorandum.

Although Big Flat has been allocated for intensive wildlife management in this report, the option to reconsider its use as a future recreation area will be retained. This reallocation would have to be justified by data indicating the need for additional recreation facilities at this site.

Buildings for storing equipment associated with the wildlife management program will be required. They should be located as needed at the various wildlife management areas. Maintenance and repair can be accomplished at existing facilities.

Hunting will be allowed on Lake Sacajawea except in and near developed recreation areas.

9.08. PORT AND INDUSTRIAL USE

a. Corps' Responsibilities

Corps' authorities and responsibilities related to development and operation of public port terminal or of industrial use and access lands are limited to those administrative measures and actions necessary to, or associated with, the making of project lands available for these uses. These include:

(1) Formulation of the project master plan.

(2) Determination of environmental impact statements pertaining to conveyance of project lands to non-Federal ownership or administration.

(3) Preparation of environmental impact statements pertaining to conveyance of project lands to non-Federal ownership or administration.

(4) Securing of official "Determination of Availability" from the Secretary of the Army for disposal.

(5) Preparation and execution of quitclaim deed or lease instrument with appropriate reservations to protect project needs.

(6) Continued administration of those interests in the land as retained by the Government for project purposes.

(7) Review and approval of port development plans to insure compliance with terms of the deed or the lease and with regulations regarding work in navigable waters.

Port districts are created by a vote of the people within the areas encompassed by the district boundaries, pursuant to provisions of Washington State Law WSC53.04.020. State law stipulates that the port commission must prepare and present to the people at a public hearing a comprehensive plan of development. Once officially adopted, this comprehensive plan becomes the guide for all port development. Copies of these comprehensive plans for each port district are on file in the Land Use and Environmental Section of the Walla Walla District Office.

b. Industrial Demand

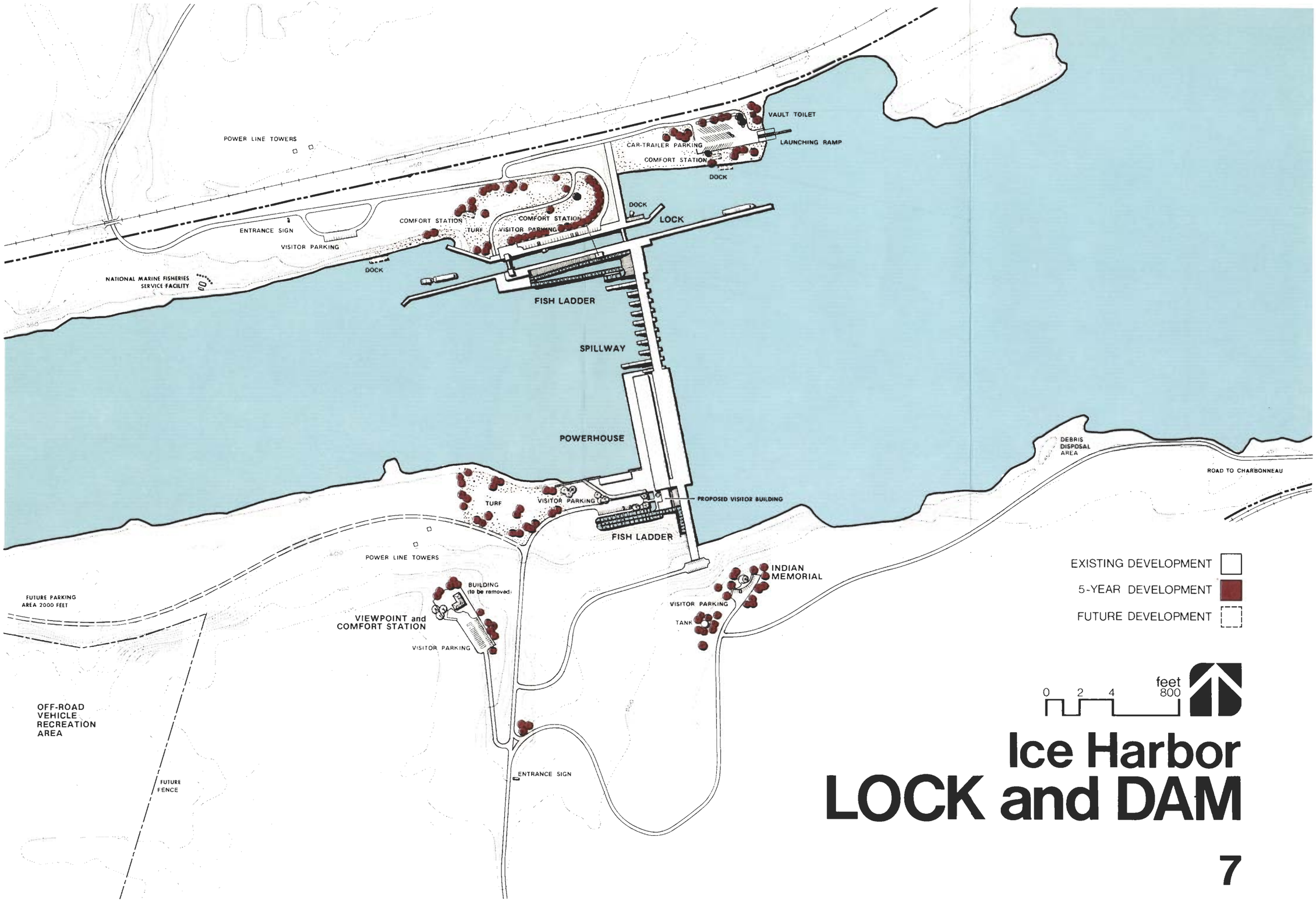
An industrial survey is presented as Item Number 5 in the "Supporting Data". The survey concludes that there is no need to provide significant additional land or port terminals and industrial development.

c. Port of Walla Walla

Port facilities at Sheffler, at River Mile 29, are operated by the Walla Walla Grain Growers' Association. The land is on lease from the Port of Walla Walla. The total amount of tonnage through the elevator for 1973-1974 amounted to 100,000 tons. Access to Sheffler is by paved road off Highway 124. Also, the Union Pacific Railroad runs by the site. No development is planned for this site,as capacity of the facility has just been expanded from 500,000 bushels to 533,000 bushels.

d. Port of Kahlotus

Windust storage and shipping is operated by the Port of Kahlotus. This is a tract of land approximately 11 acres in area. Shipment of wheat from this facility totaled 149,254 tons for the years 1973-1974.



Ice Harbor LOCK and DAM

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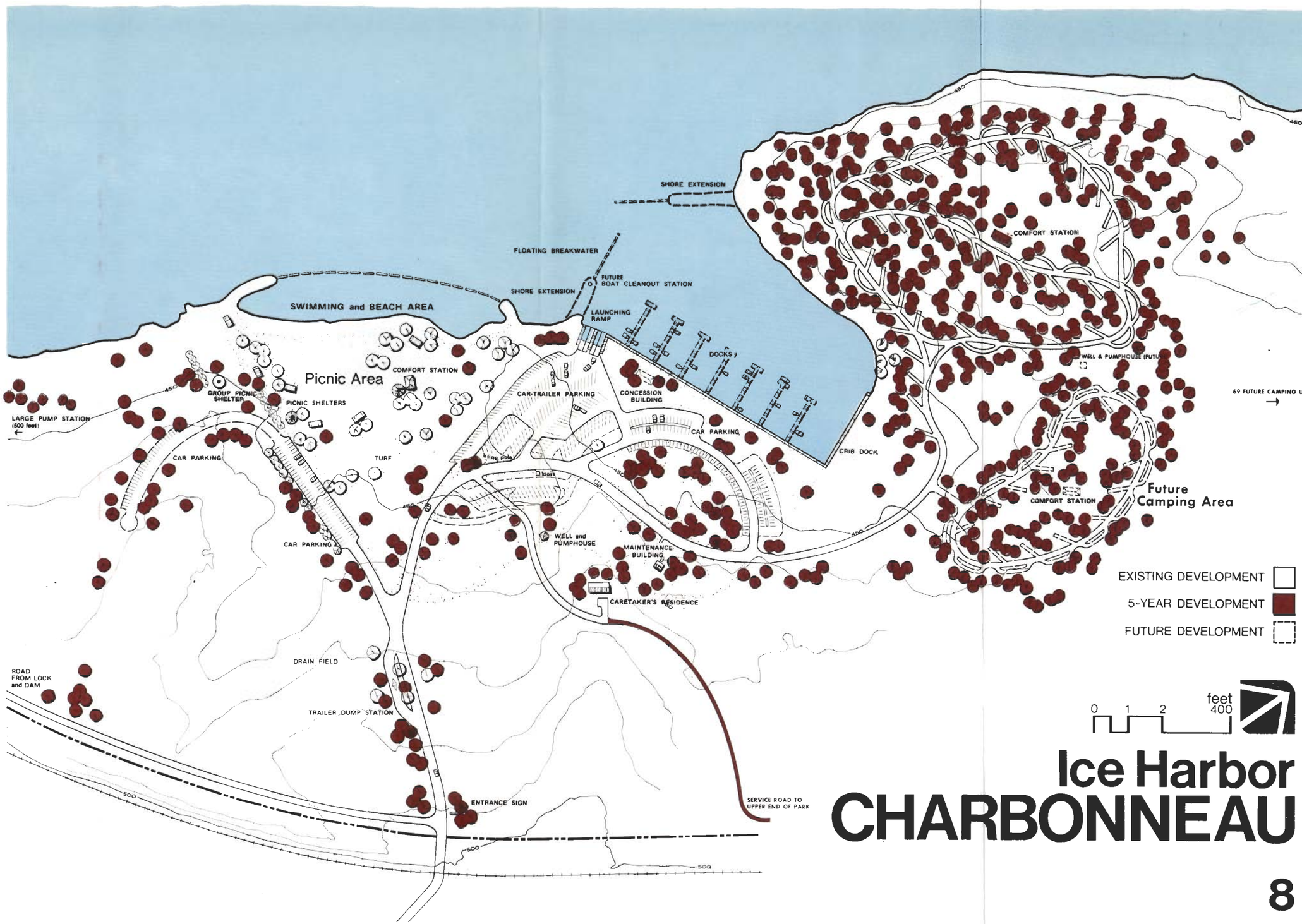

Ice Harbor
CHARBONNEAU

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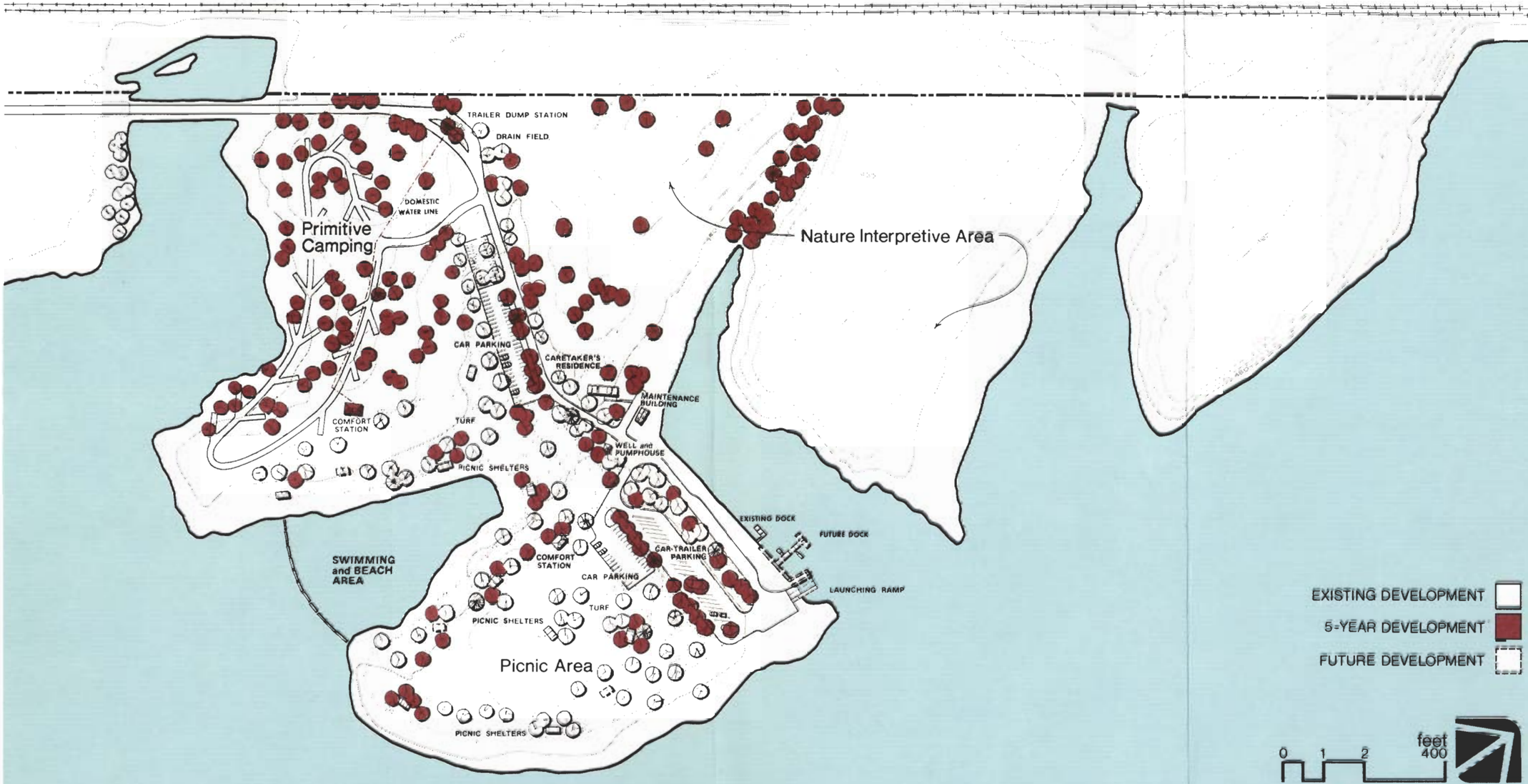

Ice Harbor
LEVEY LANDING

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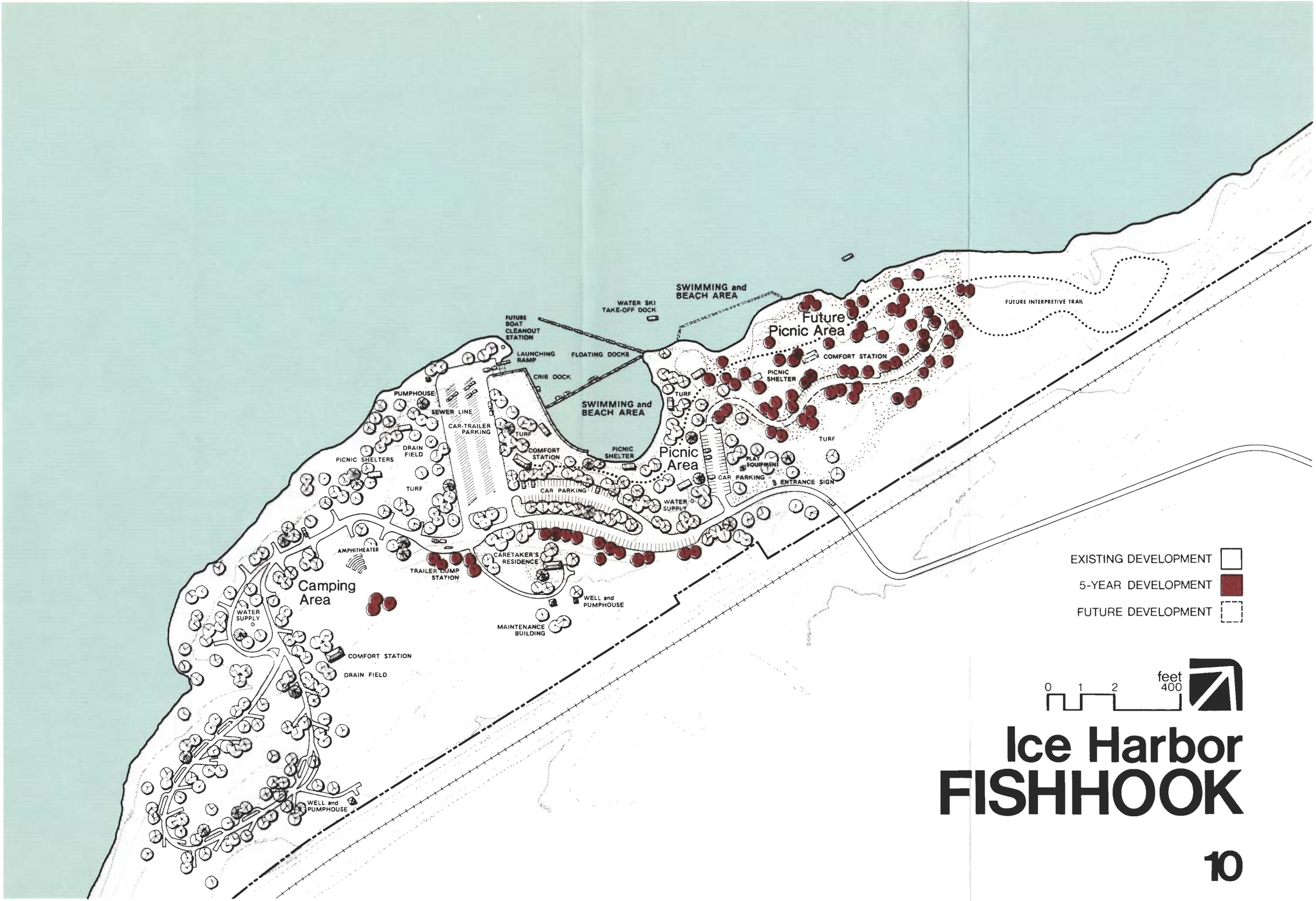
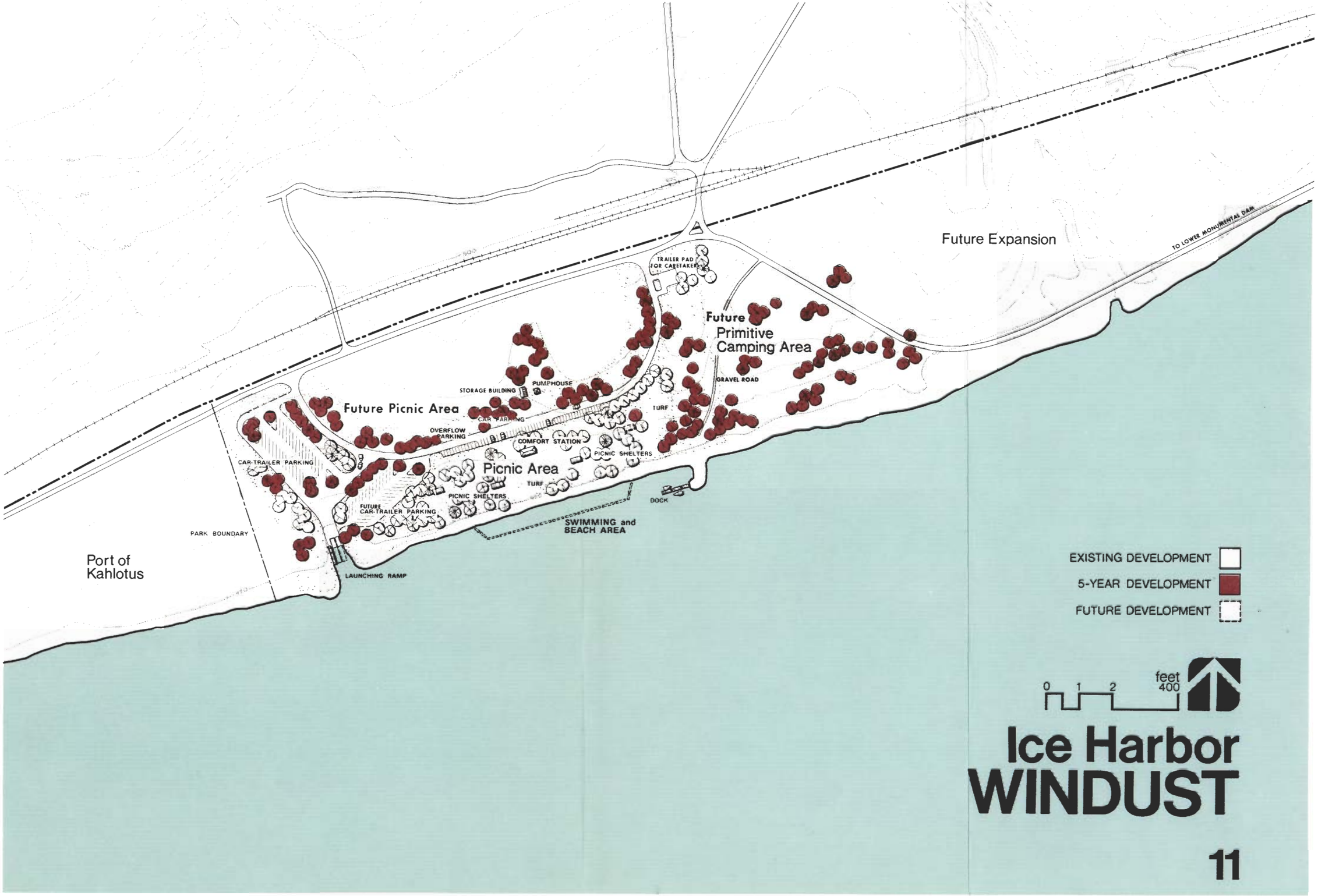


Ice Harbor FISHHOOK

10


Future Expansion
TO LOWER MONUMENTAL DAM
TRAILER PAD FOR CARETAKER
Future Primitive Camping Area
GRAVEL ROAD
STORAGE BUILDING
PUMPHOUSE
Future Picnic Area
CAR PARKING
TURF
OVERFLOW PARKING
COMFORT STATION
PICNIC SHELTERS
CAR-TRAILER PARKING
Picnic Area
TURF
PICNIC SHELTERS
DOCK
FUTURE CAR-TRAILER PARKING
SWIMMING and BEACH AREA
PARK BOUNDARY
Port of Kahlotus
LAUNCHING RAMP
EXISTING DEVELOPMENT
5-YEAR DEVELOPMENT
FUTURE DEVELOPMENT
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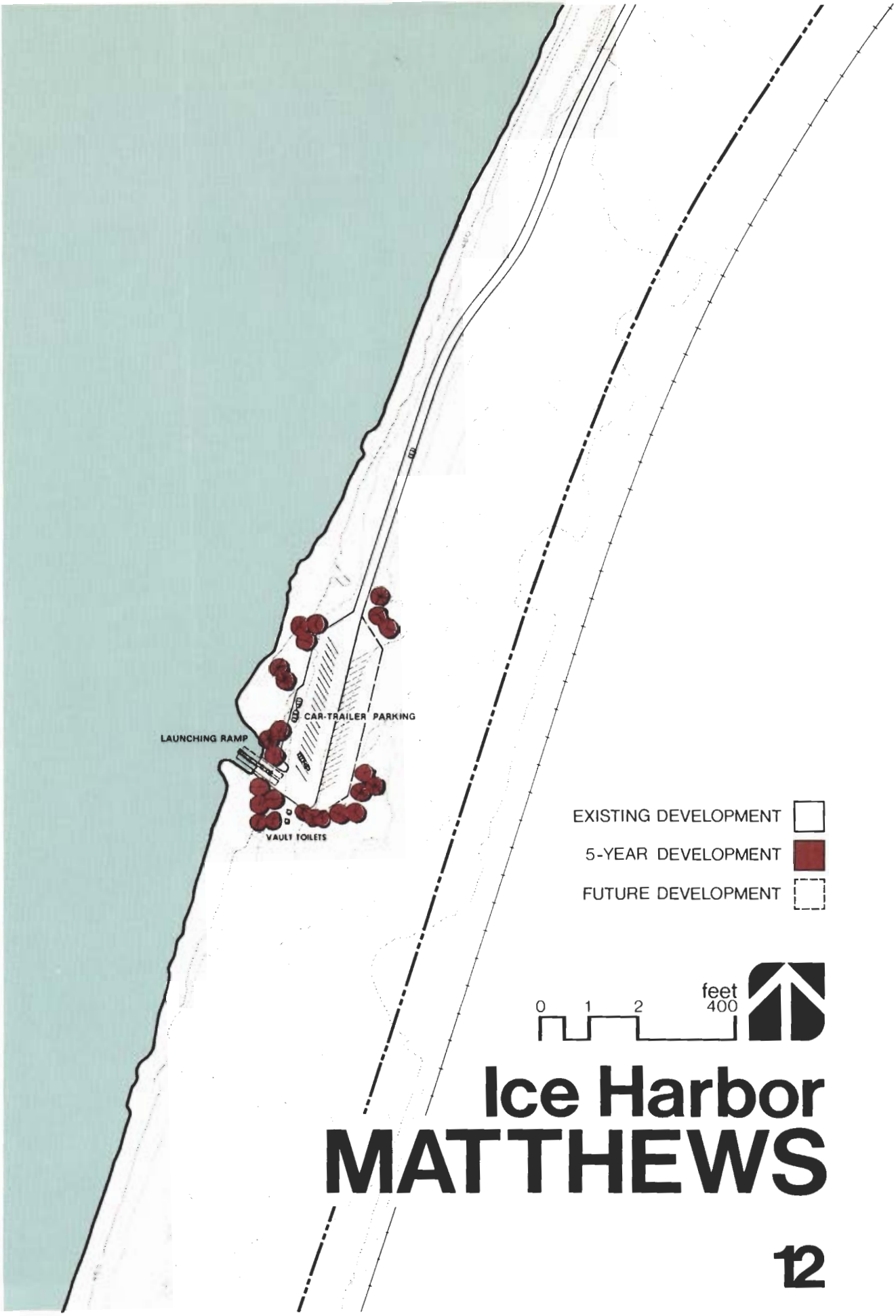
Ice Harbor
WINDUST
11



Ice Harbor
MATTHEWS

12

DESIGN CRITERIA

FACILITY LOAD and OTHER DESIGN CRITERIA

10.01. COMPLETED DESIGN MEMORANDA

The purpose of this section is to provide guidance in the areas of design and load criteria that will standardize quality in the five-year and future development programs of Lake Sacajawea.

Criteria for design of recreation and related facilities are set forth in various Engineer Regulations and Engineer Manuals and form the basis for preparation of feature design memoranda and contract plans and specifications. ER 1110-2-400, Design of Recreation Sites, Areas and Facilities, furnishes specific guidance for design of recreation facilities. Feature recreation design memoranda have already been prepared and submitted for essentially all elements of the Ice Harbor initial recreational development program. These design memoranda furnish detailed data and represent design response to the instructions furnished in ER 1165-2-400, Recreation Planning, Development and Management; ER 1120-2-400, Recreation Resource Planning; and EM 1110-2-400, Recreation Planning and Design Criteria.As guidance for proposed development, existing design and criteria in each of the areas should dictate how future improvements should be implemented. Design memoranda will be provided for each area as improvements are warranted and funds are available. Thus, this section offers only some general discussion expressing planning philosophies of the District plus some District policies supplementary to the EM's and ER's. Plates 13 through 35 illustrate the design intent that will be discussed in this section.

10.02. SITING

Location of various recreational facilities in relation to pool levels and flooding hazards has been and will be governed by criteria adopted and published in September 1970 in Walla Walla District (see Item No. 7 of Supporting Data). Siting of facilities with regard to factors other than flooding hazard will be governed by principles set forth in ER 1110-2-400, paragraph 5. In all instances, preservation and enhancement of the scenic and natural qualities of the areas will be prime objectives.

10.03. ROADS

In terms of negative, man-made impacts on the environment, roads are often the greatest offenders. Consideration should be given to visualizing how the road will appear in the landscape and

how the landscape will appear from the road. A road which blends and moves with the land is well worth striving for. The alignment of access roads to recreational or operational sites has a marked influence on the attitude the visitor takes toward the site. The expesssion, "First impressions are the most lasting" applies directly to the planning of an access road and associated entrance signs. Road alignment within a park is a major consideration of the site plan. Roads can unite individual use areas or become undesirable barriers, as when they are placed between a beach and picnic area. Roads can be used to define spaces when they circumvent an area or form desirable separations, such as between day-use and overnight facilities.

In general, all project roads should be all-weather type to reduce maintenance costs. The quality of these roads should reflect their use. That is to say, an access road that connects a bituminous paved county road to a highly developed recreation area should be designed with bituminous paving, 4-foot shoulders, 10% maximum grade, and adequate features to handle surface runoff. An access road that connects to a small boat-launching facility, however, may require only a light surface treatment and may be steeper and narrower than the major access road described above.

10.04. PARKING AREAS

The design and siting of parking areas are important aspects of the site plan. The parking area forms the terminus for the access road. The ease with which the visitor is able to enter and leave the parking is important. The parking area is essentially a holding area for vehicles and without forethought it can be not only expensive but unsightly, hot,and confusing. The following principles should influence parking area design:

Highly visible terrain on the site should be ruled out as a location for parking.

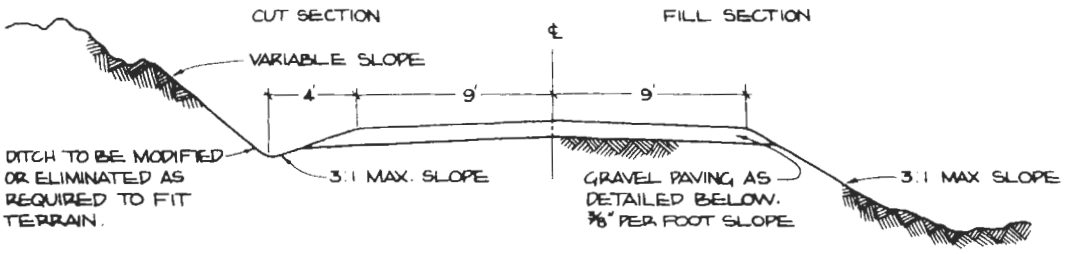
Mounds, hedges, or recessed lots are helpful in reducing the visibility of the parking area.

Trees can be used within the lot to provide shade. Shrubs help in reducing the apparent size of a large lot.

The layout should consider pedestrians leaving and entering the lot. The pedestrian walkway should be identified by a change in elevation, a change of materials, planters, railing, etc.

Overflow parking areas should be grassed rather than paved.

Ice Harbor DETAILS



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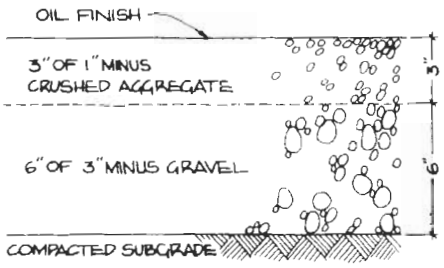
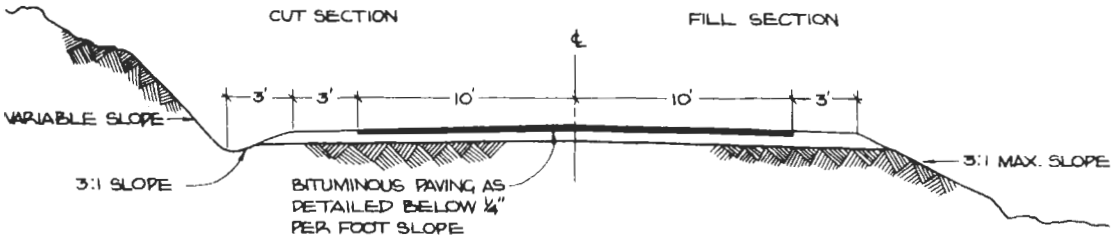


paving

LIGHT DUTY ROAD

13

Ice Harbor DETAILS



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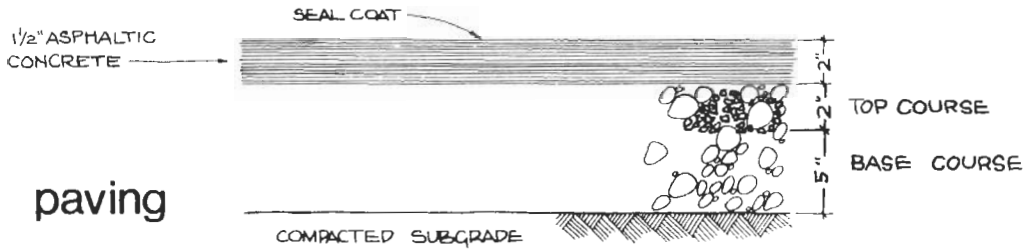


paving

MEDIUM DUTY ROAD

14

Two or more small lots are often easier to site than one large lot with uniform grading.

10.05. DOMESTIC WATER AND SEWER SYSTEMS

The present potable water supply at Fishhook is unsuitable for drinking and must be corrected. Studies are underway to determine corrective action. Abundant ground water is available and all other major recreation areas are supplied with ample water.

Major recreation areas are presently equipped with septic tank and drain field systems. These systems or similar systems in the same general location will meet all future needs for subsurface disposal of sewage effluent. Septic tanks will be cleaned as necessary and the solid waste matter will be removed from project lands. All domestic water and sewer systems will conform to standards of the Washington State Board of Health.

Electrical service will be provided at all recreation sites designated for intensive use. Other sites will not have electrical service. All electric lines within recreation sites will be placed underground unless special conditions make such installation impractical.

For safety reasons, lighting intensities should conform to EM 385-1-1 or to American National Standards Institute Standard A 85.1, Practice for Protective Lighting.

10.06. TRAILS

There are opportunities for foot trails on Ice Harbor for various purposes, including fisherman access, access to scenic and historical points of interest, and as linkages between recreation areas. Future work will include developing a trail network that would serve to join all areas on the Lower Snake River project. Design of trails will depend much upon the use of the land through which the trail is built. Adequate safety measures, such as rock parapets or fences, should be used to protect the trail hiker. However, care should be exercised to insure that such safety measures do not detract from environmental quality. Generally, a trail will fall within the following two categories.

a. Informal

Trails in natural areas, low-density recreation areas, wildlife areas, or other areas of minimum development will be designed as simple access routes with no built-up base or surfacing. Trails should be little more than a two or three-foot-wide defined path across the terrain.

b. Formal

Foot trails built in intensive-use recreation areas must be capable of withstanding use from a concentration of visitors; consequently, the trail may take on a different appearance than the informal trail. It may be necessary to provide surfacing to prevent excessive wear or to suppress dust. The trail is then a formal walk, and materials used in surfacing should relate to other natural or man-made elements in the plan. Care should be taken to align these trails between major destination points; otherwise they will not be effective.

10.07. SWIMMING BEACH

The swimming beach is assured of being populated during the hot summer days characteristic of the Ice Harbor region. Typically, the beach is the center of activity in any day use area and a popular pastime for campers as well. The beach is also an important focus for people watching by those of all ages.

a. Water Quality

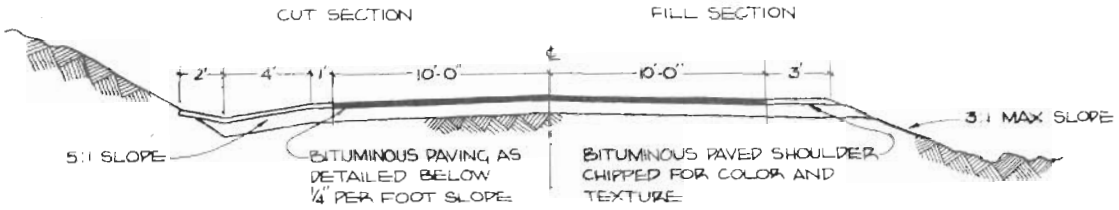
Obviously, the most important feature of a beach is good, clean water. Experience at beaches built elsewhere in the District has proved that a beach recessed into the shoreline, built to thwart wave action, does not allow for adequate water exchange. Swimming areas built directly on the shoreline, however, require stabilization such as asphalt paving or gravel to counteract wave action.

b. Design

There are two basic choices of swimming area design. The shoreline beach which is exposed to wave action must be constructed in two segments. Sand for sunbathing, which is most susceptible to erosion, will be placed back from the shoreline away from frequent wave action. The underwater portion will be surfaced with asphalt paving. This will allow hose cleaning during low water levels to remove silt which settles in the shallow beach area.

The other choice is to construct a protected sand area which is recessed into the shoreline. The design of this type of swimming area must be one which allows through circulation of water in such a manner as to prevent the buildup of pollutants without

Ice Harbor DETAILS



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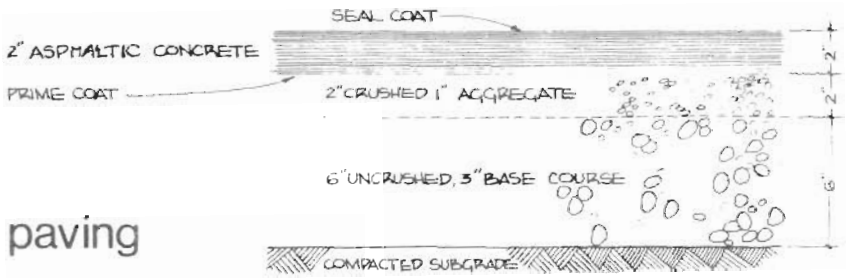
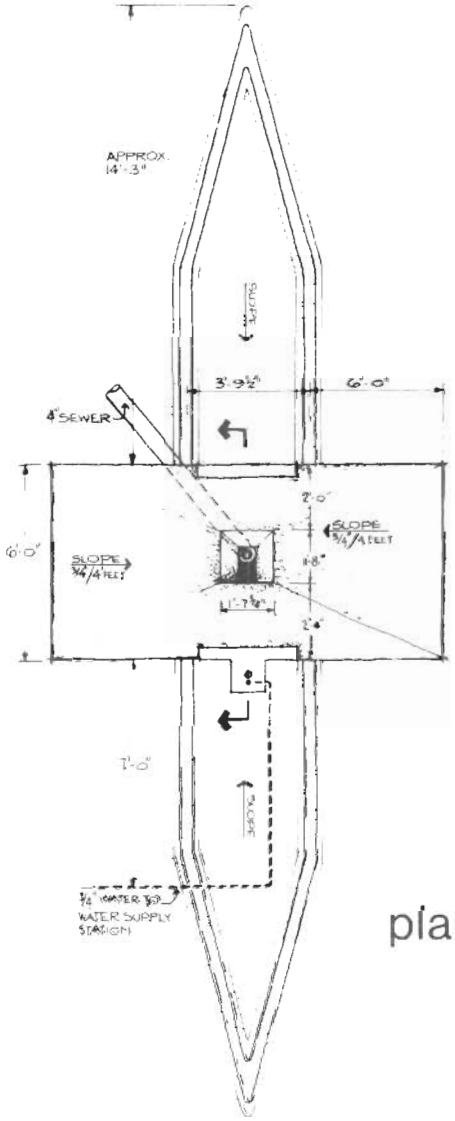


paving

HIGH STANDARD ROAD

15

Ice Harbor DETAILS



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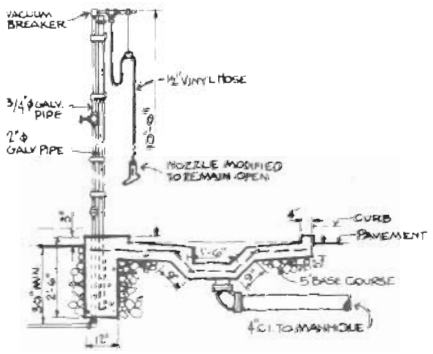
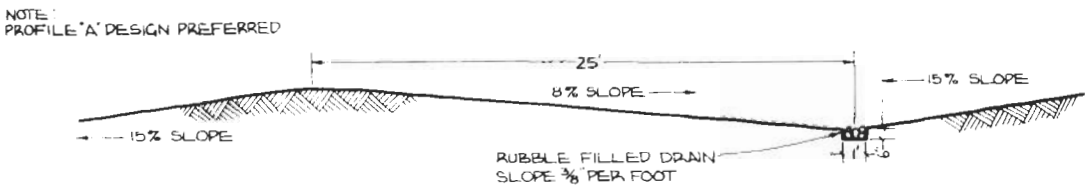


section

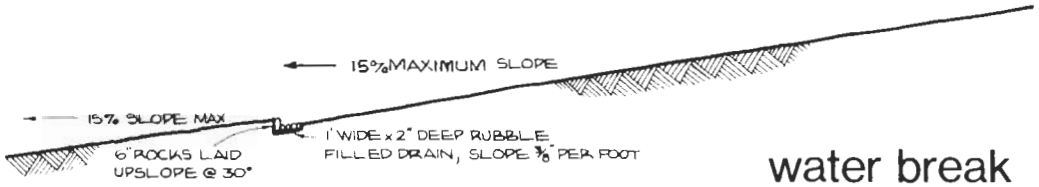
SANITARY DUMP STATION

16

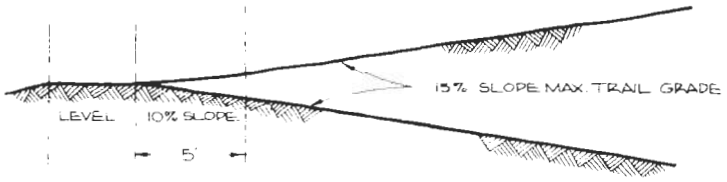
Ice Harbor DETAILS

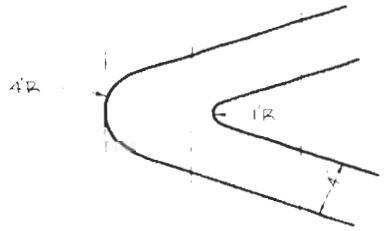


water break A



water break B





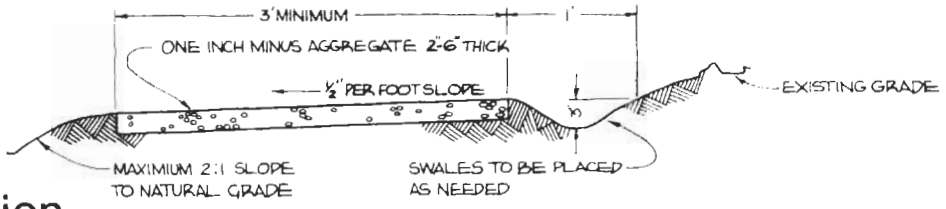
NOTE:
TRAIL GRADES SHOULD NOT EXCEED 15% EXCEPT IN EXTREME CASES GRADE SHOULD VARY WHERE APPROPRIATE TO AVOID FATIGUE.

switchback

TRAIL GRADING

Ice Harbor DETAILS

NOTE:
AGGREGATE THICKNESS DETERMINED BY SOIL CONDITIONS AND ANTICIPATED VISITOR USE

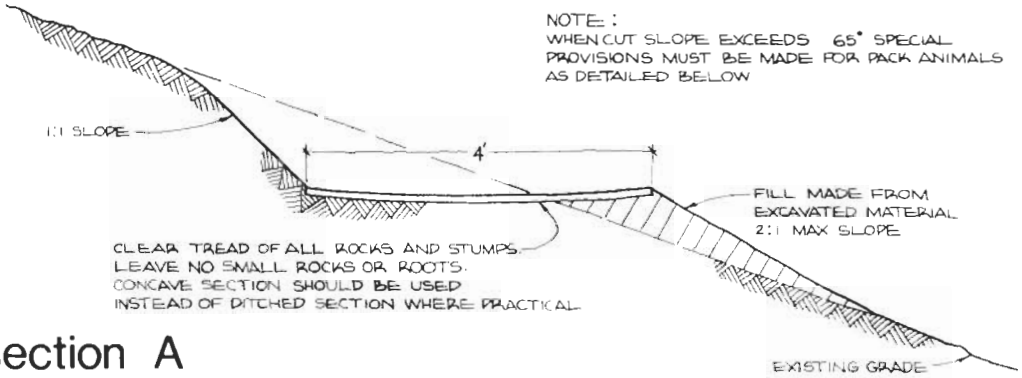


section

INTENSIVE USE TRAIL

REMOVE LOOSE EARTH AND SLIDE ROCK 2 TO 3' ABOVE EDGE OF CUT

NOTE:
WHEN CUT SLOPE EXCEEDS 65° SPECIAL PROVISIONS MUST BE MADE FOR PACK ANIMALS AS DETAILED BELOW



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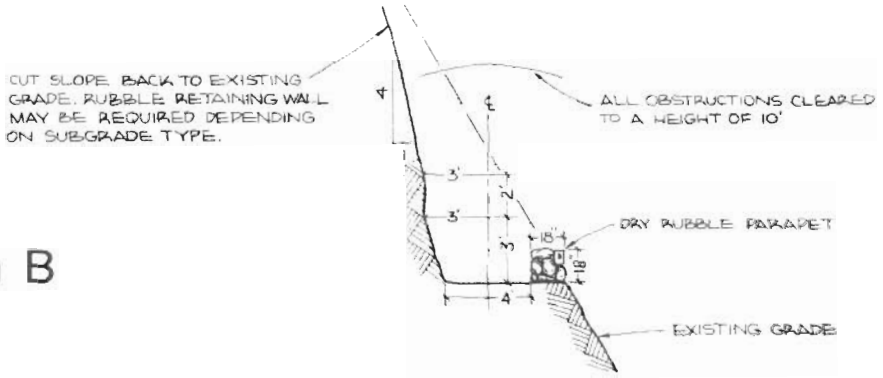


section B

HILLSIDE TRAIL

causing beach erosion. A riprap breakwater would be utilized to protect the beach from severe wave action and to direct the circulation of water through the swimming area. This second choice is less desirable than the first in that it would require considerably more engineering and cost.

Optimum slopes for underwater portions of the beach are in the range of 1 vertical on 20 horizontal. Landside portions can be as steep as 1 vertical on 10 horizontal if wave exposure is very minimal. It is desirable to separate the sanded area from the turf with a simple concrete curb, six to 18 inches high. Seating areas with shade should be placed close to the beach for swimming supervision by parents and for passive recreationists. All swimming areas will be protected from boating either by use of floating booms or riprap breakwater configuration.

10.08. LANDSCAPING

The primary aim of all planting design should be to use plants to solve functional problems, making the landscape more habitable and pleasurable.

a. Natural Landscaping

The most logical approach, and usually the most successful in terms of plant survival, is to choose plants which are growing in the area and to plant them in situations to which they are accustomed; for example, a weeping willow should be planted near water rather than on a dry hillside. Native vegetation at Ice Harbor more than four feet in height, except along the shoreline and in ravines, is very rare.

b. Mixed Landscaping

Another approach, such as that used at Fishhook Park, is a compromise between a natural and an urban landscape. Clipped lawn will be kept to a minimum. Dryland grass and preferably native species will be planted over the majority of park and will be irrigated to maintain vitality. Trees and shrubs, while not native, will be chosen for ability to adapt to climatic conditions of the site.

10.09. ELDERLY AND HANDICAPPED VISITORS

All major public use areas and visitor facilities will be designed to accommodate the elderly and handicapped. They are sometimes a forgotten segment of the visiting public. Today, with increased mobility and affluence, they are getting out in groups, pairs, or with families to picnic at a park or visit a dam. Many of these visitors are affected by age and a dwindling reserve of stamina. Forethought in planning can make a visit more enjoyable. Following are a few suggestions.

a. Visitor Facilities

(1) Radio Transmitter

Low-wattage radio messages explaining the facility can be transmitted from the visitor center and picked up on a car radio. The visitor need not leave the car.

(2) Parking Lot Window Speaker

Several parking stalls in a lot might be designated for the handicapped or elderly. Speakers on stands, similar to those in an outdoor movie theater, could be installed and messages recorded to entertain the visitor who would prefer to remain in the car.

(3) Shuttle System and Elevators

Where horizontal or vertical walking distances are extreme, elevators and shuttle systems should be considered.

(4) Swimming Beach

A small section of the beach could be paved underwater so that a wheelchair could be wheeled into the water and the occupant can enjoy the water at firsthand.

(5) Passive Recreation

All active recreation areas (ballfields, swimming beaches, etc.) should have facilities (benches and shade) for passive recreation.

b. Parks - Camping Area

(1) Paved Campsite

One or two campsites located closest to the restrooms could be developed for visitors in wheelchairs. The total site might be paved so that the wheelchair can be maneuvered easily from tent to table, fire pit, water, and trash can.

(2) Paved Paths

The campsites for the handicapped should be joined to the restroom and day-use area by paved paths so wheelchairs can be moved at ease through the park.

(3) Picnic Table

One side of the picnic table in the handicapped campsites should be left without a bench so that a wheelchair can be moved up to the table.

(4) Parking Lots

A parking space or two should be signed for handicapped parking. Provisions for cutaway curb or a ramp up the curb should be made.

(5) Mini-Tours

Short tours can be planned to visit one or more of the most interesting features at the dam and thereby reduce walking distances.

(6) Waiting Areas

Shaded, comfortable waiting areas might be provided near the parking lot or entrance to the visitor building where the elderly may sit while the remainder of the party tours the facility. Play areas might be designed in conjunction with this waiting area, both for the enjoyment the elderly visitors would receive from watching the youngsters and for the supervision they offer.

c. Parks - Day Use

(1) Fishing Pads

Level fishing pads can be built on riprapped slopes or other embankments difficult to traverse for the elderly. Portable lawn chairs can be set up on these pads.

(2) Game Areas

Shuffleboard courts, horseshoe pits, etc., might be provided.

10.10. PLAYGROUND FACILITIES

A playground should be included in the design for all major intensive-use recreation areas. Each playground should be designed

individually as an integral part of the site plan. Consideration should be given to locating the playground in relation to parking, beach, day use and camping. Provisions for informal supervision, including seating and shade for parents and the elderly, are to be designed into the plan. The design should consider indigenous material on or near the site, which could include wood, water, brick, mounds, and plants. Playgrounds should be creative play areas in which the child is stimulated by his environment to imagine a world of his choosing.

10.11. CAMPING AREAS

a. General

Major changes in camping patterns have occurred in recent years, arising from changes in income status, travel habits, amount of leisure time, and especially from changes and improvements in design of outdoor recreation vehicles and camping equipment.

Many campers:

Are not interested in nature. They want only visual contact with nature, such as from a viewpoint or car window.

Are actually looking for social contact. Studies indicate that many campers are traveling in groups of two or more families or are elderly and are traveling in caravans with other elderly people or merely enjoying a non-building contact or conversation with other campers.

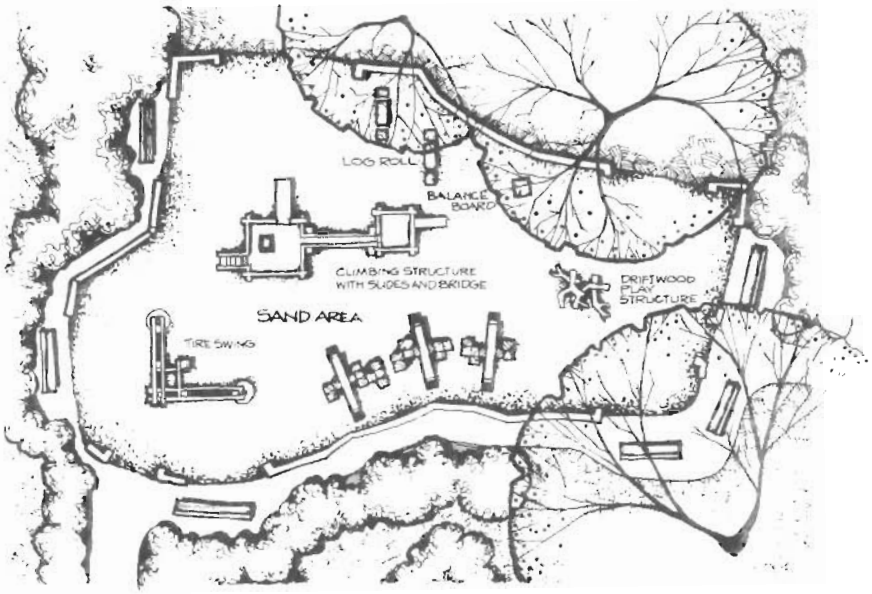
Are not camping to rough it. With exceptions, campers will spend as much for comfort as they can afford, be it tent or trailer camping.

b. Design Criteria

Because of the increasing popularity of camping and the demand for recreation lands, campgrounds must be designed to maximize all available space and to satisfy the varying needs for privacy or group sociability. These needs, it should be recognized, vary according to the amount of privacy the camper can provide for himself, which in turn depends upon his mode of camping and duration of stay. The trailer camper has the privacy of his trailer, in which he may find both visual and audio privacy; whereas the tent offers no audio privacy and visual privacy only as long as the camper can endure the cramped confines. Thus, camp units should be appropriately designed for different modes of camping. In order to provide facilities for the various types of campers, each camping area should provide a mix of campsites which will accommodate a range of camper types from tents to mobile homes. Utility hookups need not be provided at every campsite.

Ice Harbor
DETAILS

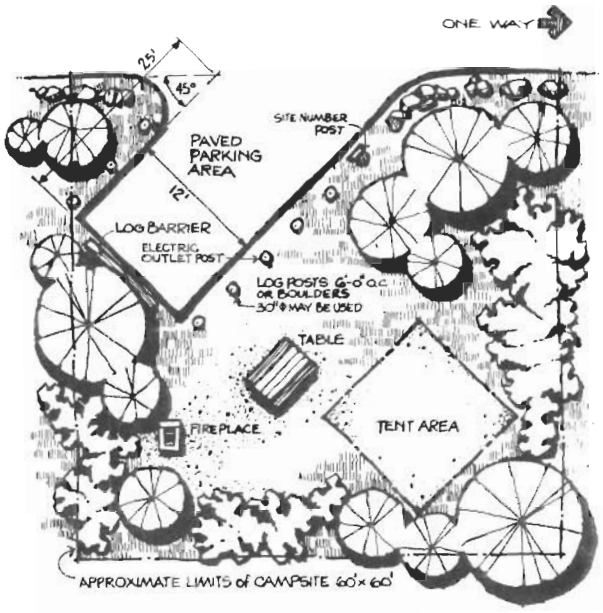
elevation



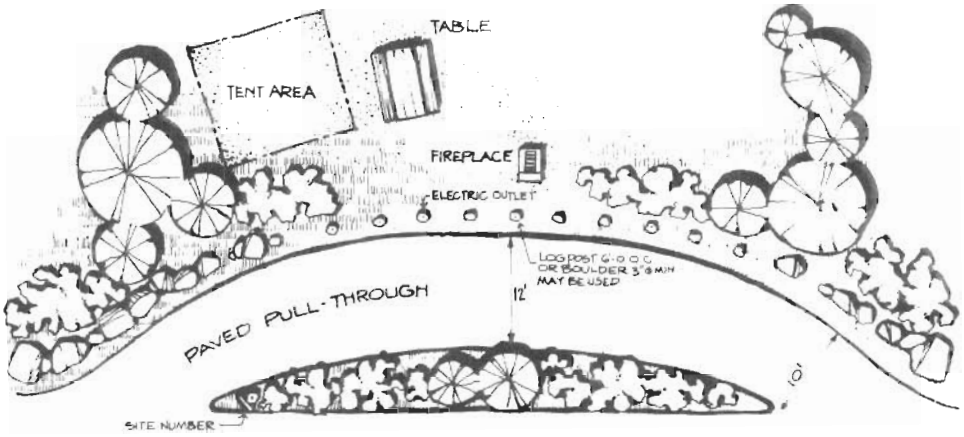
plan

TYPICAL
PLAY AREA

Ice Harbor
DETAILS



back·in



pull·through

CAMPING UNITS

20

(1) Formal Tent Camping

Since the tent camper spends much time outside his tent cooking, eating, and relaxing, he requires the largest activity space and an audio buffer space between his unit and the next. Thus, units should be spaced at 75-to 100-foot intervals. Each unit should have a table, fireplace, and level tent pad consisting of sand, pea gravel, or grass. Several of these sites should share common utilities.

(2) Informal Tent Campers

In order to provide the maximum in flexibility, a simple grassed, open area can be set aside in each campground for informal camping. Tenters would be given the option to pitch their tent at random or in groups. Several fireplaces will be spotted and portable tables provided. This area could also serve as an overflow area for trailer campers. Utilities in these areas should also be shared.

(3) Trailer Camper - Extended Visit

The trailer camper has different space requirements than the tenter mentioned above. Most trailer campers do spend more time outside and would appreciate a table and fire place. It is not necessary to provide an audio buffer area as for the tent unit. As a minimum, a small, level pad (12' x 15'), screened by fence and/or shrubbery, with a table and fireplace should be provided on this pad. Individual utility hookups are optional.

(4) Overnight Trailer

Higher-density camping can be developed for trailer campers spending only one evening in the campground. They have little time to "set up" out-of-doors. Units can be placed fairly close to

each other and separated by a fence or planter. The space saved by this consolidation can be allocated as joint open space and picnic area. Tables and a fire circle could be located in this joint area for each five or ten units. Individual utility hookups are optional.

(5) Multi-Trailer Unit

Units should be provided for trailer campers traveling in groups of two families or more. The utility hookups, fireplace, and tables should be located to accommodate trailers arranged in door-to-door groups.

10.12. ARCHITECTURAL FEATURES

Architectural character should be obtained through the logical consideration of the site, combined with the style, shape, and selection of building materials. Consideration must also be given to the diverse motifs of architectural design of existing structures on the project.

Style and building materials should relate to the character of the area -- that of agriculture and rural living. Materials can reflect this rural atmosphere. Rough-formed concrete, rough sawn and stained cedar or redwood siding, and thick-butt cedar roof shakes are basic types of materials that could be used to reflect a rustic quality and unify structures throughout the project.

10.13. SIGNS

Directional and informational signs are an important aspect of the visitor program since signs are often the first and last impression a visitor has of a project. A number of general questions must be answered about signs.

Are signs visible and legible but not obtrusive?

Are there too few or too many signs?

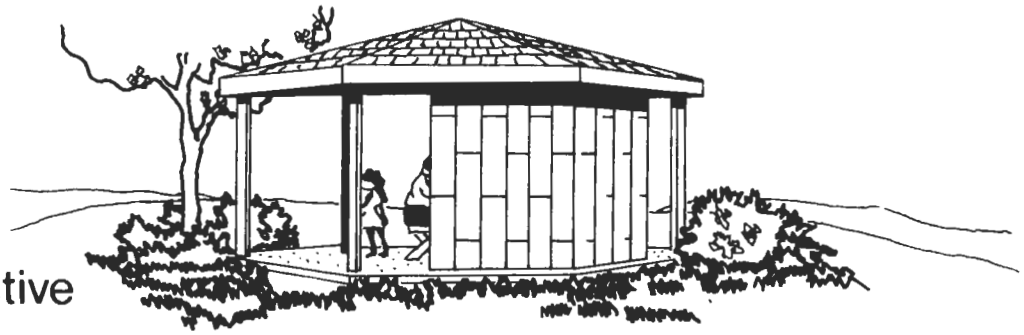
Have the signs been designed along with other features of the project or as an afterthought?

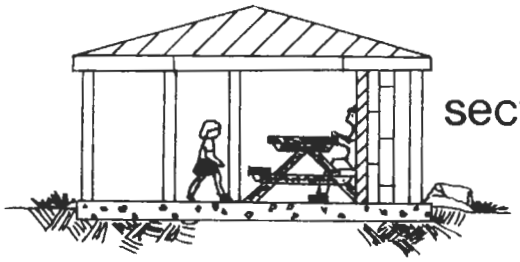
It has been determined that the format of all project signs shall be the same throughout the Walla Walla District. See sheet number 31 in this section.

Signing, in general, should conform to the Sign Guidelines Manual prepared by the North Pacific Division. The Manual provides guidance for numerous aspects, which include design, procurement, implementation, and maintenance.

Ice Harbor
DETAILS

perspective





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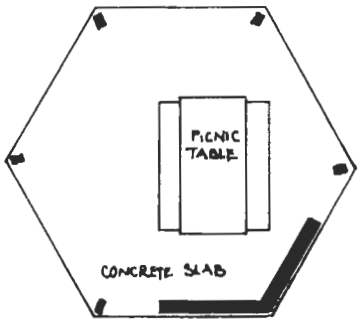

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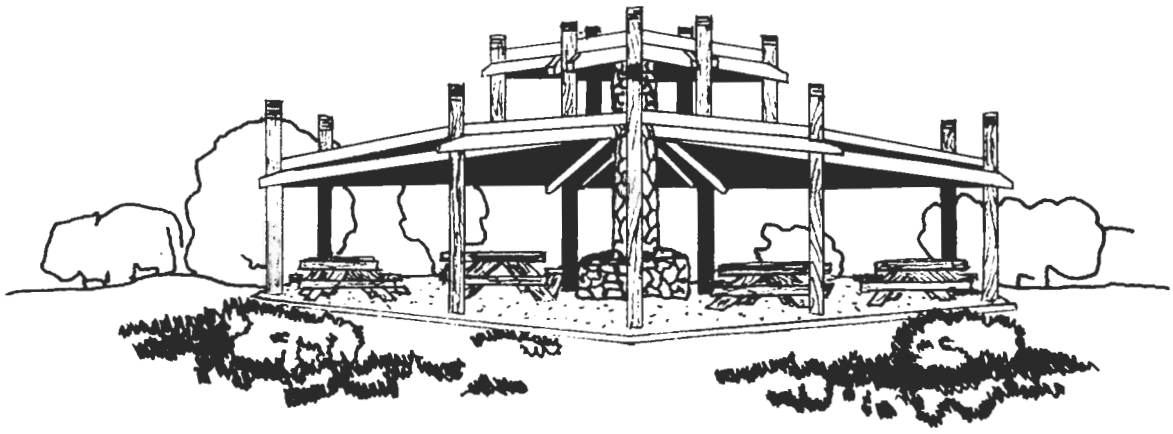
PICNIC SHELTER

21

Ice Harbor
DETAILS



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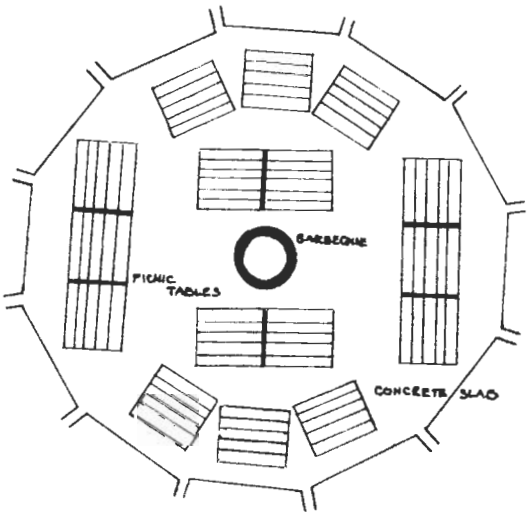


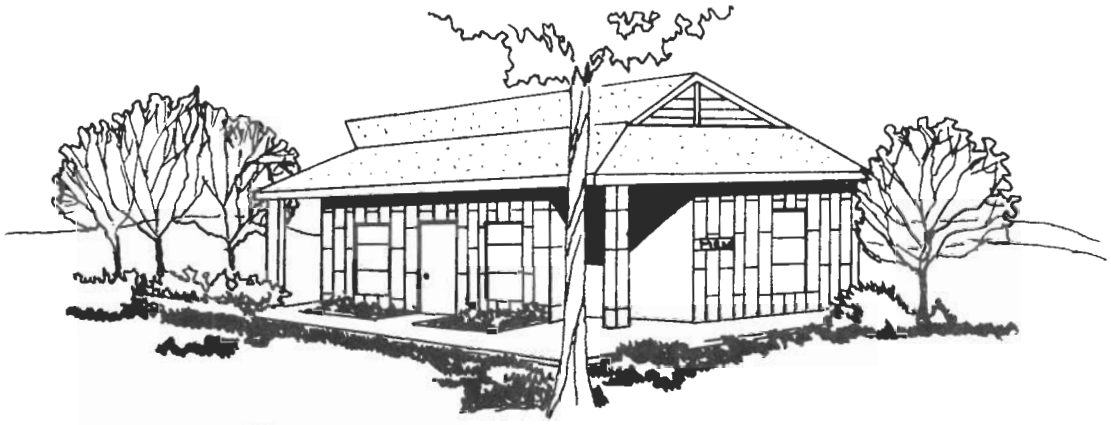
feet

plan

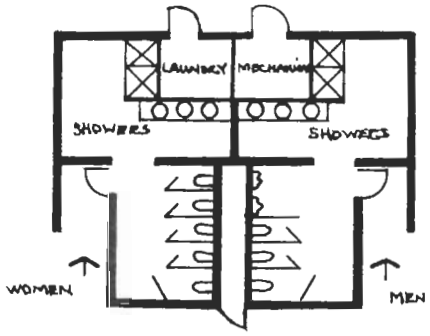
GROUP SHELTER

22

Ice Harbor
DETAILS



perspective

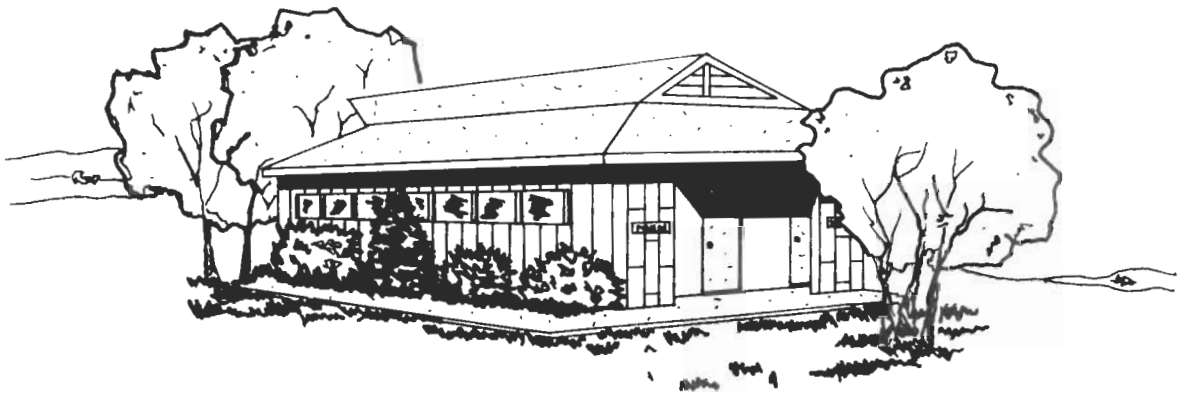


plan

Camping Area
COMFORT STATION

23

Ice Harbor
DETAILS



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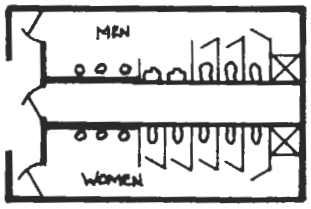


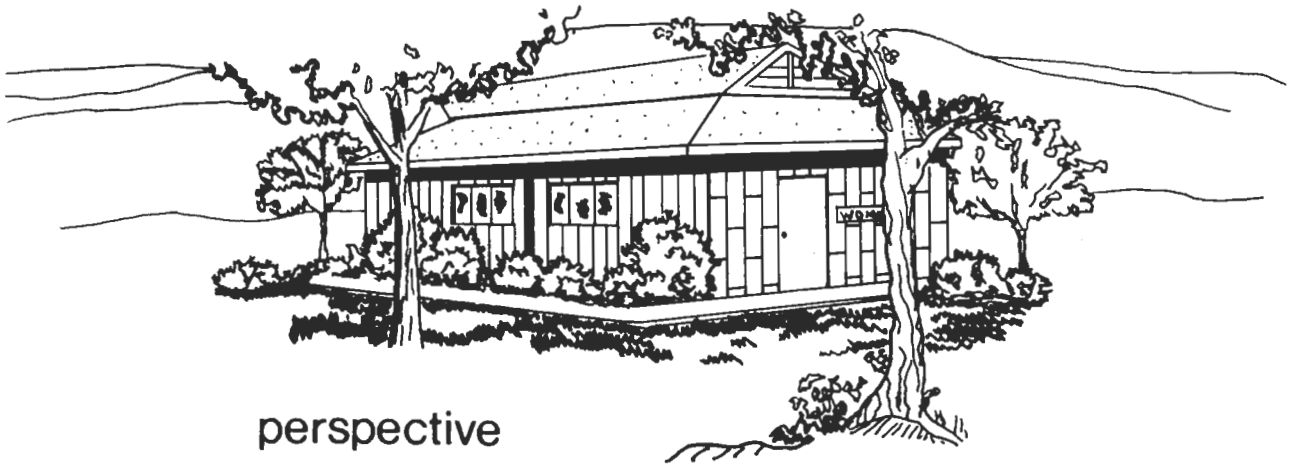
0 1 2 feet

plan

Day Use Area
COMFORT STATION

24

Ice Harbor
DETAILS



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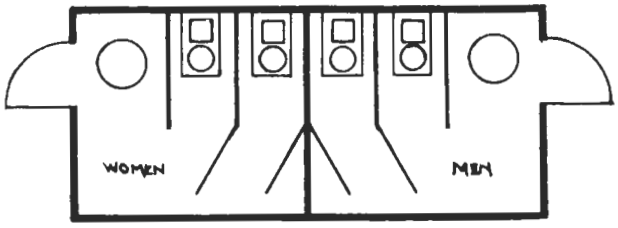
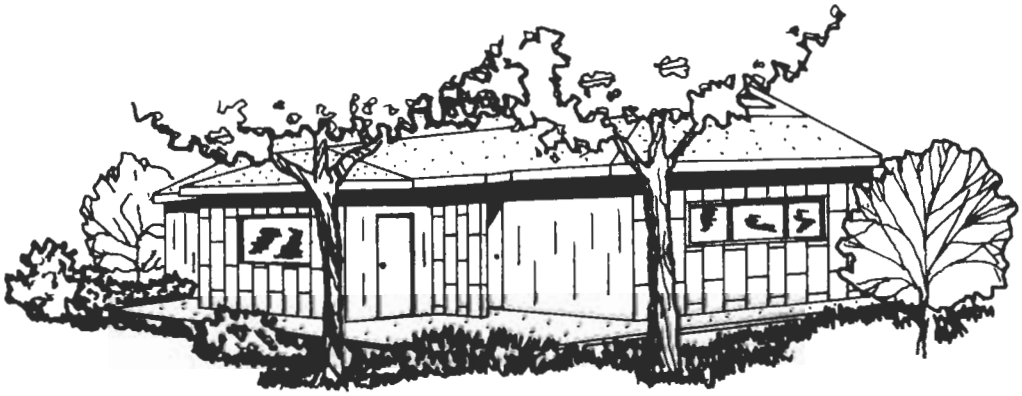


plan

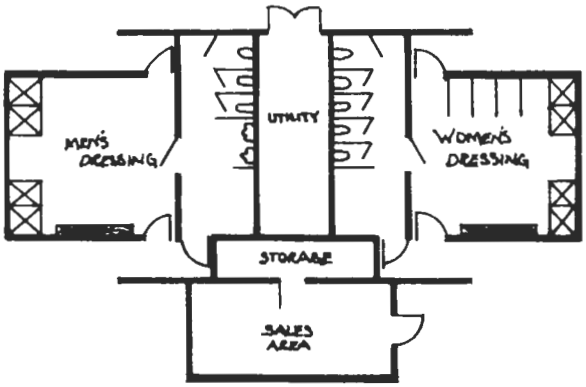
VAULT TOILET

25

Ice Harbor
DETAILS



perspective

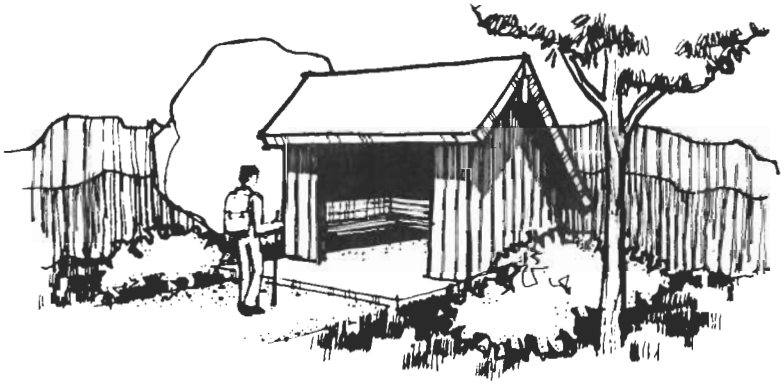


feet 0 1 2 12 plan

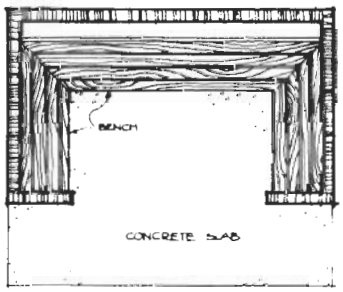
Swimming Area
COMFORT STATION

26

Ice Harbor
DETAILS



perspective



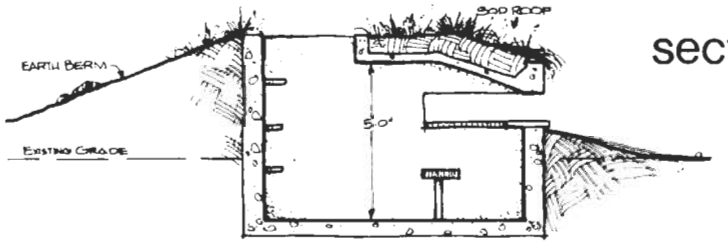
0 1 2 feet

plan

TRAIL STATION

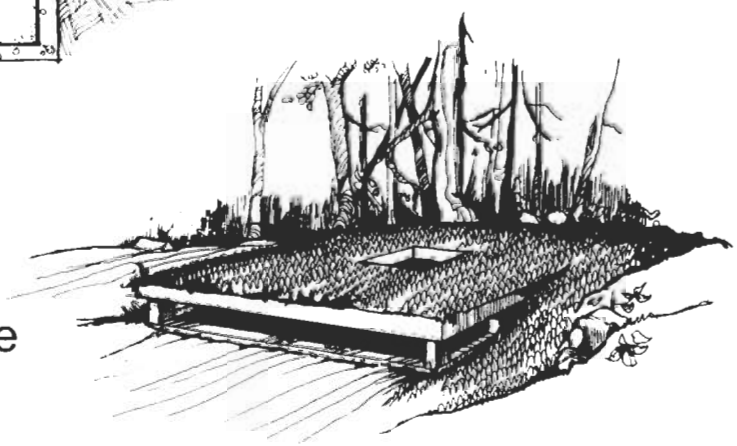
27

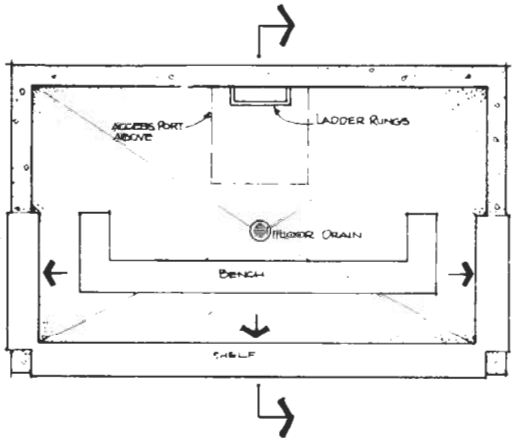
Ice Harbor
DETAILS



section

perspective





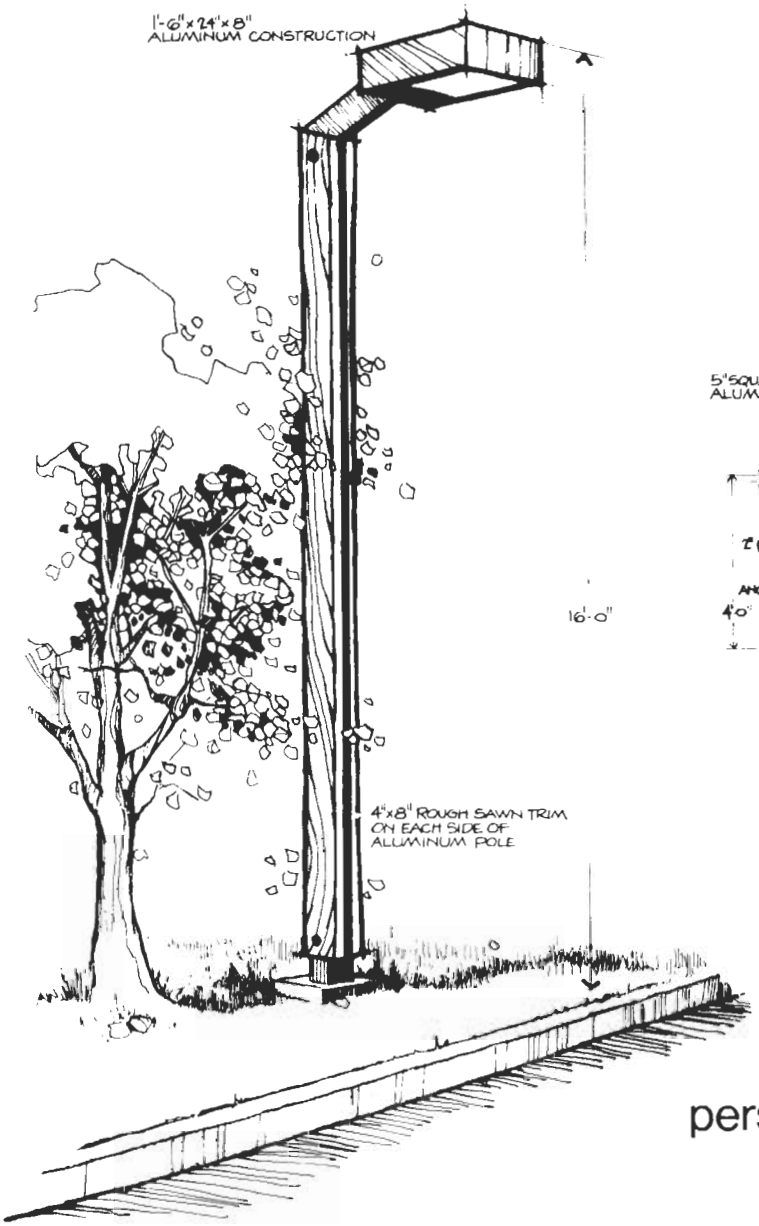
feet

plan

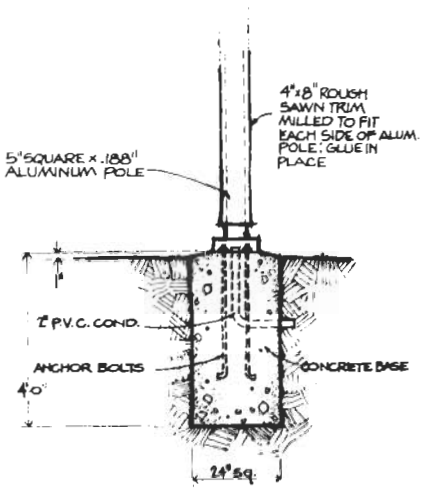
WILDLIFE
OBSERVATION BLIND

28

Ice Harbor
DETAILS



perspective

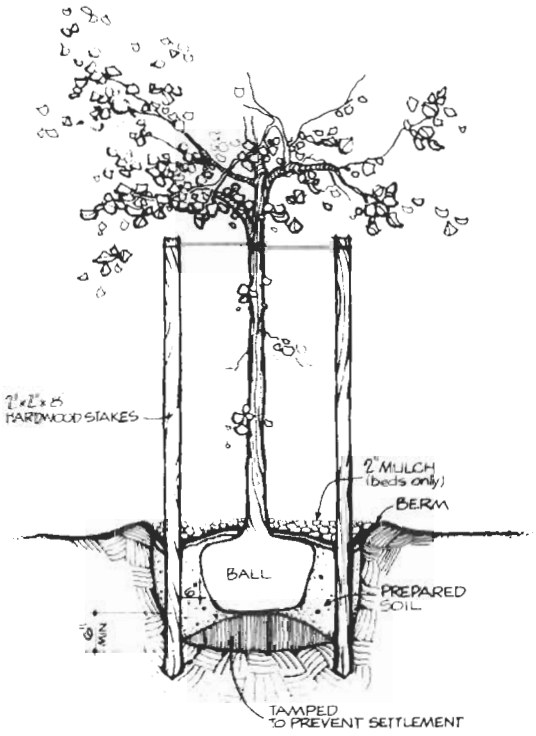


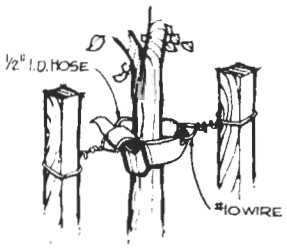
section

LIGHTING

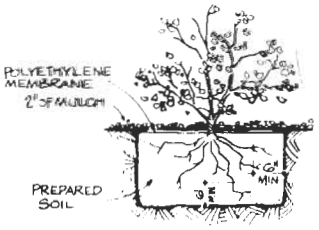
29

Ice Harbor DETAILS

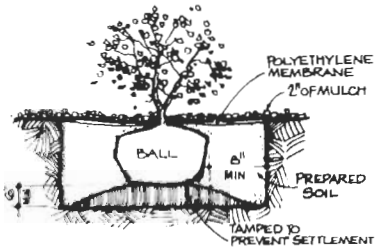




tree staking



bare root shrubs



balled and burlapped shrubs

TREE PLANTING

30

Ice Harbor
DETAILS

entrance

entrance

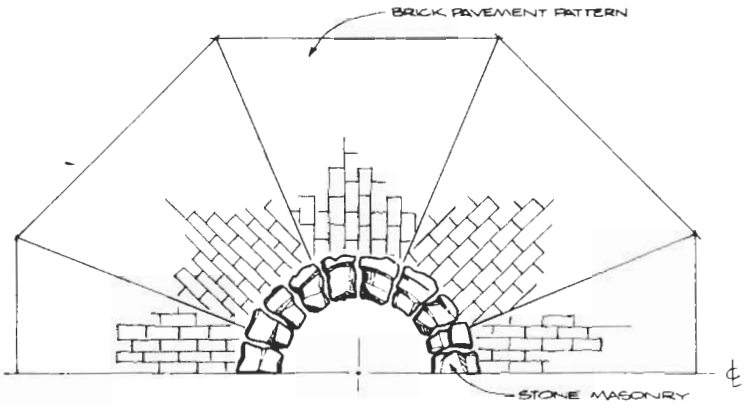
directional

NOTES:

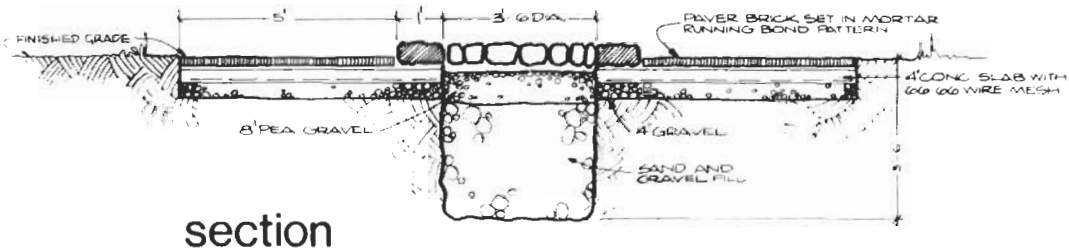
1. ALL LETTERING IS TO BE RECESSED AND FILLED WITH BLACK PAINT. THE CASTLE AND ARROWS ARE TO BE PAINTED RED.
2. MAJOR SIGNS ARE TO BE ARCHITECTUAL WHITE CONCRETE.
3. MAJOR SIGN BASES ARE TO BE EXPOSED AGGREGATE.

SIGN MOTIF

Ice Harbor
DETAILS



half plan

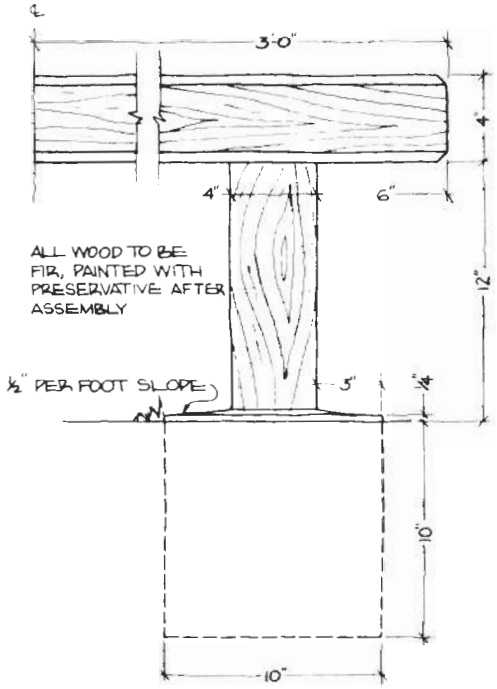


section

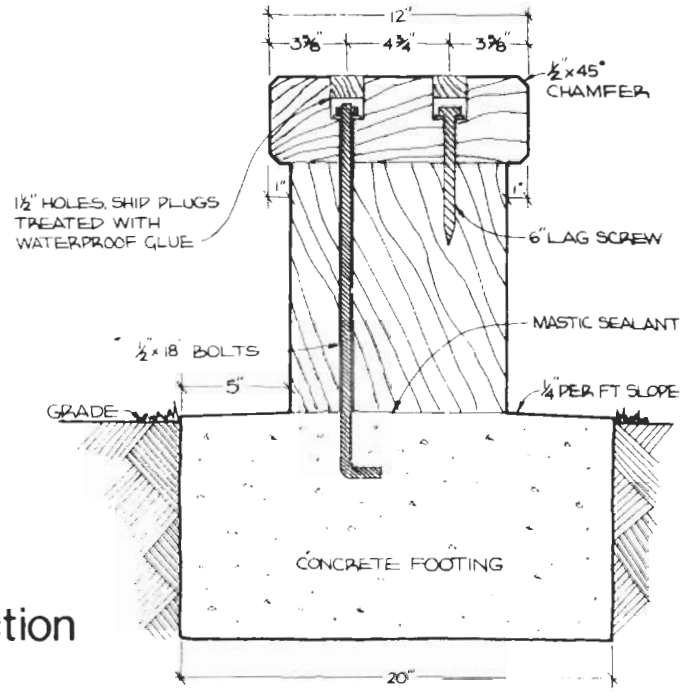
FIRE PIT

32

Ice Harbor DETAILS



half elevation

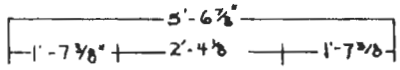


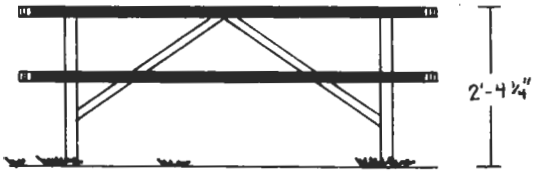
section

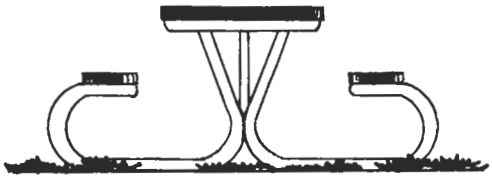
BENCH

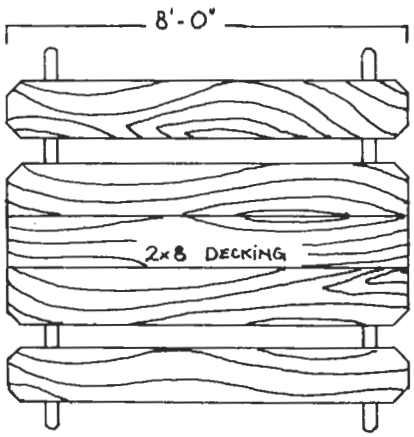
33

Ice Harbor
DETAILS









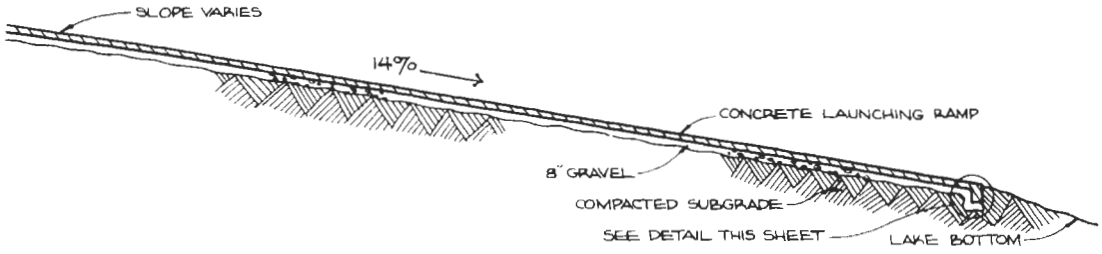
ALL WOOD PARTS TO BE FIR, PENATRATION TREATED WITH A NON-IRRITATING PRESERVATIVE

ALL BOLTS TO BE ½" DIA GALVANIZED WITH WITH GALVANIZED WASHERS

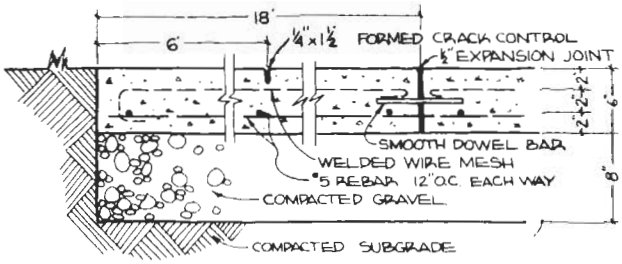
PICNIC TABLE

34

Ice Harbor DETAILS

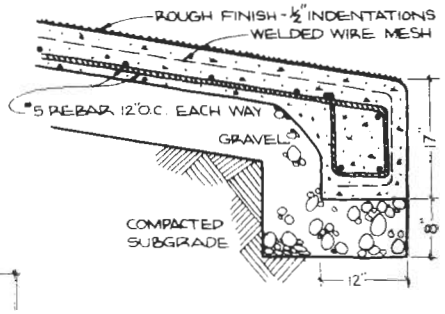


profile

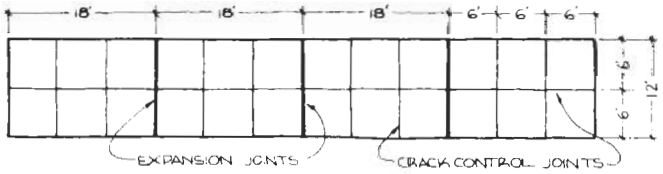


paving

NOTE:
DOWEL BARS ACROSS EXPANSION JOINTS SHALL BE PROVIDED WITH EXPANSION CAPS; ONE HALF THE BAR SHALL BE PAINTED AND OILED TO PREVENT BOND WITH CONCRETE. ALL CONCRETE TO BE 3,000 LBS. @ 28 DAYS



end footing



joint layout

BOAT LAUNCHING RAMP

35

SPECIAL PROBLEMS

SPECIAL PROBLEMS

SPECIAL PROBLEMS

In planning for proper and beneficial development and management of the natural and man-made resources of the Ice Harbor Project, many varied problems are encountered. The earlier sections of this master plan have attempted to identify and evaluate these problems and offer workable solutions. Some of these problems warrant further mention because of their unique character or because no clearly satisfactory solutions have been worked out.

11.01. NATURAL RESOURCE PRESERVATION

One of the resources of the Ice Harbor pool area is the semi-desert type flora typical of most of the project shorelands. In general, plants are supported in sandy soils which are subject to wind and water erosion. This condition,compounded by the low precipitation rate in the area,results in fragile vegetation. To preserve this usually fragile vegetative cover, while still accommodating a reasonable degree of public entry and use of the lands, is a special problem. Its resolution will require continuing efforts on the part of project management personnel, an effective educational and interpretive program to obtain the cooperation of the public, physical control measures such as fencing of selected areas against encroachment, and policing to control various activities which are particularly destructive of the landscape - off-road vehicle use, deliberate vandalism, fire, and theft. A basic approach is, of course, proper planning for all development and management, which is the aim and, hopefully, the achievement of this master plan.

11.02. DEBRIS DISPOSAL

A debris-gathering, holding, and haul-out facility was installed in the reservoir in 1963, a short distance upstream from the dam. Large volumes of drift have been removed from the reservoir with the haul-out conveyor and supplementary mobile equipment. Essentially all of this material has been hauled away for free firewood by local area residents. The present plans call for installation of trapping, holding, haul-out, and disposal facilities to be installed at the headwaters of both the Clearwater and Snake River Arms of Lower Granite Reservoir. These facilities should intercept and remove essentially all incoming debris. The facility at Ice Harbor will be retained and operated to handle debris not trapped by the Lower Granite facility. This is expected to be small in volume, since tributary streams below Lower Granite drain areas of barren or very light timber cover.

Septic tanks and tile fields are utilized at developed areas which have flush-type toilet facilities. Solid waste in the septic tanks is emptied and removed periodically from the project area by truck.

11.03. COST SHARING ON FUTURE RECREATION DEVELOPMENT

In Section 9, it was briefly mentioned that discussions have been held between the Corps of Engineers and representatives of the Washington State Parks and Recreation Commission concerning possible future leasing of Ice Harbor recreation areas to the State. At the present time, none of the recreation areas on Ice Harbor project are leased to non-Federal recreation agencies, and there is very little possibility that any of the parks will be leased within the next five years.

Since current policies preclude the Corps from recreation development without cost sharing, the lack of non-Federal participation is expected to create problems in recreation management and facilities expansion to meet projected future public needs.

The five-year recreation development program set forth in this master plan includes only those items of work which can properly[1] be carried out under current Corps' regulations (i.e., maintenance, resurfacing of roads, solving problems of health and safety, provision of primitive camping and other, more fully developed camping where charges can be assessed to offset O&M costs). Due to the cost-sharing constraints, expansion of facilities for boat launching, car-trailer parking, picnicking, swimming, and car parking cannot be accomplished. During the next five-year period, the item of most significant need (which cannot be met by the five-year program) will be car-trailer parking, as illustrated on the chart in Item G of SD-34, Supporting Data.

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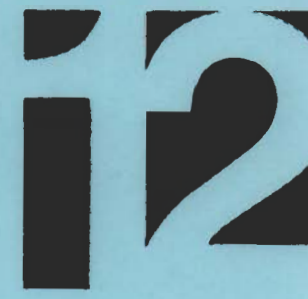
[1] This assumes that the corresponding and related funding will be provided in the various recreation development accounts.

RESOURCE MANAGEMENT



PROJECT RESOURCE MANAGEMENT

12.01. GENERAL

A detailed overview of project resource management is provided by the Project Resource Management Plan, Appendix A to the Ice Harbor Master Plan. A brief general description of material contained within that plan follows.

12.02. OPERATIONAL CONCEPTS AND POLICIES

The authorized purposes of the Ice Harbor Lock and Dam and Lake Sacajawea are navigation, irrigation, and hydroelectric power production, with collateral uses accruing to public use and recreation, fish and wildlife management, and agriculture.

Among the goals of resource management are the implementation of proposals set forth in the updated master plan; the protection of natural and man-made project resources along with safe, attractive recreation facilities; and the monitoring of encroachments, erosion, and outgrants.

12.03. PROJECT RESOURCES

Complete descriptions of developed recreation areas were given in Section 9. Natural resources include several fish and wildlife management areas along both sides of Lake Sacajawea.

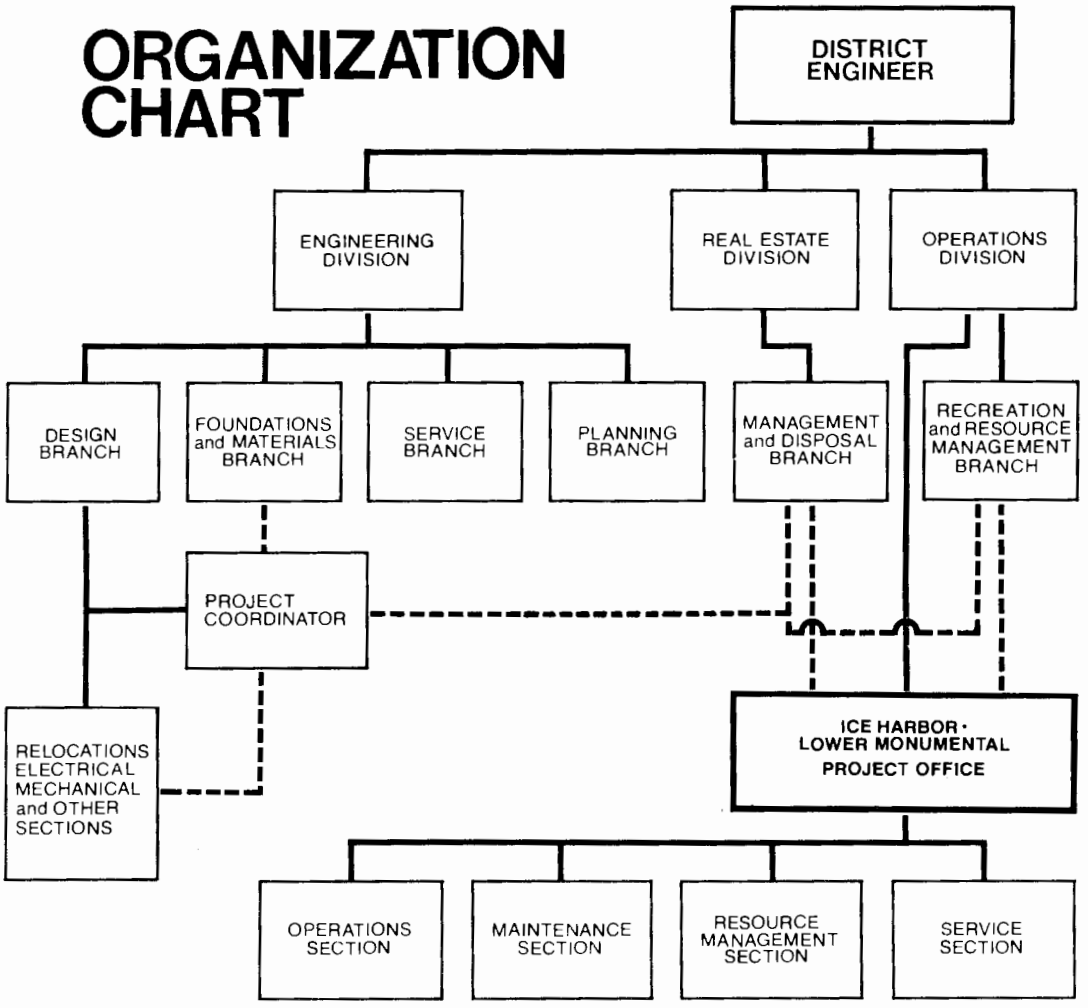
12.04. ADMINISTRATION AND MAINTENANCE

Responsibility for updating the master plan is assigned to Engineering Division. This is to be done about every five years or sooner, depending on changing needs. Engineering Division is also involved in all conceptual planning for shoreland use,visitor facilities, and related activities. Conceptual design of project signs is coordinated in accordance with policies set forth in the District Sign Manual. Sections in Planning Branch and Engineering Division provide conceptual planning information, hydrologic data, and engineering expertise in support of the resource management activities.

Resource management appendices to the master plan are prepared and updated by the Recreation-Resources Management Branch of Operations Division. Assistance with the appendices is provided by the project office.

The Ice Harbor-Lower Monumental project office supervises all operations, maintenance, and resources management functions of the

project and is the local representative for the Corps of Engineers in these matters. The Service Section performs clerical and administrative duties. The Operations Section performs operation activities, which include power production, navigation and fish passage; makes observations and records data to assist Engineering Division in performance of periodic inspections and evaluations; and performs visitor control functions on the dam structure. The Maintenance Section plans, performs, and coordinates all maintenance activities except those which are assigned to the Resource Management Section. That Section also assists in the performance of periodic inspection and evaluation of structures. The Resource Management Section performs grounds maintenance, makes observations and records data related to the reservoir, implements the recreation-resources program, performs operation and maintenance functions related to recreation and natural resources, inspects lease areas, and implements visitor control exclusive of the powerhouse and dam structure.



RANGE MANAGEMENT 13

RANGE MANAGEMENT

13.01. GENERAL

Detailed information on vegetative management for the Ice Harbor project is provided in the Range Management Plan, Appendix B to the master plan. A brief general description of vegetative management on project lands is given in this section.

13.02. PHYSICAL AND ECOLOGIC CHARACTERISTICS

Lake Sacajawea is the most downstream segment of the four-segment Lower Snake River project. The area is typified by hot, arid summers and cold, dry winters. The lake area is topographically characterized by undulating soils over basalt. Impoundment resulted in replacement of rich alluvial bottomland soils by rocky, dry, steep slopes with practically no soil. Deeper soils sometimes occur on the remaining gentle slopes and on sandy alluvial deposits. Vegetation on Ice Harbor lies entirely within the Agropyron-Poa (bluebunch-wheatgrass-bluegrass) vegetative zone (Daubenmire 1970, page 5). The shallow loessal soils and the profusely scattered basalt outcroppings are not conducive to dense vegetative stands. Generally, the lower reaches of the project are dominated by grasses and forbs.

13.03. TREATMENTS REQUIRED

Vegetative restoration and landscape enhancement on Ice Harbor project will be accomplished by use of plants endemic to the reservoir area or suitable domesticated plants found to be more beneficial

as wildlife plantings. This will be accomplished by propagating and planting the non-domestic species presently inhabiting undisturbed portions of the reservoir basin. The same types of plants will be used in plantings made for wildlife. Weed and pest control will be practiced as required in developed recreation areas, but such measures will be used on fish and wildlife lands only after careful consideration of environmental factors. Soil sterilants will be used only if no other control method is possible.

13.04. PERSONNEL AND FACILITIES

Vegetative management is the responsibility of recreation planners and biologists of the Recreation and Resource Management Branch of Operations Division. However, most of the planting at developed recreation areas and on fish and wildlife lands will be accomplished through contracts and Corps' personnel. Maintenance pruning and large-scale weed control programs will also be accomplished through contracts. The resource manager will be responsible for preparing an annual work program for vegetative management and will maintain records of completed work.

FIRE PROTECTION 14

FIRE PROTECTION PLAN

14.01. GENERAL

Detailed information on fire protection is provided in the Fire Protection Plan, Appendix C to the master plan. A brief general description of project fire protection is given in this section.

14.02. COOPERATIVE AGREEMENT

Local firefighting units, county and/or city, are available to extinguish major fires.

14.03. PERSONNEL AND EQUIPMENT

Ice Harbor personnel will undergo periodic organizational training. Tools and firefighting equipment are available at the dam. A 3/4 ton pickup truck with pump is available for fire suppression in accessible areas only. A similar pump system is available on the project patrol boat. Each pumps water directly from the lake.

14.04. FIRE PREVENTION

During the dry summer months, project personnel will be alert to identifying fire hazards and will take the necessary measures needed to minimizing or eliminating fire hazards. Such practices as mowing and irrigating will be used around recreation areas to lessen the possibility of fires by reducing available fuel. On fish and wildlife lands, careful consideration will be given to the effect of fire on habitat.

FISH and WILDLIFE MANAGEMENT

i5

FISH and WILDLIFE MANAGEMENT

15.01. GENERAL

A detailed description of fish and wildlife management activities and techniques to be employed on Ice Harbor Lock and Dam project is presented in Appendix D to the master plan and in the wildlife design memorandum. A brief general description of project fish and wildlife management is given in this section.

15.02. WILDLIFE

Wildlife resources in the Ice Harbor project area include big game, migratory game birds, upland game and non-game birds, mammals, and reptiles. Migration requirements for these species are outlined in the compensation report which was reviewed by two independent experts. This report was authorized by Congress in the fall of 1976. A design memorandum for wildlife management on project land has been prepared. Initial implementation of this plan is now underway.

a. Big Game

Mule deer and whitetail deer reside on the canyon rims and walls and in the draws that border Ice Harbor pool. Replacement of riparian habitat lost during pool raise is impossible in many areas where the pool comes up to rock cliffs or riprapped fills and is extremely difficult in other areas. Where possible, every effort will be made to replant shorelines with plant species naturally occurring in the canyon, and project boundaries will be fenced to prevent competition from encroaching cattle.

b. Migratory Game Birds

Ducks, geese, and mourning doves nest in the Ice Harbor pool area and use it as a wintering and resting place during migration. Floating or other artificial nest structures will provide further mitigation for lost goose-nesting habitat. Food crops for wildlife will be provided for nesting and migrating birds. Further details are being provided in the wildlife habitat development design memorandum and in studies recommended in the compensation report.

c. Upland Game

Upland game in the project area includes ring-necked pheasant, California quail, chukar partridge, Hungarian partridge, and cottontail rabbits.Food and cover plots will partially compensate for the loss of riparian habitat resulting from pool raise. Maintaining brush and natural vegetation on shorelands and in draws will help perpetuate remaining populations. Fencing of project boundaries will be required to prevent encroachment of grazing cattle and to protect food and cover plantings.

d. Non-Game

A variety of non-game mammals, birds, and reptiles inhabit the project area. Generally, these species will benefit from food and cover plots established for game species. Special attention will be given to protecting the nesting sites of raptorial birds, such as eagles, hawks, and falcons. Animal control will not be practiced on project lands unless conditions dictate a need for control as the only solution to a serious problem.

15.03. FISHERIES

Fisheries resources in the Ice Harbor project area can be divided into the two categories based upon life history and management requirements.

a. Anadromous Fish

These are fish that spawn in freshwater streams but migrate to the ocean to grow to adulthood. They include spring, summer, and fall chinook salmon; steelhead trout; coho salmon; and sockeye salmon. The two fish ladders provide adequate upstream passage for adult steelhead and salmon. However, there are problems with the downstream passage of juvenile fish. The majority of downstream migrants pass the dam via the spillway or turbines; a fact that causes significant losses. Research facilities have

been provided for monitoring the fish runs. Fish counting is a project responsibility, as at other Corps' dams and research facilities are open to fishery agencies.

b. Resident Fish

These are fish that complete their life cycle in the same river, stream, or lake area. They include trout, bass, and other warmwater game fish, sturgeon, and a variety of minnows, suckers, and others that are not valued commercially or as sport fish. Management for resident fish is primarily a matter of providing habitat that is conducive to the development of a combination of species that provide a viable population capable of sustaining a sport fishery. Steps that could be taken in the Ice Harbor project area to provide this habitat include providing habitat for insects and forage fish upon which warmwater fish feed, and development of pond areas behind highway or railroad fills for warmwater fisheries or put-and-take trout fisheries. Additional habitat for warmwater fish will develop as aquatic vascular plants become established in shallow areas of Lake Sacajawea.

15.04. FISHING AND HUNTING ACTIVITIES

All project lands and waters will be open to public fishing. All project lands and waters, except public recreation areas, will be open to hunting as sanctioned under local, state, and Federal laws. These activities will only be restricted in areas where such restrictions are in the interest of public safety. Fishermen and hunters will be afforded all access privileges available to the general public.

15.05. ENDANGERED SPECIES

The occurrence of Endangered Species, Threatened Species, or those placed on the National Audubon Society's Blue List has been given special consideration. The canyon cliffs offer potential habitat for the Endangered peregrine falcon and Threatened prairie falcon.

PROJECT SAFETY

PROJECT SAFETY

16.01. GENERAL

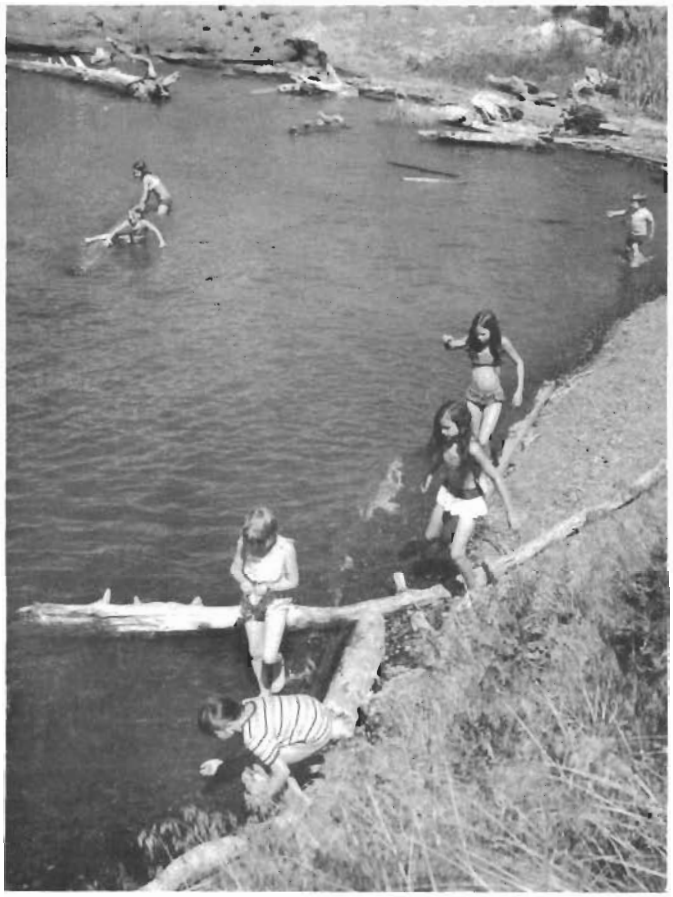
The complete project safety plan for the updated master plan is offered in Appendix E. A brief summary of the safety plan follows.

16.02. OBJECTIVES

The safety plan for the project area is designed to establish policies that will protect both project employees and the visiting public. The main objective of the plan is to establish and maintain preventive measures which will control or eliminate unsafe conditions. To achieve this objective, safety regulations and provisions must be developed and implemented so that the project employees and the visiting public will be made aware of their importance and necessity. Safety requirements outlined in Appendix E are based upon EM 385-1-1, General Safety Requirements, and other Federal and state regulations.

16.03. SPECIFIC SAFETY CONCERNS

Safety concerns of particular local interest along Lake Sacajawea include pollution in swimming areas; floating debris which endangers boats, swimmers, and water skiers; slumping and rockfall hazards and the possibility of flash flooding in the reservoir side canyons; and rattlesnakes, which impose a threat primarily to hikers and hunters.



Safety measures have been designed to draw personal attention to these and other hazards in an effort to develop and retain the highest degrees of respect and responsibility for safety on the part of all individuals associated with Corps' project lands.

16.04 ADMINISTRATIVE RESPONSIBILITIES

The adherence to safety regulations and preventive measures on project lands, which is the responsibility of the project administration, also applies to the housekeeping practices and general activities within administrative and maintenance facilities, as well as to sanitation, pest control, access features, and maintenance of public use facilities.

COST ESTIMATE

COST ESTIMATE

The costs shown in this Section are presented for two categories of work: (1) work to be done in the next five years, and (2) work to be done in the future beyond the five-year period. The estimated costs have been developed from quantities estimated from the plans illustrated on Plates 7 through 12 in Section 9. These estimates have been made without benefit of detailed engineering studies; therefore they are subject to refinement prior to construction of the work. Price levels are cited as of February 1976.

The estimated costs shown are based on all work being accomplished by construction contract. In some instances, where work may be done by Government personnel, the costs may actually be less than shown.

Since Ice Harbor project does not have any recreation areas leased and operated by non-Federal recreation agencies, and the probability for leasing in the foreseeable future is remote, the cost estimate does not show development by non-Federal agencies. As mentioned in Section 11, paragraph 11.03, the development program must be tailored to match current cost-sharing limitations rather than the goal of meeting needs. This condition is reflected in the five-year development program, where only the following facilities, allowed under current policies and regulations, are proposed.

a. Road resurfacing and tree planting for shoreland environmental management are proposed on the basis that these are normal operation and maintenance actions.

b. Comfort stations with other domestic water and sewer improvements are proposed on the basis of public health and sanitation.

c. Campground development is proposed on the basis of regulations allowing for such development where fees can be collected to offset maintenance costs.

The cost estimate for the future development beyond the five-year program is based on the objective of meeting future public needs without constraint by cost-sharing limitations. Therefore, the costs are generally indicative of the development needed to meet projected future use. If the cost-sharing limitations continue indefinitely into the future, and if the current lack of non-Federal recreation sponsorship continues at Ice Harbor, the future capability to meet recreation needs at Ice Harbor will be seriously limited,particularly in regard to day-use and boating facilities. As the population in the nearby Tri-Cities area continues to expand, the objectives to meet recreation needs at Ice Harbor will not be met.

Several items of work at Ice Harbor project are not covered in this cost estimate. These are:

a. Costs for the new south shore fish viewing and visitor interpretive facilities development at the dam. These are presented in Design Memorandum 4.1.

b. Costs for implementation of wildlife development. These are covered in the recently completed and approved design memorandum for wildlife habitat development covering all four Lower Snake River projects.

Funding for the landscaping at the north and south shores at the dam and the miscellaneous items on page 17-4 will be from the Buildings and Grounds account,rather than from the Recreation Cost-Sharing account.

SUMMARY

Area	Five-Year Development Program	Future Development Program
Lock and Dam	$ 300,009	$ 786,436
Charbonneau	883,782	2,005,751
Levey Landing	183,070	154,110
Fishhook	80,987	1,286,288
Windust	27,840	410,040
Matthews	3,783	70,627
Total	$1,479,451	$4,713,252
Reservoir Trail System		96,000
Grand Total	$1,479,451	$4,809,252
Called	$1,480,000	$4,810,000

LOCK AND DAM
REFER TO PLATE 7

Item	Unit	Unit Price	Five Year Development Program Quantity	Five Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
ORV Area						
4 strand wire fence	ft	$ 3.00			12,000	$ 36,000.00
Parking lot						
Excavation	cy	5.50			850	4,675.00
Leveling course	cy	16.00			425	6,800.00
Top course	cy	13.00			94	1,222.00
Access Road						
Excavation	cy	1.50			6,480	9,720.00
Embankment	cy	.85			6,480	5,508.00
Base course	cy	12.00			1,852	22,224.00
Top course	cy	13.00			926	12,038.00
Total ORV Area						$ 98.187.00
Landscaping North Shore						
Topsoil	cy	19.00			6,233	$118,427.00
Seed, fert., mulch	sf	.10			510,000	51,000.00
Trees	ea	110.00	64	$7,040.00		
Shrubs	ea	22.00			400	8,800.00
Irrigation	sf	.30			510,000	153,000.00
Total Landscaping North Shore				$7,040.00		$331,227.00

LOCK AND DAM (Cont'd)

Item	Unit	Unit Price	Five-Year Development Program Quantity	Five-Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Landscaping South Shore						
Topsoil	cy	$ 19.00	3,422	$ 65,018.00		
Seed, fert., mulch	sf	.10	280,000	28,000.00		
Trees	ea	110.00	65	7,150.00		
Shrubs	ea	22.00	400	8,800.00		
Irrigation	sf	.30	280,000	84,000.00		
Total Landscaping South Shore				$192,968.00		
Miscellaneous						
Demolition of old Office Building and Reconstruction of Comfort Station	job	$75,000.00			1	$ 75,000.00
Vault toilet	ea	20,000.00	1	$ 20,000.00		
Comfort station (500 sf)	ea	50,000.00			1	50,000.00
Improve drain field	job	9,000.00			1	9,000.00
Boat dock (200 ft)	sf	37.00			2	7,400.00
Total Miscellaneous				$ 20,000.00		$141,400.00
Sub-Total				$220,008.00		$570,814.00
Contingency (15%)				30,001.00		85,662.00
Direct Cost				$250,009.00		$656,436.00
Engineering and Design				25,000.00		65,000.00
Supervision and Administration				25,000.00		65,000.00
TOTAL				$300,009.00		$786,436.00

CHARBONNEAU
REFER TO PLATE 8

Item	Unit	Unit Price	Five Year Development Program Quantity	Five Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Picnic Area						
Access road and parking						
Excavation	cy	$ 5.50			1,000	$ 5,500.00
Leveling course	cy	16.00			600	9,600.00
Asphalt con. pav.	sy	9.50			1,700	16,150.00
Total Picnic Area						$ 31,250.00
Boating Area						
Shore Extension						
Rock fill	cy	4.50			2,000	9,000.00
Riprap	cy	8.50			500	4,250.00
Floating conc. breakwater	lf	250.00			310	77,500.00
Tie-up docks	ea	35,000.00			7	$245,000.00
Concession bldg.	ea	200,000.00			1	200,000.00
Parking lot						
Excavation	cy	5.50			2,000	11,000.00
Leveling course	cy	16.00			2,417	38,672.00
Asphalt conc. pav.	sy	9.50			9,667	91,837.00
	sf					
Landscaping						
Trees	ea	110.00	120	$13,200.00		
Shrubs	ea	22.00			200	4,400.00
Seed, fert., mulch	sf	.10			160,000	16,000.00
Dredging of basin	job	16,000.00			1	16,000.00
Boat clean out station	ea	27,000.00			1	27,000.00
Total Boating Area				$13,200.00		$740,659.00

CHARBONNEAU (Cont'd)

Item	Unit	Unit Price	Five-Year Development Program Quantity	Five-Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Camping Area						
Comfort stations (750 sf)	ea	$ 75,000.00	1	$ 75,000.00	2	$150,000.00
Utilities						
Septic tank and field	ea	28,000.00	1	28,000.00	2	56,000.00
Water line	lf	11.00	1,500	16,500.00	800	8,800.00
Electric line (underground)	lf	11.00	1,500	16,500.00	800	8,800.00
Well and pumphouse	job	116,000.00			1	116,000.00
Access road						
Excavation	cy	5.50			4,000	22,000.00
Leveling course	cy	16.00	860	13,760.00[1/]	2,800	44,800.00
Asphalt paving	sy	9.50	7,700	73,150.00[1/]	12,600	119,700.00
Campsites[2/]	ea	3,000.00	54	162,000.00	96	288,000.00
Landscaping[2/]						
Trees	ea	110.00	300	33,000.00	460	50,600.00
Shrubs	ea	22.00	350	7,700.00	170	3,740.00
Irrigation	sf	.30	460,000	138,000.00	220,000	66,000.00
Signs	job	3,000.00	1	3,000.00	1	3,000.00
Erosion, control, and maintenance of shoreline	job	50,000.00	1	50,000.00	1	
Total Camping Area				$616,610.00		$937,440.00
Service road						
Grading	job	$ 5,000.00	1	$ 5,000.00		
Grading and gravel	job	5,000.00	1	5,000.00		
Total Service Road				$ 10,000.00		

CHARBONNEAU (Cont'd)

	Five-Year Development Program		Future Development Program	
	Quantity	Cost	Quantity	Cost
Sub Total		$639,810.00		$1,709,349.00
Contingency (15%)		95,975.00		256,402.00
Direct Cost		$735,782.00		$1,965,751.00
Engineering and Design		74,000.00		20,000.00
Supervision and Administration		74,000.00		20,000.00
TOTAL		$883,782.00		$2,005,751.00

1/ Resurface existing road and parking
2/ See also Wildlife Habitat Development Design Memorandum

LEVEY LANDING
REFER TO PLATE 9

Item	Unit	Unit Price	Five-Year Development Program Quantity	Five-Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Primitive Camping Area						
Campsite						
Gravel road and spurs	cy	$ 13.00	1,000	$13,000.00		
Landscaping						
Trees	ea	110.00	70	7,700.00		
Table, grill and trash receptacle	ea	700.00	20	14,000.00		
Total Primitive Camping Area				$34,700.00		
Picnic Area						
Landscaping						
Trees	ea	$ 110.00	40	$ 4,400.00		
Shrubs	ea	22.00	100	2,200.00		
Picnic unit (shelter, table, and grill)	ea	5,000.00			3	$15,000.00
Parking area						
Excavation	cy	5.50			200	1,100.00
Leveling course	cy	16.00			200	3,200.00
Asphalt con. pav.	sy	9.50			800	7,600.00
Comfort station	ea	75,000.00		75,000.00		
Total Picnic Area				$81,000.00		$26,900.00

LEVEY LANDING (Cont.)

Item	Unit	Unit Price	Five Year Development Program Quantity	Five Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Boating Area						
Crib dock	lf	$ 270.00			210	$ 56,700.00
Boat dock	ea	12,600.00			1	12,600.00
Landscaping						
Trees	ea	110.00	20	$ 2,200.00		
Seed, fert., mulch	sf	.10			38,000	3,800.00
Irrigation	sf	.30			38,000	11,400.00
Total Boating Area				$ 2,200.00		$ 84,500.00
Nature Interpretive Area[1/]						
Landscaping						
Trees	ea	110.00	60	$ 6,600.00		
Miscellaneous						
Water line to trailer dump station	lf	10.00	800	8,000.00		
Sub Total				$133,100.00		$111,400.00
Contingency (15%)				19,970.00		16,710.00
Direct Cost				$153.070.00		$128,110.00
Engineering and Design				15,000.00		13,000.00
Supervision, Administration				15,000.00		13,000.00
TOTAL				$183,070.00		$154,110.00

1/ See also Wildlife Habitat Development Design Memorandum

FISHHOOK
REFER TO PLATE 10

Item	Unit	Unit Price	Five Year Development Program Quantity	Five Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Camping Area						
Improvement of domestic water supply system	job	$50,000.00	1	$50,000.00		
Landscaping						
Irrigation	sf	.30			312,000	$ 93,600.00
Total Camping Area				$50,000.00		$ 93,600.00
Boating Area						
Boat clean out	ea	$27,000.00			1	$ 27,000.00
Future Picnic Area						
Re-grade shoreline	cy	$ 2.00			45,000	90,000.00
Beach sand	cy	19.00			2,500	47,500.00
Buoys	job	1,800.00			1	1,800.00
Topsoil	cy	19.00			10,000	190,000.00
Seed, fert., mulch	sf	.10			800,000	80,000.00
Trees	ea	110.00	75	$ 8,250.00		
Shrubs	ea	22.00			200	4,400.00
Irrigation	sf	.30			800,000	240,000.00
Picnic shelters	ea	5,000.00			2	10,000.00
Comfort station (800 sf)	ea	80,000.00			1	80,000.00
Septic tank and field	ea	28,000.00			1	28,000.00
Road and paving						
Excavation	cy	5.50			1,600	8,800.00
Leveling course	cy	16.00			900	14,400.00
Asphalt conc. pav.	sy	9.50			550	5,225.00
Interpretive trail and Amphitheater	job	11,700.00			1	11,700.00
Total Picnic Area				$ 8,250.00		$ 811,825.00

FISHHOOK (Cont.)

	Five Year Development Program		Future Development Program	
	Quantity	Cost	Quantity	Cost
Sub Total		$58,250.00		$ 932,425.00
Contingency (15%)		8,737.00		139,863.00
Direct Cost		$66,987.00		$1,072,288.00
Engineering and Design		7,000.00		107,000.00
Supervision, Administration		7,000.00		107,000.00
TOTAL		$80,987.00		$1,286,288.00

WINDUST
REFER TO PLATE 11

Item	Unit	Unit Price	Five-Year Development Program Quantity	Five-Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Auto Parking						
Leveling course	cy	$ 16.00	128	$ 2,048.00		
Asphalt conc. pav.	sy	9.50	577	5,482.00		
Auto-trailer parking						
Excavation	cy	5.50			1,600	$ 8,800.00
Leveling course	cy	16.00			1,200	19,200.00
Asphalt conc. pav.	sy	9.50			4,800	45,600.00
Total Parking Area				$ 7,530.00[1/]		$ 73,600.00
Landscaping						
Trees	ea	$ 110.00	120	$13,200.00		
Shrubs	ea	22.00			500	$ 11,000.00
Seed, fert., mulch	sf	.10			150,000	15,000.00
Irrigation	sf	.30			150,000	45,000.00
Total Landscaping - Future				$13,200.00		$ 71,000.00
Miscellaneous						
Picnic shelter	ea	$ 5,000.00			2	$ 10,000.00
Launching ramp	ea	10,000.00			1	10,000.00
Floating breakwater	lf	250.00			500	125,000.00
Total Miscellaneous						$145,000.00

WINDUST (Cont'd)

	Five-Year Development Program		Future Development Program	
	Quantity	Cost	Quantity	Cost
Sub Total		$20,730.00		$298,600.00
Contingency (15%)		3,110.00		43,400.00
Direct Cost		$23,840.00		$342,400.00
Engineering and Design		2,000.00		34,000.00
Supervision, Administration		2,000.00		34,000.00
TOTAL		$27,840.00		$410,040.00

1/ Resurface existing parking area

MATTHEWS
REFER TO PLATE 12

Item	Unit	Unit Price	Five Year Development Program Quantity	Five Year Development Program Cost	Future Development Program Quantity	Future Development Program Cost
Parking Area						
Excavation	cy	$ 5.50			890	$ 4,895.00
Leveling course	cy	16.00			670	10,720.00
Asphalt conc. pav.	sy	9.50			2,670	25,365.00
Total Parking Area - Future						$40,980.00
Miscellaneous						
Trees	ea	$ 110.00	25	$2,750.00		
Launching ramp	ea	10,000.00			1	$10,000.00
Total Miscellaneous				$2,750.00		$10,000.00
Sub Total				$2,750.00		$50,980.00
Contingency (15%)				413.00		7,647.00
Direct Cost				$3,163.00		$58,627.00
Engineering and Design				300.00		6,000.00
Supervision, Administration				300.00		6,000.00
TOTAL				$3,763.00		$70,627.00

CONCLUSIONS and RECOMMENDATIONS

5. CONCLUSIONS and RECOMMENDATIONS

The information assembled and furnished in this segment of the master plan consists of various statistical and tabulated data and detailed study backup information relevant to and supportive of the basic premises set forth in the master plan. It is presented in this manner to allow brevity in and easy use of the main report, while still having the backup material readily available for field staff or others who may need it. Each item is numbered for easy reference and is self-explanatory.

CONCLUSIONS and RECOMMENDATIONS

A concerted effort has been made toward formulating a viable and effective master plan for continued improvements and management of the Ice Harbor Lock and Dam Project in such a manner as to assure accrual of maximum public benefits. This effort has extended over many months,requiring numerous contacts with various concerned agencies. Every effort has been made to evaluate and appraise all natural and man-made resources of the project in an unbiased manner so as to realize maximum potential of project lands.

Lands have been zoned in an attempt to satisfy all conceivable projected needs of project operations, recreational use, and fish and wildlife management. This has resulted in a major reclassification of acreages allocated to the various land uses. Recreation and project operation lands have been reduced,reflecting projections of the industrial and recreational surveys provided as Items five and six respectively in the "Supporting Data." These surveys generally indicated that the lands presently in use as intensive recreation areas or public port terminals and industrial areas were sufficient to accommodate future demands. Fish and wildlife management lands have been increased at no adverse expense to recreation and project operations functions,thereby facilitating an effective wildlife habitat development program on lands allocated for that purpose. The wildlife design memorandum provides detailed information on how this program is to be implemented.

The Ice Harbor Lock and Dam Project provides resources of considerable regional significance to Southeastern Washington. It is generally concluded that implementation of this master plan is warranted and will achieve realization of the objectives set forth in paragraph 1.03.

It is recommended that:

1. The land use allocation shown on the Land Use Maps in this report be used as a guide to future planning and management at the Ice Harbor project.

2. The improvements to recreation areas outlined in Section 9 be implemented as soon as possible so as to keep pace with projected needs.

3. This master plan be approved as a guide for continued preservation and enhancement of the area's natural resources while providing opportunities for enjoyment of the environment.

4. This master plan will serve as a basis for the preparation of feature design memoranda.

SUPPORTING DATA

Item 1
LEGISLATIVE HISTORY

The legislative history leading to the authorization of Ice Harbor Lock and Dam dates back to 1902 when the first formal proposal for the improvement of the Lower Snake River was adopted by Congress. The River and Harbor Acts of 1910 and 1935 authorized improving the Snake River channel to a 60-foot width and a five-foot depth. A synopsis of subsequent important legislation and related actions follows.

1. River and Harbor Act of 1945

Public Law 14, Seventy-Ninth Congress, First Session, authorized construction of four locks and dams at River Miles 4, 57, 93, and 135 on the Snake River. This law also provided for open-channel improvement to a minimum depth of five feet over a bottom width of 150 feet outside the pools. The earlier House Document 704, Seventy-Fifth Congress, Third Session contained the authorized plan which proposed that open-river improvement be replaced by six locks and dams when justified.

a. Washington, D.C., Public Hearings

Proponents of House Document 704 held a public hearing in Washington, D.C., in 1945 to present voluminous data in support of immediate slackwater navigation to Lewiston and to point out the economic consequences to the nation and the region which would be caused by any delay.

b. Local Public Hearings

At that time, local interests in general wanted adoption of a comprehensive plan in the interest of navigation for the coordinated development of the Columbia and Snake Rivers through a series of locks and dams from The Dalles, Oregon, to Lewiston, Idaho.

c. Fishery Interests

Fishery interests in general did not oppose the adoption of a comprehensive plan of improvement, but desired that further developments on the Columbia and Snake Rivers be held in abeyance until the effect of Bonneville and Grand Coulee Dams on the fishing industry was determined.

2. House Document 531

At the request of Congress, the Corps of Engineers completely reviewed the original reports on the Columbia River and tributaries. These studies, carried on during the last half of the 1940's,

resulted in House Document No. 531, Eighty-First Congress, Second Session, dated 20 March 1950. That report is the basis for much of the water resource development that has taken place in the Columbia River Basin during the past two decades. It considered four Lower Snake River dams at River Miles 9.7, 44.7, 72.2, and 113.1. The four become part of the overall plan of development. Thus, the most downstream unit, which was to become Ice Harbor Lock and Dam, was moved from River Mile 4 to River Mile 9.7.

3. Construction Funding

Funds for Ice Harbor Lock and Dam construction were first appropriated by Congress for Fiscal Year 1956. The first construction work was begun in the fall of calendar year 1956. Appropriations were received annually as construction proceeded, so there were numerous public laws which appropriated funds for Ice Harbor Lock and Dam.

Item 2
DESIGN MEMORANDA

No.	Subject	Cover Date
-	Preliminary Design Report, Powerhouse	Dec 1959
1	General Plan and Detailed Cost Estimate	31 Oct 1952
	Supp. 1 to DM 1	5 Aug 1955
2	First-Step Cofferdam and Access Facilities	23 Jan 1956
3	Powerhouse and Fish Pumping Plant (2 Volumes)	1 Feb 1956
4	South Shore Permanent Fish Facilities - Part 1	Not Submitted
4	North Shore Fish Facilities - Part 2	15 Jul 1959
4.1	South Shore Fish Viewing and Visitor Facilities	26 Jul 1974
5	South Shore Non-Overflow, and Spillway Dam	7 Jun 1957
6	Concrete Aggregate Investigation	20 Jul 1956
7	Relocation of SP&S Railway	19 Sep 1956
8	Part 1 - Real Estate, Construction Area	17 Aug 1955
	Supp. 1 to Part 1	1 Aug 1956
	Part 2 - Real Estate, Flowage Area	5 Nov 1957
	Supp. 1 to Part 2	1 Jun 1961
9	Downstream Gaging Station	Jun 1960
10	Resident Engineer Office Building	26 Jun 1956
11	Water Supply	25 Jul 1956
12	Second-Step Cofferdam	10 Jun 1958
13	Navigation Facilities and North Non-Overflow Dam	24 Nov 1958
14	Right Abutment Embankment	24 Nov 1958
15	Landscaping and Grounds Development	27 Feb 1963
16	Embankment Protection, SP&S	28 Feb 1958
17.1	UPRR Relocation - Part I	8 Oct 1958
17.2	UPRR Relocation - Part II	10 Mar 1959
	Supp. 1 - Relocation Realignment	22 Sep 1969
18	Embankment Protection, NP Railway	9 Jul 1959
19	Staffing of Ice Harbor Project	12 Apr 1957
20	Permanent Warehouse	22 Apr 1958
21	Remote Operation of Spillway Gates	18 Nov 1958
22B	Public Use and Access Facilities	22 May 1961
	Supp. 1	19 Mar 1962
	Supp. 2, Part A	25 Jun 1963
	Supp. 2, Part B	9 Jul 1963
23	Foundation Grouting and Drainage	22 Oct 1957
24	Reservoir Clearing	31 Jul 1959
25B	The Master Plan with Appendix 1	3 Sep 1963
25.1	Charbonneau Park	28 Jan 1969

No.	Subject	Cover Date
26	Debris Disposal Facilities	19 May 1961
27	Navigation Lock: Upstream Floating Guide Walls	30 Nov 1960
28	Cost Allocation Studies	21 Jun 1961
29	Remote Control of Snake River Projects	7 Sep 1962
	Supp. 1 - Microwave Communications	23 Oct 1962
	Supp. 2 - Communications System	22 Jan 1965
30	Navigation Lock Fire Protection System	23 May 1962
31	Preliminary Design Report, Powerplant Units 4-6	Mar 1968

Item 3
PHYSICAL and OPERATIONAL DATA

General

Stream, Snake River	River Mile 9.7
Drainage area, square miles	109,000
Length of dam, over-all, feet	2,822
Maximum height, headwater to tailwater, feet	101
Completion date	1964
Project acreage above normal full pool excluding railroad and road rights-of-way	3,569.2

Lake

Normal pool elevation, feet, msl	440
Minimum pool elevation, feet, msl	437
Power pondage, acre feet	24,900
Length, normal pool, miles	31.9
Normal pool area, acres	8,370
Maximum width, miles	1.0
Minimum width, miles	0.12
Average width, miles	0.40
Length of shoreline, miles	80

Spillway Section

Crest elevation, feet, msl	391
Number spillway bays	10
Size of gates, feet	50 x 52.9
Spillway capacity, cfs (design flood-pool elev. 446)	850,000

Powerhouse

Powerhouse length, feet	671
Number power units initially	3
Number power units ultimately	6
Revolutions per minute (Kaplan Turbines)	90
Horsepower per unit	143,000
Generator capacity per unit, kw, nameplate	90,000
Generator capacity per unit, kw, overload capability	103,500

Navigation Lock

Maximum lift, feet	105
Lock clear length, feet	675
Lock clear width, feet	86
Filling time, minutes	11

Fish Ladder

Number fish ladders	2
Slope ratio	
North Shore	1 on 10
South Shore	1 on 16
Ladder clear width, feet	
North Shore	24
South Shore	16
	24

Item 4
ECOLOGY

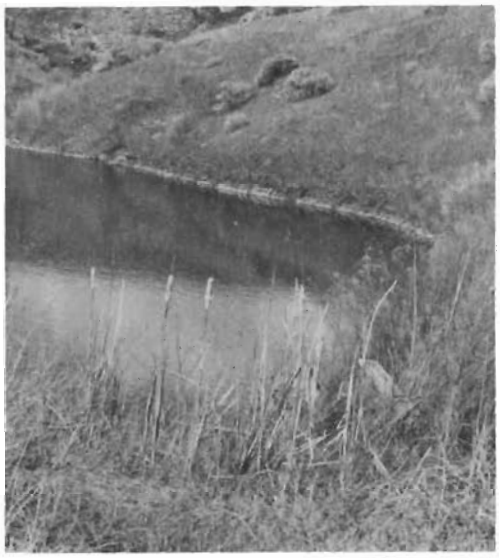
A. VEGETATION

Diversity of native vegetation types is limited in the study area due to the arid climate. Given adequate moisture the potential for greater species diversity is high as evidenced by the numerous introduced species on irrigated areas such as Charbonneau and Levey Parks. Stands of pine, cottonwood, poplar, locust, alder,and willow,with an undergrowth of bluegrass,are found in the irrigated park and recreation areas. Elsewhere, dominant or conspicuous native species are largely limited to cheatgrass bromes, bluebunch wheatgrass, bluegrass, rabbitbrush, bitterbrush, and mustard. Cheatgrass is dominant in many areas, particularly on the flatter terrain underlain with alluvium. The species of cheatgrass are well suited to the shallow infiltration of the light rains that occur in the region and are aided by overgrazing. Following rapid maturation, a cover of cheatgrass dries out to produce a purplish-brown fluff with a high fire hazard potential.

Rabbitbrush is also favored by the alluvial soils and terrain, particularly along or near the reservoir. But like cheatgrass, it is rather ubiquitous and appears to be limited only by cultivation on steep rocky slopes. It is often associated with cheatgrass and lesser amounts of bluebunch wheatgrass and scabland sage, and is also aided by overgrazing.

Bluebunch wheatgrass and the more desirable cover species that occur in the region tend to be favored by slopes and wherever a moisture advantage can be realized, such as along the bases of outcrops and where grazing is difficult or prevented.

Shrubs are confined to a few small areas along the reservoir shoreline and in the bottoms of several side canyons. Riparian vegetation is even more restricted and species such as cattail and willow are found in isolated shoreline clusters mostly along flooded side canyon embayments. Few native trees or canopied species exist in the region.



The upland areas above the gorge and out of the project boundary contain most of the region's agriculture. Crops consist primarily of grains. Pastures for grazing contain mostly bluebunch wheatgrass and cheatgrass.

B. WILDLIFE

Of the wildlife known to occur in the Lower Snake River region, approximately 170 species of birds are listed. Four species, the ferruginous hawk, the American osprey, the northern long-billed curlew, and the western burrowing owl, are classified as undetermined. Geese and ducks are common as are such upland game birds as pheasants, quail, chukar, and Hungarian partridge. There are many species of hawks, and both the golden eagle and the northern bald eagle are found here. The prairie falcon is the only endangered species in the area, although the sparrow hawk is on the Audubon Society's Blue List of Species. It is obvious from reviewing the list that there is quite a diversity of bird species in the project area. The definitions of the status terms used above are as follows:

Endangered Species. Defined by the Office of Endangered Species, Fish and Wildlife Service, as a species or sub-species that is "threatened with worldwide extinction."

Threatened Species. Defined by the Office of Endangered Species, Fish and Wildlife Service, as: "A species of native wildlife having its existence endangered for any reason and requiring assistance for survival."

Blue List. The list includes those species reported by the National Audubon Society (American Birds, December 1973) as declining in numbers throughout its range.

Undetermined Status. Defined by the Office of Endangered Species, Fish and Wildlife Service, as: A species or subspecies that is "possibly threatened with extinction, but about which there is not enough information to determine its status. More information is needed."

About 55 species of mammals are found in the region. The larger species include mule deer, whitetail deer, bobcat, and coyote. Intermediate-sized mammals include badger, beaver, yellow-bellied marmot, mink, muskrat, river otter, porcupine, the blacktailed jackrabbit and mountain cottontail, raccoon, skunk,and weasel. There are numerous species of small rodents and eight species of bats.

Seven species of snakes are known to inhabit the Lower Snake River area,of which only one, the Northern Pacific rattler is venomous. The painted turtle and four species of lizards are other reptiles listed as occurring in the project area.

Habitats - Wildlife populations directly depend upon the life support provided by the availability of suitable habitats. Wildlife

diversity is determined by the components of a habitat. Habitats are made up of plant communities which in turn are influenced by the depth and fertility of soil, the availability and quality of water, and the slope and exposure of the land.

Utilization of a habitat by wildlife is influenced in turn by the kind of land use that occurs in or near the habitat. Human activities can disturb or modify wildlife use of habitats, often to the detriment of the wildlife. However, human activity within the Lower Snake River region has resulted in at least two beneficial effects on certain types of wildlife. Waterfowl and shore birds are attracted to the shelter and nesting sites in and along the slackwater and flooded embayments within the reservoir area. In addition, grain spillage on the nearby cultivated fields on the plateau above the reservoir provides a handy food source for some wildlife, particularly the game birds.

Habitats studied in the project area are usually comprised of one, and occasionally several plant communities. These communities are continually progressing through various successional stages, from bare ground to annuals, perennials, and finally to climax succession species. Grazing, cutting, burning, or agricultural activities can change the natural progression or modify the climax or final community. At any given time, therefore, some habitats may not have reached a stage suitable for good food or cover production but at some time in the future may become more desirable and capable of supporting a larger wildlife population. In addition, habitats may contain areas that are in varying stages of succession. Thus plant communities were evaluated with respect to both their present and projected potential utility to wildlife.

Five factors were considered in delineating possible management areas. The factors are: (1) soils, particularly deep, highly productive soils; (2) availability of water, particularly subirrigation sources; (3) land slope and direction of exposure; (4) the present animal use; and (5) land use on or near habitat areas.

C. AQUATIC LIFE

Studies of aquatic life in Lake Sacajawea have centered primarily on the fish population. Both anadromous and resident species are present. The anadromous species receive significant attention since Lake Sacajawea is part of the anadromous fishery resource of the Snake-Columbia Rivers system. These species, principally salmon and steelhead trout, lend importance to the reservoir in terms of its relation to inland and ocean sport fishing plus the commercial and marketing industry. The passage of these fish through the reservoir thus has regional, national, and international significance. Fish ladders at the dam aid migration. The fish ladder on the north bank of the dam is a prototype of a design used subsequently at other dams under the "Ice Harbor Type" designation. The ladder on the south bank has been modified to resemble other ladders in the system.

Anadromous fish using the ladders consist of chinook salmon, steelhead trout, coho salmon, sockeye salmon, and American shad. Counting stations on the Snake River are a part of this and similar upstream passage facilities, with Snake River averages to date computed at Ice Harbor Dam. Annual chinook and steelhead runs total about 80,000 and 65,000, respectively, while coho and sockeye salmon number from several hundred to a few thousand each.[1] Also passing through the reservoir in varying lesser numbers are anadromous American shad and some Pacific lamprey. No spawning of anadromous fish except possibly shad occurs in the reservoir.

A more specific breakdown of fish passing upstream is seen in the following figures compiled at the Ice Harbor counting station in 1975 for the main counting period extending from April through October. These are adjusted totals to account for counting periods of 50 minutes out of each counting hour. Actual counts are multiplied by a factor of 1.2. Chinook salmon, 31,686; Steelhead trout, 16,218; shad, 3,483; Coho salmon, 1,559; and sockeye salmon, 243.[2]

The upstream passage of anadromous species appears to be quite successful, although definitive measurements of passage efficiency have not been made. Measures to facilitate the downstream passage of young fish are present at the dam. Downstream migration poses complicated problems.

The downstream movement of fish occurs largely during high flows, a feature of mixed influences. Because spill is usually concurrent with the downstream movement of anadromous species, many fish pass through the spillway. Spillway passage is assumed to cause minimal mortalities compared to turbine passage which has been measured at approximately 15 percent for power plants of this type.[3] During the runoff season, water plunges into the spillway basin below the dam, creating a supersaturation of dissolved gases downstream. This induces gas embolism in the bloodstream of most fish, sometimes resulting in significant mortalities. Flip lips are devices built into the downstream end of the spillway

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[1] Source: U. S. Army Engineer Division, North Pacific, Anadromous Fish Passage Report.

[2] U. S. Army Engineer Division, North Pacific, Annual Fish Passage Report, 1973.

[3] U. S. Army Corps of Engineers, Fish Passage Through Turbines: Tests at Big Cliff Hydroelectric Plant, 1966.

apron to divert the flow up and over the surface of the tailrace. These devices alleviate the gas supersaturation problem.A collection and transportation system for Snake River anadromous fish is being used and turbine screens are being tested to alleviate the downstream passage problem.

High and low flows of water in the reservoir affect resident species. The spawning success of resident species within the reservoir, except for trout and possibly a few others, is affected by the amount of pool fluctuation occurring in the spawning and hatching periods of each species. Crappie, largemouth and smallmouth bass and carp generally prefer spawning depths of less than two feet of water (though bass may spawn in from one to ten feet of water). These three main species of warmwater fish in the reservoir could be significantly affected by spring and summer pool fluctuations.

Other resident species include white and black crappie, squawfish, brown bullhead, channel catfish, bluegill, pumpkinseed, suckers, whitefish, chiselmouth, white sturgeon, and other lesser species. None of the resident fish species is considered rare or endangered. A possible exception is the white sturgeon, the largest fish in the Columbia and Snake Rivers (up to 20 feet in length and weighing in excess of 1,200 pounds). Ordinarily this fish disappears in impoundments such as Ice Harbor Reservoir, but apparently it has been able to survive and even reproduce here as evidenced by the young that have been collected.

Aquatic vegetation is marginally productive in the reservoir and serves as food for certain fish species and waterfowl. The vegetation is a food source for carp and indirectly for other species through the food-chain production of phytoplankton, zooplankton and insects with aquatic life history stages, such as mayflies, stone flies and caddisflies.

Sport fishing on the reservoir is for both anadromous and resident species. Fishing for anadromous fish is spotty and largely confined to the upstream end of the reservoir near the tailrace of Lower Monumental Dam. The most extensive sport fishing is for the spiny ray varieties, principally crappie, smallmouth bass,and catfish. These species are present in good numbers, are satisfactory in size,and bite fairly readily. Consequently, this is a popular growing sport attracting thousands of anglers annually.

Item 5
INDUSTRIAL SURVEY OF THE ICE HARBOR LOCK and DAM PROJECT

The purpose of an industrial survey is to define clearly the present uses of areas allocated for industrial use along the reservoirs of the Lower Snake River Project, the total land presently allocated for industry, and present shipping patterns. In addition, port authority plans are presented and evaluated in light of existing trends and activities.

The lands set aside for industrial purposes on the Snake River include the land for manufacturing development and the land allocated for the public port districts. Demands upon the land for competing uses require an efficient allocation to the different categories. It is possible to analyze the trends of the Snake River region and calculate the needs of this area for land set aside for industrial development.

Non-Agriculturally Related Industry

Growth in the non-agriculturally related industry is occurring in the Columbia River in the Tri-Cities area. The lack of any major urban center on the Snake River between the Tri-Cities and Lewiston, Idaho, precludes any significant industrial growth along this portion of the river. Specifically the lack of adequate labor markets, the insufficiency of complementary transportation systems, and the lack of a large consumer market seem to be the major reasons for this lack of development.

It is therefore very important that any plans calling for nonagriculturally related industrial development along the reservoirs be

carefully examined. Under present conditions it appears highly unlikely that any development in this area will occur.

Agriculturally Related Industries

Development of the agriculturally related industry appears at present to be the major concern of the port districts. The ability of barge transportation to carry bulk commodities cheaply and the location in the largest wheat producing area in Washington justifies the interest shown by the port districts in the agricultural section. The comprehensive plans for the port districts reveal major interest in: grain storage facilities, warehouse facilities for general cargo, liquid fertilizer and other farm chemical production plants, and petroleum handling facilities.

The need for new facilities in this area is dependent upon two important factors:

1. Projected growth in the agricultural sector, and

2. The demand and supply relationships of the existing facilities.

It is necessary to discuss each of these factors with regard to proposed port development.

It is almost impossible to predict the future production path for agricultural products. At present the wheat production in the area is increasing -- responding to the large demand (reflected in high prices) for wheat on the market. At the same time the availability of irrigation has produced a movement away from wheat to other products along some portions of the river. With the continued use of better farming methods -- the development of improved strains, it is expected that yields per acre will continue to increase, but it is impossible to predict if current trends will continue in the future. With regard to present demand and supply relationships of the existing grain handling facilities, it appears that some serious problems do exist. Storage facilities in Columbia County will have to be expanded in order to handle future grain production. Other counties have not expressed a great need for expanded storage facilties but continued growth in grain production will require some expansion in the future.

In addition to grain handling facilities, there has been much discussion concerning the development of fertilizer plants in the area. Presently no such facilities exist on the Lower Snake River. Although the region along the Lower Snake River is agricultural and utilizes fertilizer, it seems unlikely that actual fertilizer production facilities would be built along the reservoirs in the near future for the following reasons:

1. There is presently a fertilizer shortage due in large part to a scarcity of raw materials. Given a shortage of raw materials,

fertilizer companies are not going to be expanding production facilities.

2. The surrounding area, although a consumer of fertilizer, does not consume enough to justify the type of large production facility necessary to achieve economics of scale.

3. There is no labor surplus in the area which would be necessary to operate a production facility.

4. All raw materials would have to be imported as none exist in the immediate area.

Although it seems unlikely that actual production facilities will be built along the Lower Snake, it seems quite probable that distribution facilities will be constructed. This could occur for several reasons.

1. Barge transport costs are well below other modes of transport.

2. A fertilizer production facility could be built in the Tri-Cities area where it would have access to a larger market as well as a greater labor supply. The fertilizer from this facility could be barged to distribution points along the Lower Snake.

3. At present barges carry grain downstream but go upstream empty. Carrying fertilizer to distribution points along the reservoirs would partially resolve this problem.

Developing distribution facilities for other products such as general cargo and petroleum also seems possible since these are in demand (although not in sufficient quantity to justify production) in the region. They could also help resolve the problem of empty upstream barge traffic.

In summary, the type of development for which pressure might be expected to occur along the Lower Snake, in order of probability is:

1. Additional grain-handling facilities at the Port of Columbia;

2. Grain-handling facilities at other ports, depending upon production increases in the surrounding area;

3. Development of fertilizer storage and distribution facilities;

4. Development of general cargo and petroleum storage and distribution facilities.

No production facilities are foreseen at this time.

The actual development of certain areas will be affected by various factors. The table on the following page relates existing and proposed port facilities to those factors which influence location decisions.

Port Sites/Location Factors

Port		Transport Facility		Labor Availability	Power	Area Market Size
		Road	Rail			
Sheffler Walla Walla Co. Cap. 16,000 tons	1.97 acres	Good Paved Road to Hwy. 124	Excellent U. P. R. R.	Fair	Good	Poor
Windust Franklin Co. 1973 shipments = 150,000 tons	3.0 acres	Fair Gravel to Pasco Kahlotus Road	Poor R.R. across river	Poor	Good	Poor
Port of Columbia near Tucannon River Columbia Co. 1973 shipment = 130,000 tons	18.5 acres*	Good Hwy. 261	Excellent U. P. R. R.	Fair	Good	Fair
Riparia Whitman Co. No facilities	900 acres	Poor	Excellent	Poor	Good	Poor
Lyons Ferry Franklin Co. No facilities	190 acres	Good Hwy. 261	Excellent	Poor	Good	Fair
Central Ferry Whitman Co. Grain storage & loading	850 acres	Excellent Hwy. 295 (127)	Excellent	Fair	Good	Fair
Almota Whitman Co. Grain loading facility	18 acres	Fair Access	Excellent	Fair	Good	Fair

Port			Transport Facility Road	Rail	Labor Availability	Power	Area Market Size
Central Ferry Garfield Co. Grain storage	20	acres	Excellent Hwy. 295 (127)	Poor R.R. across river	Fair	Good	Fair
Penawawa Whitman Co. No facilities	20	acres	Poor	Excellent	Fair	Good	Fair
Illia Garfield Co. No facilities			Fair	Poor	Fair	Good	Fair

*Plans call for development of additional 89 acres.

The Lower Snake River in Washington cuts across the primary wheat producing area in the state. Data from the U. S. Department of Agriculture show that this area produces almost 60 percent of the wheat in the entire state.[1] The following table shows production (in bushels) for the counties in Washington surrounding the Lower Snake River.

Wheat Production 1972 (in bushels)[2]

Adams	12,605,500	(17.5)
Asotin	1,460,800	(2.0)
Benton	3,728,400	(5.1)
Columbia	5,985,500	(8.2)
Franklin	4,210,400	(5.8)
Garfield	4,714,200	(6.4)
Walla Walla	13,815,000	(18.9)
Whitman	26,644,000	(36.4)
TOTAL	73,163,800	100.0

Total state production, 1972, 122,083,000

In addition to wheat production, the area also supplies barley, peas, grass seed, and some grape vineyards near the Tri-Cities area. With the major concern in agriculture, the food processing industry is an important part of the economic structure of the region.

The lack of major urban areas along the Snake River precludes the location of any major industrial facilities,even with the availability of cheap electrical power afforded by the dams.This situation may change when Lower Granite Dam is completed, which will provide slackwater to the Lewiston-Clarkston urban area. At present, the Tri-Cities are the only major urban centers near the river, but their location on the confluence of the Snake and Columbia Rivers will provide very little industrial development in the project. Most development seems to be proceeding along the Columbia River, which has direct access to the ocean. Other urban areas, such as Walla Walla and Pullman, are located in the interior of the counties and depend upon other modes of transportation, such as railroads.

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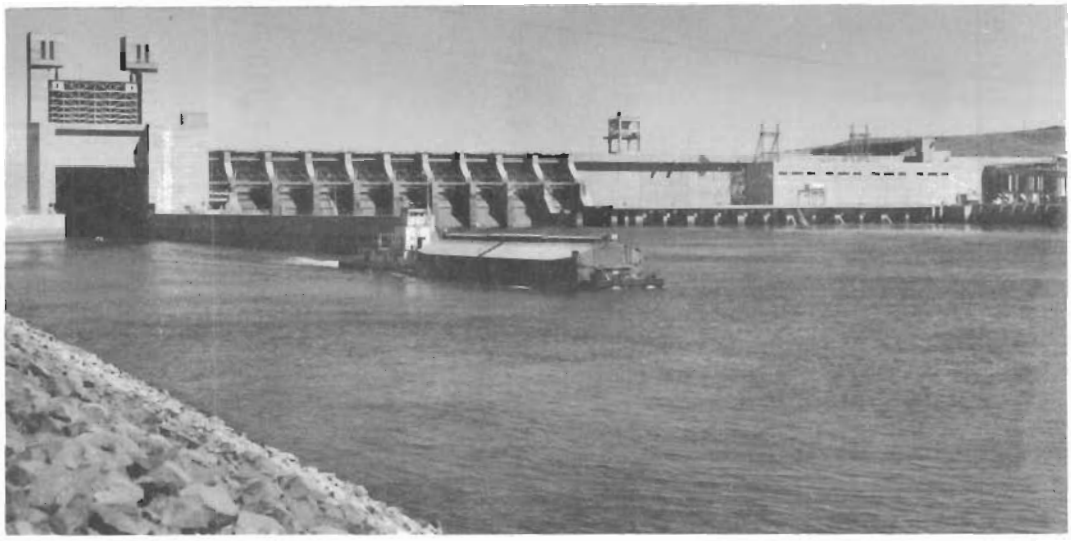
[1] U. S. Department of Agriculture, Statistical Reporting Service, Wheat Production Report, 1972 (Seattle, 1973).

[2] Source: U. S. Department of Agriculture,Statistical Reporting Service, 1973.

Industrial use of the Snake River at present is mostly storage and transportation facilities for bulk commodities such as grain. There are also electrical substations located at each damsite and irrigation pumping stations providing water to the surrounding farmlands. This report will provide descriptions and locations of industrial uses along each reservoir at present and the land area involved. It will also provide descriptions and locations of future industrial sites along each reservoir.



Ice Harbor supplies 31 miles of slackwater from the confluence of the Snake and Columbia Rivers upstream to Lower Monumental Dam. It has been in operation since 1962 and was the first of the four dams along the Lower Snake River. Since its opening the tonnage handled by the dam has increased from 4,666 tons in 1962 to 1,205,647 tons in 1973. Primarily responsible for the great increase was the opening of the Lower Monumental and Little Goose Dams to commercial traffic. The following table presents the commodity and tonnage going through Ice Harbor Dam for selected years from 1962 to 1973.

The cargo going upstream is directly related to the construction and maintenance of the dams further upriver. It appears from the data that the most important function of this dam is the shipment of wheat to the ocean ports from the wheat producing areas in the interior.

Development along the river consists of railroads, storage facilities for grain, and irrigation pumping plants. The lake's topography and location do not provide much of a stimulus for industrial growth.

The Burlington Northern Railroad runs along the northern shore for the entire length of the reservoir. This provides rail service to

Report of Commerce Through Ice Harbor Dam 1962-1973 (in tons)

Commodity	1962 .		1969*		1970**		1972		1973	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Gasoline										
Diesel										
Stove oil										
Misc. Petroleum Products										
Misc. Cargo	14,055	348	11,826	1,610	4,361	2,307	1,310	3,740		
Wheat		3,770		230,581		397,286		1,307,108		1,176,991
Barley, Oats & Rye		548				5,186		41,904		28,656
Total	14,055	4,666	11,826	232,191	4,361	404,779	1,310	1,352,482		1,205,647

* 1969 - Lower Monumental Dam put into operation

** 1970 - Little Goose Dam put into operation

Source: Army Corps of Engineers, Walla Walla District

the Tri-Cities area. On the south side the Union Pacific Railroad operates, also running the length of the reservoir.

There are two areas along the river developed as grain storage and shipping areas: one is located at Sheffler (River Mile 29) and the other is located at Windust (River Mile 39) just below Lower Monumental Dam.

The facilities at Sheffler are operated by the Walla Walla Grain Growers Association. The land is 1.97 acres on lease from the Port of Walla Walla.[1] The total amount of tonnage through the elevator for 1973-74 amounted to 100,000 tons.[2] Access to Sheffler is by a paved road off State Highway 124. Also the Union Pacific Railroad runs by this site. No development is planned for this site as capacity of the facility has just been expanded from 500,000 bushels to 533,000 bushels.[3]

Windust storage and shipping is operated by Port of Kahlotus.[4] This is a tract of land approximately 3 acres in area. Shipments of wheat from this facility totaled 149,253 tons for the year.[5] Access to Windust is by gravel roads off of the Pasco-Kahlotus road. There are no plans to expand the operations at this site.

Of importance along this portion of the Snake River is the use of the water for irrigation in this section of Washington. For this purpose irrigation pumping stations are located at five sites along the reservoir. This has allowed some conversion of the surrounding land to irrigated croplands including some grape vineyards.

The location of heavy industrial development is concentrated in the Tri-Cities area along the Columbia River and also south of the confluence at Wallula and Burbank. Any future industrial growth will occur primarily in these areas.

The table on the following page summarizes the present situation at each of the port facilities along Ice Harbor Reservoir. The table illustrates existing uses, in acres, for each facility as well as total acres presently controlled or operated by the Port. Present grain storage capacity and annual grain movements through the facility are also shown. Finally the amount of land necessary to double grain storage and handling facilities is shown. The final

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[1]Telephone interview with Mr. Schmidt of Walla Walla Grain Growers, 29 May 1974.

[2]Ibid.

[3]Ibid.

[4]Telephone interview with Mr. Woody, Windust Grain Elevator, 29 May 1974.

[5]Ibid.

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ICE HARBOR INDUSTRIAL ACREAGE

Port	Port Contact	Existing Acreage Controlled By Port	Existing Acreage Utilized By Function	Grain Storage Capacity	Annual Grain Flow Through (1973)	Acreage Necessary to Double Grain Storage & Handling Capacity	Acreage Required in Addition to That Currently Controlled By Port
Sheffler	Walla Walla Grain Growers Association Mr. Schmidt	2 acres	1 acre - Grain Storage and Handling	16,000 Tons	100,000 Tons	1 acre	none
Windust	Port of Kahlotus Elevator Operator- Mr. Woody	5 acres	3 acres - Grain Storage and Handling	4,500 Tons	150,000 Tons	2.5 acres	1/2 acre

figure was calculated to illustrate the acreage requirements under the most optimistic growth situation in the area. All data in the table are based on conversations with the various port managers and grain elevator operators.

Other port areas are undeveloped. From the above it is clear that the land requirements to double grain storage and handling facilities are minimal. Total land required beyond that which the ports presently control is one-half acre.

The other potential port area development activities are fertilizer storage and distribution facilities and ultimately general cargo storage, petroleum storage,and distribution facilities.

Distribution centers set up along the reservoirs must be able to serve the region,including both sides of the river. This then requires a bridge facility. The only areas which meet this requirement are the Central Ferry facilities on Little Goose Reservoir and the Lyons Ferry facility on Lower Monumental Reservoir. At present the Lyons Ferry area is undeveloped,while Central Ferry has grain storage and handling facilities and is developing a fertilizer tank farm. The road serving Central Ferry is also superior to that serving Lyons Ferry.

Given the existing situation and state of development of the various facilities, the following development course seems adequate to handle all future realistic demand situations.

1. Reserve the amount of land necessary to double the capacity of the grain storage and handling facilities. This should handle all future foreseeable demand,including the introduction and improvement of wheat hybrids.

2. Allocate 50 acres in the Central Ferry area to handle additional fertilizer storage and distribution facilities, petroleum storage and distribution facilities, and general warehouse storage and distribution facilities. The actual amount of necessary land depends upon the size of the facilities required, which is a function of the market. Given the limited market, 50 acres seems adequate to handle all required services.

The above should satisfy all regional demands for the foreseeable future. There appears to be no need to develop those port areas presently undeveloped. Industrial activities are not justified as discussed previously.

Any long-term future development could occur through an expansion at Central Ferry,with the next alternative being Lyons Ferry.

Item 6
RECREATION DEMAND ANALYSIS OF THE ICE HARBOR LOCK and DAM PROJECT

The demand analysis undertaken here has two objectives; (1) to identify the amount of demand that may be expected on Ice Harbor project, and (2) to utilize this information to determine the need for recreational land and facilities at the project.

The base data used to determine the projected visitation in this report were obtained from a study sponsored by the Pacific Northwest River Basins Commission. A look at the background and development of this study aids in understanding the methodology used in determining visitor use.

When the Pacific Northwest River Basins Commission began collecting recreation information for use in its Comprehensive Coordinated Joint Plan (CCJP) from the several states and many agencies involved, the need for uniformity of recreation terms, data, and data procession became acute. An analysis of the problems revealed that different terms were used to define the same item, similar terms were used to define different items, (i.e., in one state an agency prepared plans on river basins,another on special district boundaries), different types of data were presented, and projections of future population and activity trends were inconsistent.[1]

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[1]Pacific Northwest River Basins Commission,Regional Recreation Data Program for the Northwest, June 1975.

Prompted by these inconsistencies, on 6 September 1973, the River Basins Commission requested its Recreation Committee to develop a coordinated regional recreation use projection study program. Responding to this request and to the interest of the Regional Director of the Bureau of Outdoor Recreation, the Committee established a work group comprised of the Bureau of Outdoor Recreation and six other state and Federal recreation agencies. Later a standing subcommittee, the Recreation Data Subcommittee, was established to insure the long-term continuance of the program. The CCJP study required that recreation use information and resource requirements be provided for 1970 (base year), 1980, 2000, and 2020. The analysis was based on existing data. The study included the States of Washington, Idaho, and Oregon; the 11 western counties of Montana; and Teton County, Wyoming.

The methodology used in the updating of this Master Plan is to compare the 1975 visitation at Ice Harbor with the Recreation Data Subcommittee projected visitor use for the same year. After establishing a ratio between these two figures, the same ratio is applied to the 1985 projected visitor use.

The CCJP Report has divided its study areas into zones which correspond with county boundaries. The Ice Harbor recreation sites are located in both Walla Walla County (Zone 36) and Franklin County (Zone 11).

The Corps' visitation data compiled by the project office indicates that the following number of people visited the Ice Harbor project in 1975:

Walla Walla County		Franklin County	
Site	Visitors	Site	Visitors
Fishook Park	53,167	Levey Park	29,881
Ice Harbor Dam	111,780	Windust Park	26,611
Charbonneau Park	43,593	Dalton Lake	7,382
Wood Pile	14,284	Emma Lake	2,140
Other areas	1,005	Other areas	1,005
Total	223,829	Total	67,019
Total Visitation			290,848

Visitation listed under the heading of "Other areas" was divided equally between the two counties.

Occasions are defined as the participation in any single activity by one individual. One person may participate in several recreation occasions during a single visit to a site. To determine the number of recreation occasions occurring at the project, a duplication factor must be applied to the actual visitor count. By using the data contained in the Ice Harbor visitation records, past duplication factors are calculated and shown below:

Year	Distribution Total		Visitor Total		Duplication Factor
1975	400,220	÷	290,848	=	1.37
1974	280,194	÷	237,682	=	1.17
1973	268,328	÷	170,723	=	1.57
1972	342,230	÷	181,154	=	1.88

Average Duplication Factor = 1.49

Since there is such a variation in the duplication factor during 1975 through 1972, an average will be used for the purpose of determining recreation occasions.

Total Occasions Which Occurred at Ice Harbor in 1975

County	Total Visitation		Duplication Factor		Occasions
Walla Walla -	223,829	x	1.49	=	333,505
Franklin -	67,019	x	1.49	=	99,858

The CCJP study lists projected annual occasions for the year 1970, 1980, 2000, and 2020. By interpolating between the 1970 and 1980 figures, the projected annual occasions for 1975 can be obtained. The 1985 occasions are found by interpolating between 1980 and 2000.

CCJP Projected 1975 and 1985 Total Annual Occasions

		1975	1985
Walla Walla County	=	2,932,000	3,331,100
Franklin County	=	3,198,500	4,256,250

The percent of total county occasions which occurred at the Ice Harbor recreation sites can be calculated by dividing the total county occasions into the total Ice Harbor occasions.

Percent of County Occasions Occurring at Ice Harbor in 1975

County	Ice Harbor Occasions		County Occasions		Percent
Walla Walla -	333,505	÷	2,932,000	=	11.37
Franklin -	99,858	÷	3,198,000	=	3.12

The 1985 Ice Harbor occasions can be computed by multiplying the above percentage figures by the total projected 1985 county occasions. In applying the 1975 percentage figure to the 1985 projection, it is assuming that the county recreation use patterns will remain stable during the next 10 years.

Projected 1985 Occasions for Ice Harbor

County	County Occasions		Percent		Ice Harbor Occasions
Walla Walla -	3,331,100	x	.1137	=	378,746
Franklin -	4,256,250	x	.0312	=	132,795
Total Ice Harbor Occasions					511,541

Recreation activity occasions can be converted to annual visitors by dividing by the duplication factor as shown below:

511,541 ÷ 1.49 = 343,316 Total Annual 1985 Visitors

The distribution of activity occasions, calculated from past visitation records, is shown on the following page.Because of the variation in some of the percentages, the average of a four year period was used to distribute the 1985 occasions.

Distribution of Occasions at Ice Harbor

Activity	1972	1973	1974	1975	Average
Camping	2.4%	2.2%	4.6%	4.1%	3.3%
Picnicking	27.2%	29.8%	16.3%	17.4%	22.4%
Boating	9.3%	10.4%	10.3%	8.4%	9.5%
Fishing	9.1%	8.2%	10.6%	5.1%	8.1%
Hunting	0.2%	0.2%	0.1%	0.8%	.3%
Sightseeing	17.9%	20.0%	46.7%	43.4%	31.8%
Waterskiing	11.3%	1.1%	5.2%	4.5%	5.4%
Swimming	18.9%	20.7%	10.2%	17.3%	16.5%
Other	3.5%	7.3%	-- %	-- %	2.7%
					100.0%

Projected Occasions by Activity for 1985

Activity	Percent		Total 1985 Occasions		Number of Occasions
Camping	.033	x	511,541	=	16,881
Picnicking	.224	x	511,541	=	114,585
Boating	.095	x	511,541	=	48,596
Fishing	.081	x	511,541	=	41,435
Hunting	.003	x	511,541	=	1,535
Sightseeing	.318	x	511,541	=	162,670
Water Skiing	.054	x	511,541	=	27,623
Swimming	.165	x	511,541	=	84,404
Other	.027	x	511,541	=	13,812
		Total			511,541

To determine the kinds and amount of recreation facilities which will be required to meet the 1985 demand a "design day" or average peak day must be established. An assumption is made that annual use can be accommodated if facilities are provided to accommodate average peak day use. This means that overuse may occur on 5-10 days per year but more development would not be efficient use of resources. A "design day" is defined as the number of occasions occurring on an average weekend day during the peak month of visitation. The following calculation is in accordance with the procedure outlined in EC 1130-2-123, Appendix A, dated 23 July 1973:

511,541 x .23 x .67 ÷ 9 = 8,758

Whereas:

511,541 = Annual attendance (occasions)

.23 = Percent of annual use occurring in peak month of recreation seasons (based on past 3 years visitation reports).

.67 = Percent of use occurring on weekends of peak month.

9 = Number of weekend days in peak month.

8,748 = Occasions occurring on design day.

The distribution of activities for a design day is as follows;

Activity	Percent	Design Day	Number of Occasions
Camping	.033	8,758	289
Picnicking	.224	8,758	1,962
Boating	.095	8,758	832
Fishing	.081	8,758	709
Hunting	.003	8,758	26
Sightseeing	.318	8,758	2,785
Water Skiing	.054	8,758	473
Swimming	.165	8,758	1,445
Other	.027	8,758	237
Total			8,758

In determining the primary facilities necessary to accommodate the design load, some judgment factors were required.Other criteria and percentages were selected from the publication "Outdoor Recreation Space Standards," prepared by the Bureau of Outdoor Recreation (BOR), April 1967, and ER 1120-2-403, Technical Report No. 2. Data taken from other sources will be so stated.

Camping - Preliminary standards developed by the Recreation Subcommittee of the Pacific Northwest River Basins Commission indicate that the average number of persons per camping party is four and the daily turnover rate is one. Two hundred and eighty nine camping occasions are estimated to occur in a design day. The number of camping units required to meet the 1985 demand is:

$$289 \div 4 \div 1 = 72 \text{ camping units}$$

Picnicking -The Recreation Data Subcommittee studies show that only 70-90 percent of those picnicking will desire a picnic table. They also indicate the average number of persons per party is four and the daily turnover rate is two. One thousand, nine hundred and sixty two picnickers are expected during a design day.

$$1{,}962 \times .80 \div 4 \div 2 = 196 \text{ picnic tables}$$

The Subcommittee also suggests that picnic tables be spaced no more than 10 per acre.

$$196 \text{ tables} \div 10 = 20 \text{ acres}$$

Boating - Technical Report No. 2 from ER 1120-2-403 indicates that, on the average, 17 percent of the vehicles entering Corps' projects will have trailered boats. This includes all of those participating in the activities of water skiing, fishing, and boating.

$$8{,}758 \div 1.49 \div 2.7 \times .17 \div 40 = 9 \text{ lanes}$$

Whereas:

8,758 = total occasions estimated for design day

1.49 = duplication factor

2.7 = average number of people per car (from Ice Harbor project surveys)

.17 = percent of cars with trailered boats

40 = daily launchings per lane (BOR standard)

Fishing -Those using a boat are included in the above computation. Those fishing from the boat require no special facilities.

Hunting - No special facilities are required for this activity.

Sightseeing - Visitor facilities are being provided at the dam. Parking is discussed below.

Water Skiing - Launching ramp requirements are included in the computation for boating. Additional ski docks will be installed as use increases. The number and timetable for installation of these facilities will be a judgment decision.

Swimming -The Nevada Department of Conservation and Natural Resources and several other agencies use a standard of one linear foot of shoreline per swimmer and a turnover rate of two. The Data Subcommittee also uses a turnover rate of two but indicates that only between 60 and 80 percent of the swimmers will use the developed swimming areas. The remainder will use natural beaches along the shoreline. Considering the shoreline conditions at Ice Harbor,it is estimated that 80 percent of those swimming will use the developed swimming sites. One thousand, five hundred and forty five swimmers are expected on an average weekend day in July.

$$1{,}445 \times .80 \div 2 \times 1 = 578 \text{ linear feet of beach}$$

Parking - As was stated earlier in this discussion,nine launching lanes will be needed to meet the 1985 demand. Using the standard of 40 launchings per lane per day, 360 car-trailer parking spaces will be required at the project to meet the 1985 projections.

With 1,962 picnic occasions projected for 1985 and four persons per party, with a turnover rate of two, 245 parking spaces are needed for picnickers.

$$1{,}962 \div 4 \div 2 = 245 \text{ parking spaces}$$

It is estimated that only 75 percent of the sightseers will require parking space at the dam and recreation sites. Some visitors just drive through the area or stop at the roadside for a few minutes. The average number of people per car is 2.7 and the turnover rate is four, according to the project surveys. Two thousand, seven hundred and eighty five sightseeing occasions are projected for a design day in 1985.

$$2{,}785 \div 2.7 \div 4 \times .75 = 193 \text{ parking spaces}$$

For the activity of swimming, the BOR states that the turnover rate is two. Surveys at Ice Harbor show that there are 2.7 people per car. It is estimated, however, that approximately 35 percent of those swimming are also picnicking and will not require parking. Swimming occasions are expected to total 1,445.

$$1{,}445 \div 2.7 \div 2 \times .65 = 173 \text{ parking spaces}$$

The activities of hunting and bank fishing usually occur in the more or less isolated locations,rather than at the developed site and would, therefore, not require a formal parking space. Those fishing from boats are included in the facilities computed for boaters.

The total requirement for car parking for 1985 is 611 spaces. Three hundred and sixty five car-trailer spaces will be needed.

The preceding pages of this section have shown the procedure used to estimate the total recreation facilities that will be required to meet visitor demands to the year 1985. The calculations shown below will indicate the future visitor needs of the project to the year 2020.

Page SD-28 shows the percent of total county occasions which occurred at Ice Harbor in 1975 to be:

Walla Walla County - 11.37 percent

Franklin County - 3.12 percent

Assuming that county recreation use patterns will remain stable over the next 45 years, future Ice Harbor occasions can be projected by applying the above percentage rate to the CCJP projected county occasions.

Projected Occasions for the Year 2000

County	County Occasions		Percent		Ice Harbor Occasions
Walla Walla	4,528,400	x	.1137	=	514,879
Franklin	6,076,200	x	.0312	=	189,577
Total Ice Harbor Occasions					704,456

Projected Occasions for the Year 2020

County	County Occasions		Percent		Ice Harbor Occasions
Walla Walla	6,645,600	x	.1137	=	755,605
Franklin	9,458,000	x	.0312	=	295,090
Total Ice Harbor Occasions					1,050,695

The total occasions indicated above can be converted to visitors at the project by dividing by 1.49, which is the Ice Harbor duplication factor.

704,456 ÷ 1.49 = 472,789 annual visitors for the year 2000

1,050 ÷ 1.49 = 705,164 annual visitors for the year 2020

The increase from the 1985 projections to the year 2000 and 2020 projections is determined by the following method:

By applying these increase factors to the 1985 facility requirements shown on pages SD-31 through SD-33, the total facility needs for the years 2000 and 2020 can be estimated. These estimates are indicated in the following table.

Total Facilities Required to Meet Ice Harbor Visitor Needs

Activity	1985	2000	2020
Camping (units)	72	99	148
Picnicking			
Units	196	262	403
Acres	20	27	41
Boating (lanes)	9	12	18
Swimming (linear feet of beach)	578	773	1,187
Parking (spaces)			
Car-trailer	360	481	739
Sightseeing	193	258	396
Swimming	173	231	355

The table on the following page shows both the existing and proposed facilities at the project.

EXISTING AND PROPOSED FACILITIES

Activity	Required to meet 1985 Demand	Lock & Dam	Charbonneau	Levey	Fishhook	Windust	Matthews	Existing Total	Proposed 5 Year	Proposed Future
Camping	72 units		5 year - 54 future - 27	5 year - 20	exist - 39			39	74	27
Picnicking	20 acres	future - 13	exist - 11 future - 4	exist - 11	exist - 4 future - 18	exist - 5		31		40
Boating	9 lanes	exist - 2	exist - 4	exist - 2	exist - 2	exist - 1 future - 1	exist - 1 future - 1	12		2
Swimming	578 LF beach		exist - 480	exist - 550	exist - 700 future - 300	exist - 600		2,300		300
Auto Parking	611 spaces	exist - 179	exist - 150 future - 90	exist - 68 future - 30	exist - 150 future - 28	exist - 60		607		148
Auto/Trailer	360 spaces	exist - 33	exist - 48 future - 63	exist - 22	exist - 57	exist - 15 future - 45	exist - 20 future - 20	195		148

Item 7
POLICY OF STRUCTURE LOCATIONS IN FLOOD PLAIN AREAS

1. References:

a. Executive Order 11296.

b. EM 1110-2-400, 1 September 1971, Recreation Planning and Design Criteria and ER 1110-2-400 Design of Recreation Sites, Areas and Facilities.

c. Proposed Flood Hazard Evaluation Guidelines for Federal Executive Agencies, September 1969, U.S. Water Resources Council.

d. NPWEN, multiple-addressed Disposition Form of 1 November 1967, subject, "Policy on Structure Locations in Flood Plain Areas."

2. The following criteria are to be used in determining the location of structures constructed by us and others on lands over which we have control. These criteria supersede those of reference d. The objective of these guidelines is to prevent uneconomic and unnecessary flood plain development and avoid operation and navigation problems that might occur with improper developments along reservoir shorelines. At the same time it is realized that river and reservoir shorelines are valuable resources and proper developments should not be overly restricted. In general, these criteria provide only minimum elevations and more restrictive design should be used where needed to meet the guideline objectives.

3. Certain facilities, particularly those required for boating and water recreation, need to be located near the water and require considerations of utilization, topographic features, and other design factors. Because of the judgment required, no specific elevation related to flood frequency can be specified. Facilities in this category are:

a. Sea walls, bulkheads, breakwaters, windbreaks, and other protective devices, fixed or floating, and designed to withstand overtopping.

b. Picnic areas and improved beaches, excluding permanent facilities that would be damaged by flooding or subject to flotion.

c. Davits, monorails, duorails, hoists, elevators, marine railways, and similar boat launching and retrieving facilities, provided all machinery that would be damaged by water is located above the 100-year flood level and, further, that all facilities

are sufficiently anchored to avoid being washed away by a flood of this magnitude. Also, it is highly desirable to have these facilities fully operable for floods of the 5-year flood magnitude.

d. Service piers and docks, launching docks, and handling piers, provided they are operable for the 5-year flood and will not be washed away by the 100-year flood.

e. Gasoline-dispensing facilities, exclusive of storage.

4. The following facilities should be located above the level of the 5-year flood.

a. Picnicking facilities that would be subject to flood damages or flotation.

b. Bottom of pit-type toilets and latrines, or an adequate seal to 5-year flood level, provided this meets state standards.

c. The lowest 50 percent of parking areas can be located between 5- and 10-year flood level,provided this is at least one foot above maximum normal pool in protected areas and a significant wave height above maximum normal pool in areas exposed to wave action.

d. Tops of boat-launching ramps, provided these are at least one foot above maximum normal pool in protected areas and three feet above maximum normal pool in areas exposed to wave action.

e. Access roads to boat-launching ramps and picnic areas. The general rule for access roads is that they should be safely usable any time the facilities served are usable.

5. The following facilities should be located above the level of the 10-year flood:

a. At least 25 percent of parking area, provided this is at least three feet or a significant wave height above the maximum normal pool.

b. Overnight camping areas.

c. All pumps.

d. Water supply wells, which should be usable to 10-year flood level.

6. The following facilities are to be located above the 50-year flood level:

a. Bath-change shelters and bath houses.

b. All sanitary facilities except pit-type toilets.

c. At least 25 percent of parking area, provided this is at least three feet or a significant wave height above maximum normal pool.

d. Roads to buildings for human occupancy.

7. The following facilities must be located above the level of the 100-year flood:

a. Warehouses and storage facilities, excepting those used for storage of inflammable liquids or gases, provided they are flood proofed to the higher of the following: (1) on Snake and Columbia Rivers respectively, three and five feet above maximum normal pool, or (2) level of the standard project flood.

b. Sales and service buildings associated with commercial marinas having permanent fixtures which would be damaged by floods with flood proofing to the higher of the following: (1) on Snake and Columbia Rivers, respectively, three and five feet above maximum normal pool, or (2) level of the standard project flood.

8. The following structures, improvements, and facilities, must be located a minimum of three and five feet above the maxumum normal operating pool on Snake and Columbia Rivers, respectively, or above the level of the standard project flood, whichever is higher.

a. Warehouses without flood proofing.

b. Sales and service buildings associated with commercial marinas without flood proofing.

c. Facilities for storage of inflammable liquids or gases, provided they are flood proofed three feet above SPF level.

d. Buildings for human habitation. (Consideration may be given to allowing occupation of existing facilities located at about the 100-year flood elevation if the occupancy is controlled by the Corps.)

e. Museums and buildings containing valuable historical, legal, medical, financial, Governmental, literary, or scientific documents or data, provided they are flood proofed three feet above SPF level.

9. The following criteria are proposed for minimum elevations on the flood plains of rivers and streams:

a. Finished flood elevations of buildings subject to flood damage by water, or whose contents may be subject to damage by

water, should be located one foot above the level of the 100-year flood. Lower floor elevations may be permitted where flood proofing would provide protection for water levels one foot above the 100-year flood.

b. The minimum finish grade at buildings should be such that they will not be adversely affected by the 50-year flood.

c. Necessary access roads to buildings for human occupancy should be adequate to allow passage of emergency vehicles for the 50-year flood.

d. Every effort should be made to locate beyond the floodway zone where a constriction would cause an increase in the upstream water surface. Where such construction is necessary, the rise in water surface caused by the construction should be limited to one foot for floods up to the magnitude of the 100-year flood.

10. Definitions

a. A certain frequency flood refers to conditions on Columbia River with storage provided under the Canadian Treaty, Libby, and all existing regulations. In addition, for Snake River and the Columbia River below Snake River, Dworshak storage is included in the flow considerations.

b. Following are the discharges for various flood frequencies and standard project floods to be used with these regulations in the indicated reaches:

(1) Snake River, Grande Ronde to Clearwater River:

Frequency	Discharge - cfs
5-yr	140,000
10-yr	160,000
25-yr	185,000
50-yr	210,000
100-yr	240,000
SPF	295,000

Backwater curves for determining control elevations should start at elevation 738.0 at Snake River Mile 139.5 for this reach of the river.

(2) Snake River below Clearwater River to south:

Frequency	Discharge - cfs
5-yr	215,000
10-yr	250,000
25-yr	290,000
50-yr	320,000
100-yr	355,000
SPF	420,000

(3) McNary Reservoir above Snake River:

Frequency	Discharge - cfs
5-yr	360,000
10-yr	400,000
25-yr	465,000
50-yr	485,000
100-yr	525,000
SPF	540,000

(4) Columbia River, Snake River to John Day Dam:

Frequency	Discharge - cfs
5-yr	450,000
10-yr	520,000
25-yr	600,000
50-yr	660,000
100-yr	715,000
SPF	810,000

c. Elevations for various frequency floods are those that will occur with the designated flow and the maximum normal operating pool.

Item 8
FEDERAL RULES and REGULATIONS

Published in the Federal Register (36 CFR Chapter III)

327.1 POLICY. (a) It is the policy of the Secretary of the Army acting through the Chief of Engineers to provide the public with safe and healthful recreational opportunities within all water resource development projects administered by the Chief of Engineers.
(b) Unless otherwise indicated herein, the term "District Engineer" shall include the authorized representatives of the District Engineer.
(c) All water resource development projects open for recreational use shall be available to the public without regard to sex, race, creed, color or national origin. No lessee, licensee, or concessionaire providing a service to the public shall discriminate against any person or persons because of sex, race, creed, color or national origin in the conduct of his operations under the lease, license or concession contract.

327.2 MOTOR VEHICLES. (a) The operation and parking of motor vehicles, including off-road vehicles as set forth in paragraph (b) of this section, is prohibited on roadways of water resource development projects at those locations and at times designated by the District Engineer and marked by the posting of appropriate signs.
(b) The operation of off-road vehicles, including but not limited to motorcycles, minibikes, trail bikes, snowmobiles, dune buggies, all terrain vehicles, and other motor vehicles designed for or capable of cross-country travel on natural terrain, when operated off the roadways of water resource development projects is prohibited except at locations and at times designated by the District Engineer and marked by the posting of appropriate signs.
(c) No person shall operate any motor vehicle including off-road vehicles in a careless, negligent, or reckless manner so as to endanger any person or property.

327.3 VESSELS. (a) It shall be a violation of these regulations to operate any vessel for a fee or profit upon the waters of water resource development projects unless such operation is authorized by lease, license or concession contract with the Department of the Army. This paragraph shall not apply to the operation of vessels upon navigable waters of the United States.
(b) No vessel shall be operated in prohibited areas of a lake, reservoir, or other body of water. Such areas shall be designated by the District Engineer and marked by the posting of appropriate signs.
(c) No person shall operate any vessel or manipulate any water skis or other similar device in a careless, negligent or reckless manner so as to endanger any person or property.
(d) The construction of floating or stationary mooring facilities or any other structure of any kind in the lake, reservoir or other body of water is prohibited unless a permit therefore has been issued by the District Engineer. No habitation of such facilities will be permitted.
(e) All vessels when not in actual use shall be removed from the lake, reservoir or other body of water unless securely moored at mooring facilities permitted by the District Engineer.

327.4 AIRCRAFT. (a) The operation of aircraft on lands or waters other than at the landing areas designated by the District Engineer is prohibited. Such designated areas shall be marked by the posting of appropriate signs.
(b) Except in extreme emergencies involving the safety of human life or threat of serious property loss, the air delivery of any person or thing by parachute, helicopter, or other means without written permission of the District Engineer is prohibited.
(c) The provisions of this section shall not be applicable to aircraft engaged on official business of the Federal Government or used in emergency rescue in accordance with the directions of the District Engineer or forced to land due to circumstances beyond the control of the operator.

327.5 SWIMMING. Swimming, snorkling or scuba diving is permitted, except in those areas of the lake, reservoir or other body of water designated by the District Engineer and marked by the posting of appropriate signs.

327.6 PICNICKING. Picnicking is permitted, except in those areas designated by the District Engineer and marked by the posting of appropriate signs.

327.7 CAMPING. (a) Camping is prohibited except in areas designated by the District Engineer. Such designated areas shall be marked by the posting of appropriate signs.
(b) Camping at a fee site without payment of designated fees as set forth in 327.25 is prohibited.
(c) The length of stay at all campgrounds shall be limited to 14 consecutive days. Occupancy of any campsite for a period greater than 14 consecutive days is prohibited without written permission of the District Engineer.
(d) Camping equipment or other property left unattended at a campsite for the purpose of holding the site for future occupancy is prohibited.
(e) The digging or leveling of any ground or the construction of any facility without written permission of the District Engineer is prohibited.
(f) Camping equipment shall be completely removed and the sites cleaned before the departure of the campers.

327.8 HUNTING, FISHING AND TRAPPING. Hunting, fishing and trapping are prohibited in areas designated by the District Engineer. Such restricted areas shall be marked by the posting of appropriate signs.

327.9 SANITATION. (a) Dumping or disposal in any manner of refuse, garbage, rubbish, trash, debris, or litter of any kind into the waters of or onto any land Federally owned and administered by the Chief of Engineers is prohibited except at locations and in receptacles provided for such purposes.
(b) It shall be a violation to bring onto any water resource development project any refuse, garbage, rubbish, trash, debris, or litter of any kind for dumping or in any other manner disposing of such refuse, garbage, rubbish, trash, debris or litter of any kind into the waters of or onto any land Federally owned and administered by the Chief of Engineers.

327.10 FIRES. (a) Gasoline and other fuels, except that which is contained in storage tanks of vehicles, vessels, camping equipment, or hand portable containers shall not be stored within the water resource development project areas without written permission of the District Engineer.
(b) Fires shall be confined to fireplaces, grills, or other facilities designed for this purpose and shall in addition be confined to those areas designated by the District Engineer.
(c) The gathering of wood for use as fuel at campsites or picnic areas is prohibited except for the gathering of dead material on the ground.

327.11 CONTROL OF HORSES, DOGS, CATS AND PETS. (a) No person shall bring or have horses in camping, picnic, swimming beach or other similar areas, or developed recreation areas.
(b) No person shall bring dogs, cats, or other pets into developed recreation areas unless penned, caged, on a leash no longer than six feet in length or otherwise under physical restrictive controls at all times.

327.12 RESTRICTIONS. (a) The District Engineer may establish a reasonable schedule of visiting hours for all or portions of a project area and close or restrict the public use of all or any portion of a project by the posting of appropriate signs indicating the extent and scope of closure. All persons shall observe such posted restrictions.
(b) Quiet shall be maintained in all public use areas between the hours of 10 p.m. and 6 a.m. Excessive noise during such times which unreasonably disturbs persons is prohibited.
(c) The operation or use of any audio or other noise producing device including but not limited to communications media and motorized equipment or vehicles in such a manner as to unreasonably annoy or endanger persons is prohibited.

327.13 EXPLOSIVES, FIREARMS, OTHER WEAPONS AND FIREWORKS. (a) The possession of loaded firearms, ammunition, projectile firing devices, bows and arrows, crossbows, and explosives of any kind is prohibited unless:
(1) in the possession of a law enforcement officer or Government employee on official duty;
(2) used for hunting or fishing during the hunting or fishing season as permitted under Section 327.8 of this regulation or
(3) unless written permission has been received from the District Engineer.
(b) The possession or use of fireworks is prohibited unless written permission has been received from the District Engineer.

327.14 PUBLIC PROPERTY. Destruction, injury, defacement or removal of public property including natural formation, historical and archeological features and vegetative growth is prohibited without written permission of the District Engineer.

327.15 ABANDONMENT OF PERSONAL PROPERTY. (a) Abandonment of personal property is prohibited. Personal property shall not be left unattended upon the lands or waters of the project except in accordance with these regulations. After a period of 24 hours, abandoned or unattended personal property shall be impounded and stored at a storage point designated by the District Engineer. The District Engineer shall assess a reasonable impoundment fee, which shall be paid before the impounded property is returned to its owner.

(b) The District Engineer shall by public or private sale or otherwise, dispose of all lost, abandoned or unclaimed personal property that comes into his custody or control. However, property may not be disposed of until diligent effort has been made to find the owner, his heirs or next of kin, or his legal representative. If the owner, his heirs or next of kin, or his legal representative is determined but not found, the property may not be disposed of until the expiration of 120 days after the date when notice, giving the time and place of the intended sale or other disposition, has been sent by certified or registered mail to that person at his last known address. When diligent effort to determine the owner, his heirs or next of kin, or his legal representatives is unsuccessful, the property may be disposed of without delay, except that if it has a fair market value of $25 or more the property may not be disposed of until three months after the date it is received at the storage point designated by the District Engineer. The net proceeds from the sale of property shall be converted into the Treasury of the United States as miscellaneous receipts.

327.16 LOST AND FOUND ARTICLES. All lost articles shall be deposited by the finder at the Resource Manager's Office or with a Ranger. The finder shall leave his name, address and phone number. All lost articles shall be disposed of in accordance with the procedures set forth in Section 327.15, above.

327.17 ADVERTISEMENT. Advertising by the use of billboards, signs, markers, audio devices or any other means whatever is prohibited unless written permission has been received from the District Engineer.

327.18 COMMERCIAL ACTIVITIES. The engaging in or solicitation of business without the express written agreement of the District Engineer is prohibited.

327.19 PERMITS. (a) It shall be a violation of these regulations to refuse to comply with the terms of conditions of any permit issued under the provisions of this regulation by the District Engineer.
(b) (1) Permits for floating structures of any kind in waters of water resources development projects, whether or not such waters are deemed navigable waters of the United States but where such waters

are under the management of a Corps of Engineers lake Resources Manager, shall be issued under the authority of this regulation. District Engineers will delineate those portions of the navigable waters of the United States where this provision is applicable and post notices of this designation, in the vicinity of the lake Resource Manager's Office.
(2) Permits for non-floating structures of any kind constructed, placed in or affecting waters of water resource development projects where such waters are deemed navigable waters of the United States, shall be issued under the provisions of Section 10 of the Act approved March 3, 1899 and Section 290.120 of Title 33, Code of Federal Regulations.
(3) Permits for non-floating structures of any kind in waters of water resources development projects where such waters are under the management of a Corps of Engineers lake Resource Manager and where such waters are not deemed navigable waters of the United States shall be issued as set forth in sub-paragraph (1) of this paragraph.

327.20 UNAUTHORIZED STRUCTURES. The construction or placing of any structure of any kind under, upon or over the project lands or waters is prohibited unless a permit therefor has been issued by the District Engineer. Structures not under permit are subject to summary removal by the District Engineer.

327.21 SPECIAL EVENTS. Special events such as water carnivals, boat regattas, music festivals, dramatic presentations, or other special recreation programs are prohibited unless a permit therefor has been issued by the District Engineer. The public shall not be charged any fee by the sponsor of such event unless the District Engineer has approved in writing the proposed schedule of fees.

327.22 UNAUTHORIZED OCCUPATION OF LANDS. (a) Occupying any lands, buildings or other facilities within water resource development projects for the purpose of maintaining same as a residence without the written authorization of the District Engineer is prohibited. The provisions of this section shall not apply to the occupation of lands for the purpose of camping in accordance with the provisions of Section 327.7.
(b) The ranging, grazing or watering of livestock on lands of water resource development projects administered by the Corps of Engineers is prohibited except when authorized by lease, license or other agreement with the District Engineer.
(c) Unless otherwise authorized by law, use of project lands or waters for agricultural purposes is prohibited except when authorized by lease, license or other agreement by the District Engineer.

327.23 OUTGRANTED LANDS. Applicable laws and regulations of State and local governments shall be deemed to apply on project lands or waters which are outgranted by the District Engineer by lease, license, or other written agreement to State and local governments provided, however, that the regulations in this Part 327 are deemed to apply to such outgranted project lands and waters as a minimum regulatory requirement.

327.24 INDIAN LANDS. The regulations in this Part 327 shall be deemed to apply to those lands and waters which are subject to treaties and Federal laws and regulations concerning the rights of Indian Nations and which lands and waters are incorporated, in whole or in part, within water resource development projects administered by the Chief of Engineers to the extent that the regulations in this Part 327 are not inconsistent with such treaties and Federal laws and regulations.

327.25 SPECIAL RECREATION USE FEES. (a) Section 210 of Public Law 90-483, 82 Stat. 746 and Public Law 92-347, 86 Stat. 459 authorizes the establishment of special recreation use fees for the use of specialized sites, facilities, equipment or services furnished at substantial Federal expense at all water resource development projects administered by the Secretary of the Army acting through the Chief of Engineers.
(b) The range of fees set forth in paragraph (c) of this section are established in accordance with the following criteria:
(1) The direct and indirect amount of Federal expenditure;
(2) the benefit to the recipient;
(3) the public policy or interest served;
(4) The comparable recreation fees charged by other Federal and non-Federal public agencies within the service area of the management unit at which the fee is charged;
(5) the economic and administrative feasibility of fee collection;
(6) the extent of regular maintenance required; and
(7) other pertinent factors.
(c) When facilities come within the above criteria, District Engineers shall recommend to the Office, Chief of Engineers, for designation applicable fee charges within the ranges as set forth below:

Camp and trailer sites	Up to $4.50 for overnight use
Group use sites	Up to $0.50 per person per night
The District Engineer may select group use rates in lieu of the above "group camping sites" special recreation fee, and may establish a minimum group use charge of at least $3.00 per night per group without regard to group size or other provisions of this Part.	
Elevators	At least $0.10 per person round trip where elevators are provided as a special service to the public
Electrical hook-ups	$0.50 per day
Specialized sites (highly developed day-use)	$0.50 to $1.50 per car per day

Special recreation use fees may be established for other types of specialized facilities in addition to those which are listed in this paragraph.
(d) The District Engineer shall post signs at areas with designated Special Recreation Use Facilities in a manner such that the visiting public will be clearly notified that special recreation use fees are charged.

(e) Failure to pay the user fee prescribed in this section is a violation of the Land and Water Conservation Fund Act, as amended, (Public Law 92-347, 86 Stat. 459) and subjects the violator to punishment by a fine of not more than $100.

327.26 INTERFERENCE WITH GOVERNMENT EMPLOYEES. Interference with any Government employee in the conduct of his official duties pertaining to the administration of these regulations is prohibited.

327.27 VIOLATION OF RULES AND REGULATIONS. Except for violations coming within the scope of Section 327.25 of this regulation, in accordance with Section 324 of the River and Harbor Act of 1970 (84 Stat. 1818, 16 USC 460d, as amended) violations of the provisions of this regulation shall subject the violator to a fine of not more than $500 or imprisonment for not more than six months, or both. Any person charged with such violation may be tried and sentenced in accordance with the provisions of Section 3401 of Title 18, United States Code. All persons designated by the Chief of Engineers for that purpose shall have the authority to issue a citation for violation of these regulations, requiring the appearance of any person charged with violation to appear before the United States magistrate within whose jurisdiction the water resource development project is located for trial.

SELECTED BIBLIOGRAPHY

Bell, Milo C., Allen C. DeLacy, and Gerald F. Paulik. A Compendium on the Success of Passage of Small Fish Through Turbines, Corps of Engineers, North Pacific Division, Fisheries Engineering Research Program, Portland, Oregon, May 1967.

Bell, Milo C. Study to Determine Impacts of Power Peaking on the Fish and Wildlife Resources, Columbia River, Washington and Oregon. Prepared under contract with the Corps of Engineers, North Pacific Division, 3 October 1974.

Billings, M. C. Structural Geology, 3rd edition, Prentice Hall Publishers, 1972.

Bingham, J. W. and M. J. Grolier. "The Yakima Basalt and Ellensburg Formation of South Central Washington." U. S. Geological Survey Bulletin 1224-G, p. G1-15, 1966.

Bingham, J. W. and K. L. Walters. Stratigraphy of the Upper Part of the Yakima Basalt in Whitman and Eastern Franklin Counties, Washington. U. S. Geological Survey Professional Paper S-25C, p. C87-90, 1965.

Bonneville Power Administration. The Hydro-Thermal Program: A Status Report. December 1971.

Bonneville Power Administration. Columbia River Power - Source to User. April 1971 (leaflet).

Bretz, J. H. "The Lake Pleistocene Submergene in the Columbia Valley of Oregon and Washington." Journal of Geology, Vol. 27, p. 489-506, 1919.

Bretz, J. H. "Channeled Scablands of the Columbia Plateau." Journal of Geology, Vol. 31, p. 617-649, 1923.

Bretz, J. H. "The Spokane Flood Beyond the Channeled Scablands." Journal of Geology, Vol. 33, p. 97-115, 1925.

Bretz, J. H. "The Channeled Scabland of Eastern Washington." Geographic Review, Vol. 18, p. 446-477, 1928.

Buettner, Mark R. Water Quality of the Palouse River Drainage. Idaho Cooperative Fishery Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, Idaho, 1973.

Bureau of Municipal Research on Service, University of Oregon in Cooperation with the Bureau of Governmental Research and Services, University of Washington. Recreation Facilities, Estimated Use and Recreation Charges, Reported by the Cities and Counties of Oregon and Washington, 1965.

Buss, Irven O. and W. H. Funk (principal investigators). Water Resource Development in the Snake River Area on Wildlife. Departments of Zoology (Wildlife Biology), Civil Engineering, Washington State University, Pullman, Washington, 15 July 1973.

Buss, Irven O. and Larry D. Wing. "Pre-impoundment Observations of Wintering Mallards and Nesting Canada Geese on the Snake River, Southeast Washington." Research Studies, 34:1, March 1966.

Calkins, F. C. Geology and Water Resources of a Portion of East Central Washington. U. S. Geological Survey Water Supply Paper 118, 96p, 1965.

Campbell, C. D. Introduction to Washington Geology and Resources. Washington Division of Mines and Geology Publication, 1962.

Chappell, W. M. "The Effect of Miocene Lavas on the Course of Columbia River in Central Washington." Journal of Geology, Vol. 44, p. 379-386, 1936.

Cicchetti, Charles J. Forecasting Recreation in the United States: An Economic Review of Methods and Applications and Plan for the Required Environmental Resources. D. C. Heath and Company: Lexington, Mass., 1973.

City of Pullman, Washington. Comprehensive Outdoor Recreation and Open Space Plan, 1965.

Clegg, Ferris Leigh. Vegetation Inhabiting the Lower Granite Reservoir Basin, 1973.

Coffman, J. L. and C. A. von Hake. Earthquake History of the United States. U. S. Department of Commerce Publication 41-1, 1973.

Conference Proceedings. Nitrogen Studies Meeting, Corps of Engineers with Northwest Fishery Agencies and Environmental Protection Agency, 17 February 1971.

Department of the Army Office Chief of Engineers. "Estimating Initial Reservoir Recreation Use." Plan Formulation and Evaluation Studies - Recreation, Technical Report #2, October 1969.

Ebel, Wesley J. Effects of Transportation on Survival and Homing Ability of Salmonids from the Snake River (Progress Report). Bureau of Commercial Fisheries, Seattle, Washington, September 1970.

Ebel, Wesley, J. Relations Between Fish Behavior, Bio-assay Information, and Dissolved Gas Concentrations on Survival of Juvenile Salmon and Steelhead Trout in the Columbia and Snake Rivers. National Marine Fisheries Service, June 1973.

Edwards, George S. Progress Report on Impacts of Water Resource Development in the Snake River Area to Wildlife. 12 January 1973.

Falter, C. M., W. H. Funk, et al. Water Quality of Lower Snake River, Especially the Lower Granite Pool Area, Idaho - Washington, 1972.

Fish Commission of Oregon. Effects of Peaking on Salmon; Annual Progress Report. Prepared under contract with the Corps of Engineers, March 1974.

Flint, R. F. "Origin of the Cheney-Palouse Scabland Tract, Washington." Geological Society of America Bulletin, Vol. 49, p. 461-523, 1938.

Flint, R. F. "Summary of the Late Cenozoic Geology of Southeastern Washington." American Journal of Science, Vol. 35, p. 223-230, 1938.

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

Freeman, O. W. "The Snake River Canyon." Geographic Review, Vol. 28, p. 597-608, 1938.

Fuller, R. E. "The Aqueous Chilling of Basaltic Lava on the Columbia River Plateau." American Journal of Science, 5th Series, Vol. 21, p. 281-300, 1931.

Goldin, Kenneth D. "Recreational Parks and Beaches: Peak Demand, Quality and Management." Research Reports #16, University of California, Davis, California, 1970.

Graham, C. E. Structure of the Western Portion of the Lewiston Downdrop in Southeastern Washington. Washington State University Masters Thesis, 1949.

Grant, R. Y. "A John Day Vertebrate Fossil Discovered in the Keechelus Series of Washington." American Journal of Science, Vol. 239, p. 590-593, 1941.

Gray, J. and L. R. Kittleman. "Geochronometry of the Columbia River Basalt and Associated Floras of Eastern Washington and Western Idaho." American Journal of Science, Vol. 256, p. 257-291, 1967.

Grolier, M. J. and J. W. Bingham. "Geologic Map and Sections of Parts of Grant, Adams and Franklin Counties, Washington." U. S. Geological Survey Map I-589, 1971.

House Document 704, 75th Congress, 3rd Session. Columbia and Snake Rivers, Oregon, Washington, and Idaho. 13 June 1938.

House Document 531, 81st Congress, 2nd Session. Columbia River and Tributaries, Northwestern United States, 8 vols. 20 March 1950.

House Document 403, 87th Congress, 2nd Session. Columbia River and Tributaries, 5 vols., 10 May 1962.

Interagency Committee for Outdoor Recreation. Washington Statewide Comprehensive Outdoor Recreation and Open Space Plan, Vol. 1. Olympia, Washington, 1973.

Johnstone, Donald L. and others. Water Quality of Swim Areas in the Snake and Columbia Rivers. Washington State University, College of Engineering, Research Division.

Junge, C. O., and B. E. Carnegie. Operational Studies at Dams on the Lower Columbia and Snake Rivers. April 1970.

King, James G. and others. Pacific Waterfowl Flyway Report, No. 70. Bureau of Sport Fisheries and Wildlife, Juneau, Alaska, November 1973.

Lanzillotti, Robert F. "The Washington Tourist Survey, 1951." Recreational Resource Studies #20. State College of Washington, School of Economics and Business, Bureau of Economics and Business Research, Pullman, Washington, 1952.

Laval, W. N. Stratigraphy and Structural Geology of Portions of South Central Washington. University of Washington, Ph.D. Dissertation, 208p, 1956.

Laval, W. N. "Primary Structures of the Columbia River Basalt Flows, South Central Washington." (abstract) Geological Society of America Bulletin, Vol. 68, p. 1867, 1957.

Long, C. W., and W. M. Marquette. Evaluation of Fingerling Passage and Survival Through a Perforated Bulkhead and Modified Spillway, (draft proposal). November 1971.

Lowry, W. D. and E. M. Baldwin. "Late Cenozoic Geology of the Lower Columbia River Valley, Oregon and Washington." Geological Society of America Bulletin, Vol. 63, p. 1-24, 1952.

Lupher, R. L. and Warren. "The Asotin Stage of the Snake River Canyon Near Lewiston, Idaho." Journal of Geology, Vol. 50, p. 866-881, 1942.

Mackin, J. H. A Stratigraphic Section in the Yakima Basalt and the Ellensburg Formation in South Central Washington. Washington Division of Mines and Geology, Rep. Inv. 19, 45p, 1961.

Mackin, J. H. "Diatomite Deposits in Eastern Washington." (abstract) Northwest Science, Vol. 21, p. 33, 1947.

Mapes, B. E. Sediment Transport by Streams in the Walla Walla River Basin, Washington and Oregon: July 1962 - June 1965. Prepared in Cooperatin with the Washington State Department of Water Resources and the U. S. Army Corps of Engineers, U. S. GPO: Washington, D. C., 1969.

National Marine Fisheries Service and Bureau of Sport Fisheries and Wildlife. Special Report on the Lower Snake River Dams, 1972.

National Marine Fisheries Service. Progress Report Evaluation of Fish Protective Facilities at Little Goose Dam and Review of Other Studies Relating to Protection of Juvenile Salmonids in Columbia and Snake Rivers, 1972, by W. J. Ebel and others, February 1973.

National Park Service (Walker and Havens). An Evaluation of the Aesthetic Values as Related to the Water Resources of the Columbia - North Pacific Region. 1973.

Newcomb, R. C. Tectonic Structure of the Main Part of the Basalt of the Columbia River Group, Washington, Oregon and Idaho. U. S. Geological Survey Map I-587, 1970

Newcomb, R. C. Quality of the Groundwater in Basalt of the Columbia River Group, Washington, Oregon and Idaho. U. S. Geological Survey Water Supply Paper 1, 999-N, 1972.

Oregon State University, University of Idaho and University of Washington. Inventory of Riparian Habitats and Associated Wildlife Along Columbia and Snake Rivers (Study Plan), 30 September 1973.

Osawa, M. and G. Goles. Trace Element Abundances in Columbia River Basalts in Columbia River Basalt Symposium, 2nd Proceeding. Cheney, Washington: Eastern Washington State College Press, p. 55-72, 1970.

Outdoor Recreation Resources Review Commission. National Recreation Survey, Report #19. GPO: Washington, D. C., 1962.

Outdoor Recreation Resources Review Commission. Participation in Outdoor Recreation: Factors Affecting Demand Among American Adults, Report #20. GPO: Washington, D. C., 1962.

Owen, John D. The Price of Leisure: An Economic Analysis of the Demand for Leisure Time. McGill-Queen's University Press: Montreal, 1970.

Pacific Northwest River Basins Commission. Columbia-North Pacific Region Comprehensive Framework Study of Water and Related Lands, April 1970.

Pacific Northwest River Basins Commission (Fish and Wildlife Committee). Status of Columbia River Salmon and Steelhead Trout. 1972.

Pacific Northwest River Basins Commission (Power Planning Committee), 20 Questions on Electric Power Loads and Resources in the Pacific Northwest. Bonneville Power Administration responses to questions posed by the Oregon Nuclear and Thermal Energy Council, November 1972.

Richmond, Henry R., Administrator, Bonneville Power Administration. Electricity and the Environment: Enemies or Allies. Remarks before allied daily newspapers of Washington; Richland, Washington. 14 May 1970. (Written speech).

Russell, I. C. A Geological Reconnaissance in Central Washington. U. S. Geological Survey Bulletin 108, 108p, 1893.

Schmincke, H. M. "Stratigraphy and Petrology of Four Upper Yakima Basalt Flows in South Central Washington." Geological Society of America Bulletin, Vol. 78, p. 1385-1422, 1967.

Schmincke, Hans-Ulrich. "Flow Directions in Columbia River Basalt Flows and Paleo-currents of Interbedded Sedimentary Rocks, South Central Washington." Geologische Rundschau, Vol. 56, #3, p. 992-1020, 1967.

Smith, G. O. Geology and Physiography of Central Washington. U. S. Geological Survey Professional Paper 19, p. 9-39, 1903.

Thayer, T. P. and C. E. Brown. Columbia River Group in Changes in Stratigraphic Nomenclature by the U. S. Geological Survey, 1965. U. S. Geological Survey Bulletin 1244-A, p. A23-25, 1966.

Thornbury, W. D. Regional Geomorphology of the United States. John Wiley and Sons Publishers, 1965.

Thompson, Erwin N. Man and Events on Lower Snake River.

Tri-State Steelheaders, Inc. Steelhead Fishing Method Study, Lake Sacajawea, Washington. Walla Walla, Washington, March 1970. (Also published a pamphlet digest of this document).

University of Idaho. Photo-Interpretation Analysis of the University of Idaho Study Area.

U. S. Army Engineer District, Walla Walla, Design Memorandum No. 27.1. Lyons Ferry-Palouse Falls Trail System, Lower Monumental Project, Snake River, Washington.

U. S. Army Engineer District, Walla Walla. Environmental Impact Statement: Little Goose Lock and Dam, February 1974.

U. S. Army Engineer District, Walla Walla, Design Memorandum No. 7B. Master Plan for Development and Management of Lower Monumental Reservoir, Snake River, Washington, 8 November 1966.

U. S. Army Corps of Engineers, Walla Walla District. Record of Public Meetings for Compensation for Fish and Wildlife Losses. 1973.

U. S. Army Corps of Engineers, Walla Walla District. Special Lower Snake River Report for Compensation for Fish and Wildlife Losses. 1973.

U. S. Army Engineer District, Walla Walla. Water Quality Report (2) and Lower Granite Lock and Dam, Snake River, Washington and Idaho, Vol. 1 of 3, May 1973.

U. S. Army Corps of Engineers. Water Quality Report - Lower Granite Lock and Dam, Snake River, Washington, Idaho, 1973. U. S. Army Engineer District, Walla Walla, Washington, Vols. 1, 2, 3.

U. S. Army Corps of Engineers, North Pacific Division. Annual Fish Passage Report, 1973.

U. S. Army Corps of Engineers, North Pacific Division. Quarterly Progress Report, Nitrogen Supersaturation, August - October 1972. (Letter Report).

U. S. Army Corps of Engineers, North Pacific Division. Nitrogen Supersaturation Problem. Public meeting presentation, 23 March 1971.

U. S. Army Corps of Engineers, North Pacific Division. Power Pondage Studies,(Hourly-Daily-Weekly, 1974-1975 Conditions). Columbia River and Tributaries Review Study. October 1972.

U. S. Army Corps of Engineers, North Pacific Division, Portland and Walla Walla Districts. Annual Fish Passage Report, Columbia River Projects: Ice Harbor, Lower Monumental, and Little Goose; Oregon and Washington, 1973.

U. S. Army Corps of Engineers, North Pacific Division, Nitrogen Supersaturation Problem. A presentation to Washington State Legislative Interim Committee on Fish and Game, Spokane, Washington, 24 June 1971.

U. S. Army Engineer Division, North Pacific Corps of Engineers, Portland, Oregon. Fisheries: Handbook of Engineering Requirements and Biological Criteria. Fisheries Engineering Research Program, February 1973.

U. S. Army Corps of Engineers, North Pacific Division. Information About a Study of Columbia River and Tributaries. 1971. (Brochure).

U. S. Department of Commerce. 1970 Census of Population (Oregon, Washington, Idaho).

U. S. Department of Commerce (National Marine Fisheries Service) and U. S. Department of the Interior (Fish and Wildlife Service). A Special Report on the Lower Snake River Dams - Ice Harbor, Lower Monumental, Little Goose, and Lower Granite, Washington and Idaho. September 1972.

U. S. Department of Commerce (National Oceanic and Atmospheric Administration) and (National Ocean Survey). Snake River, Lower Monumental Reservoir, Washington, Nautical Chart 683-SC, Edition 2, March 1973.

U. S. Department of Commerce (National Oceanic and Atmospheric Administration - Environmental Data Service). Local Climatological Data - Annual Summary with Comparative Data, Lewiston, Idaho, 1972.

U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife. Threatened Wildlife of the United States. 1973 edition.

Washington State Department of Game. Steelhead Fishing Project, Ice Harbor Reservoir, 1969. By D. R. Eldred, March 1970.

Wallace, Robert F. "Economic Aspects of Wildlife Resources of the State of Washington." Economic and Business Studies, #19. The State College of Washington, School of Economics and Business, Bureau of Economic and Business Research: Pullman, Washington, 1952.

Washington State Highway Department. Annual Traffic Report, 1972. Olympia, Washington, 1972.

Washington State Parks. Washington State Outdoor Recreation Guide. Olympia, Washington, 1972.

Washington State Parks. Park and Recreation Guidelines. Olympia, Washington.

Waters, A. C. "Basalt Magma Types and Their Tectonic Associations - Pacific Northwest of the United States." American Geophysical Union, Geophysical Mon. 6, p. 158-170, 1962.

Waters, A. C. "Stratigraphic and Lithologic Variations in the Columbia River Basalt." American Journal of Science, Vol. 259, p. 583-611, 1961.

Waters, A. C. "Determining Direction of Flow in Basalts." American Journal of Science: Bradley, Vol. 258-A, p. 350-366, 1960.

Watkins, N. D. and A. K. Baksi. "Magneto-stratigraphy and Oriclinal Folding of the Columbia River, Steens and Owyhee Basalts in Oregon, Washington and Idaho." American Journal of Science, Vol. 274, p. 148-189, 1974.

Weissenborn, A. E. "Geologic Map of Washington." U. S. Geological Survey Map I-583, 1969.

Western Resource Conference. Urban Demands on Natural Resources. University of Denver, Denver, Colorado, 1970.

Willis, Bailey. Changes in River Courses in Washington Territory Due to Glaciation. U. S. Geological Survey Bulletin 46, 10p, 1887.

Wright, T. L. and others. "Chemical Variation Related to the Stratigraphy of the Columbia River Basalt." Geological Society of America Bulletin, Vol. 84, p. 371-386, 1973.

EXHIBITS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
NORTHWEST REGION
~~4000 SECOND AVENUE~~
~~SEATTLE, WASHINGTON 98104~~
915 SECOND AVENUE, RM. 990
SEATTLE, WASHINGTON 98174

IN REPLY REFER TO:
D6427 CNP

APR 23 1975

Colonel Nelson P. Conover
District Engineer
Walla Walla District
Corps of Engineers
Bldg. 602, City-County Airport
Walla Walla, Washington 99362

Dear Colonel Conover:

We have reviewed the draft of the updated Ice Harbor Master Plan as requested by your letter dated April 10, 1975. Although we do not normally review master plans, we did review this one as it relates to our participation in the Columbia River and Tributaries Study. Our review was limited primarily to portions dealing with the potential impacts on recreation opportunities from present and future operations of Ice Harbor Dam.

We believe this plan adequately addresses current and future recreation development needs. We note also under Supporting Data, Item 7, that some consideration is being given in the location and design of facilities to minimize possible adverse effects from reservoir operations or flooding. Such provisions are very important in light of proposed future changes in operation of Ice Harbor and other Columbia and Lower Snake River Projects for power peaking purposes.

The plan includes a proposal for development of some project lands for use by off-road vehicles (ORV). For assistance in your planning we refer you to Executive Order 11644 which provides policy and procedures for ensuring that the use of ORVs on public lands will be controlled and directed so as to protect the resources, to promote the safety of all users and to minimize conflicts among the various uses of those lands.

Thank you for the opportunity to review this report.

Sincerely yours,

Maurice H. Lundy
Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE

~~BUREAU OF SPORT FISHERIES AND WILDLIFE~~

Reference: RBS River Basin Studies
P.O. Box 1487
Olympia, Washington 98507

April 24, 1975

District Engineer
Walla Walla District, Corps of Engineers
Bldg. 602, City-County Airport
Walla Walla, Washington 99362

Dear Sir:

This is in response to Colonel Conover's April 10, 1975 letter requesting our comments on your draft Master Plan for the Ice Harbor project, Washington.

The draft plan does address major environmental issues. However, we do not agree that project impact on natural aspects of the canyon are minimal. Project features such as drowning of the natural free-flowing river and floodplain, road cuts, extensive riprapping, power line installation and other structural installation have destroyed or degraded fish and wildlife and other natural values. Studies by Washington State University of the Lower Granite project show that most recreationists interviewed preferred the natural free-flowing river to reservoirs (Warner and Shew, 1973).

On page 8-2, line 12, it is stated that wildlife habitat management will be allowed as an interim use. We suggest inclusion of needed measures, particularly fencing to exclude livestock, be provided as a project feature in the interest of wildlife loss mitigation.

On page 8-6 under g. Operations: Natural Areas. We disagree that foot or bridle paths into all areas occupied by rare and endangered species would not be detrimental. For example, if nesting peregrine falcons occurred on project land, human intrusion could result in loss of young.

On page 9-2 under b. Goals. We agree with your view that the public should have correct information on which to base decisions. Therefore high fish and wildlife and other environmental costs of the project should be provided to the public.

On page 9-3, e. The Dam. Information provided on anadromous fish runs should include a discussion of project impacts in terms of spawning

habitat and dam passage losses.

On page 15-2 under b. Migratory Game Birds. We suggest inclusion of grazing areas as an element of the goose mitigation plan. A suitable food source is essential for successful Canada goose production.

On page 15-2 under c. Upland Game. The need for immediate fencing of project boundaries should be stated. Extensive overgrazing of project lands over a number of years may have already caused irreversible vegetational losses.

On page 15-2 under d. Nongame. Protection of raptorial bird feeding areas should be mentioned. Destruction of rodent and other prey species by intensified farming of adjoining lands emphasizes need for protection of remaining desert habitat on project lands as a source of raptor food animals.

We trust that our comments on your draft Master Plan for Ice Harbor project will be of value.

Sincerely,

Robert G. Bowker

Robert G. Bowker
Acting Field Supervisor

May 22, 1975

State of Washington
Department of Ecology

Colonel Nelson P. Conover, CE
District Engineer
Walla Walla District
U. S. Army Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362

Dear Colonel Conover:

In reviewing the draft Ice Harbor Master Plan, we found the proposed management plan to be in conformity with the Shoreline Master Programs for Franklin and Walla Walla Counties.

The Master Plan appears to provide a well-balanced, comprehensive resource management plan for the future expansion and development of the reservoir and its shorelines.

If the two counties bordering this proposed project have not had the opportunity to review the draft Master Plan, then we would suggest they be sent a copy for review so that the local governments' views and comments will be represented.

We appreciate the opportunity to review and comment on the content of this proposed plan and look forward to reviewing the final version of the Master Plan.

Sincerely,

Fred D. Hahn

Fred D. Hahn, Assistant Director
Office of External Affairs

FDH:dt

DEPARTMENT OF GAME

600 North Capitol Way / Olympia, Washington 98504

April 25, 1975

Nelson P. Conover
Colonel, Corps of Engineers
District Engineer
Building 602 City-County Airport
Walla Walla, Washington 99362

Dear Colonel Conover:

Your draft of the updated Ice Harbor Master Plan was reviewed by our staff as requested. Comments follow.

The content of this draft plan represents an apparent reevaluation of land use adjacent the reservoir. We found this approach to be commendable. If implemented, wildlife habitat features would represent a significant beginning in mitigation of losses which have occurred.

There are two items concerning wildlife we would like to see clarified:

1. There seem to be discrepancies in the location, size or scope of wildlife habitat areas in this master plan and the "Wirth Report" on this subject. Perhaps this will be clarified in your final document.

2. In your Land Use Master Plan (graphic No. 5), we had problems with superimposition of uses. Some areas are color coded for "Intensive Management, Operations-Fish and Wildlife", and also cross-hatched as "Recreation Lands". As you are aware there are inherent conflicts between some types of wildlife use and certain recreation activities. Again, this probably can be clarified.

Regarding the fishery resource, we note that you have not included a discussion on measures to protect or enhance the anadromous fish runs. Measures such as flip lips, turbine screens and flow regulation have been recommended by the fishery agencies to reduce project related fish mortalities and improve fish passage.

Sincerely,

THE DEPARTMENT OF GAME

E. S. Dziedzic

Eugene S. Dziedzic, Asst. Chief
Environmental Management Division

ESD:jb
cc: CBFTC Members

WASHINGTON STATE
PARKS & RECREATION COMMISSION

LOCATION: THURSTON AIRDUSTRIAL CENTER PHONE 753-5755

P. O. BOX 1128 OLYMPIA, WASHINGTON 98504

January 5, 1976

IN REPLY REFER TO:
65-583-0720
Ice Harbor Pool Revised Master Plan - Levey Site Proposed Development

Mr. Tom Slater
Recreation Planning
Walla Walla District Corps of Engineers
Building 602, City-County Building
Walla Walla, Washington 99362

Dear Mr. Slater:

In our meeting last September 17, 1975 you asked me to obtain any information I could regarding the interest or demand for resident group camping facilities (environmental learning center) at the levey site.

After reviewing use figures and group interest in that section of the state, it is our concensus that such facilities would not be needed within the upcoming five year period and perhaps not for the ensuing five years as other relatively nearby facilities are not used to capacity. We would like to request that you retain the identification of those proposed facilities within the master plan and contact us regarding the current need at the time plan updates take place.

Thank you very much for taking the time and trouble to allow us to review your plan and express our opinion regarding these facilities.

Sincerely,

William A. Bush

William A. Bush, Chief BP
Long Range Planning

bp
cc: Betty Champagne
Administrative Services

Robert Reiter
Parks Planner, Wenatchee

WASHINGTON
Department of
FISHERIES

DANIEL J. EVANS
GOVERNOR

ROOM 115, GENERAL ADMINISTRATION BUILDING • PHONE 753-6600
OLYMPIA, WASHINGTON 98504

DONALD W. MOOS
DIRECTOR

December 23, 1975

Colonel Nelson P. Conover
District Engineer
U.S. Army Corps of Engineers
Walla Walla District
Building 602 City-County Airport
Walla Walla, Washington 99362

Dear Colonel Conover:

The Washington Department of Fisheries has reviewed your Draft Master Plan for the Management of All Natural and Man-made Resources of Ice Harbor Lock and Dam. We have the following comments on this document.

On page 2-3 the statement is made that "the Ice Harbor project is operated to provide optimum navigational and power generating conditions without creating unnecessary detriment to other project uses such as fish and wildlife management and recreation". We were pleased to note that the Corps had assigned a high priority to fish and wildlife needs in relation to this project.

On page 15-2, in reference to the salmon and steelhead runs, the statement is made that "fish passage facilities for upstream migrant adults and for downstream migrant juveniles have been provided at Ice Harbor Dam for these species". The two fish ladders provide adequate upstream passage for adult fish, but it should not be implied that the present fingerling by-pass and collection system provides passage for many downstream migrants. The majority of the downstream migrants pass the dam either via the spillways, if spilling is occurring, or through the turbines. Significant losses are incurred on the downstream migrants and we urge that construction of hatcheries to compensate for project-incurred losses, as mentioned on page 15-13, be implemented as quickly as possible.

The physical and operational data on page SD-6 implies that the two fish ladders are identical with a slope ratio of 1 on 16 and a clear width of 24 feet. This conflicts with the discussion on page SD-10 of designed differences between these ladders. We suggest adding to this discussion that fish passage through the ladders can be adversely effected by power peaking operations at the dam.

The presence of downstream migrant passage facilities is again indicated on page SD-11. We suggest adding a description of these facilities and a discussion of other possible juvenile protection measures such as turbine screens and the collection and transportation program at Little Goose and Lower Granite dams.

We appreciate the opportunity to review and comment on this report.

Sincerely,

Donald W. Moos
Director

DWM:DA:lmd

PORT OF
WALLA WALLA

COMMISSIONERS
L. T. PEPIN, Pres.
CHARLES T. NUNN, Vice-Pres.
MORRIS GANGUET, Secy.
MANAGER
JAMES H. BEDDOW

P. O. BOX 1077 • AREA CODE 509 • 525-3100 • WALLA WALLA, WASHINGTON 99362

May 14, 1975

Col. Nelson Conover
District Engineer
Walla Walla District, Corps of Engineers
Bldg. 602, City-County Airport
Walla Walla, WA. 99362

Dear Col. Conover:

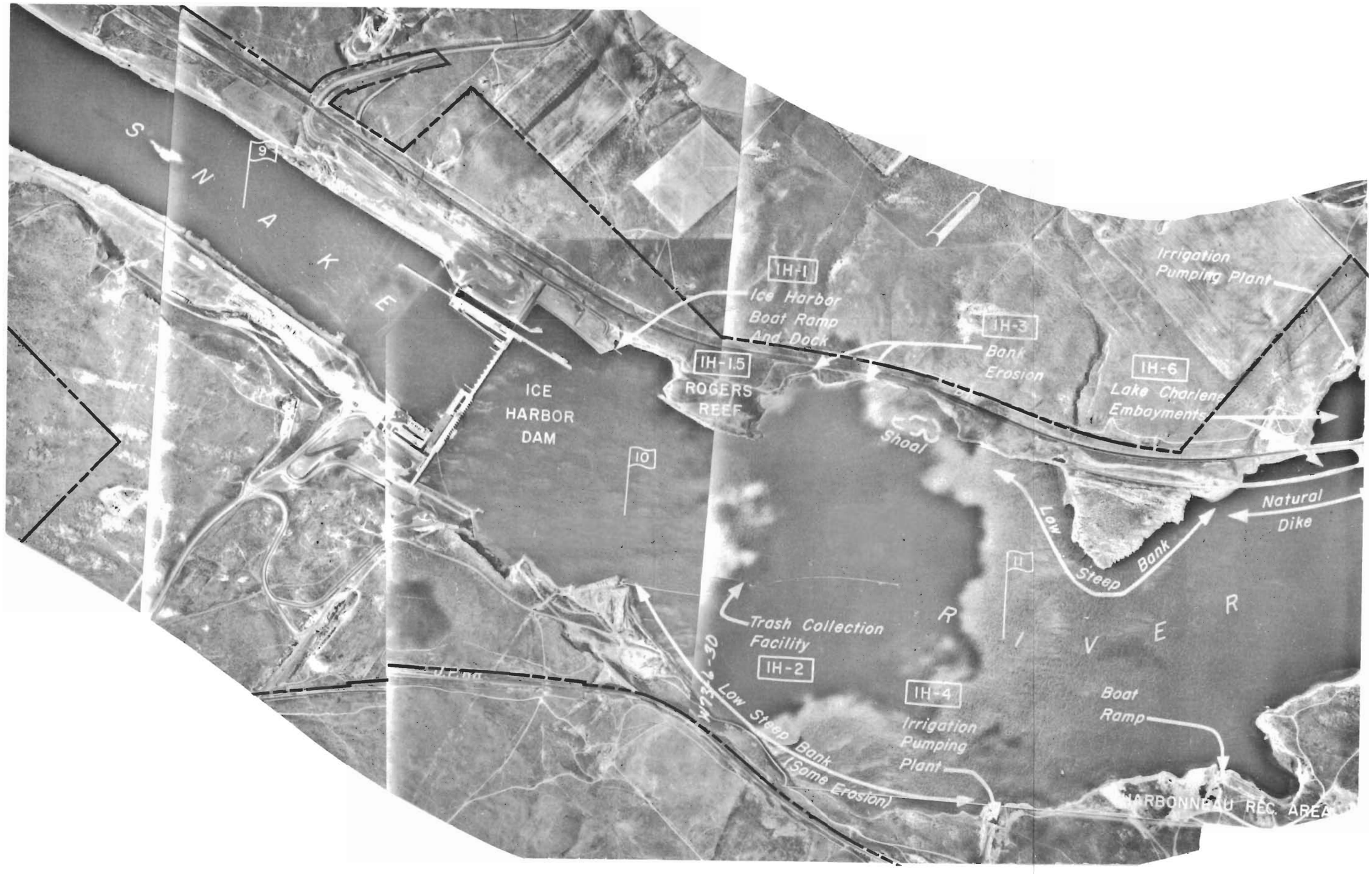
We have reviewed the Ice Harbor Master Plan dated January 1975, specifically the areas designated for port and industrial purposes that lie within Walla Walla County.

It is our opinion that the areas set aside for these purposes are adequate for the foreseeable future.

Sincerely,

J. H. Beddow

JHB:ml



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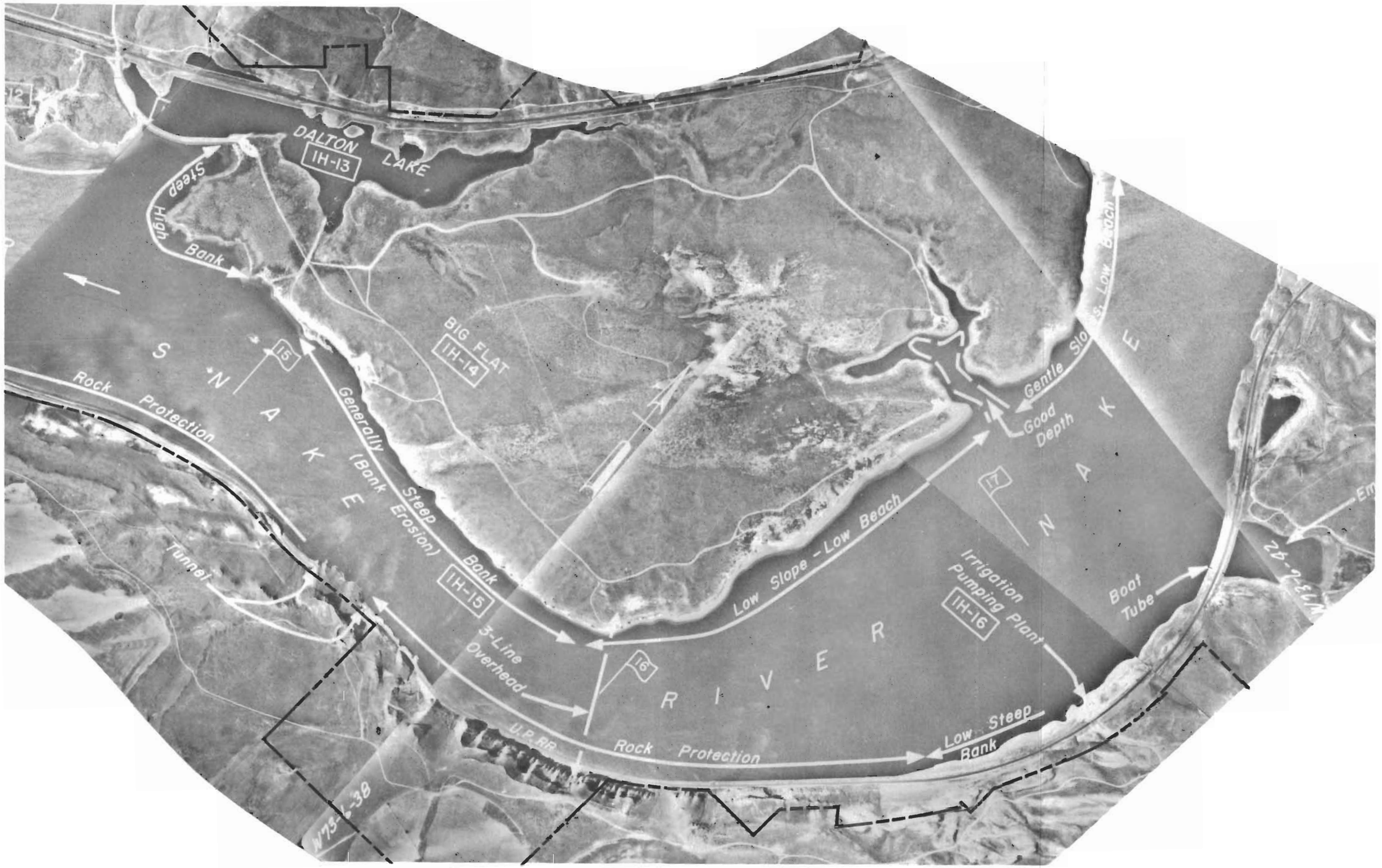

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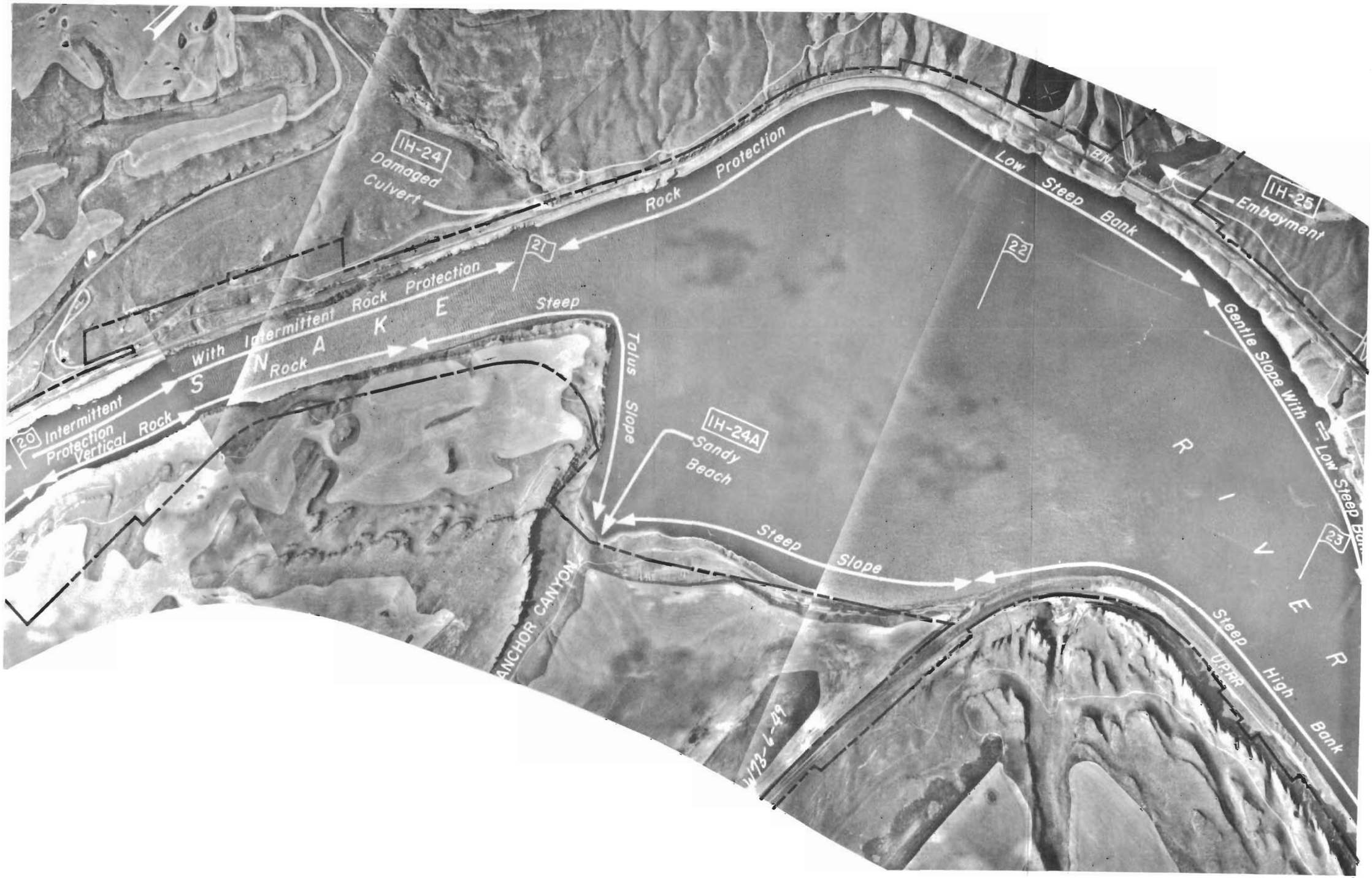
1973 Aerial Mosaic LAKE SACAJAWEA



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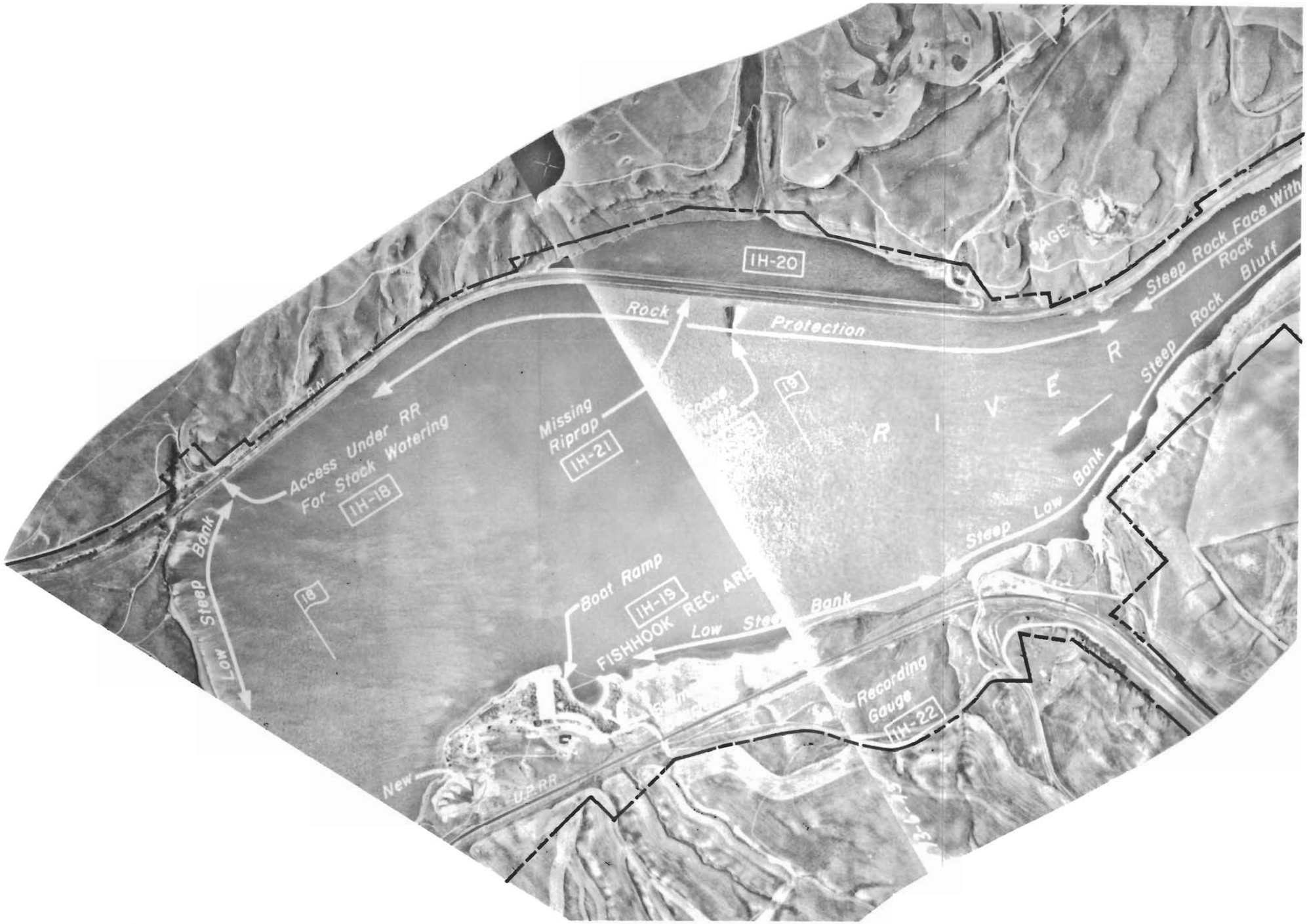

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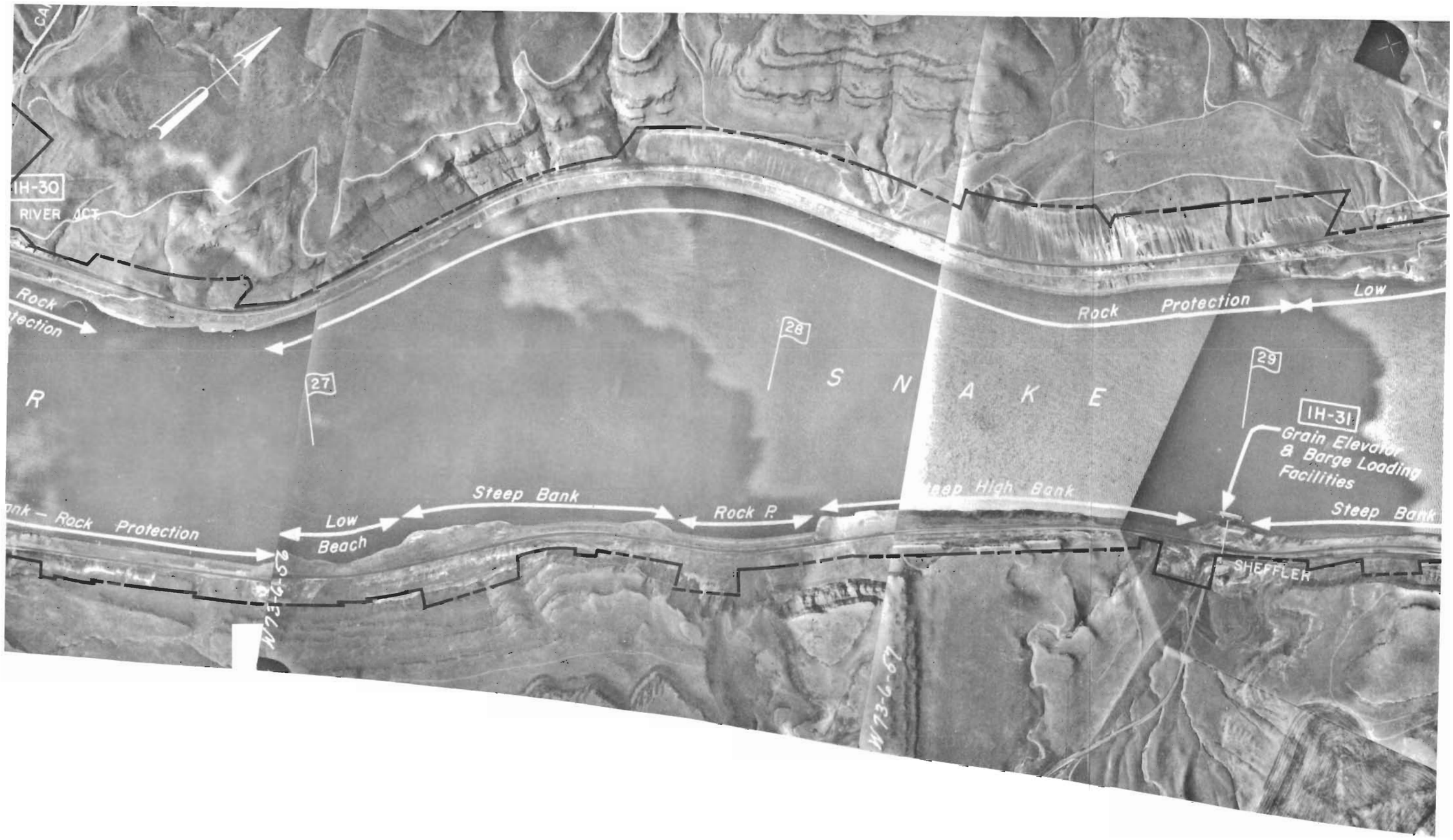

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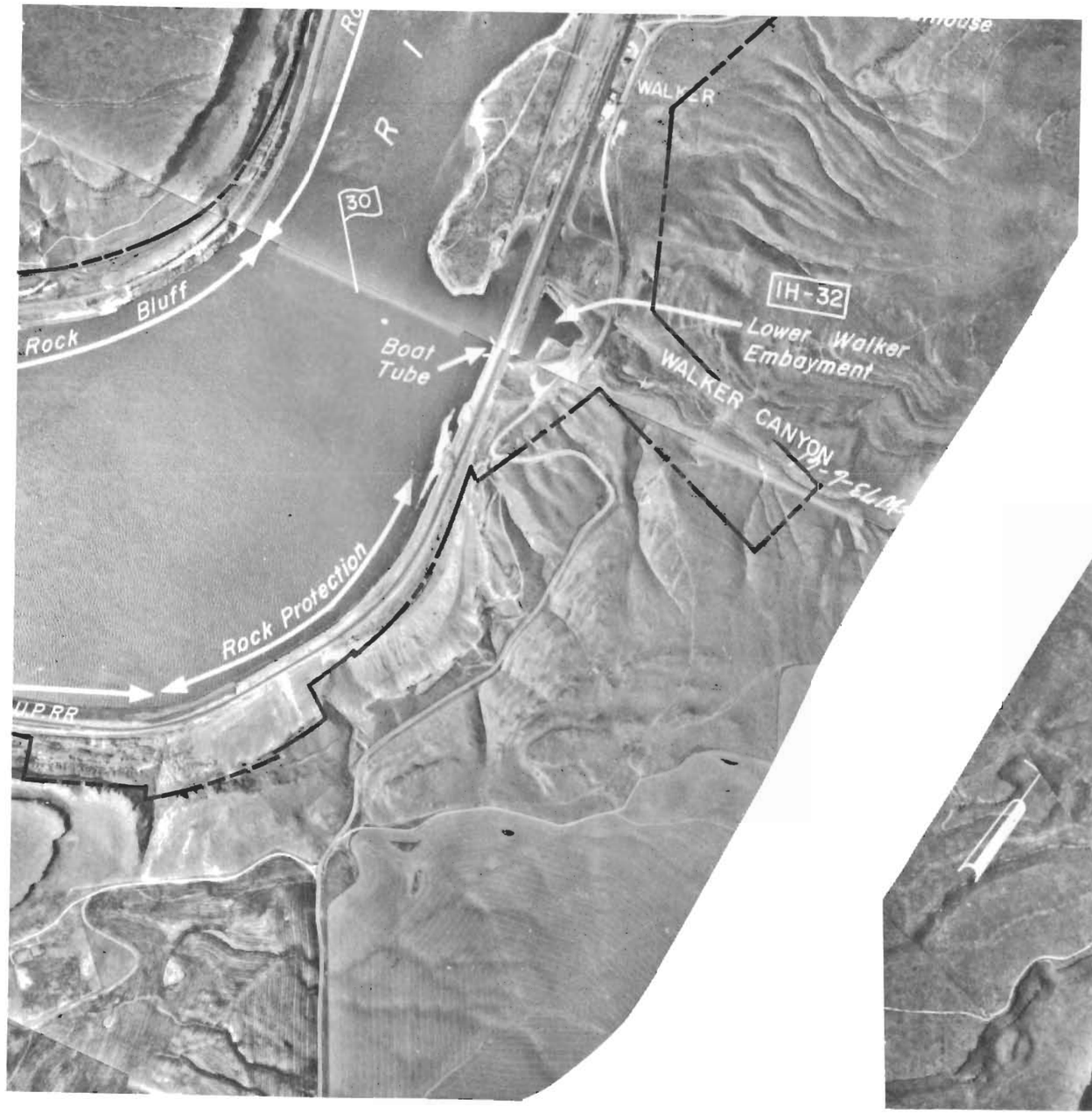

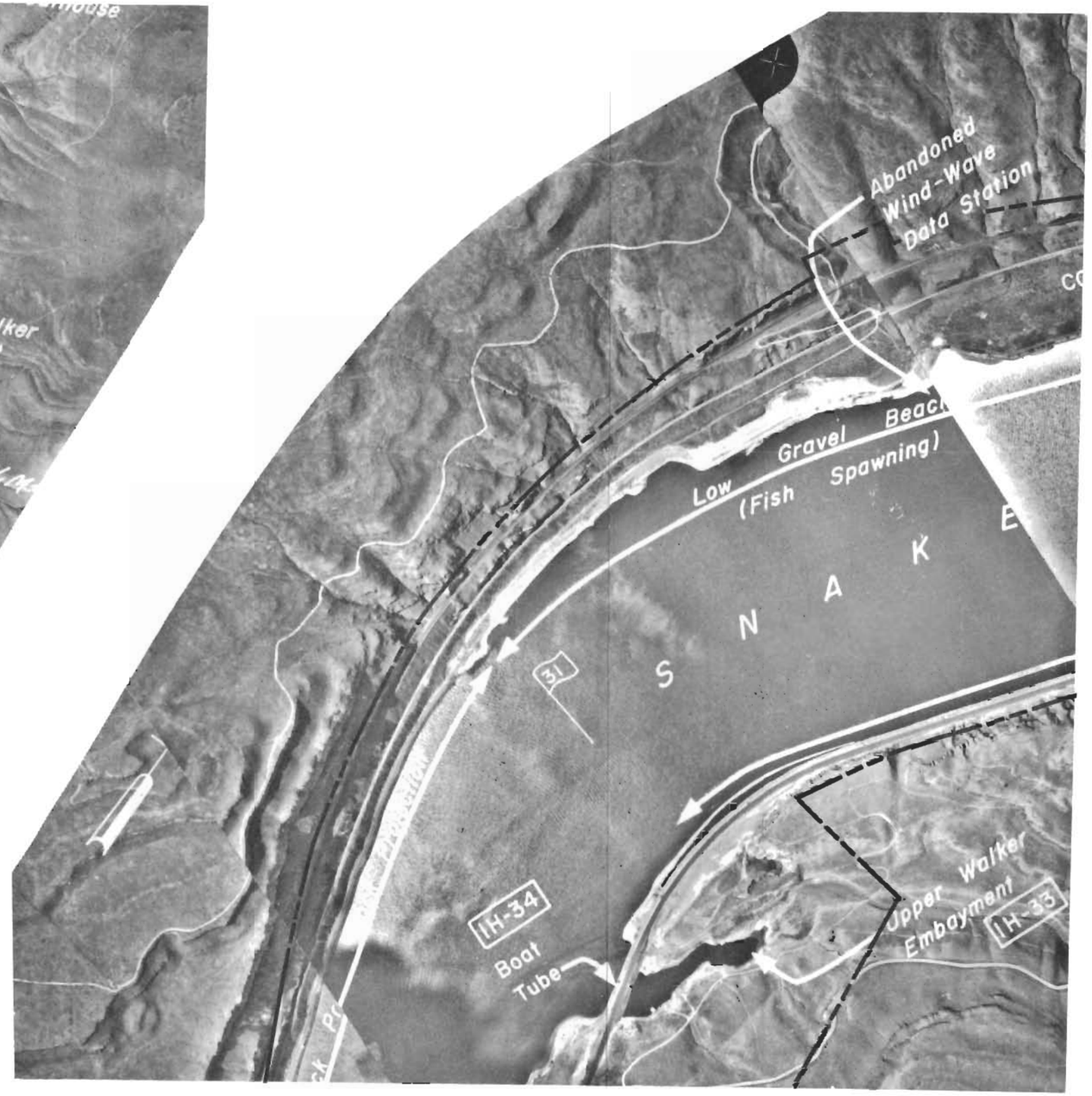

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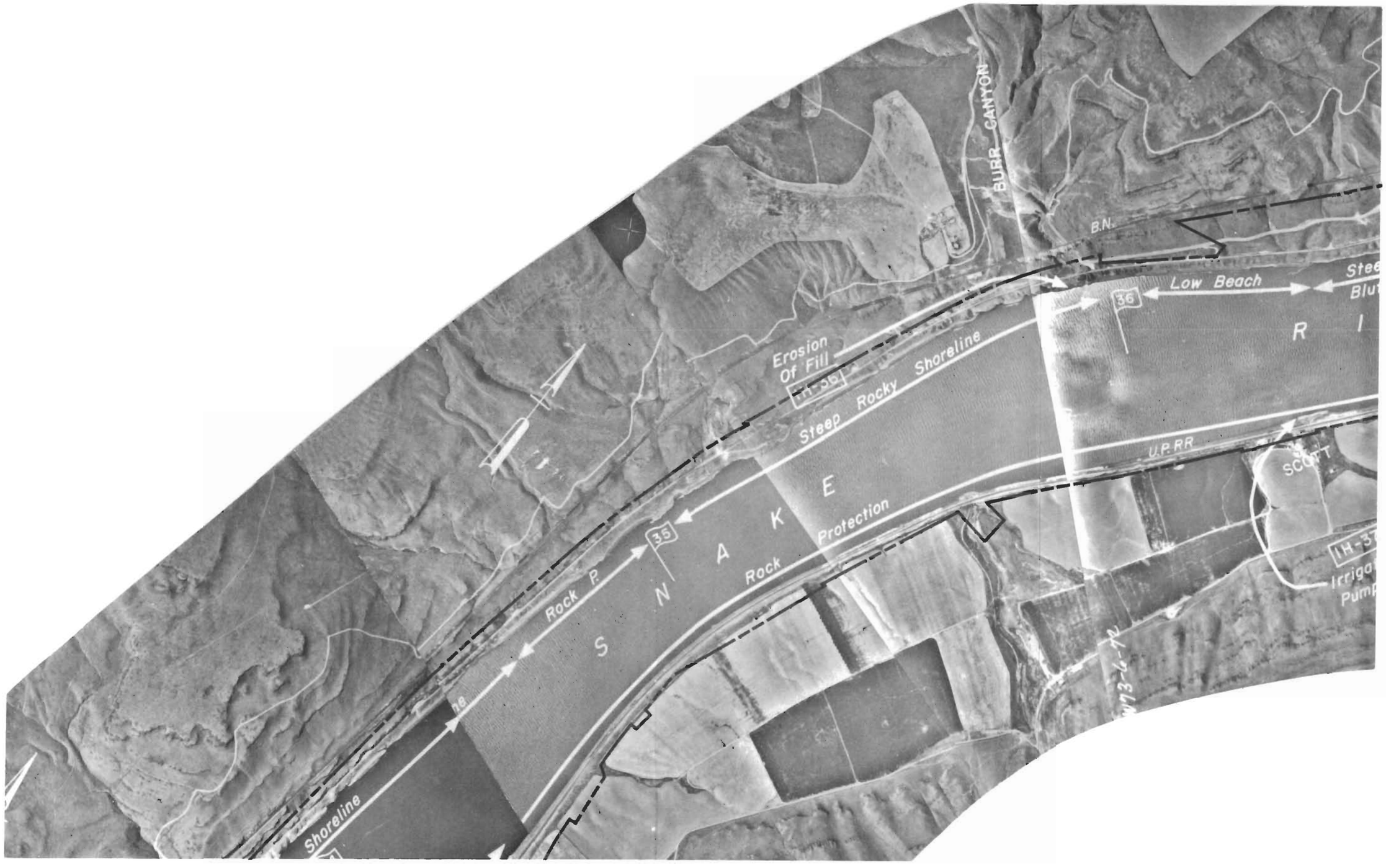

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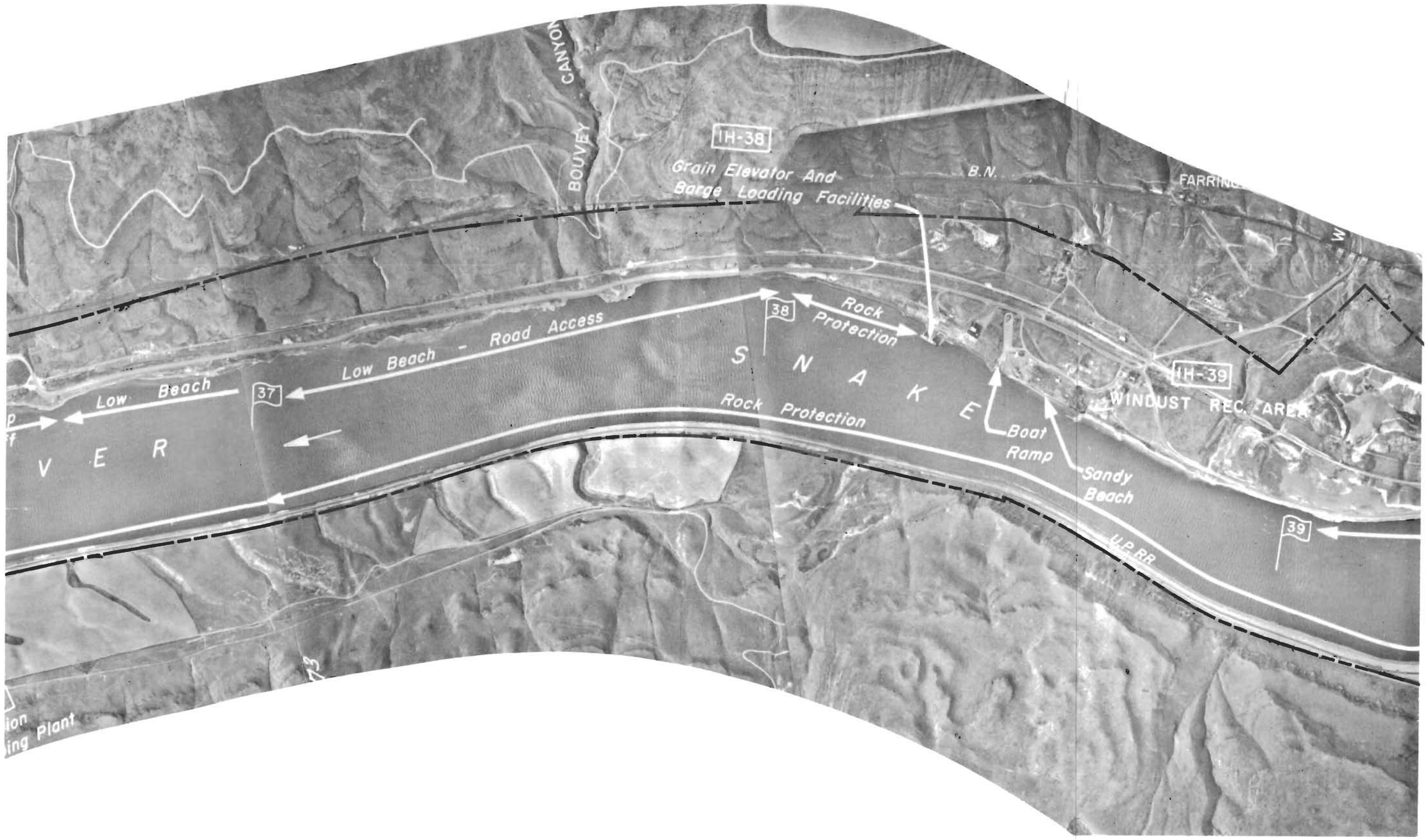

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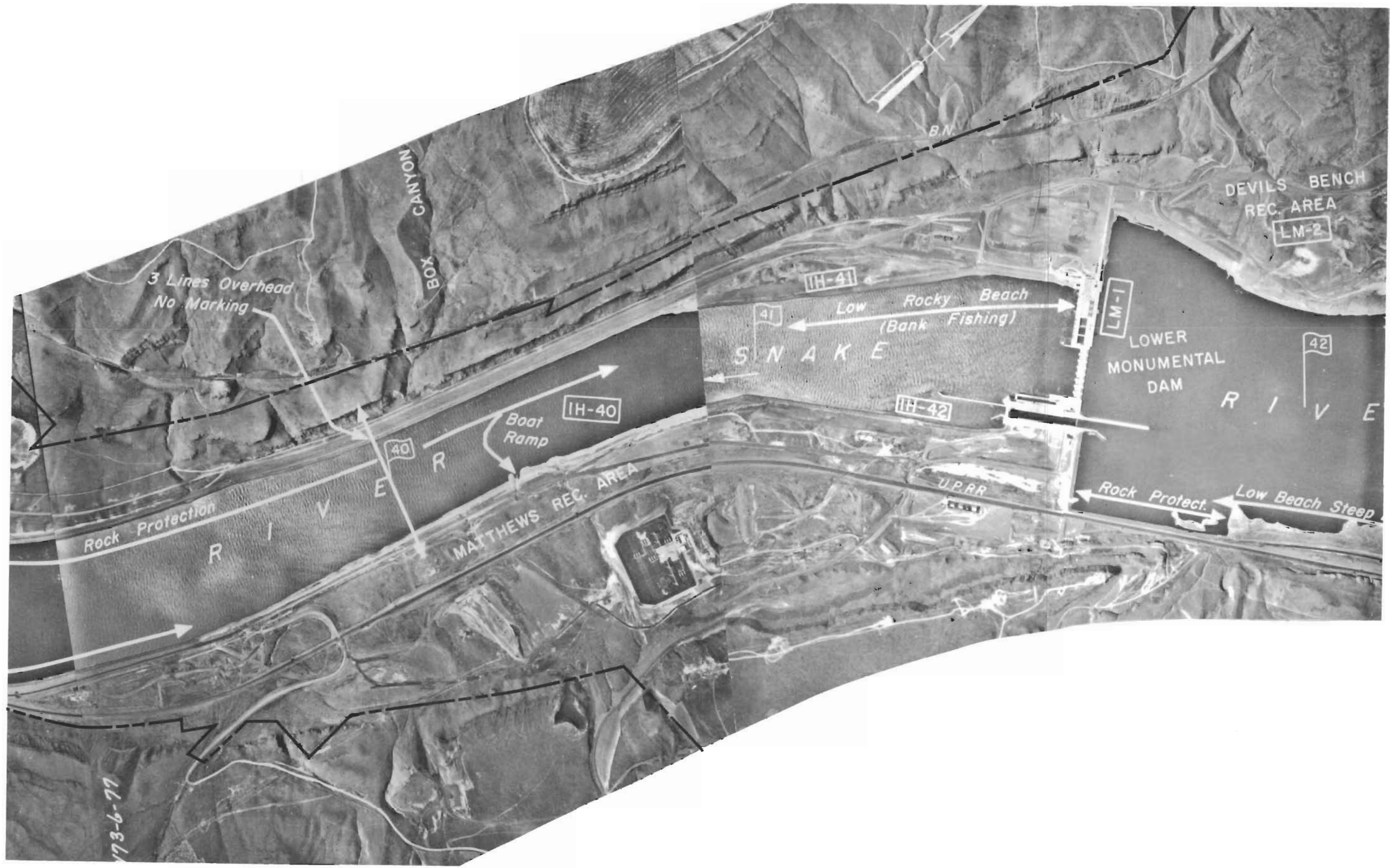

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1973 Aerial Mosaic LAKE SACAJAWEA

ACKNOWLEDGEMENTS

This master plan has been prepared by Wirth Associates of Billings, Montana. There have been many people in the Corps of Engineers involved in its preparation as well as those associated with Wirth Associates.

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Branch for Environment
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