Swan Falls Project
FERC No. 503
License Application

Table of Contents

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INITIAL STATEMENT

EXECUTIVE SUMMARY

EXHIBIT A
DESCRIPTION OF PROJECT

EXHIBIT B
STATEMENT OF PROJECT OPERATION AND RESOURCE UTILIZATION

EXHIBIT C
CONSTRUCTION HISTORY AND PROPOSED CONSTRUCTION SCHEDULE

EXHIBIT D
STATEMENT OF COSTS AND FINANCING

EXHIBIT E
ENVIRONMENTAL REPORT

EXHIBIT F
GENERAL DESIGN DRAWINGS

EXHIBIT G
MAPS OF THE PROJECT

EXHIBIT H
GENERAL INFORMATION

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

List of Tables

LIST OF TABLES

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

List of Figures

LIST OF FIGURES

Swan Falls Project
FERC No. 503
License Application

Initial Statement

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

IDAHO POWER COMPANY

SWAN FALLS PROJECT
FERC Project No. 503

APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT—
EXISTING DAM

INITIAL STATEMENT

1. Idaho Power Company (the Applicant) applies to the Federal Energy Regulatory Commission (FERC) for a new license for the Swan Falls Project as described in the attached exhibits. The project is currently designated as FERC Project No. 503. The existing FERC license expires on June 30, 2010.

2. The location of the project is

State:	Idaho
Counties:	Ada and Owyhee counties
Nearby Towns:	Caldwell, Nampa, Meridian, Kuna, Melba, Boise, and the Unincorporated City of Murphy
Stream:	Snake River

3. The exact name, business address, and telephone number of the Applicant are

Idaho Power Company
1221 W. Idaho Street
P.O. Box 70
Boise, ID 83707
Telephone: (208) 388-2550

The exact name and business address of the person authorized to act as agent for the Applicant in this application are

Mr. Tom Saldin
Senior Vice President and General Counsel
Idaho Power Company
P.O. Box 70
Boise, Idaho 83707

4. The Applicant is a domestic corporation organized under the laws of the State of Idaho and authorized to do business in the states of Idaho, Oregon, Nevada, and Wyoming and is not claiming preference under section 7(a) of the Federal Power Act. Furthermore, the Applicant does not seek benefit under section 210 of the Public Utility Regulatory Policies Act of 1978, as amended (PURPA).

5. (i) Following are the statutory or regulatory requirements of the state in which the project is located and that affect the project as proposed with respect to bed and banks; to the appropriation, diversion, and use of water for power purposes; and to the right to engage in the business of developing, transmitting, and distributing power and in any other business necessary to accomplish the purposes of the license under the Federal Power Act:

    A. Reference is made to the general laws of the State of Idaho relating to the appropriation of waters and attainment of permits and licenses as contained in Idaho Code Title 42, Chapters 2, 4, and 17. A license to appropriate waters of the State of Idaho for power purposes is required.

    B. Reference is made to the general laws of the State of Idaho relating to the acquisition of easements for use of state-owned submerged and formerly submerged lands as contained in Idaho Code Title 58, Chapters 1, 6, and 13 and the Equal Footing Doctrine (Idaho Admission Act of July 3, 1890, 26 Statute 215, Chapter 656).

    C. Other than Idaho Code 42-203B(5), no special hydroelectric water power or irrigation laws of the State of Idaho pertain to the project, and no certificates of public convenience and necessity from the Idaho Public Utilities Commission are required for the proposed new license. In addition, no special state laws regarding the right to engage in the business of developing, transmitting, and distributing power apply to the Applicant.

D. On October 24, 1984, the Applicant and the State of Idaho entered into the Swan Falls Agreement that is referred to in Idaho Code 42-203B(5), which states:

> *The governor or his designee is hereby authorized and empowered to enter into agreements with holders of water rights for power purposes to define that portion of their water rights at or below the level of the applicable minimum stream flow as being unsubordinated to upstream beneficial uses and depletions, and to define such rights in excess thereof as being held in trust by the state under subsection (2) of this section. Such agreements shall be subject to ratification by law. The contract entered into by the governor and the Idaho Power Company on October 25, 1984, is hereby found and declared to be such an agreement, and the legislature hereby ratifies the governor's authority and power to enter into this agreement.*

(ii) Following are the steps the Applicant has taken or plans to take to comply with each of the laws cited above:

A. The Applicant has acquired water right licenses from the State of Idaho, Department of Water Resources, as required for application of beneficial use of waters of the State of Idaho. Any water needs beyond those for which the Applicant has received licenses will be filed with the State of Idaho, Department of Water Resources, as required.

B. The State of Idaho, Department of Lands, did not require easements for submerged and formerly submerged lands prior to 1992. The Applicant is aware that such easements are now required. The Applicant has worked with the Department of Lands to acquire the necessary easements pursuant to the rules adopted in 1992. Since the adoption of the rules, the Applicant has acquired an easement for its Swan Falls Project (FERC Project No. 503).

C. A copy of the agreement dated October 25, 1984—commonly referred to as the Swan Falls Agreement—between the Applicant and the State of Idaho was submitted to FERC on January 12, 2000, along with a request from the Applicant that FERC recognize this agreement as a definition of the Applicant's water rights for the Swan Falls Project and the other projects of the Applicant identified in the Agreement.

D. The Applicant has requested of the State of Idaho Department of Environmental Quality that certification pursuant to Section 401(a) of the Clean Water Act be issued for the project.

6. The Applicant owns and operates the existing project facilities.

The following information is submitted as part of this Application for New License Major Project—Existing Dam for the Swan Falls Project pursuant to the requirements of 18 CFR § 4.32.

7. To the best of the Applicant's knowledge, no person, citizen, association of citizens, domestic corporation, municipality, or state other than the Applicant has or intends to obtain, and will maintain any proprietary right necessary to operate and maintain the existing project.

8. (i) The names and mailing addresses for every county in which any part of the project is located, and for any federal facilities that would be used by the project, are

Ada County
200 West Front Street
Boise, ID 83702

Owyhee County
P.O. Box 128
Owyhee County Courthouse
Murphy, ID 83650

The project does not involve the use of any federal facility.

(ii) No part of the project or any federal facilities that would be used by the project are located within any city, town, or similar local political subdivision. There is no city, town, or similar local political subdivision that has a population of 5,000 or more people located within 15 miles of the project dam; therefore, no names or mailing addresses are included.

(iii) To the best of the Applicant's knowledge, no part of the project, and any federal facilities that would be used by the project, are located within any irrigation district, drainage district, or similar special purpose political subdivision; therefore, no names or mailing addresses are included.

(iv) To the best of the Applicant’s knowledge, no irrigation district, drainage district, or similar special purpose political subdivision owns, operates, maintains, or uses any project facilities or any federal facilities that would be used by the project; therefore, no names or mailing addresses are included.

(v) The names and mailing addresses of every other political subdivision in the general area of the project that there is reason to believe would likely be interested in, or affected by, the application are

City of Boise
715 South Capitol Boulevard
Boise, ID 83702

City of Caldwell
621 Cleveland Boulevard
Caldwell, ID 83605

City of Kuna
P.O. Box 13
Kuna, ID 83634

City of Melba
P.O. Box 206
Melba, ID 83641

City of Meridian
33 East Idaho Avenue
Meridian, ID 83642-2300

Unicorporated City of Murphy
P.O. Box 128
Murphy, ID 83650

City of Nampa
411 3rd Street South
Nampa, ID 83651

(vi) No part of the project is located on tribal land. However, all Native American tribal governmental organizations in the region surrounding the project were invited to participate in the consultation process for the license application. The names and mailing addresses of Native American tribal governmental organizations that there is a reason to believe are interested in, or may be affected by, the application are

Shoshone–Bannock Tribes
P.O. Box 306
Fort Hall, ID 83203

Shoshone–Paiute Tribes
P.O. Box 219
Owyhee, NV 89832

Fort McDermitt Tribe
P.O. Box 457
McDermitt, NV 89421

Burns Paiute Tribe
100 Pasigo Street
Burns, OR 97720

9. The exhibits that are filed as part of this Application for New License for Major Project—Existing Dam are

Exhibit A	Description of Project
Exhibit B	Statement of Project Operation and Resource Utilization
Exhibit C	Construction History and Proposed Construction Schedule
Exhibit D	Statement of Costs and Financing
Exhibit E	Environmental Report
Exhibit F	General Design Drawings (withheld for security purposes)
Exhibit G	Maps of the Project
Exhibit H	General Information

The foregoing INITIAL STATEMENT and attached Exhibits are hereby made a part of this Application for New License for Major Project—Existing Dam.

IN WITNESS WHEREOF, Applicant has caused its name to be hereunto signed by James C. Miller, its Senior Vice President, Power Supply, and attested to by Patrick A. Harrington, its Corporate Secretary, all thereunto duly authorized this 6th day of June, 2008.

By James C Miller
James C. Miller
Senior Vice President, Power Supply

ATTEST:

By Patrick A. Harrington
Patrick A. Harrington
Corporate Secretary

Verification

This Application for New License for Major Project—Existing Dam is executed in the

State of Idaho
County of Ada

By: James C. Miller
Senior Vice President, Power Supply
Idaho Power Company
P.O. Box 70
Boise, Idaho 83707

being duly sworn, deposes and says that the contents of this Application for New License for Major Project—Existing Dam are true to the best of his knowledge or belief. The undersigned Applicant has signed the Application for New License for Major Project—Existing Dam this 6th day of June, 2008.

IDAHO POWER COMPANY

By James C Miller
James C. Miller
Senior Vice President, Power Supply

SUBSCRIBED AND SWORN to before me, a Notary Public of the State of Idaho, this 6th day of June, 2008.

Frances J Martin
Notary Public for Idaho
Residing at Boise, Idaho

(NOTARIAL SEAL)

FRANCES J. MARTIN

Swan Falls Project
FERC No. 503
License Application

Executive Summary

EXECUTIVE SUMMARY

Introduction

The Applicant owns and operates 17 hydroelectric projects on the Snake River and its tributaries. All but two of these projects are licensed and regulated by the Federal Energy Regulatory Commission (FERC), in accordance with the Federal Power Act (FPA). The existing license for the Swan Falls Project (FERC No. 503) was issued in December 1982 and will expire at the end of June 2010. Consistent with the FPA and applicable FERC regulations, the Applicant seeks to relicense this project and to continue operating it for the benefit of its owners and customers.

The Swan Falls Project

The Swan Falls Project is located on the Snake River in Ada and Owyhee counties in Idaho, about 35 miles south of Boise. The project occupies lands of the United States within the Snake River Birds of Prey National Conservation Area, which is administered by the Department of the Interior, Bureau of Land Management. There are no other developments in the immediate vicinity of the project. The closest hydroelectric projects are C.J. Strike, approximately 36 river miles upstream, and Brownlee, approximately 173 river miles downstream. Access to the Swan Falls Project is by county road from the town of Kuna, located approximately 19 miles north of the project.

The original dam and power plant at Swan Falls were constructed beginning in 1900. The power plant was designed by one of Idaho’s first hydraulic engineers, Andrew J. Wiley, and was initially developed to provide power for the Silver City Mining District located in the Owyhee Mountains, approximately 28 miles southwest of the dam. The Swan Falls Project, the first hydroelectric power plant built on the Snake River, was producing power by 1901. The dam and power house were expanded or extensively remodeled three times between 1901 and 1913: new sections were added to the east and west ends of the original power plant to accommodate additional new generators in 1907 and 1910, respectively, and the original powerhouse was reconstructed in 1913. Additional generation was added to the original power plant in 1918 and 1944.

The existing powerhouse was completed in 1994 and has two identical generating units with a combined nameplate capacity of 25 megawatts. The first unit was first synchronized on February 21, 1994, and declared commercial on March 8, 1994. The second unit was first synchronized on April 25, 1994, and the new plant was declared commercial on May 20, 1994. After commissioning of the new powerhouse, the old powerhouse was decommissioned. Work began on stabilizing and restoring the structure and removing all equipment, piping, and electrical wiring except for several items to display for public viewing and education. The old powerhouse is now a museum and is listed on the National Register of Historic Places. The retained major items include generator unit 1, turbine and generator unit 5, hydro and DC/AC exciters, several lube oil pumps, four transformers from different eras, and other miscellaneous items. A handicap access ramp to the unit 5 viewing platform is provided in the former units 3 and 4 spaces below the generator, and stairs lead to the turbine level. The last of the old units was permanently taken out of service on March 14, 1994.

Swan Falls Dam is a 1,218-foot-long concrete gravity and rock-fill dam composed of the left (looking downstream) abutment embankment, the spillway section, a center island, the old powerhouse section, the intermediate dam, and the new powerhouse. The left embankment fill is essentially as constructed in the early 1900s. Swan Falls Reservoir is a long and narrow water body confined within the canyon through which the Snake River flows; the reservoir extends upstream about 12 miles from the dam.

Currently, over 400,000 customers rely on the Applicant's hydro and thermal generation system for power. The Swan Falls Project is an integral part of this generation system, combining with the rest of the Applicant's hydro facilities to provide nearly two-thirds of its total generating capacity in a normal water year.

General Operations

The Swan Falls Project is considered a run-of-river project under all water conditions. That is, the reservoir is not used to store water on a seasonal basis. The reservoir storage available is used on a limited basis to reregulate inflows resulting from operations of the upstream C.J. Strike Project. The power plant is normally operated to comply with the ramping rate restriction at the ramping gauge, located approximately one mile below Swan Falls Dam. The ramping rate restriction for the Swan Falls Project is 1 foot per hour and 3 feet per day.

Although the Swan Falls Reservoir has minimal storage, it can be used on a limited basis to meet short-term, unexpected peak load requirements. Under these conditions, the project is still operated to comply with the ramping rate restriction. Normal maximum operating headwater is 2,314 feet mean sea level (msl), and minimum operating headwater is 2,310 feet msl.

Under the current license, instantaneous minimum flows below Swan Falls Dam are required to be no less than 5,000 cubic feet per second (cfs) during the irrigation season (April 1 to September 30) and no less than 4,000 cfs outside the irrigation season (October 1 to March 31). If the average daily inflow is less than the specified minimums, the license provides that the plant discharge must be equal to the average inflow. Exhibit B of the license application contains more detailed information regarding existing operations, along with proposed future operations.

Relicensing Schedule

According to FERC regulations, the current licensee of a hydroelectric project must notify FERC five years before a license expires that it intends to apply for a new license. The licensee must then submit its final application for a new license two years before the current license expires. The FERC license for the Swan Falls Project expires on June 30, 2010. Therefore, the Applicant filed the Notice of Intent with FERC in June 2005. Because FERC requires that the license application be filed on or before June 30, 2010, the Applicant submitted the draft *New License Application: Swan Falls Hydroelectric Project* in September 2007 and filed this final *New License Application: Swan Falls Hydroelectric Project* with FERC in June 2008.

Consultation

FERC regulations also require that the Applicant consult with appropriate state and federal agencies and Indian tribes. Throughout the relicensing process, the Applicant involved these agencies and tribes, as well as any other agencies, tribes, counties, cities, non-governmental organizations, or groups that expressed interest in the Swan Falls relicensing process.

The Applicant utilized what has become known as the Traditional Licensing Process (TLP) for the Swan Falls Project. The process is generally viewed as requiring less upfront consultation between the Applicant and stakeholders. However, in processes where the issues are few and the potential for conflict is low, the need for upfront consultation is diminished. Such was the case for the Swan Falls Project, especially since the project has recently gone through a relicensing phase and became fully operational under the new license in the early 1990s. Notwithstanding the above, considerable flexibility exists to include broader consultation within the TLP. Therefore, recognizing the benefits of broader consultation among relicensing stakeholders, the Applicant held an informal consultation meeting in May 2004. The purpose of the meeting was to familiarize participants with the Swan Falls Project and to gain a better understanding of resource issues and concerns they believed the Applicant should consider during the relicensing process.

In March 2005, the Applicant initiated the first stage of formal consultation by submitting the *Formal Consultation Package for Relicensing: Swan Falls Project* (FCP) for review and comment. An informal consultation meeting held in May 2004 aided in developing the FCP. The release of the FCP was followed by a site tour and a joint agency public consultation (JAPC) meeting in May 2005. The purpose of the JAPC meeting was for the Applicant to present the information included in the FCP to agencies, tribes, and other interested parties and receive feedback on the proposed studies, including their scope and if additional studies were needed. The first stage of formal consultation concluded at the end of June 2005, when written comments on the FCP were due. No comments submitted at the JAPC meeting or received in response to the FCP recommended additional studies or significant modifications to the proposed studies.

Relying upon the comprehensive study plans developed during the first stage of consultation, the Applicant initiated and completed the relicensing studies and reports contained in this license application.

In June 2007, the Applicant conducted a second informal consultation meeting with interested parties to review study results and discuss potential protection, mitigation, and enhancement measures, including providing an opportunity for participants to identify additional measures. The Applicant also took the opportunity to update participants on the remaining steps and timelines for relicensing the Swan Falls Project. No major concerns were raised about the studies or the potential measures at the meeting.

The second stage of formal consultation was initiated when the Applicant submitted its draft *New License Application: Swan Falls Hydroelectric Project* in September 2007 to stakeholders for their review and comment. Subsequent to submitting the draft, the Applicant received comment letters from stakeholders regarding the information, including proposed PM&E measures, contained in the draft. Pursuant to FERC regulations, the Applicant conducted a joint meeting on February 19, 2008, with agencies and tribes, as well as other interested parties, to attempt to reach agreement on resource impacts and the Applicant's plan to protect, mitigate impacts to, or enhance the environment affected by Swan Falls operations. The meeting was productive, and the Applicant was able to resolve most of the disagreements. A summary of the joint meeting is included as Attachment E of the Consultation Appendix. The Applicant has also responded to comments received on the draft license application. The comment letters and corresponding responses to comments are included in Attachment F of the Consultation Appendix. New measures that were recommended by agencies have been added to the relevant PM&E sections of the final license application, along with the Applicant's reasons for either accepting or rejecting them.

The Application

The final application to license the Swan Falls Project is developed and organized according to the relevant sections in 18 CFR Part 16: procedures relating to the takeover or relicensing of licensed projects. Data that the Applicant collected and analyzed during the studies were used in developing the application, including proposed measures for protecting, mitigating, or enhancing resources. Following is a list of the documents that make up this application:

Exhibit A	Description of Project
Exhibit B	Statement of Project Operation and Resource Utilization
Exhibit C	Construction History and Proposed Construction Schedule
Exhibit D	Statement of Costs and Financing
Exhibit E	Environmental Report

Exhibit F	General Design Drawings (withheld from public copies for security purposes)
Exhibit G	Maps of the Project
Exhibit H	General Information

In addition, technical reports (including nonclassified study results), public safety and resource management plans, and details of consultation are appended to this license application.

Protection, Mitigation, and Enhancement Proposals

License applications to FERC include proposed protection, mitigation, and enhancement (PM&E) measures. To ensure their coordinated implementation, the Applicant integrates PM&E measures into its land, or resource, management plans. The *Swan Falls Resource Management Plan* is appended as Technical Report E.6-A.

The process for developing PM&E measures begins with identifying resource issues and developing studies to determine project impacts and includes agency, tribal, and public input. The Applicant used several FERC-required and voluntary, informal consultation meetings to define resource issues, possible impacts, and potential PM&E measures related to its ongoing operation of the Swan Falls Project. The issues, possible impacts, and potential measures were evaluated in the context of study results to determine their validity. Through this process, the Applicant intended to identify those areas where resource concerns existed, determine whether the concern was related to project operations, and, if so, develop measures to offset project effects.

In considering this application, it is important to understand that the Applicant is not required to mitigate for every project impact, nor is it required to fund mitigation measures that are unrelated to project impacts or that are attributable to the original construction of the project. In determining what environmental measures are appropriate, FERC begins with an examination of the existing project, including operations, and its effect on the environment, as it exists at the time of relicensing. This examination establishes the environmental baseline. FERC does not attempt to recreate pre-project conditions or hypothesize an environmental baseline that assumes that the project does not exist nor attempt to determine what might have occurred had the project been configured, operated, or maintained differently under the prior license. In short, FERC does not attempt to determine what condition the resources would be in now if things had been done differently in the past. See City of Tacoma, 98 FERC ¶ 61,274(2002); *American Rivers v. FERC*, 201 F.3d 1186 (9th Cir. 1999); *Conservation Law Foundation v. FERC*, 216 F.3d 41 (D.C. Cir. 2000).

Given the foregoing, the Applicant has proposed measures that are, first and foremost, intended to offset ongoing project impacts identified from the Applicant's environmental review. Where impacts were clearly identified or the potential for an impact clearly exists, the Applicant has proposed a corresponding measure intended to mitigate the impact (e.g., protecting sensitive habitat and improving recreation resources). The Applicant has also proposed measures to offset potential impacts that were not clearly identified through studies, yet could be reasonably tied to project operations (e.g., weed control). Finally, the Applicant considers FERC's directive to balance power and nonpower values a critical element in making decisions that are in the public interest. Therefore, the Applicant's proposed measures take into consideration their impact on power costs and are aimed at addressing project-related impacts while preserving the power values of the project. By doing so, the Applicant's plan adequately and equitably protects, mitigates, or enhances the resources affected by Swan Falls Project operations. The measures that the Applicant believes are appropriate for addressing ongoing, project-related impacts are identified in the following license application sections, along with a summary of associated benefits and estimated costs. In addition, the Applicant has included a corresponding PM&E appendix for the final license application, which consolidates the PM&E measures and summarizes the cost information.

- Section E.2.4. in Report on Water Use and Quality
- Section E.3.1.3. in Report on Fish, Wildlife, and Botanical Resources
- Section E.3.2.3. in Report on Fish, Wildlife, and Botanical Resources
- Section E.3.3.3. in Report on Fish, Wildlife, and Botanical Resources

- Section E.4.2.6. in Report on Historical and Archaeological Resources

- Section E.5.4. in Report on Recreational Resources

- Section E.6.3. in Report on Land Management and Aesthetics

Resource Management Plan

The *Swan Falls Resource Management Plan* (Technical Report E.6-A) represents a comprehensive, coordinated approach to managing the Applicant's land and the resources found on that land. It includes policies that guide the use of land and water within project boundaries, as defined in the FERC licenses, and on other Applicant-owned property. It also contains policies for promoting cooperation and coordination with other land management entities. Because of its emphasis on resource management, the *Swan Falls Resource Management Plan* also supports the relicensing process by demonstrating responsible stewardship.

Conclusion

The Applicant recognizes that developing an application to license the Swan Falls Project with FERC is an important undertaking. The Applicant believes that it is the appropriate entity to advance and promote the elements of this application to agencies, tribes, nongovernmental organizations, and the affected public. In addition, the Applicant is committed to meeting FERC requirements, balancing resource values, and demonstrating sound environmental stewardship by implementing corporate environmental policies.

Furthermore, the Applicant recognizes the need to continue developing and implementing the PM&E measures of the license and policies of the *Swan Falls Resource Management Plan*. Such development and implementation would be planned with appropriate agency, tribal, and public input. The Applicant will devote the time and resources necessary to comply with the terms of a new license while providing its owners with a reasonable return for their investment and its customers with safe, reliable, and economical electricity.

Swan Falls Project
FERC No. 503
License Application

Exhibit A
Description of Project

The *Code of Federal Regulations* below—18 CFR § 4.51(b)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(b) *Exhibit A* is a description of the project. This exhibit need not include information of project works maintained and operated by the U.S. Army Corps of Engineers, the Bureau of Reclamation, or any other department or agency of the United States, except for any project works that are proposed to be altered or modified. If the project includes more than one dam with associated facilities, each dam and the associated component parts must be described together as a discrete development. The description for each development must contain:
>
> (1) The physical composition, dimensions, and general configuration of any dams, spillways, penstocks, powerhouses, tailraces, or other structures, whether existing or proposed, to be included as part of the project;
>
> (2) The normal maximum surface area and normal maximum surface elevation (mean sea level), gross storage capacity, and usable storage capacity of any impoundments to be included as part of the project;
>
> (3) The number, type, and rated capacity of any turbines or generators, whether existing or proposed, to be included as part of the project;
>
> (4) The number, length, voltage, and interconnections of any primary transmission lines, whether existing or proposed, to be included as part of the project (see 16 U.S.C. 796(11));
>
> (5) The specifications of any additional mechanical, electrical, and transmission equipment appurtenant to the project; and
>
> (6) All lands of the United States that are enclosed within the project boundary described under paragraph (h) of this section (Exhibit G), identified and tabulated by legal subdivisions of a public land survey of the affected area or, in the absence of a public land survey, by the best available legal description. The tabulation must show the total acreage of the lands of the United States within the project boundary.

A.1. GENERAL DESCRIPTION AND LOCATION OF THE SWAN FALLS PROJECT

The Swan Falls Hydroelectric Project is located approximately 35 miles south of Boise, Idaho on the Snake River in Ada and Owyhee counties. The project occupies lands of the United States within the Snake River Birds of Prey National Conservation Area (NCA), which is administered by the Department of the Interior, Bureau of Land Management (BLM). There are no other developments in the immediate vicinity of the project. The closest hydroelectric projects are C.J. Strike, about 36 river miles upstream, and Brownlee, about 173 river miles downstream. Access to the Swan Falls Hydroelectric Project is by county road from the town of Kuna, located approximately 19 miles north of the project.

The Snake River flows generally from the south to north at Swan Falls. The existing project was constructed on the downstream edge of waterfalls caused by a ridge of basalt extending across the river. The average drop across the falls is approximately 15 feet. Swan Falls Reservoir is a long and narrow water body confined within the canyon through which the Snake River flows; the reservoir extends upstream approximately 12 miles from the dam. At a normal surface water elevation of 2,314 feet above mean sea level (msl) (referred to as elevation 2,314), the reservoir has a surface area of approximately1,525 acres and a capacity of approximately 7,425 acre-feet.

A.1.1. Dam and Powerhouse

Swan Falls Dam is a 1,218-foot-long concrete gravity and rock-fill dam composed of the left (looking downstream) abutment embankment, the spillway section, a center island, the old powerhouse section, the intermediate dam, and the new powerhouse. The left embankment fill is essentially as constructed in the early 1900s, except for an added sheet-pile wall on the upstream side constructed in 1936. The elevation of the embankment is 2,320 feet msl. The spillway section is composed of 12 equal-width, concrete sluiceway sections. The center island is a basalt bedrock outcrop covered with a gravel access road. The old powerhouse is listed on the National Register of Historic Places (Technical Report E.4.1-B), has been converted into a museum, and is a reinforced concrete structure that measures 25 feet high, excluding the superstructure of the buildings. The original concrete is judged to be in good condition. Between the new powerhouse and the old powerhouse is a short (20-foot-long) gravity concrete structure, commonly referred to as the intermediate dam. The new powerhouse, which was completed in 1994, is 200 feet wide (upstream to downstream) and 111 feet long.

A.1.2. Spillway

The spillway, reconstructed in 1986, is located between the left embankment and the island in the middle of the river. It is in the same position as the original spillway, which was completely removed. The entire spillway was placed on basalt and claystone that was excavated and cleaned during reconstruction. A grout curtain was placed along the entire length of the spillway. Drainage was provided behind the curtain to reduce uplift.

The new spillway includes 12 equal-width, concrete spillway sections controlled by identical radial gates on pier-mounted trunnions. The spillway is divided into two sections by a bend corresponding to a change in foundation geology. The western section, contiguous with the left embankment, is a gated, concrete ogee section with eight radial gates founded on claystone that contains intermittent basalt dikes. Flow through the gates discharges into concrete roller basins. Because these eight spillways are suitable for use at low tailwater levels, they are preferably operated. The eastern section, which is adjacent to the island, contains four radial gates discharging onto a flat slab, all founded directly on basalt. Energy dissipation for these eastern sluiceways is dependent on high tailwater; therefore, the gates are typically operated last during spill conditions.

The gated openings are 31 feet wide and 16 feet, 1 inch high. The crest of the spillway ogee is at elevation 2,300. The gates are operated by individual hoists located on platforms above the piers at elevation 2,324. Electric gate heaters were installed on nine gates to ensure gate operation during freezing conditions. The spillway has a capacity of 105,112 cubic feet per second (cfs) at reservoir elevation 2,318 (incorporating a 2-foot freeboard from the left embankment).

Primary vehicle access to the spillway is via the right abutment through the old powerhouse.

A.1.3. Intake and Penstocks

The new powerhouse intake is at the upstream face of the new powerhouse. There is a 38-foot-wide by 77-foot-high trash rack over each intake (including a 19.5-foot-tall apron panel). The trash rack is composed of 3/4- by 3-inch vertical steel bars spaced at 6 inches on center, leaving a net open area of 3,300 square feet. The peak water velocity through the trash rack when the trash rack is clean is 6 feet per second. Debris accumulation on the rack increases water velocity through the rack. A manually controlled and hydraulically operated trash rake is mounted above the trash rack for cleaning.

The Swan Falls Powerhouse does not contain penstocks. Concrete flow channels, separated by a 5-foot-wide concrete pier, lead to each of the two pit-bulb turbine generators. Approximately 36 feet downstream of the trash rack, each flow channel is further divided by a generator pit. The steel generator pits, which are vertical steel shafts and contain the unit gearboxes and generators, are open at the top to the powerhouse interior. The turbine flow goes around each steel generator pit and enters a 17.5-foot-diameter round turbine ring surrounding the Kaplan-style turbine. After passing through the turbine ring, the flow passes through the draft tube into the powerhouse tailrace. The total plant hydraulic capacity is 20,400 cfs.

A.1.4. Powerhouse

The old powerhouse is made up of three separate, but interconnected, sections. The west section near the island is 49 feet wide (upstream to downstream) and 72 feet long. It housed units 1 and 2. The middle section is 49 feet wide (upstream to downstream) and 92 feet long. It housed units 3, 4, 5, and 6. The east section, which housed units 7, 8, 9, and 10, is 34 feet wide (upstream to downstream) and 126 feet long. The generator floor in all sections is approximately at elevation 2,323.

The power plant has been through significant changes over time. In 1901, the original plant was commissioned with three 300-kilowatt (kW) units. In 1907, two 700-kW Dayton Globe units were installed in a new powerhouse. In 1910, two 1,282.5-kW units were installed in units 1 and 2 with the powerhouse modifications. In 1913, two 1,250-kW units were installed in units 3 and 4, and the three original units were removed. In 1918, generating units were placed in units 5 through 10, and the two Dayton Globe units were removed. Units 5 and 6 had two 1,250-kW units, and units 7 through 10 had four 800-kW units. In 1944, two 1,100-kW units replaced the 1910 units in units 1 and 2. In 1948, the generators were rewound.

The new powerhouse was completed in 1994 and has two identical generating units. The first unit was first synchronized on February 21, 1994, and declared commercial on March 8, 1994. The second unit was first synchronized on April 25, 1994, and the new plant was declared commercial on May 20, 1994. The bottom of the flow channels at the turbine pits is at elevation 2,245, the equipment rooms are at elevations 2,283.5 and 2,291, and the control room and enclosed operating floor with assembly bay are at elevation 2,307.

After commissioning of the new powerhouse, the old powerhouse was decommissioned. Work began on stabilizing and restoring the structure and removing all equipment, piping, and electrical wiring, except for several items to display for public viewing and education. The old powerhouse is now a museum. The retained major items include generator unit 1, turbine and generator unit 5, hydro and DC/AC exciters, several lube oil pumps, four transformers from different eras, and other miscellaneous items. A handicap access ramp to the unit 5 viewing platform is provided in the former units 3 and 4 spaces below the generator, and stairs lead to the turbine level. The last of the old units was permanently taken out of service on March 14, 1994.

Stability of the old powerhouse was reviewed in 1988, in conformance with Part 12 independent consultant inspection requirements. The analysis report, as submitted to the Federal Energy Regulatory Commission on January 6, 1989, recommended that stability improvements be performed. As a result of inspection and decommissioning of the old powerhouse, several projects were completed, including filling the draft tubes and turbine pits with concrete. Since the unit 5 turbine pit was left open for public viewing, stabilization concrete was placed in the intake area between the stoplog slot and intake gate.

A.1.5. Tailraces

A channel has been excavated in the riverbed downstream of the powerhouse to increase the available gross head. The channel has a length of approximately 1,400 feet, was excavated to elevation 2,276, and is 120 feet wide at the bottom. Most of the excavation was in-river alluvium, and the average side slope of the channel is two horizontal to one vertical.

A.2. RESERVOIR

Swan Falls Reservoir is a long, narrow body of water confined between both sides of the canyon. General reservoir data follow:

Location of the dam:	Snake River river mile 457.7
Length:	12 miles
Reservoir water surface elevations, normal maximum:	2,314 feet msl
Surface area:	1,525 acres
Total storage:	7,425 acre-feet
Usable storage:	6,745 acre-feet

Although no reservoir rule curve exists for the Swan Falls Reservoir, a reservoir area and capacity curve will be developed with updated information for the draft and final license applications.

A.3. TURBINE GENERATORS

The new powerhouse has two open, pit-type, horizontal Kaplan (four-blade) turbines with adjustable blades and wicket gates. The 5.3-meter-diameter runners turn at 89.61 revolutions per minute (rpm) through single-stage, double-helical, epicyclical speed increasers, which turn the generators at 514 rpm. The centerline of the runner is at elevation 2,267. The rated output at 7,350 cfs and 22.5 feet of head is 12.5 megawatts (MW) per unit. Information about the turbines and generators is included below:

Turbine	
Type	Horizontal Kaplan
Nameplate net head	22.5 feet
Nameplate output	12.5 MW
Hydraulic capacity at nameplate net head and output	7,350 cfs
Generator	
Nameplate rating	13,585 kW
Power factor	0.95
Voltage	6.9 kilovolts (kV)

A.4. SWAN FALLS PROJECT PRIMARY TRANSMISSION LINES

The Swan Falls Power Plant is connected to the interconnected transmission system by a 138-kV wood pole, H-frame transmission line (Swan Falls Tap [Line 954]). The Swan Falls Tap extends east from the power plant for 1.2 miles, rising out of the canyon and across the plain, to connect into the Strike Junction–Caldwell 138-kV transmission line (Line 920).

The Swan Falls Tap was built in 1993 to accommodate increased power production resulting from a major modification of the Swan Falls Power Plant (see Exhibit C about construction of the new powerhouse). Those portions of the Swan Falls Tap located on federal lands are permitted by a BLM right-of-way (ROW) grant. The ROW width is 50 feet, 25 feet on either side of the centerline. The BLM grant expires in 2013. The Swan Falls Tap serves no other purpose than to transmit power from the power plant to the interconnected transmission system.

A.5. APPURTENANT EQUIPMENT

Miscellaneous systems and equipment provided for the operation of the power plant include the unwatering system, compressed air system, fire protection system, water supply and drainage system, and heating and ventilation equipment. A 65-ton-capacity bridge crane for maintenance and repairs of powerhouse equipment is mounted on rails inside the powerhouse.

There are also numerous electrical systems at the project and substation. The generators are connected by cables to a switch gear. The switch gear is connected by isophase buss ducts to a 6.9/138-kV, 30,000-kilovoltamperes (kVA), OA/FA/FOA, 3-phase main transformer located on the roof of the new powerhouse. Other substation equipment includes circuit breakers, disconnect switches, lightning arrestors, potential devices, and take-off structure for the transmission line.

A.5.1. Transformers

The Swan Falls Project is served by one 33,600-kVA main power transformer. The transformer for the generators is mounted outdoors on the plant transfer deck on the downstream side of the powerhouse. The overhead high-voltage lines from the transformer span out of the Snake River Canyon up to a substation on the canyon rim.

A.5.2. Gantry Cranes

A 65-ton-capacity bridge crane for maintenance and repair of powerhouse equipment is mounted on rails inside the powerhouse.

A.5.3. Intake Trash Racks

The intake trash racks at Swan Falls Dam rest in concrete and steel slots on the face of the concrete portion of the dam. The trash racks are in either 11.75-foot-high by 20-foot-wide or 11.75-foot-high by 18-foot-wide steel panels that are stacked in the trash rack slots on the face of the concrete intake structure. There are 14 trash rack panels covering the intake to each of the two turbine generator units. The bottoms of the trash racks are at elevation 2,247.75, or 45.5 feet below the minimum reservoir elevation, while the tops of the trash racks are at elevation 1,618, or 32.8 feet below the minimum reservoir elevation. The face of each trash rack panel is composed of 3/4-inch by 3-inch-deep steel bars on edge, spaced 6 inches apart on a structural steel framework. The maximum opening is 5.25 inches wide by 25 inches high. The unobstructed open space in the trash racks is calculated to be approximately 1,700 square feet per penstock. This amount of unobstructed open space leads to an estimated peak water velocity of approximately 6.0 feet per second at the face of the trash racks. The trash racks can be cleaned using a scraper device and a mobile crane or trash rake. Because the intake for the trash rack is on the upstream face of the dam, the peak velocity of the water in the reservoir upstream of the trash racks is much lower than the velocity of the water downstream of the trash racks.

A.6. FEDERAL LAND

A table of federal lands enclosed within the project boundary is provided in Table A-1.

Table A-1 Federal land within the Swan Falls Project boundary.

		Area in Acres		
Township and Range	**Section**	**PSR**[a]	**U.S.**	**Private**
T2S R1E	17			2.22
	18		6.10	89.85
	19	6.12		196.05
	20			1.80
	30	24.54	5.15	152.18
	31		25.09	140.50
T3S R1E	5		3.42	
	6		132.86	
	7		18.74	
	8		52.36	
	15		13.50	1.48
	16			95.50
	17		15.01	
	21		4.77	5.81
	22		82.18	
	26		70.51	
	27		17.87	
	35		49.00	22.70
	36		1.62	18.51
Total		30.66	498.18	726.60

[a] Power Site Reserve—Federally administered land set aside in the early 1900s for power production development.

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Exhibit B
Statement of Project Operation and Resource Utilization

The *Code of Federal Regulations* below—18 CFR § 4.51(c)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(c) *Exhibit B* is a statement of project operation and resource utilization. If the project includes more than one dam with associated facilities, the information must be provided separately for each such discrete development. The exhibit must contain:
>
> (1) A statement whether operation of the power plant will be manual or automatic, an estimate of the annual plant factor, and a statement of how the project will be operated during adverse, mean, and high water years;
>
> (2) An estimate of the dependable capacity and average annual energy production in kilowatthours (or a mechanical equivalent), supported by the following data:
>
> (i) The minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the power plant intake or point of diversion, with a specification of any adjustments made for evaporation, leakage, minimum flow releases (including duration of releases), or other reductions in available flow; a flow duration curve indicating the period of record and the gauging stations used in deriving the curve; and a specification of the period of critical streamflow used to determine the dependable capacity;
>
> (ii) An area-capacity curve showing the gross storage capacity and usable storage capacity of the impoundment, with a rule curve showing the proposed operation of the impoundment and how the usable storage capacity is to be utilized;
>
> (iii) The estimated hydraulic capacity of the power plant (maximum flow through the power plant) in cubic feet per second;
>
> (iv) A tailwater rating curve; and
>
> (v) A curve showing power plant capability versus head and specifying maximum, normal, and minimum heads;
>
> (3) A statement, with load curves and tabular data, if necessary, of the manner in which the power generated at the project is to be utilized, including the amount of power to be used on-site, if any, the amount of power to be sold, and the identity of any proposed purchasers; and
>
> (4) A statement of the applicant's plans, if any, for future development of the project or of any other existing or proposed water power project on the stream or other body of water, indicating the approximate location and estimated installed capacity of the proposed developments.

B.1. SWAN FALLS PLANT OPERATIONS

B.1.1. Plant Supervision

Typically, the power plant for the Swan Falls Project is remotely operated from the Applicant's Generation Dispatch Center in Boise. The generation dispatchers manually control the plant on a 24-hour basis, and the Applicant has on-site plant operators on duty 8 hours a day. During off-duty hours, operators are on call to respond to alarms and unusual occurrences.

B.1.2. Estimated Annual Plant Factor

Based on historical annual generation records from April 1994 through May 2007, the plant factor averages approximately 57%. Between May 1998 and August 2000, one unit at the Swan Falls Project was out of service and under repair.

B.1.3. Operations During Low, Mean, and High Water Years

The Swan Falls Project is considered a run-of-river project under all water conditions. That is, the reservoir is not used to store water on a seasonal basis. The available reservoir storage is used to reregulate inflows resulting from operations of the upstream C.J. Strike Project, and the power plant is normally operated to comply with the ramping rate restriction at the ramping gauge located approximately one mile below Swan Falls. The ramping rate restriction for the Swan Falls Project is 1 foot per hour and 3 feet per day. Although the Swan Falls Reservoir has minimal storage, it can be used to meet short-term, unexpected peak load requirements. Under these conditions, the project is still operated to comply with the ramping rate restriction. Normal maximum operating headwater is 2,314 feet mean sea level (msl), and minimum operating headwater is 2,310 feet msl.

Under the current license, the Federal Energy Regulatory Commission (FERC) requires instantaneous minimum flows below Swan Falls Dam to be no less than 5,000 cubic feet per second (cfs) during the irrigation season (April 1 to September 30) and no less than 4,000 cfs outside the irrigation season (October 1 to March 31). If the average daily inflow is less than the specified minimums, the license provides that the plant discharge must be equal to the average inflow. The hydraulic capacity for the Swan Falls Power Plant is 20,420 cfs. The Applicant holds decreed and licensed water rights for power purposes of 9,450 cfs, plus an approved permit for 6,550 cfs. A claim for 4,420 cfs for power use, based upon beneficial use, with a priority date of October 1, 1983, has been filed in the Snake River Basin Adjudication. Under the Swan Falls Agreement, a contract between the Applicant and the State of Idaho entered into on October 25, 1984, the Applicant’s water rights for power purposes at the Swan Falls Project, and other specified Applicant-owned hydropower projects on the middle Snake River, entitle the Applicant to an unsubordinated right of 3,900 cfs average daily flow from April 1 to October 31, and 5,600 cfs average daily flow from November 1 to March 31, measured at the Murphy gauging station (USGS 13172500) located immediately below the Swan Falls Project near Murphy, Idaho at river mile 453.5. The Swan Falls Agreement further provides that the Applicant is entitled to the use of the waters of the Snake River to the full extent of its water rights but that such rights in excess of the 3,900 and 5,600 cfs minimum flows referenced above are subordinate to subsequent beneficial upstream uses upon approval of such uses consistent with state law. Pursuant to the Swan Falls Agreement, the 3,900 and 5,600 cfs minimum flows are not subject to depletion. The hydropower water rights at the Applicant's other hydropower projects on the middle Snake River upstream of the Swan Falls Project (C.J. Strike, FERC Project No. 2055; Bliss, FERC Project No. 1975; Lower Salmon, FERC Project No. 2061; Upper Salmon, FERC Project No. 2777; Shoshone Falls, FERC Project No. 2778; and Twin Falls, FERC Project No. 18) are also subject to the minimum flow and subordination provisions of the Swan Falls Agreement. In recognition of that fact, in the license for C.J. Strike, FERC Project No. 2055, FERC recognized a minimum flow of 3,900 cfs. In light of the Swan Falls Agreement, and the consistent minimum flow upstream, the Applicant is recommending in this license application that the minimum flow for the Swan Falls Project be changed to 3,900 cfs from April 1 to October 31, and 5,600 cfs from November 1 to March 31.

This change would simplify operational coordination and coincide with the minimum flow of 3,900 cfs below the C.J. Strike Project that was proposed in the *New License Application for C.J. Strike Hydroelectric Project* (IPC 1998) and ordered by FERC (FERC 2004). The Applicant believes that a revised minimum flow will have little effect on daily average project discharges because of available storage in Swan Falls Reservoir. Under this proposal, daily headwater elevations may fluctuate slightly more under low-flow conditions, but daily tailwater fluctuations would be less and would comply with the existing 1 foot per hour, 3 feet per day ramping rate restriction below Swan Falls Dam. Implementation of a revised minimum instantaneous flow of 3,900 cfs below the Swan Falls Project also would eliminate the need for a gauging plan and would not affect the Applicant's water rights under the Swan Falls Agreement.

During low-flow conditions, the Applicant monitors daily average project discharges over a three-day period to ensure that the average minimum flow is at least 3,900 cfs from April 1 to October 31, and at least 5,600 cfs from November 1 to March 31 for the purpose of satisfying the Applicant's water right under the October 25, 1984, Swan Falls Agreement. Once again, flows are measured at the Murphy gauging station on the Snake River. Measured, daily average flows that are less than those stipulated are reported to the Idaho Department of Water Resources.

B.2. SWAN FALLS DEPENDABLE CAPACITY AND AVERAGE ANNUAL GENERATION

Operations for the Swan Falls Project are significantly influenced by inflowing hydrology. However, the available reservoir storage associated with the project can be used to meet short-term, unexpected peak load requirements within the ramping rate restriction. Dependable capacity under worst-case water conditions is approximately 7.5 megawatts at 4,160 cfs.

Based on the period from April 1994 through March 2008, the average annual energy production at the Swan Falls Power Plant is 128 gigawatt hours. Between May 1998 and August 2000, one unit at the Swan Falls Project was out of service and under repair.

B.2.1. Flow Data and Flow-Duration Curve

The period of record for flow data is October 1, 1913, through September 30, 2006. The minimum, mean, and maximum inflows to Swan Falls Reservoir for this period are 4,160, 10,970, and 46,100 cfs, respectively. A water year flow-duration curve for the period October 1981 through September 2007 is provided in Figure B-1. Monthly flow-duration curves for the period 1981 through 2007 are provided in Figures B-2 through B-13.

B.2.2. Reservoir Operation Curves

The surface area of Swan Falls Reservoir is 1,525 acres. Total reservoir storage and usable storage are 7,425 acre-feet and 6,745 acre-feet, respectively. An estimate of the reservoir stage–storage relationship for the top 4 feet of the reservoir, from elevation 2,311-5 to 2,314 msl, is provided in Figure B–14. No changes in reservoir characteristics or operations are proposed.

B.2.3. Plant Hydraulic Capacity

The maximum hydraulic capacity of turbine units 1 and 2 is approximately 10,200 cfs each, for a total hydraulic capacity of approximately 20,400 cfs. The normal operating hydraulic capacity is approximately 15,000 cfs.

B.2.4. Tailwater Rating Curve

A tailwater rating curve is presented in Figure B-15.

B.2.5. Power Plant Capacity versus Gross Head Curve

A plant capacity versus gross head curve is presented in Figure B-16. This curve is based on available measured data.

B.3. POWER UTILIZATION

All generation produced by the Swan Falls Power Plant is used to meet the Applicant's system load requirements.

B.4. FUTURE DEVELOPMENT

There are no plans for future development of the power generation resource at the Swan Falls Project.

LITERATURE CITED

Federal Energy Regulatory Commission (FERC). August 2004. Article 402: minimum flow. In: Order issuing new license (108 FERC ¶ 61,125). FERC, Washington, DC. 50 p. Available at: <www.ferc.gov/whats-new/comm-meet/072804/H-5.pdf>.

Idaho Power Company (IPC). 1998. New license application for C.J. Strike Hydroelectric Project. 8 volumes. IPC, Boise, ID.

This page left blank intentionally.

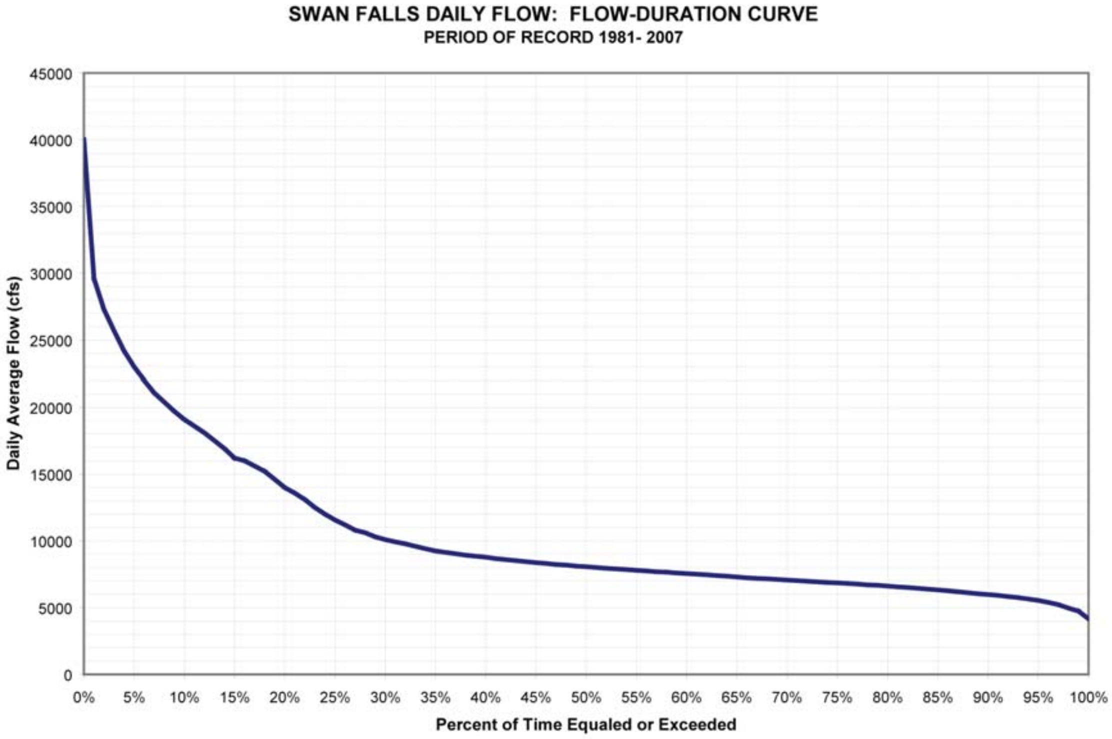


Figure B-1 **Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record October 1981–September 2007).**

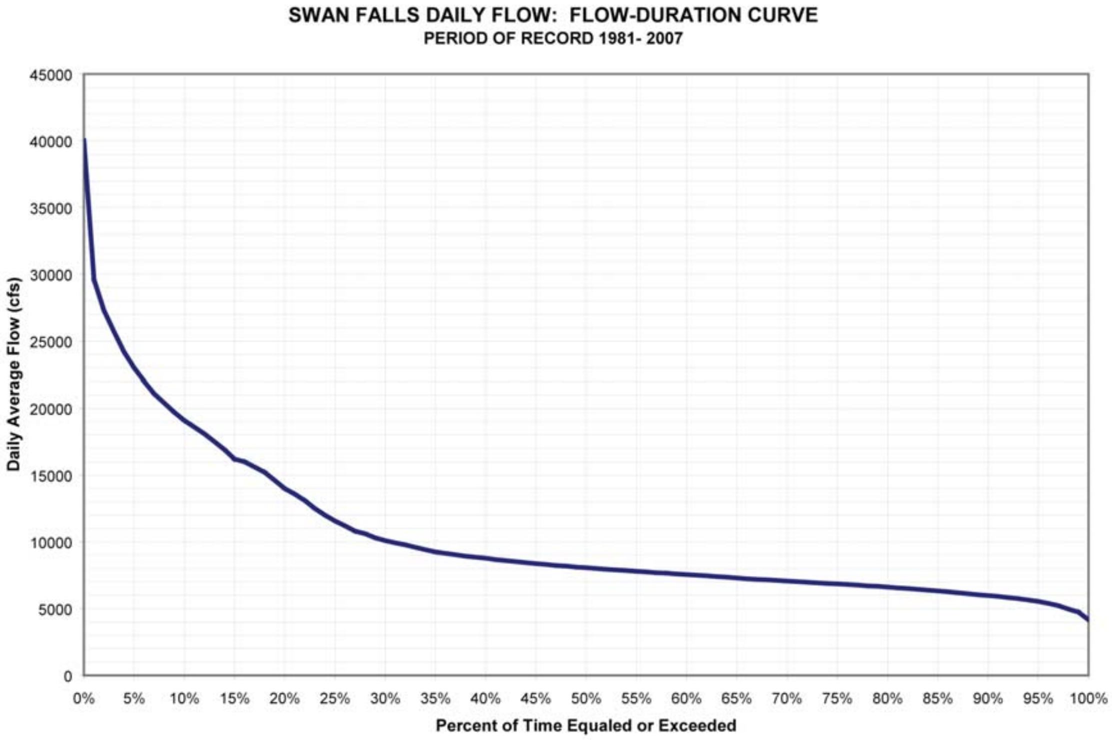


Figure B-2 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record January 1981–January 2007).

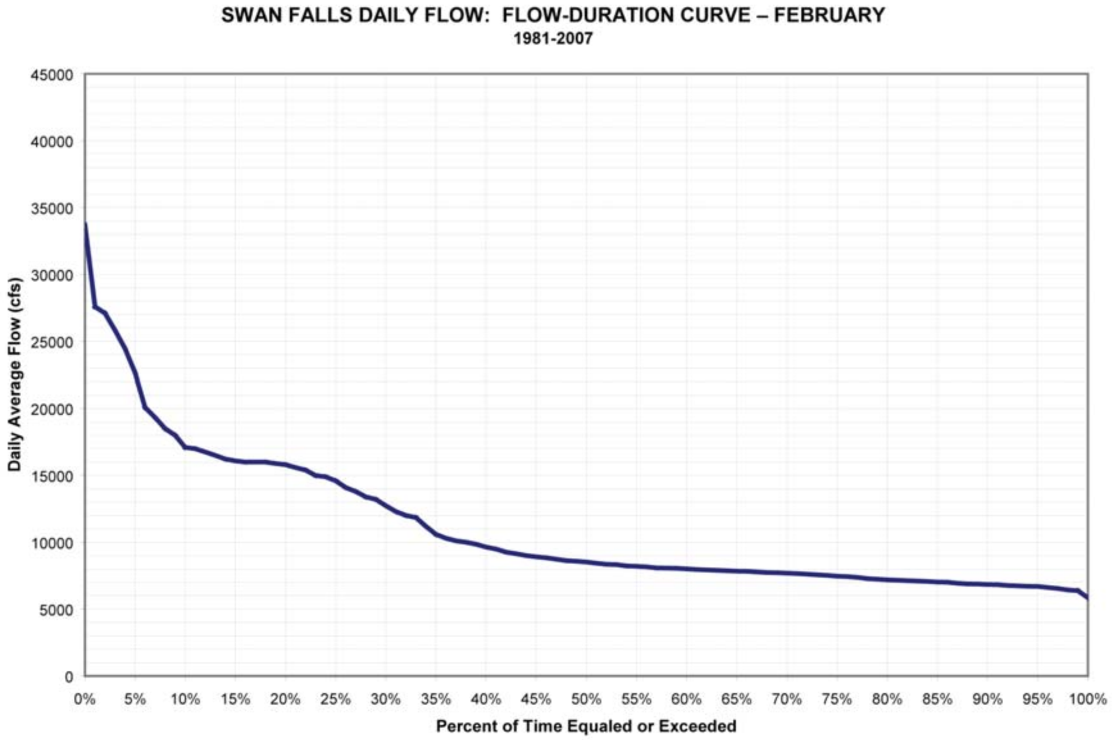


Figure B-3 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record February 1981–February 2007).

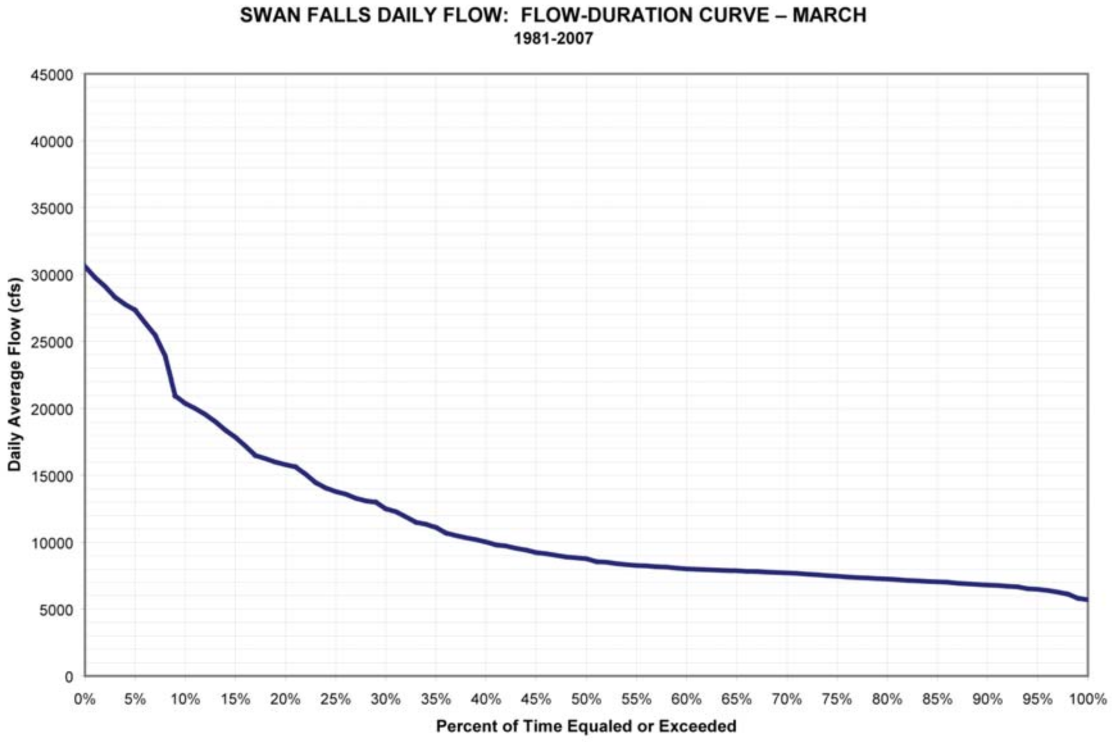


Figure B-4 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record March 1981–March 2007).

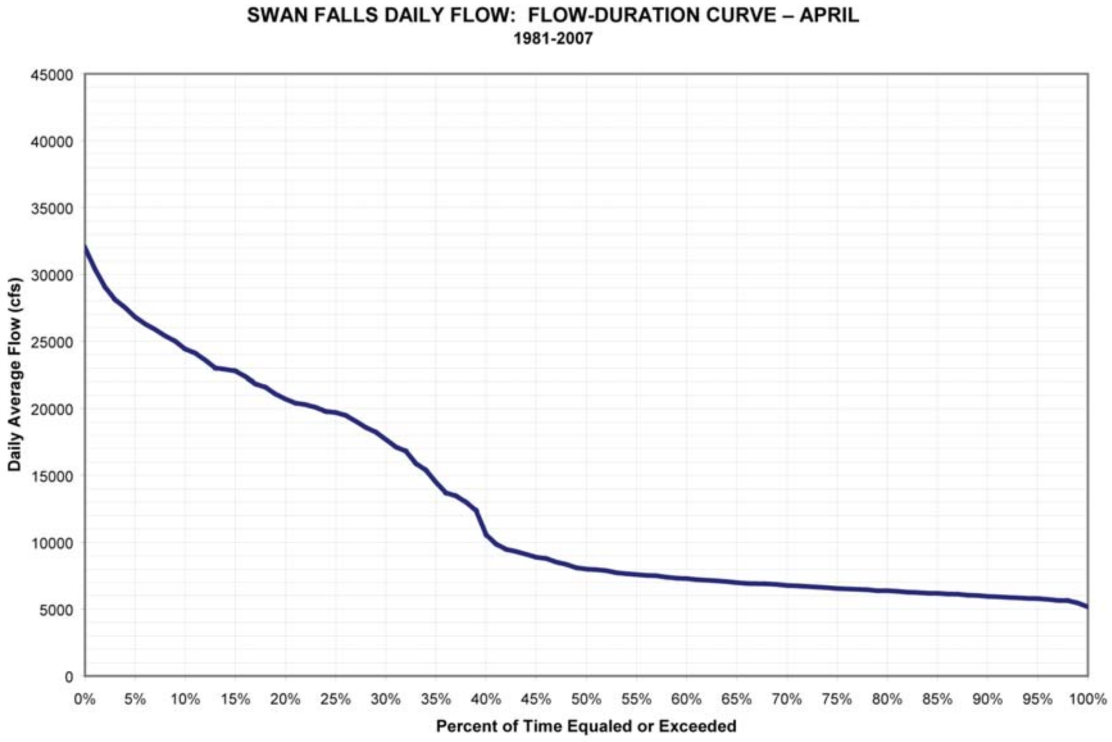


Figure B-5 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record April 1981–April 2007).

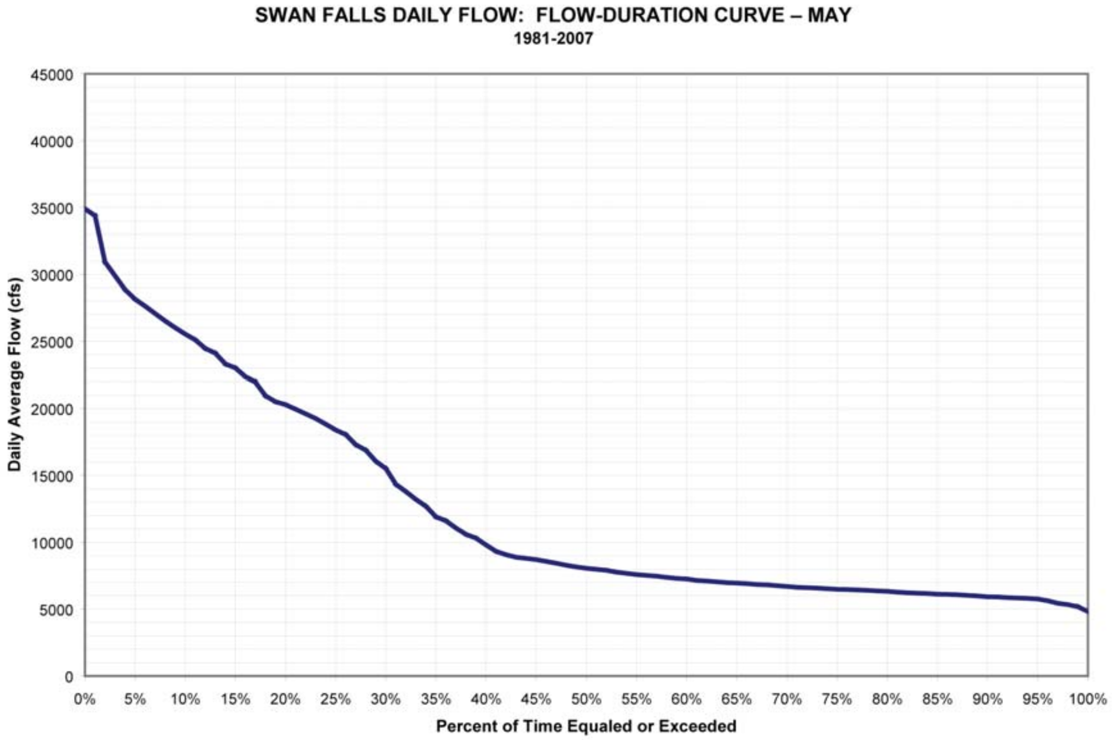


Figure B-6 **Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record May 1981–May 2007).**

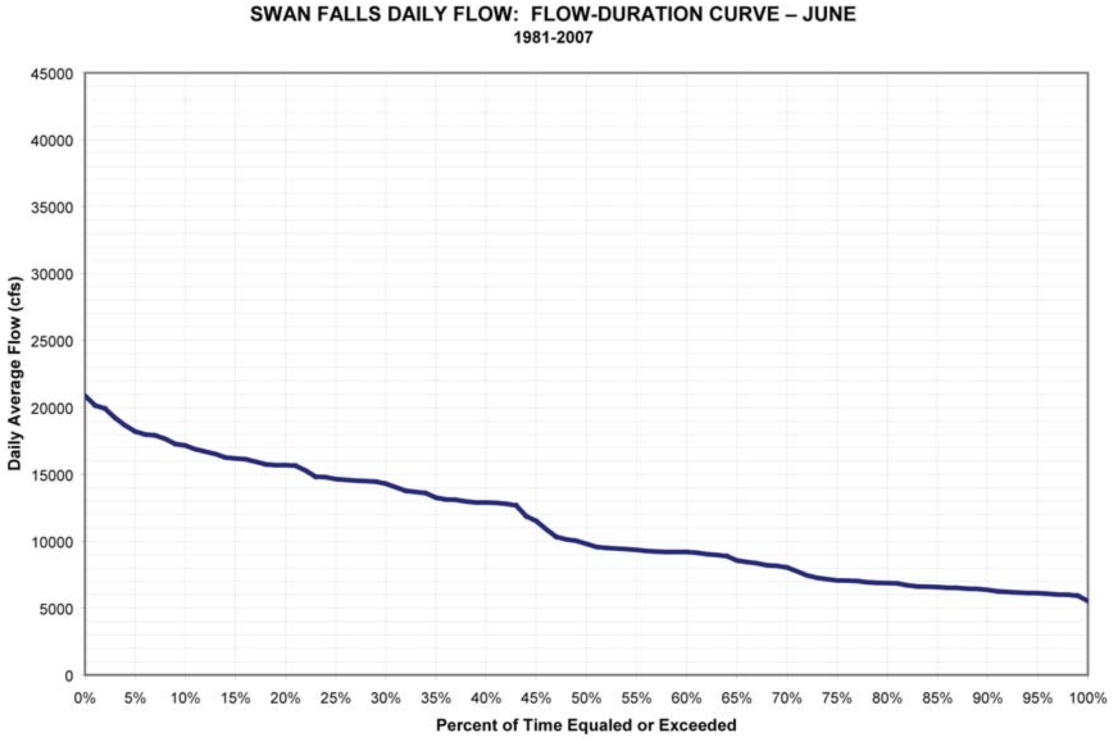


Figure B-7 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record June 1981–June 2007).

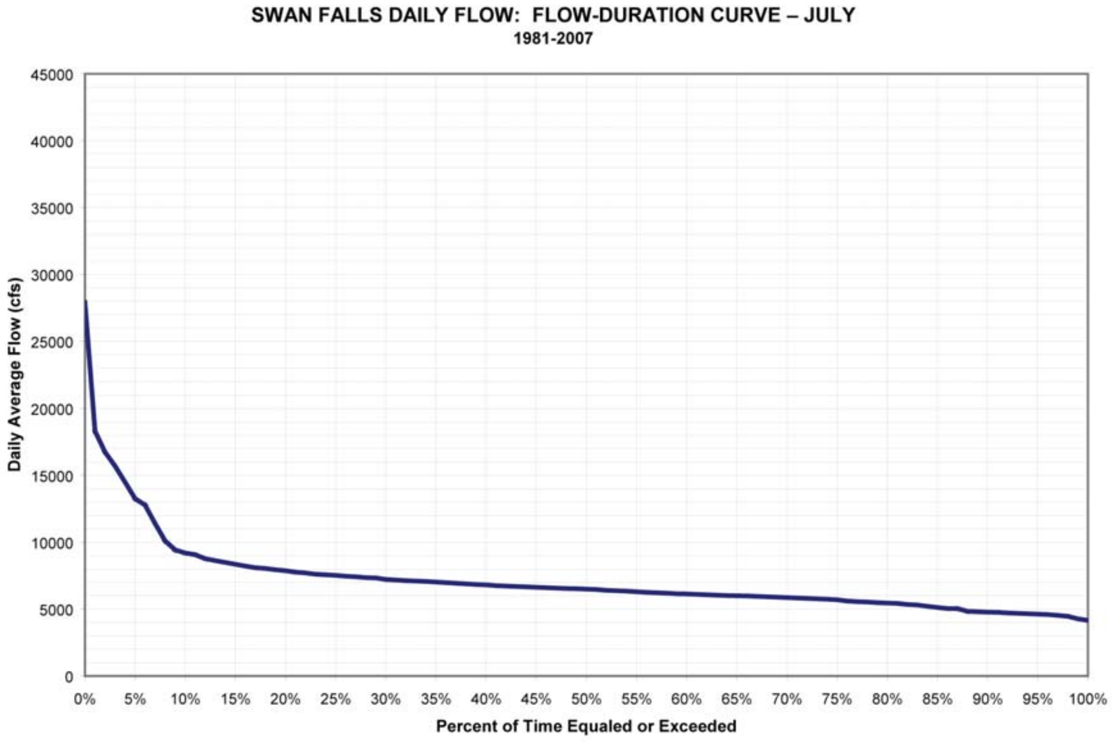


Figure B-8 **Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record July 1981–July 2007).**

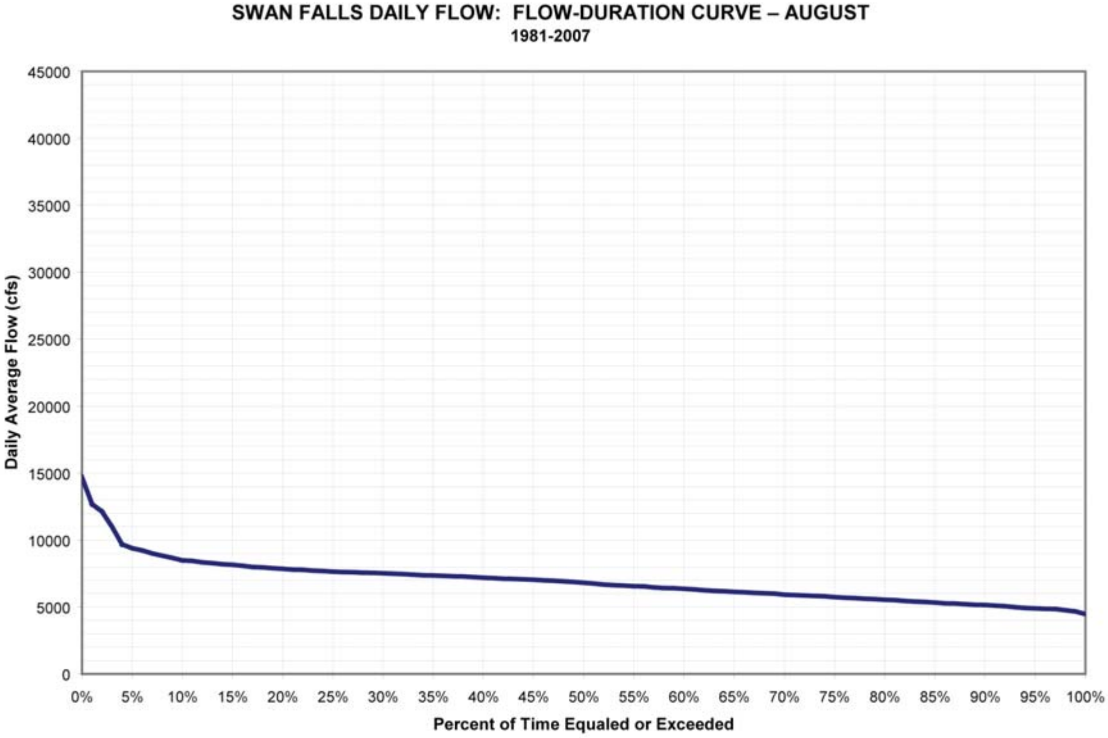


Figure B-9 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record August 1981–August 2007).

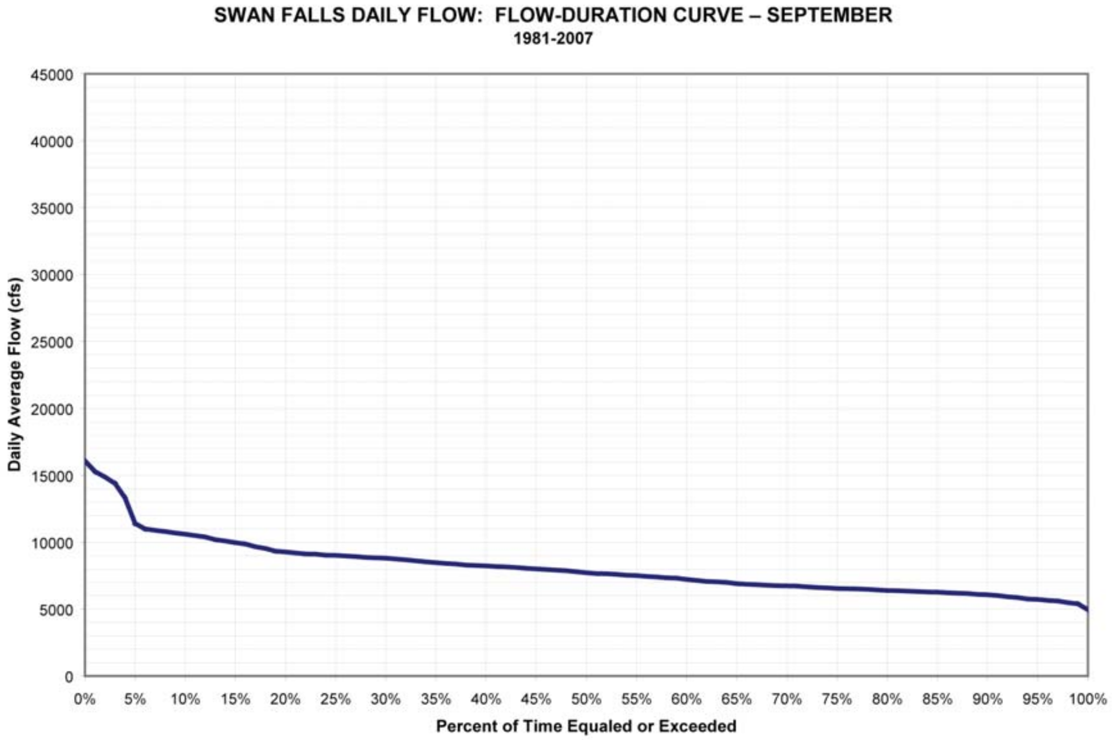


Figure B-10 **Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record September 1981–September 2007).**

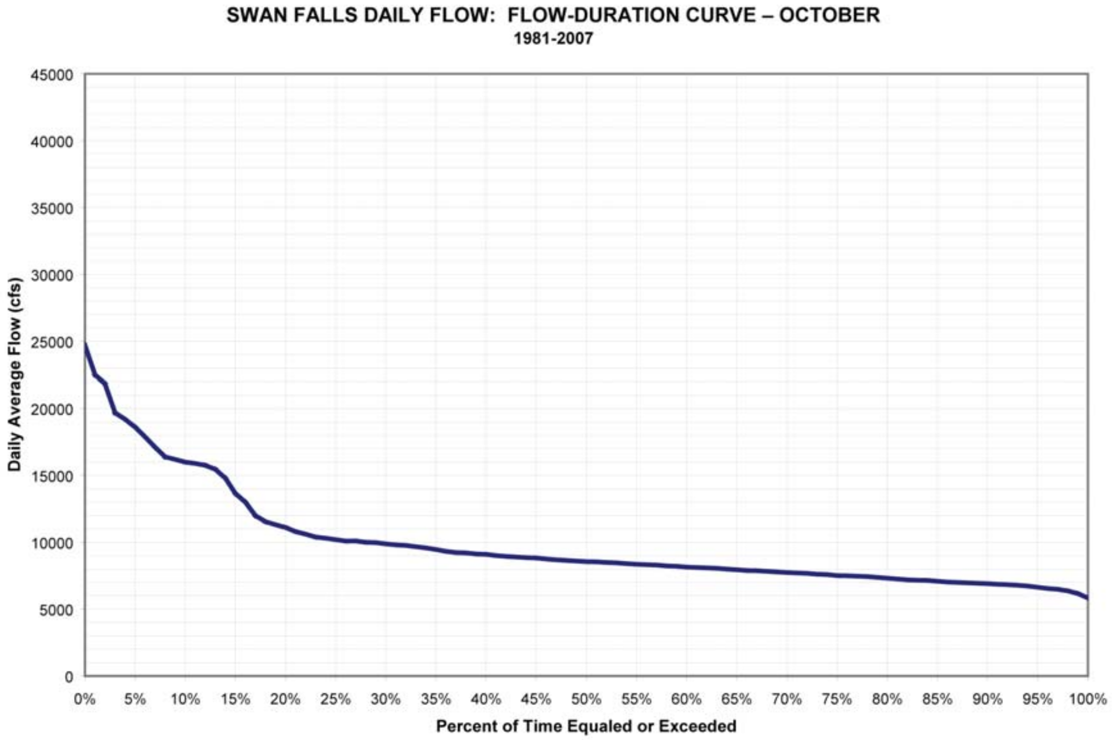


Figure B-11 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record October 1981–October 2007).

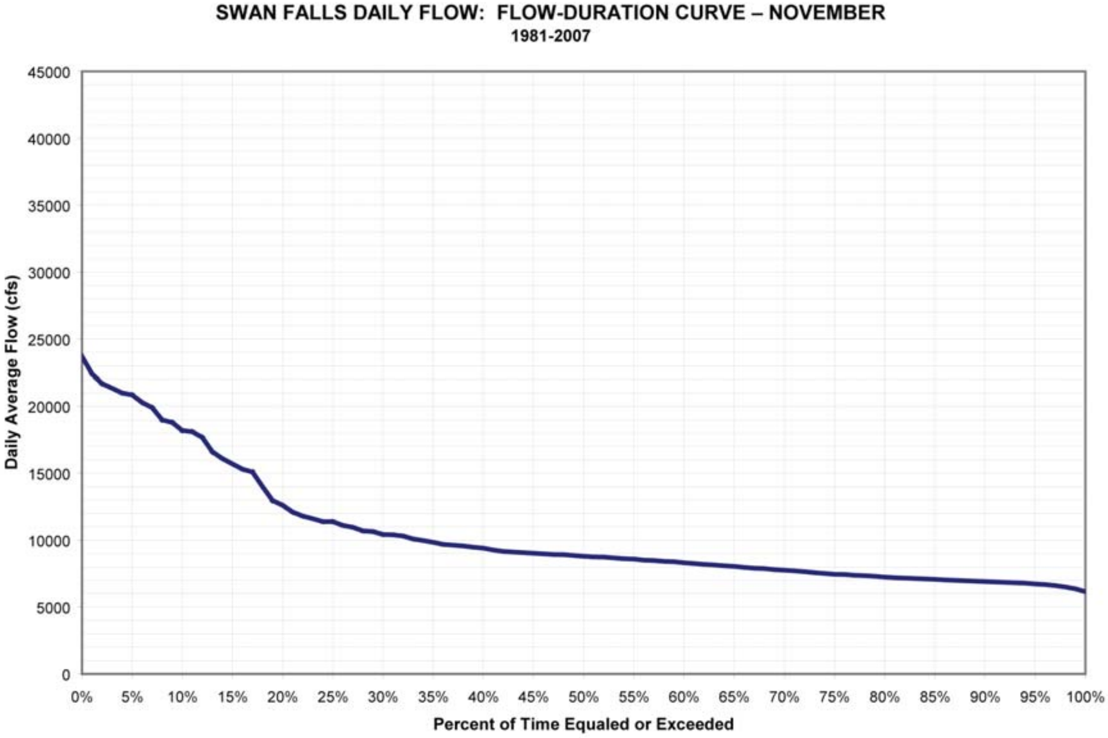


Figure B-12 Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record November 1981–November 2007).

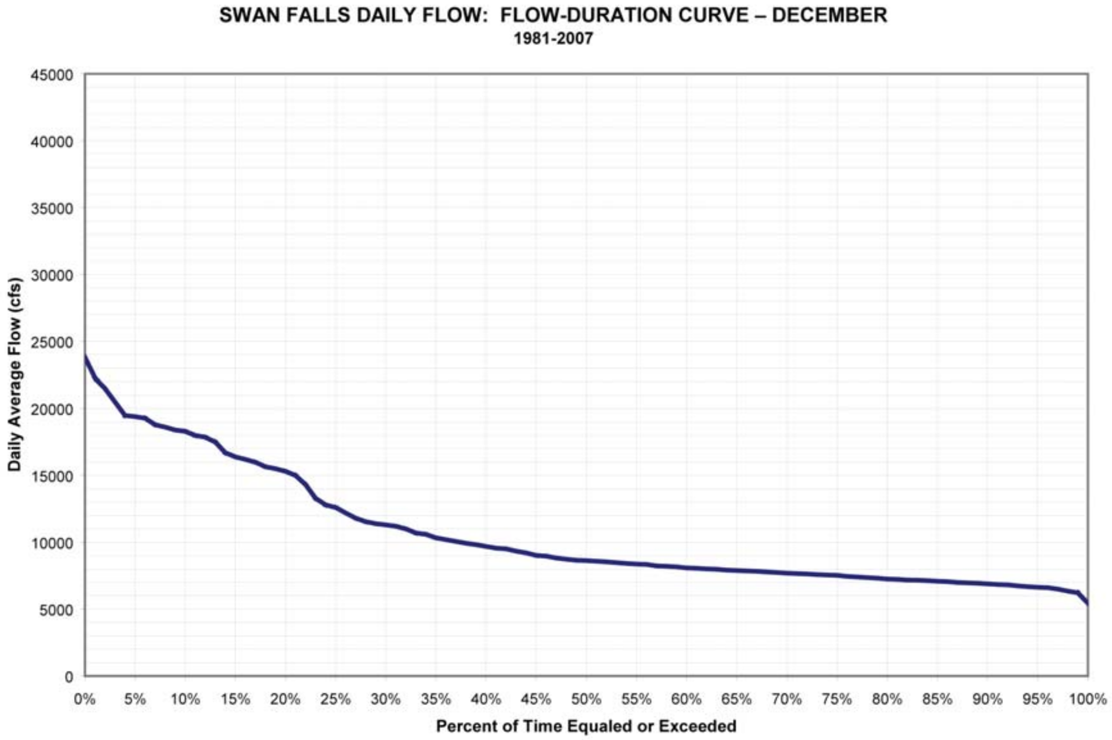


Figure B-13 **Flow-duration curve for the Snake River near Murphy, Idaho gauging station (period of record December 1981–December 2007).**

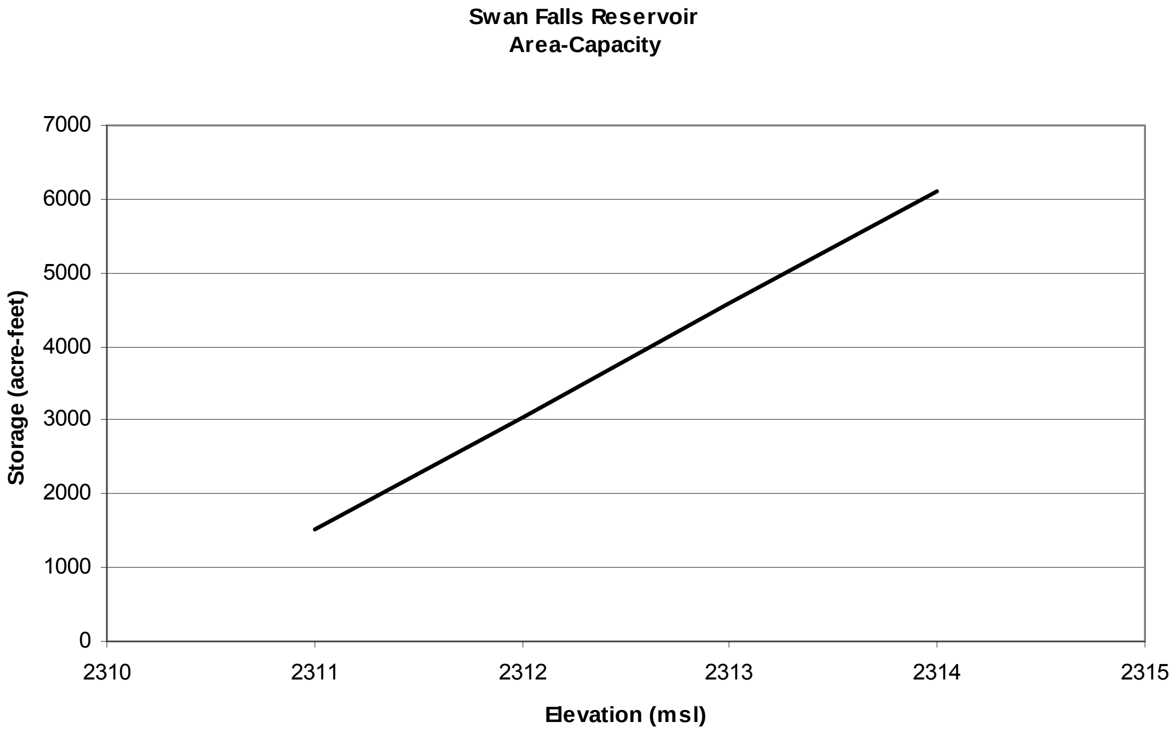


Figure B-14 Area-capacity curve for the Swan Falls Project.

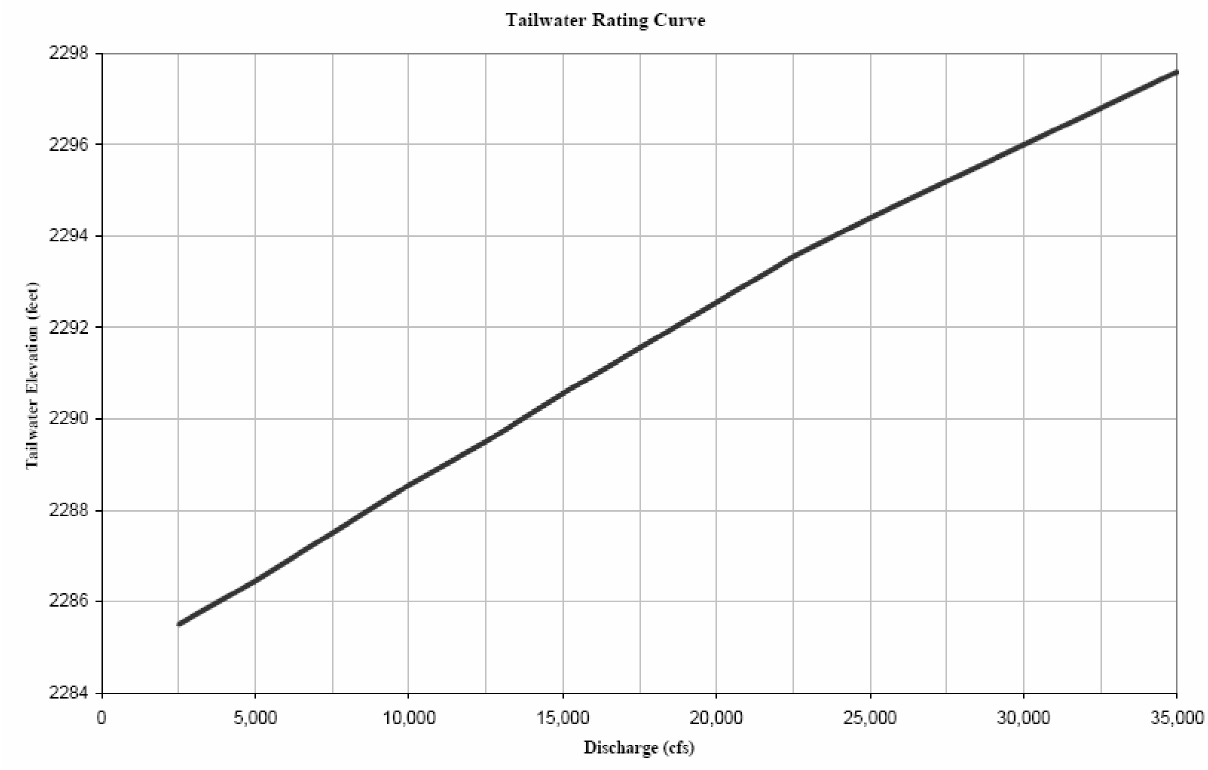


Figure B-15 Tailwater rating curve for the Swan Falls Project.

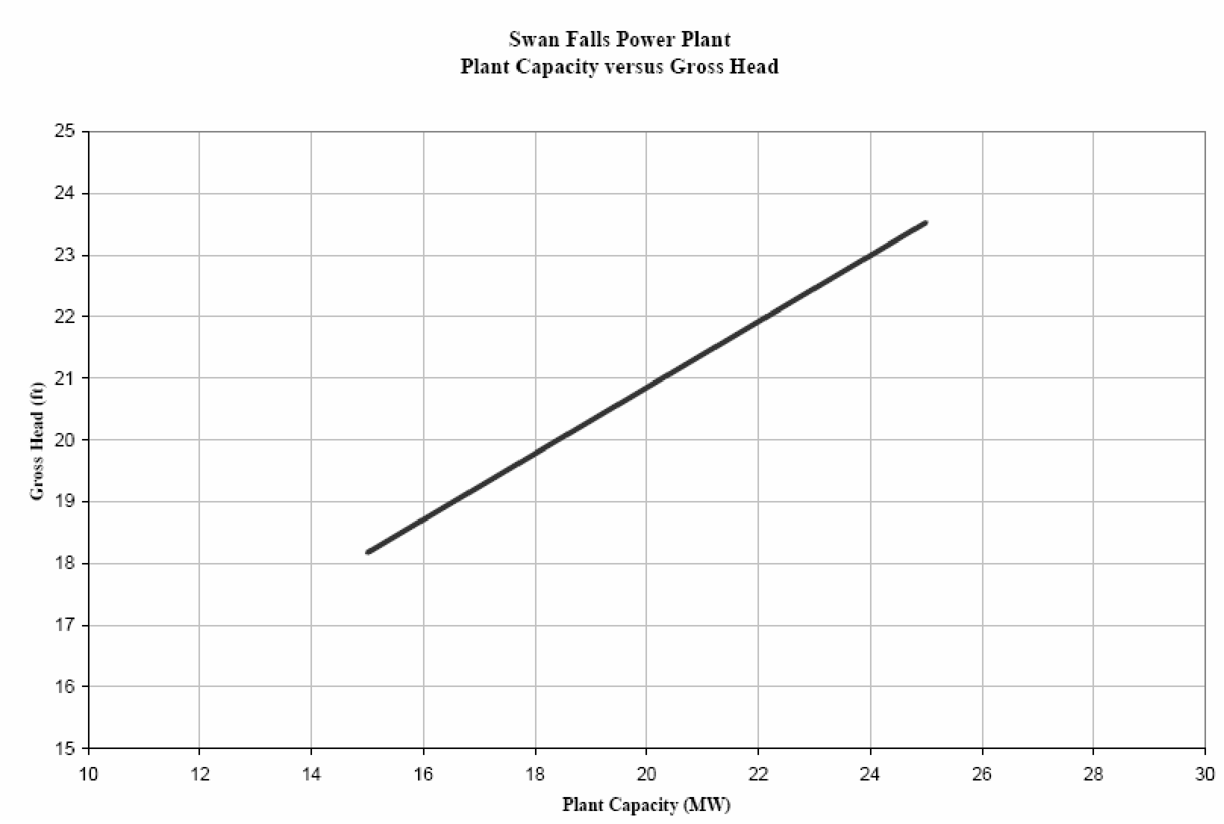


Figure B-16 Plant capacity versus gross head curve for the Swan Falls Project.

Swan Falls Project
FERC No. 503
License Application

Exhibit C
Construction History and Proposed Construction Schedule

The *Code of Federal Regulations* below—18 CFR § 4.51(d)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(d) Exhibit C is a construction history and proposed construction schedule for the project. The construction history and schedules must contain:
>
> (1) If the application is for an initial license, a tabulated chronology of construction for the existing project's structures and facilities described under paragraph (b) of this section (Exhibit A), specifying for each structure or facility, to the extent possible, the actual or approximate dates (approximate dates must be identified as such) of:
>
> (i) Commencement and completion of construction or installation;
>
> (ii) Commencement of commercial operation; and
>
> (iii) Any additions or modifications other than routine maintenance; and
>
> (2) If any new development is proposed, a proposed schedule describing the necessary work and specifying the intervals following issuance of a license when the work would be commenced and completed.

C.1. CONSTRUCTION HISTORY

The Swan Falls Project was the first dam built on the Snake River. The site was first dammed for power generation by The Trade Dollar Consolidated Mining Company of Silver City, Idaho, in 1901. The early dam was a crib-type dam and was constructed by bolting timbers to the rock bottom, filling in behind them with rock, and then covering the crib with timber planking. The power was generated with three 300-kilowatt (kW) generators that used a shaft and belt system to connect to four vertical turbines. Since then, the plant, dam, and spillway have undergone several additions, modifications, and reconstructions. The most recent reconstruction to the spillway occurred in 1986 when the spillways were completely reconstructed. The most recent reconstruction to the powerhouse occurred in 1994 when the powerhouse was rebuilt and two modern, 1,250-kW Kaplin-type turbines were constructed. At that time, all of the old turbines and generators were decommissioned. The following outlines the project's construction, commencement of commercial operation, major repairs, and upgrades:

Description of Work	**Year of Completion**
Installation of the crib dam and powerhouse with three 300-kW units	1901
Addition of a powerhouse with two 700-kW units	1907
Addition of a powerhouse with two 1,282.5-kW units	1910
Reconstruction of the original 1901 powerhouse, installation of two 1,250-kW units, and removal of the three original 300-kW units	1913
Reconstruction of the original crib dam	1917
Addition of two 1,250-kW units in the reconstructed 1901 powerhouse, addition of four 800-kW units, and removal of the two 700-kW units	1918

Description of Work	Year of Completion
Installation of a new concrete spillway with tainter gates to replace a section of the original crib dam	1920
Construction of an embankment at the west abutment to replace a section of the original crib dam and extension of the concrete spillway	1936
Replacement of two 1,282.5-kW units in the 1910 powerhouse with two 1,100-kW units	1944
Removal of the original spillway and construction of a new spillway	1986
Reconstruction of the powerhouse to add two 1,250-kW, Kaplin-type generators	1994
Synchronization of the new powerhouse and declaration of the plant as being commercial	1994
Rehabilitation of Unit 1	2000
Rehabilitation of Unit 2	2002
Installation of a secondary trash rake	2007

C.2. NEW DEVELOPMENT

The Applicant has no plans for new development at the Swan Falls Project.

Swan Falls Project
FERC No. 503
License Application

Exhibit D
Statement of Costs and Financing

The *Code of Federal Regulations* below—18 CFR § 4.51(e)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(e) *Exhibit D* is a statement of costs and financing. The statement must contain:
>
> (1) If the application is for an initial license, a tabulated statement providing the actual or approximate original cost (approximate costs must be identified as such) of:
>
> (i) Any land or water right necessary to the existing project; and
>
> (ii) Each existing structure and facility described under paragraph (b) of this section (Exhibit A).
>
> (2) If the applicant is a licensee applying for a new license, and is not a municipality or a state, an estimate of the amount which would be payable if the project were to be taken over pursuant to section 14 of the Federal Power Act upon expiration of the license in effect [*see* 16 U.S.C. 807], including:
>
> (i) Fair value;
>
> (ii) Net investment; and
>
> (iii) Severance damages.
>
> (3) If the application includes proposals for any new development, a statement of estimated costs, including:
>
> (i) The cost of any land or water rights necessary to the new development; and
>
> (ii) The cost of the new development work with a specification of:
>
> (A) Total cost of each major item;
>
> (B) Indirect construction costs such as costs of construction equipment, camps, and commissaries;
>
> (C) Interest during construction; and
>
> (D) Overhead, construction, legal expenses, taxes, administrative and general expenses, and contingencies.
>
> (4) A statement of the estimated average annual cost of the total project as proposed, specifying any projected changes in the costs over the estimated financing or licensing period if the applicant takes such changes into account, including:
>
> (i) Cost of capital (equity and debt);
>
> (ii) Local, state, and federal taxes;
>
> (iii) Depreciation or amortization; and
>
> (iv) Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies.
>
> (5) A statement of the estimated annual value of project power, based on a showing of the contract price for sale of power or the estimated average annual cost of obtaining an equivalent amount of power (capacity and energy) from the lowest cost alternative source, specifying any projected changes in the cost of power from that source over the estimated financing or licensing period if the applicant takes such changes into account.
>
> (6) A statement specifying the source and extent of financing and annual revenues available to the applicant to meet the costs identified in paragraphs (e)(3) and (4) of this section.

D.1. ORIGINAL COST OF THE SWAN FALLS PROJECT

Because this application is not the initial license application, no statement of original cost is required.

D.2. AMOUNT PAYABLE IF THE SWAN FALLS PROJECT IS TAKEN OVER

Estimates of fair value, net investment, and severance damages are provided below. The estimates of fair value and severance damages are preliminary and subject to revision, as necessary, to reflect changing conditions and to include the results of analyses that cannot be performed at this time. The measure of compensation that would be paid to the Applicant if the Swan Falls Project were taken over is uncertain, because no project has been taken over since the enactment of the

Federal Water Power Act in 1920; hence, there is no precedent to guide this determination. The Applicant believes that, under applicable law, it should be entitled to just compensation or fair value in the event the Swan Falls Project were taken over. However, the Applicant believes that a takeover would be detrimental to both the Applicant and its customers, regardless of compensation received.

D.2.1. Fair Market Value

In determining fair market value, courts generally give consideration to such criteria as the cost of reproducing the property, its market value, and the resulting damage to the remaining property of the owner. The fair market value should be determined at the time of the taking and reflect the highest price for which the property, considered at its best and most profitable use, can be sold in an open market by a willing seller to a willing buyer. The fair market value of an electric generating project may be influenced by a number of factors, including the replacement cost of equivalent capacity, the cost of purchasing an equivalent amount of power under contract, and any operating limitations that may affect output.

Based on evaluations of the possible alternatives for the existing Swan Falls Project, construction of new, combined-cycle gas generating resources is likely the least expensive and most feasible alternative. All other alternatives were considered to be more costly than a combined-cycle gas generating facility, or not feasible for other reasons. The Applicant’s current estimate of the cost of replacement power, based on natural gas generation, is $214.6 million. However, the Applicant believes that a definitive estimate of fair market value should be deferred until it becomes apparent that a recommendation for federal takeover will be made in this proceeding. If and when such a recommendation is made, the Applicant will prepare a final estimate based upon the facts and circumstances in existence at that time. In addition, the Applicant believes that the Federal Energy Regulatory Commission (FERC) would be required to conduct an evidentiary hearing to support any determination of fair market value, net investment, and severance damages.

D.2.2. Net Investment

Typically defined as the net book value, net investment includes historical costs minus the accumulated depreciation. By this definition, upon expiration of the old license in 2010, the estimated net investment of the Swan Falls Project will be approximately $44.4 million. This estimate includes the actual net investment balance at the end of 2006, plus additional investments planned between 2007 and 2010, less estimated depreciation on the Swan Falls Project between 2007 and 2010.

D.2.3. Severance Damages

Severance damages may exceed $170.2 million, which includes the present value to obtain replacement power over the new license period, minus the present value of the estimated cost to continue operating the existing project over the same period. This estimate also includes $4.2 million incurred in the years leading up to 2010 to prepare the license application for renewal. The Applicant would expect to be compensated for these costs if the Swan Falls Project were to be taken over upon expiration of the license.

The estimate for severance damages is a partial estimate because it does not include costs associated with the decreased value of replacement power sources to the Applicant's remaining system or the decrease in the Applicant's current competitive advantage caused by its reliance on higher, marginal-cost resources for replacement power. If the Swan Falls Project were taken over, the government would assume these costs. The cost of each of these factors may be substantial. The Applicant did not attempt to estimate these costs at this time because to do so would require too much speculation as to future conditions to produce a useful estimate. As explained above, if and when a federal takeover recommendation is made, the Applicant would prepare a more definitive estimate of all severance damages for consideration at a hearing.

D.3. ESTIMATED COST FOR NEW DEVELOPMENT

Because the Applicant proposes no new development, no estimated costs are applicable.

D.4. ESTIMATED AVERAGE ANNUAL COST OF THE SWAN FALLS PROJECT

The estimated average annual cost of the Swan Falls Project includes cost of capital, operation and maintenance (O&M), property taxes, and other expense components. The annual estimated cost of capital component of the Swan Falls Project represents levelized costs over a 30-year period (2010–2039) and is the Applicant's estimated annual revenue requirement. Estimated yearly O&M, property taxes, and other expenses are derived from the averages of the annual escalated cash outflows expected over the license period. Because these estimates are based on current information, they could change as new information is obtained. The economic parameters used in the estimations include the following: 1) an escalation rate of 3% based on an annual trend forecast of consumer price inflation, 2) a discount rate of 7.16% based on the Applicant's authorized capital structure, and 3) an assumed 30-year license period.[1]

D.4.1. Cost of Capital

The Applicant's historical weighted average cost of capital, 8.1%, is based on a capital structure and rate of return as set forth in Idaho Public Utilities Commission IPUC Order No. 30035. The components of annual carrying charges and depreciation, along with state and federal income taxes, are summed to figure cost of capital. These components are based on an estimate of the following: 1) remaining net project investment at the time the original license expires, 2) capital costs accumulated to prepare the application for new license, and 3) capital costs for proposed new and existing protection, mitigation, and enhancement (PM&E) measures. Given the costs of the various components, the annual levelized cost of capital for the Swan Falls Project is approximately $5.2 million (in 2010 dollars) over the assumed 30-year period. The annual levelized cost of capital for proposed new and existing PM&E measures is $0.1 million (in 2010 dollars). Descriptions for proposed new and existing PM&E measures are included in Exhibit E and the PM&E Appendix.

---

[1] The Applicant is not proposing a 30-year license period. However, to be consistent with FERC's methodology for evaluating costs and for the purpose of defining a time period for its analysis, the Applicant chose the lower limit of FERC's discretion for setting a new license term.

The Applicant has also provided the estimated total cost of capital, with no assumed escalation, over the assumed 30-year license period. The base year used for cost-estimating purposes is 2010. Table D-1 summarizes the various components of total cost of capital for the Swan Falls Project.

D.4.2. Local, State, and Federal Taxes

State and federal income taxes have been included in the Applicant's cost of capital (see section D.4.1), and were calculated using a 20-year modified accelerated cost recovery system depreciation (MACRS) with a composite tax rate of 39.1%.

Local property and kilowatt-hour (kWh) taxes are paid to taxing authorities in Idaho. The basis used to determine property taxes is assessed property value. The Applicant estimated the average annual property taxes for the Swan Falls Project using a 0.391% property tax rate applied to project investment. The results were then escalated at an annual trend of consumer price inflation (3%). Average annual estimated property taxes, based on existing investment and proposed PM&E measures, are $0.5 million.

The Applicant is subject to a kWh tax, which is assessed on all electricity generated by means of hydropower in Idaho. The Applicant estimated annual kWh taxes based on the average annual amounts paid to the taxing authorities over the last five operating years (2002–2006). The average annual kWh taxes paid to the State of Idaho that are attributed to generation from the Swan Falls Project were approximately $45,000. No escalation has been applied to this estimate because the tax is based on a fixed rate set by Idaho law.

D.4.3. Depreciation

The annual cost of capital (see section D.4.1) includes a depreciation component to account for recovery of investment.

D.4.4. Expenses

Expenses for the Swan Falls Project are composed of O&M expenses, insurance cost, and annual FERC charges. Average annual escalated expenses, including estimated PM&E expenditures, are $1.2 million for O&M, $0.2 million for insurance, and $0.1 million for annual FERC charges. The total annual estimate of future expenses over the assumed 30-year license period is, therefore, $1.5 million (in 2010 dollars) per year.

The Applicant estimated annual O&M expense for the Swan Falls Project by averaging actual expenses from the previous five operating years (2002–2006). The resulting value was then escalated at an annual trend forecast rate of consumer price inflation (3%). The average annual escalated O&M outlays expected from the proposed PM&E measures were then added to this number to determine the total average annual O&M expense for the Swan Falls Project. Insurance estimates are based on the 2006 premium amounts escalated at 3% annually. Estimated annual fees to FERC are based on the average annual fees paid over the last five operating years and escalated at 3% annually.

The Applicant has also provided total expenses over a 30-year period with no assumed inflation. The base year used for cost-estimating purposes is 2010. Table D-2 summarizes the various expense components for the Swan Falls Project.

D.5. VALUE OF THE SWAN FALLS PROJECT'S POWER

One way of calculating the annual value of the Swan Falls Project's power can be based on the estimated cost of procuring an equivalent amount of power (capacity and energy) within the Applicant's service area. This cost, based on current costs for new, combined-cycle natural gas generating resources, is estimated to be $16.8 million per year. This amount includes the levelized cost of capital and annual average escalated fuel and other expenses for the natural gas facilities over a 30-year period.

An alternative valuation for the power from the Swan Falls Project can be based on the price that the Applicant receives for the sale of the power to its customers. Since the Applicant's rates are set by the IPUC based on the cost of service, the value of power generated by the Swan Falls Project can be equated with the annual capital and O&M costs (i.e., the costs that the Applicant is allowed to recover from its customers) identified above.

D.6. SOURCES OF FINANCING AND ANNUAL REVENUES

Past performance has proven that the Applicant’s sources of financing and annual revenues are sufficient to meet the continuing O&M requirements of the Swan Falls Project. A copy of the Applicant’s annual report to its shareholders is included in Technical Report H.9-A. Also, the Applicant submits the FERC Form 1 annually.

This page left blank intentionally.

Table D-1 Estimated Swan Falls Cost of Capital—30 Years

	($ in Millions)		
	Escalation Applied @ 3%	**No Escalation**	**30-Year Levelized**
Existing Project Investment	120.3	120.3	4.6
Committed Construction (2007–2010)	0.3	0.3	0.0
Relicensing Study and Prep Costs	10.7	10.7	0.5
Existing PM&Es	0.0	0.0	0.0
Proposed PM&Es	3.7	3.3	0.1
Total Cost of Capital	135.0	134.6	5.2

Table D-2 Estimated Swan Falls Expenses—30 Years

	($ in Millions)					
	Total Expenses No PM&Es (30 Yrs)		**Total Expenses Existing PM&Es (30 Yrs)**		**Total Expenses Existing and Proposed PM&Es (30 Yrs)**	
	Escalation Applied @ 3%	**No Escalation**	**Escalation Applied @ 3%**	**No Escalation**	**Escalation Applied @ 3%**	**No Escalation**
O&M	18.7	16.3	25.8	20.3	35.7	26.3
FERC Fees	3.3	2.1	3.3	2.1	3.3	2.1
Insurance	5.8	3.7	5.8	3.7	5.8	3.7
Property Taxes	14.0	8.8	14.0	8.8	14.2	8.8
kWh Taxes	1.3	1.3	1.3	1.3	1.3	1.3
Total Expenses	43.1	32.2	50.2	36.2	60.3	42.2
Average Annual Expenses	1.4	1.1	1.7	1.2	2.0	1.4

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Exhibit E
Environmental Report

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(1)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f) *Exhibit E* is an Environmental Report. Information provided in the report must be organized and referenced according to the itemized subparagraphs below. *See* § 4.38 for consultation requirements. The Environmental Report must contain the following information, *commensurate with the scope of the proposed project*:
>
> (1) *General description of the locale*. The applicant must provide a general description of the environment of the project and its immediate vicinity. The description must include general information concerning climate, topography, wetlands, vegetative cover, land development, population size and density, the presence of any floodplain and the occurrence of flood events in the vicinity of the project, and any other factors important to an understanding of the setting.

E.1. GENERAL DESCRIPTION OF LOCALE

The Swan Falls Hydroelectric Project is located approximately 35 miles south of Boise, Idaho, on the Snake River in Ada and Owyhee counties. The project occupies lands of the United States within the Snake River Birds of Prey National Conservation Area (NCA), which is administered by the Department of the Interior, Bureau of Land Management (BLM). There are no other developments in the immediate vicinity of the project. The closest hydroelectric projects are C.J. Strike, about 36 river miles upstream, and Brownlee, about 173 river miles downstream. Access to the Swan Falls Hydroelectric Project is by county road from the town of Kuna, located approximately 19 miles north of the project.

The Snake River flows generally from the south to north at Swan Falls. The existing project was constructed on the upstream edge of waterfalls caused by a ridge of basalt extending across the river. The average drop across the falls is approximately 15 feet. Swan Falls Reservoir is a long and narrow water body confined within the canyon through which the Snake River flows; the reservoir extends upstream approximately 12 miles from the dam (Figure E.1-1). At a normal surface water elevation of 2,314 feet above mean sea level (msl), the reservoir has a surface area of approximately 1,525 acres and a capacity of approximately 7,425 acre-feet.

E.1.1. Hydroelectric Facility

The Swan Falls Project is considered a run-of-river project. That is, the reservoir is not used to store water on a seasonal basis. The available reservoir storage is used to reregulate inflows resulting from operations of the upstream C.J. Strike Project so that the existing ramping rate restriction below the Swan Falls Project is maintained. Daily average discharges presented in Figure E.1-2 illustrate a strong correlation between the measured flows below the C.J. Strike and

Swan Falls projects. This linear relationship shows that the daily average project inflows are nearly equal to the daily average project outflows, further indicating that Swan Falls Reservoir is not used for storage.

E.1.2. Transmission Lines

The Swan Falls Power Plant is connected to the interconnected transmission system by a 138-kilovolt (kV), wood pole H-frame transmission line (Swan Falls Tap [Line 954]). The Swan Falls Tap extends east from the power plant for 1.2 miles, rising out of the canyon and across the plain, to connect with the Strike Junction–Caldwell 138-kV transmission line (Line 920). The Swan Falls Tap was built in 1993 to accommodate increased power production resulting from a major modification of the Swan Falls Power Plant (see Exhibit A about construction of the new powerhouse). Those portions of the Swan Falls Tap located on federal lands are permitted by a BLM right-of-way (ROW) grant. The ROW is 50 feet, 25 feet on either side of the centerline. The BLM grant expires in 2013. The Swan Falls Tap serves no other purpose than to transmit power from the power plant to the interconnected transmission system.

E.1.3. Climate

Hot, dry summers and mild winters characterize the climate of southwestern Idaho. The climate is strongly influenced by the orographic precipitation shadow of the Oregon Coast Range and the Cascade Mountains to the west and the Owyhee Mountains to the south. Average annual precipitation at the Boise Airport is 302 millimeters (mm) (11.9 inches), declining towards the west and south (Kuna, 259 mm [10.2 inches]; Swan Falls Powerhouse, 201 mm [7.9 inches]; and Grand View, 181 mm [7.1 inches]), with most precipitation occurring between November and May (Figures E.1-3A and E.1-3B). Mean annual temperatures vary between 9.9 °C (49.8 °F) at Kuna to 12.9 °C (55.2 °F) at the Swan Falls Powerhouse (Figures E.1-3A and E.1-3B). Droughts are common in southwestern Idaho, occurring approximately every 20 years since 1900 (USGS 1996).

E.1.4. Topography

The study area and vicinity are on the southwestern portion of the Snake River Plain. The Snake River Canyon bisects the plain and is the principal physiographic feature of the study area. Cliffs and sheer canyon walls range in height from 6 to 375 feet, with the river cutting as much as 750 feet below the surrounding terrain (USGS 1996). Elevation of the canyon near Swan Falls Dam, where the canyon is deepest, ranges from 2,100 feet above msl at the canyon floor to 2,760 feet at the rim. North of the river, the terrain is relatively flat or slightly rolling except for isolated buttes. Areas south of the river are characterized by rolling topography and eroded badlands.

E.1.5. Geology

The geology of the western portion of the Snake River Plain is characterized by thick accumulations of geologically recent basalt flows interbedded with sedimentary strata of lake and stream origins. During the late Miocene and early Pliocene epochs, about 5 to 10 million years ago according to uniformitarian dating assumptions, large volumes of silicic rocks were extruded on a highly eroded topography along the axis of the Owyhee Mountains. During the late stage of eruption, powerful tensional stresses caused major faulting along the northern and southern edges of the area that would later become the Snake River Plain. Deposition of a thick sequence of clay, silt, and sand began in an extensive, shallow lacustrine environment in the western portion of the area. Silicic eruption continued sporadically, resulting in some interbedding. Subsidence and faulting continued along the northwest trend lines. During the middle Pliocene (about 4 million years ago), the basalt was extruded from widely separated vents. Volcanic vents near Sinker Creek and Rabbit Creek erupted into the shallow lakes and ponds and became interbedded with the sedimentary deposits.

In the late Pliocene (about 2 to 3 million years ago), erosion created a hummocky topography. Encroachment of a large lake began during the upper Pliocene. Granitic silt and sand, volcanic ash, and basaltic sand were deposited in this lake, which extended from east of Hagerman, Idaho, to beyond the western border of Idaho. These sediments were destined to become the upper part of the Idaho Group. Deep canyons and gullies eroded into the soft sediments that were several thousand feet thick.

During the early and middle Pleistocene, basalt erupted again from a series of vents that ran roughly parallel to the present course of the Snake River and filled many of the canyons and gullies. The extensive basalt accumulations, damming the Snake River at several locations, created many small lakes. Many of these lakes were filled with fine-grained sediments eroded from surrounding lands. During the late Pleistocene when deposition slowed, the Snake River began cutting its channel down to its present level. Another short volcanic episode occurred at this time, primarily in the northern portion of the province. The basaltic lava (Snake River Basalt) that was extruded at that time was very fluid and covered much of the area north of the present course of the Snake River. The most recent flow was approximately 1,000 years ago.

During approximately the last 10,000 years, erosion has created talus and alluvium along streams and resulted in the accumulation of thin deposits of windblown sand and silt on some flatter areas. Floodplains are currently being formed along the Snake River and a few of the larger tributary streams.

The catastrophic Bonneville Flood, which was caused by overflow and the rapid lowering of Pleistocene Lake Bonneville at Red Rock Pass near Preston, Idaho, took place 18,000 to 30,000 years ago and reached the Snake River Plain at the site of Pocatello (Malde 1968). The flood path closely followed the present Snake River. Total volume of the flood was estimated at 380 cubic miles (Malde 1968). The flood significantly affected the physiography of the study area. The narrow canyon neck upstream of Swan Falls Dam, which acted as a hydraulic dam, impounded floodwater in the Grand View basin. The lake at Grand View was the final trap for flood debris from sources upstream. Calculations at the narrow canyon neck suggest a discharge of 15 million cubic feet per second (cfs) at this location. In the stretch of canyon downstream of the constriction, the canyon floor is devoid of flood debris because of the high flow velocities, but the flood did not appreciably deepen the canyon. Several miles downstream of the constriction, where the canyon widens and flows decreased, debris was deposited by the floodwater, forming groups of bars of colossal size. This debris is known by its descriptive geologic name, Melon Gravel. These “gravels” are commonly larger than 5 feet and originated from local basaltic flows.

E.1.6. Soils

The benchlands north of the Snake River are on a broad basalt plain with several isolated cinder cones and basaltic buttes. The soils are generally light-colored, fine-textured to stony soils that have developed on basalt, sedimentary strata, and wind-modified deposits (loess). Most soils are Aridisols that developed in loess or silty alluvium and are young with a weak definition of horizons. Soils that have been mapped in the upland areas include the Terrby-fill-Cencove-Feltham Association, the Trevino-Potraz complex, and the Trusdale fine sand loam. The soils along the river and floodplain of the Snake River vary from deep loams in the Chattin Flat area to thin gravelly and cobbly soils on gravel bars and low terraces. Soils that have been mapped along the Snake River channel and alluvial plain include the Bram, Baldock, Vanderhoff, and Feltham series.

Soils in the transition zone between the bottom soils and the upland soils are variable, ranging from deep silty and sandy loams on high terraces and colluvium to terrace escarpments and rubble land. Soil units that have been mapped in the sloping land between the Snake River channel and the uplands include Terrace Escarpment, Very Stony Land, Rubble Land, Vanderhoff series, Feltham–Rubble Land complex, and Brent–Ladd complex.

E.1.7. Vegetative Cover

The history of landscape-level vegetation changes in southwest Idaho has also been well-studied and documented. By 1900, the pre-settlement sagebrush (*Artemisia tridentata*) steppe habitat of the Snake River Plain had been significantly modified by excessive livestock grazing and other disturbance factors (Quinney 1999, Yensen 1982). Non-native, invasive plant species were introduced to the area, most likely beginning in the late 1800s with Russian thistle (*Salsola kali*), which spread via the Snake River (Yensen 1982). By the 1930s, cheatgrass (*Bromus tectorum*), an exotic winter annual, was well established in the understory of the shrub steppe in southern Idaho (Quinney 1999). By providing a readily ignitable, nearly continuous carpet of vegetative material across the landscape, cheatgrass became a major factor in increasing both the frequency and intensity of wildfires on the Snake River Plain. Consequently, as wildfires have increased, native plant species have been displaced by more weeds—weeds that thrive in the early-seral, disturbed conditions brought about by frequent fires (West 1999).

The NCA reflects these past and ongoing influences. Much of the original sagebrush steppe habitat has been reduced to shrubless stands of exotic annual species; many of the remaining sagebrush stands contain understories dominated by early-seral native and exotic grasses, generally devoid of any significant native forb layer (Quinney 1999). A comprehensive vegetation study of a portion of the NCA conducted by the United States Geological Survey (USGS) showed that, in the relatively short period between 1979 and 1994, shrub-steppe coverage on the NCA decreased from 51% to 30%, with a corresponding increase in grassland coverage (USGS 1996). Since 1994, much of the remaining shrub-steppe habitat has burned in various wildfires and currently contains primarily exotic grasses (Quinney 1999). The BLM notes that, between 1979 and 1984, the extent of sagebrush-dominated habitats in the NCA decreased by over 70% (BLM 2006).

For the project area specifically, two previous studies provide information on existing riparian plant communities and their distribution. Neither of these studies addressed upland vegetation. The nearest Applicant hydroelectric facility to Swan Falls is the C.J. Strike Project, located approximately 36 river miles upstream. As part of the relicensing process for the C.J. Strike Project, the Applicant conducted a number of studies on the botanical resources of the C.J. Strike Project study area. One of these studies (Wulforst et al 2000) mapped and described riparian vegetation along the Snake River from Grand View, Idaho (16 river miles above the Swan Falls study area), to Swan Falls Dam, taking in the entire upstream reach of the present investigation. The study described nine different vegetation associations (assemblages) within the four riparian cover types delineated in their study area.

Below Swan Falls Dam, Dixon and Johnson (1999) studied general riparian vegetation along the Snake River, from the dam downstream to the Idaho–Oregon border. Although Dixon and Johnson did not describe specific vegetation assemblages, they did describe the overall floristic composition of riparian vegetation within the Swan Falls downstream reach. They also provided some general information on the extent of riparian cover types.

E.1.8. Land Development

The project area lies in a remote part of the state and nation. In 1971, the Secretary of the Interior designated approximately 26,311 acres of public land along the Snake River as the Snake River Birds of Prey Natural Area under Public Land Order 5133 (USGS 1996). During the 1970s, the BLM identified the importance of foraging habitat on the benchlands to birds of prey nesting in the canyon. Based on this information, the Secretary of the Interior established the Snake River Birds of Prey Area under Public Land Order 5777 in 1980. On August 4, 1993, Congress enacted Public Law 103-64 providing permanent protection to the area, which was renamed the Snake River Birds of Prey National Conservation Area (NCA). According to the Act, the 484,873-acre area was established "to provide for the conservation, protection and enhancement of raptor populations and habitats and the natural and environmental resources and values therewith, and the scientific, cultural, and educational resources and values of the public lands in the conservation area." The act also states: "Notwithstanding any provision of this Act, or regulations and management plans undertaken pursuant to its provisions, the Federal Energy Regulatory Commission shall retain its current jurisdiction concerning all aspects of the continued and future operation of hydroelectric facilities, licensed or relicensed under the Federal Power Act (16 U.S.C. 791a et seq.), located within the boundaries of the conservation area." Currently, the Snake River Birds of Prey NCA encompasses 483,706 acres (J. Sullivan, Snake River Birds of Prey NCA Manager, personal communication, July 21, 2004).

The Deer Flat National Wildlife Refuge (NWR) is located immediately north of the Swan Falls Study Area (Figure E.1-1). This refuge, founded by President Teddy Roosevelt on February 25, 1909, is one of the oldest refuges in the NWR System. Deer Flat NWR, managed by the U.S. Fish and Wildlife Service, provides an important breeding area for birds and mammals, as well as other wildlife. The refuge is also a significant resting and wintering area for birds migrating along the Pacific Flyway, including significant concentrations of mallards and Canada geese. Deer Flat NWR has been declared a Globally Important Bird Area by the American Bird Conservancy (http://www.fws.gov/deerflat/). Deer Flat NWR is composed of two sectors–Lake Lowell and the Snake River Islands. The Lake Lowell sector encompasses 10,588 acres, including the almost 9,000-acre Lake Lowell and surrounding lands. The Snake River Islands sector contains about 800 acres on 101 islands. These islands are distributed along 113 river miles from the Canyon–

Ada County Line in Idaho, to Farewell Bend in Oregon (http://www.fws.gov/deerflat/). Two refuge islands, Rail and Sign, are within the Swan Falls Study Area (Figure E.1-1).

Despite accessibility to the project by a good paved road from Kuna, the only other development within several miles of the project includes the county access road above the canyon to the north, minor recreational development, and several agricultural pump houses on the Owyhee County side of the reservoir.

E.1.9. Human Population Size and Density

The state's largest metropolitan area lies to the north of the project in Ada and Canyon counties. However, Owyhee County, within which the southern part of the project area lies, is one of the least-developed areas in the nation. According to the 2000 Census, the greater metropolitan area of Boise (the Boise Standard Metropolitan Statistical Area) had a population of approximately 430,000 people (U.S. Census Bureau 2007a). Ada County has had a growth rate of 46.2% since 1990—a very high rate. The county had a density of 285.2 people per square mile. Just downstream of the project, Canyon County had a 2000 population of 131,441, with a density of 222.8 people per square mile. Owyhee County, on the other hand, had a population of only 10,644, with a density of 1.4 persons per square mile (U.S. Census Bureau 2007b). The nearest population center to the project is the town of Kuna, in Ada County, having a 2000 population of 5,382.

E.1.10. Floodplain and Occurrence of Flood Events in the Project Vicinity

Flood Insurance Rate Maps have been prepared by the Federal Emergency Management Agency for Ada County, but not for Owyhee County. The steep and narrow canyon topography contains the river floodplain within a very narrow area immediately adjacent to the river. Few habitable structures lie in or near the project area. The Federal Energy Regulatory Commission has approved an Inflow Design Flood of 105,112 cfs for this project. The historic maximum daily flow between October 1, 1913, and September 30, 2003, was 46,100 cfs.

E.1.11. Project Operation

Typically, the power plant for the Swan Falls Project is remotely operated from the Applicant's Generation Dispatch Center in Boise. The generation dispatchers manually control the plant on a 24-hour basis. The Applicant has on-site plant operators on duty 8 hours a day. During off-duty hours, operators are on call to respond to alarms and unusual occurrences.

The power plant is normally operated to reregulate flows from the C.J. Strike Project to comply with the ramping rate restriction below Swan Falls. Although the Swan Falls Reservoir has minimal storage, it can be used to meet short-term, unexpected peak load requirements. Under these conditions, the project is still operated to comply with the ramping rate restriction at the ramping gauge. Normal maximum operating headwater is 2,314 feet msl, and minimum operating headwater is 2,310 feet msl.

LITERATURE CITED

Bureau of Land Management (BLM). 2006. Snake River Birds of Prey National Conservation Area: Draft resource management plan and environmental impact statement. U.S. Department of the Interior, BLM, Boise District Office, Boise, ID. ID-111-2006-EIS-1740.

Dixon, M .D., and W. C. Johnson. 1999. Riparian vegetation along the middle Snake River, Idaho: zonation, geographical trends, and historical changes. Great Basin Naturalist 59:18–34.

Malde, H. E. 1968. The catastrophic late Pleistocene Bonneville Flood in the Snake River Plain, Idaho. A study of colossal features of erosion and deposition produced along the Snake River by sudden overflow of Lake Bonneville. U.S. Government Printing Office, Washington, D.C. Geological Survey Professional Paper 596.

Quinney, D. 1999. Then and now: changes in vegetation and land use practices in Southwestern Idaho sagebrush lands, with emphasis on sagebrush and former sagebrush lands of the Snake River Birds of Prey National Conservation Area north of the Snake River. In: P. G. Entwistle, A. M. DeBolt, J. H. Kaltenecker, and K. Steenhof, compilers.

Proceedings—sagebrush steppe ecosystems symposium; 2000. Boise, ID. Bureau of Land Management Publication No. BLM/ID/PT-001001+1150. p. 91–97.

U.S. Census Bureau. June 16, 2007a. Your gateway to Census 2000. Available at: www.census.gov/main/www/cen2000.html. Accessed on: March 30, 2007.

U.S. Census Bureau. July 9, 2007b. State & county quickfacts. Available at: www.quickfacts.census.gov. Accessed on: March 30, 2007.

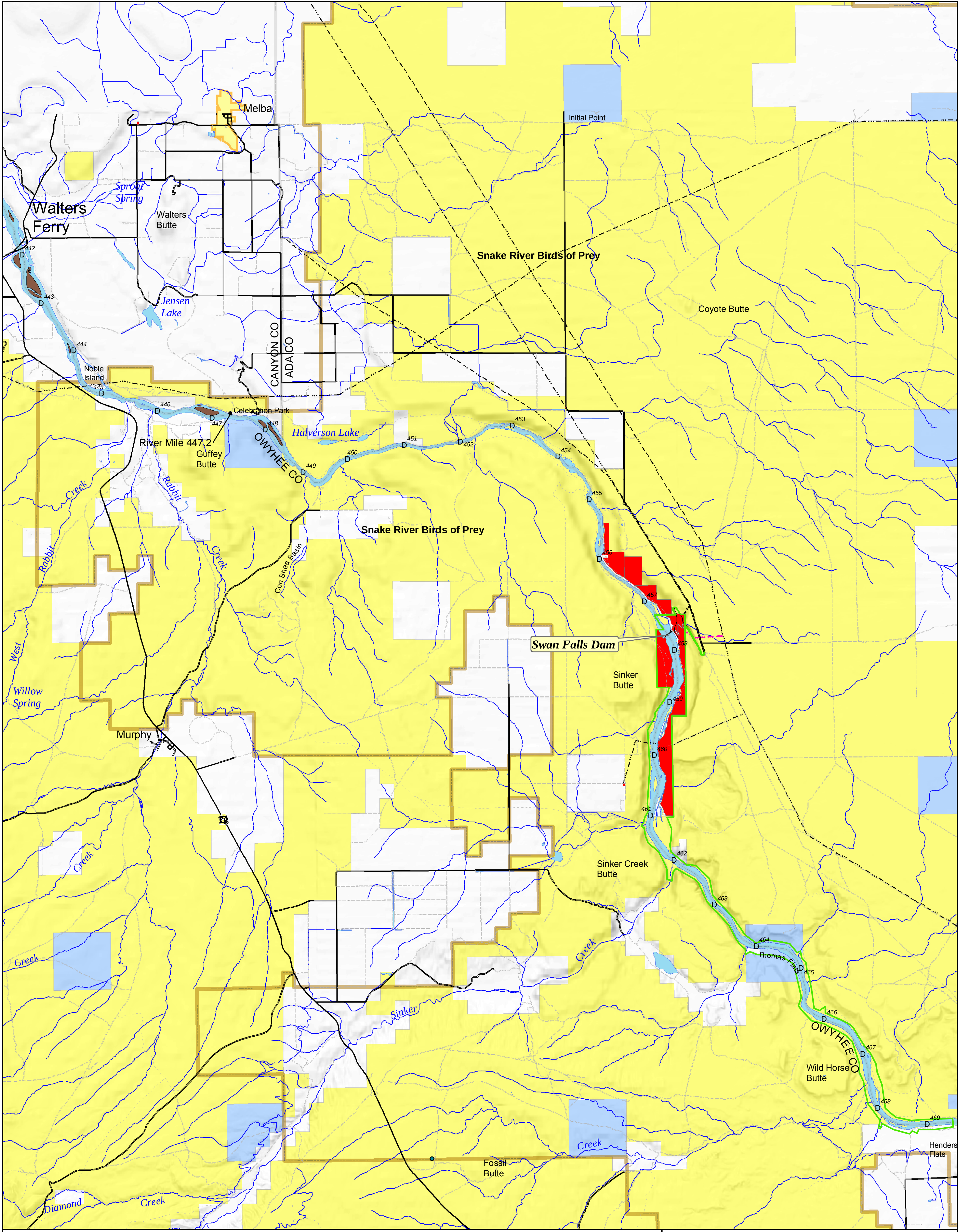
U.S. Geological Survey (USGS). 1996. Effects of military training and fire in the Snake River Birds of Prey National Conservation Area. Bureau of Land Management/Idaho Army National Guard research project final report. U.S. Department of the Interior, Geological Survey, Biological Research Division, Snake River Field Station, Boise, ID. 130 p.

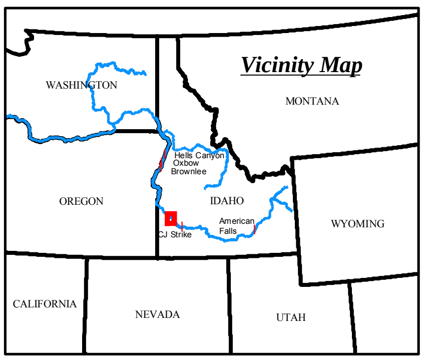
West, N. E. 1999. Synecology and disturbance regimes of sagebrush steppe ecosystems. In: P. G. Entwistle, A. M. DeBolt, J. H. Kaltenecker, and K. Steenhof, compilers. Proceedings—sagebrush steppe ecosystems symposium; 2000. Boise, ID. Bureau of Land Management Publication No. BLM/ID/PT-001001+1150. p. 15–26.

Wulforst, J., G. Annandale, and A. M. A. Holthuijzen. 2000. Terrestrial effects of load following. Response to the Federal Energy Regulatory Commission Additional Information Request No. 13. Idaho Power Company, Boise, ID.

Yensen, D. 1982. A grazing history of southwestern Idaho with emphasis on the Birds of Prey Study Area. U.S. Department of the Interior, Bureau of Land Management, Snake River Birds of Prey Research Project Report, Boise, ID. 82 p.

Theme: \\fresno\enviro_gis\terrestrial\swanfalls\fcp\mxds\SwanFalls_WaltersFerryMap.mxd





Features Legend

Transmission Line
Transmission Line - Swan Falls Tap
Primary Route
Secondary Route
Paved Road
Unpaved Road
Trail
National Wildlife Refuge Island
Birds of Prey
IPC Project Boundary
Water Body
Streams
D River Mile
🟥 Idaho Power Co Lands
🟨 BLM
🟦 STATE

IDAHO POWER
An IDACORP Company

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503
IDAHO POWER COMPANY, BOISE, ID 2004

Final License Application, Figure E.1.1

Location of the Swan Falls Study Area

0 0.45 0.9 1.8 2.7
Miles

02/20/08

This page left blank intentionally.

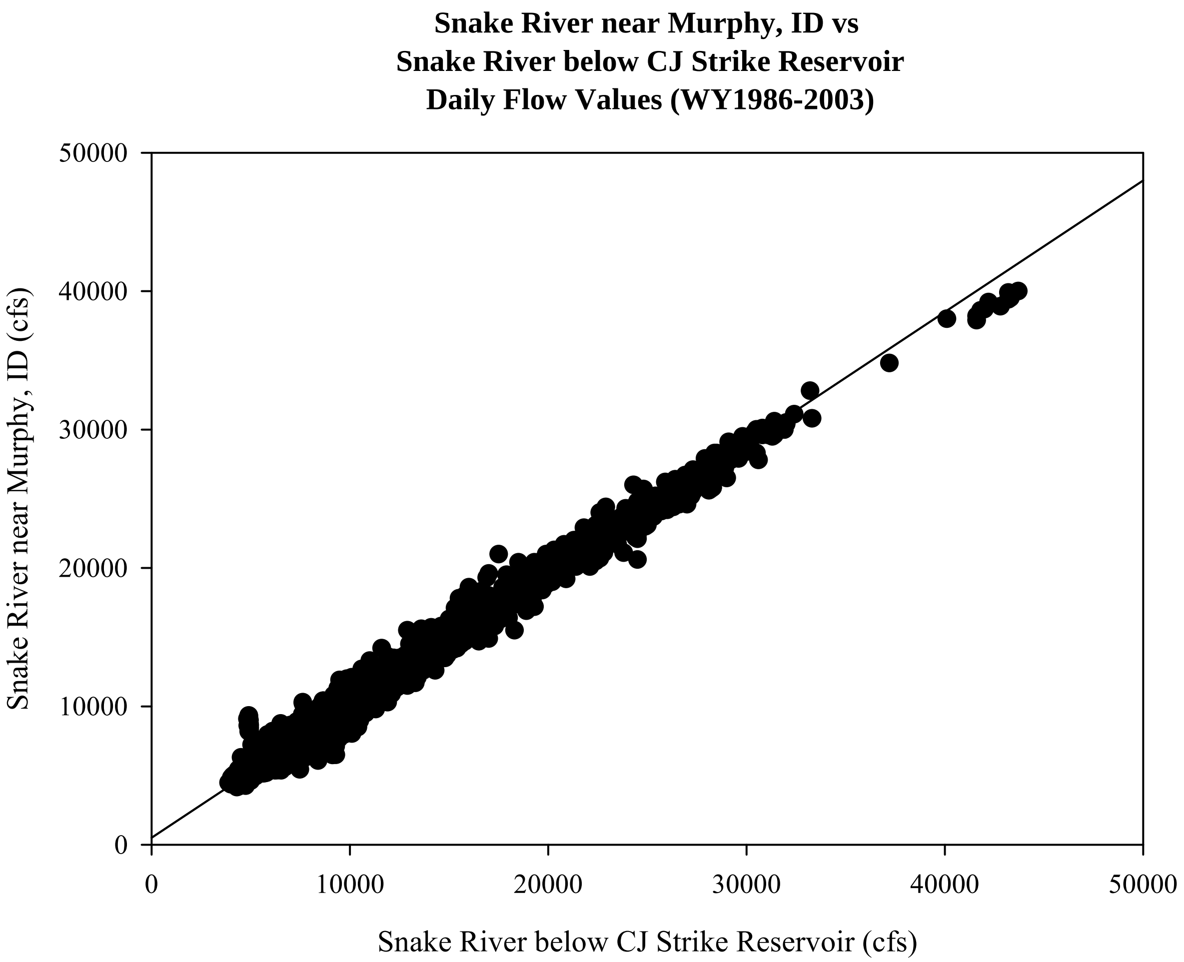
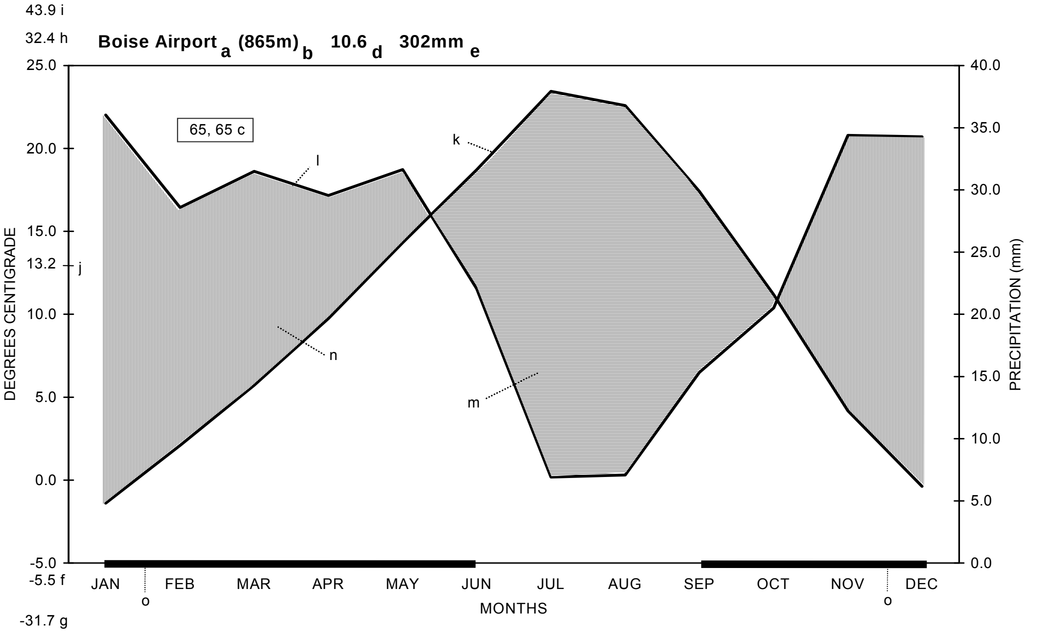


Figure E.1-2 Flow comparison of daily average discharges for the C.J. Strike and Swan Falls projects.



a: Station
b: Elevation
c: Number of years of observation (temperature, precipitation)
d: Mean annual temperature in °C
e: Mean annual precipitation in millimeters

f: Mean daily minimum of the coldest month
g: Lowest recorded temperature
h: Mean daily maximum of the hottest month
i: Highest recorded temperature
j: Mean daily temperature range
k: Monthly means of temperature in °C

l: Monthly means of precipitation in millimeters
m: Arid period (horizontal hatched)
n: Humid period (vertical hatched)
o: Months with an absolute minimum below 0 °C

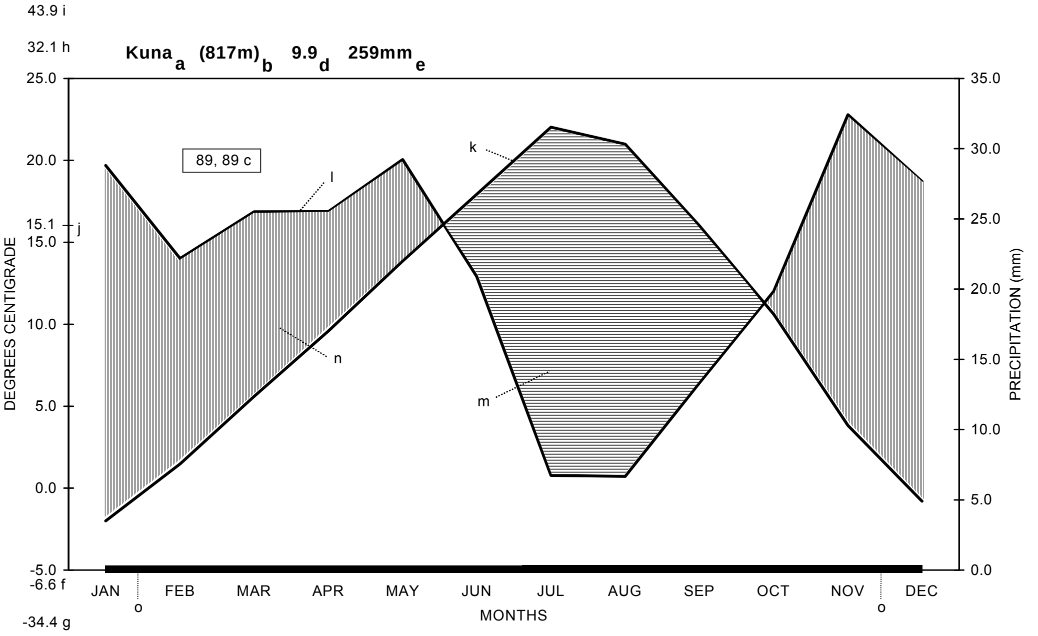
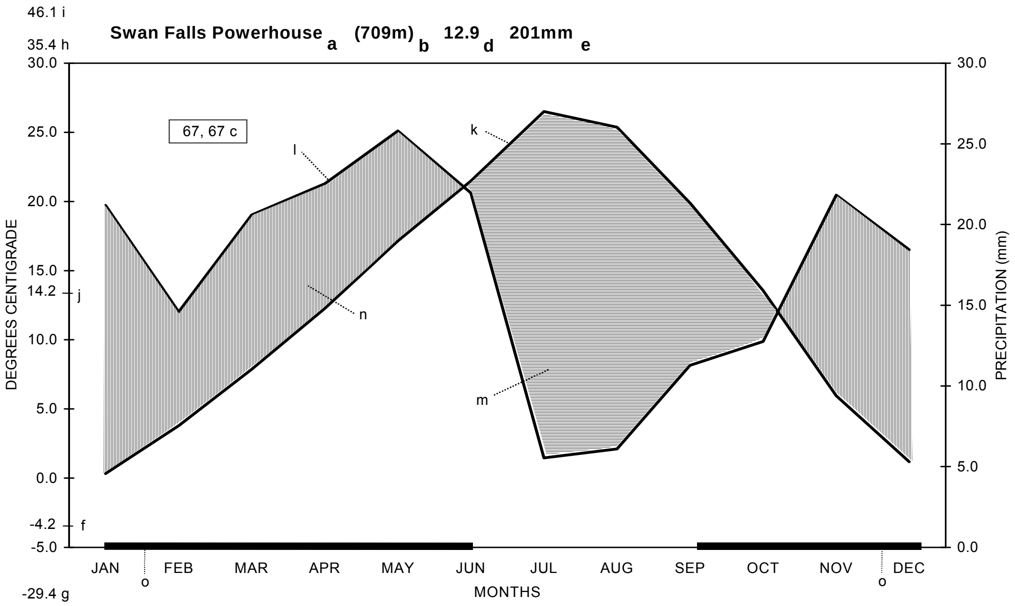


Figure E.1-3A Köppen climate diagrams for the Boise Airport and Kuna, Swan Falls study area, southwestern Idaho.



a: Station
b: Elevation
c: Number of years of observation (temperature, precipitation)
d: Mean annual temperature in °C
e: Mean annual precipitation in millimeters
f: Mean daily minimum of the coldest month
g: Lowest recorded temperature
h: Mean daily maximum of the hottest month
i: Highest recorded temperature
j: Mean daily temperature range
k: Monthly means of temperature in °C
l: Monthly means of precipitation in millimeters
m: Arid period (horizontal hatched)
n: Humid period (vertical hatched)
o: Months with an absolute minimum below 0 °C

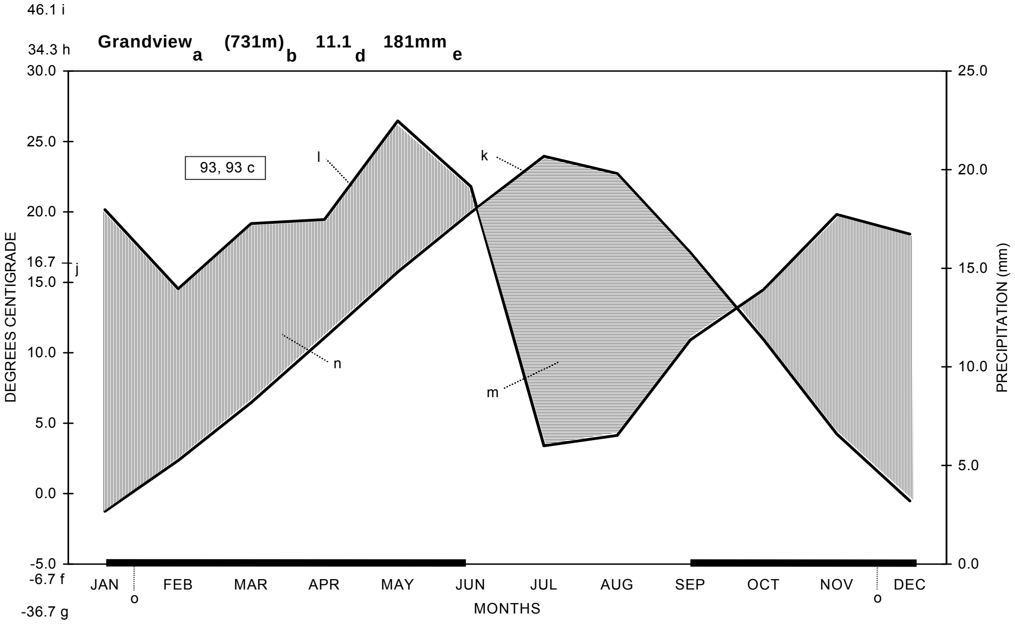


Figure E.1-3B Köppen climate diagrams for the Swan Falls Dam and Grand View weather stations, Swan Falls study area, southwestern Idaho.

This page left blank intentionally.

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(2)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f) (2) *Report on water use and quality.* The report must discuss the consumptive use of project waters and the impact of the project on water quality. The report must be prepared in consultation with the state and Federal agencies with responsibility for management of water quality in the affected stream or other body of water. Consultation must be documented by appending to the report a letter from each agency consulted that indicates the nature, extent, and results of the consultation. The report must include:
>
> (i) A description (including specified volume over time) of existing and proposed uses of project waters for irrigation, domestic water supply, steam-electric plant, industrial, and other consumptive purposes;
>
> (ii) A description of existing water quality in the project impoundment and downstream water affected by the project and the applicable water quality standards and stream segment classifications;
>
> (iii) A description of any minimum flow releases specifying the rate of flow in cubic ft per second (cfs) and duration, changes in the design of project works or in project operation, or other measures recommended by the agencies consulted for the purposes of protecting or improving water quality, including measures to minimize the short-term impacts on water quality of any proposed new development of project works (for any dredging or filling, refer to 40 CFR Part 230 and 33 CFR §§ 320.3(f) and 323.3(e));
>
> (iv) A statement of the existing measures to be continued and new measures proposed by the applicant for the purpose of protecting or improving water quality, including an explanation of why the applicant has rejected any measures recommended by an agency and described under paragraph (f)(2)(iii) of this section; and
>
> (v) A description of the continuing impact on water quality of continued operation of the project and the incremental impact of proposed new development of project works or changes in project operation.

E.2. REPORT ON WATER USE AND QUALITY

E.2.1. Consumptive Water Use

Consumptive water use is authorized in Idaho through water rights acquired pursuant to state law.

E.2.1.1. Applicant's Consumptive Use

The Applicant has the right to divert and consumptively use the waters of the State of Idaho in connection with the project pursuant to a license, partial decree, and two beneficial use claims filed in the Snake River Basin Adjudication (SRBA). The Applicant also has a pending application before the Idaho Department of Water Resources (IDWR) for a domestic use at the Project. These rights are briefly described below and summarized in Table E.2-1.

Water Right # 02-00034—A beneficial use claim, with a priority date of January 1, 1901, for 8.27 cubic feet per second (cfs) of surface water from the Snake River for commercial use associated with the Project's trash chute. This claim has been filed with the SRBA. The IDWR has recommended that this water right claim be decreed as claimed by the Applicant.

Water Right # 02-00035—A beneficial use claim, with a claimed priority date of April 1, 1905, for 0.12 cfs of surface water from the Snake River for irrigation use, from March 1 through November 15 annually, for a 6-acre park, pasture, and several lawns associated with the Project. This claim has been filed with the SRBA. The IDWR has recommended that this water right claim be decreed as claimed with a modified priority date of May 19, 1971. While the Applicant has contested this modification and has submitted proof of the claimed earlier priority date, a change of the priority date to 1971 should not affect the use of water for irrigation purposes at the Project.

Water Right # 63-26621—A decreed water right for 0.11 cfs of ground water for domestic use at employee homes and a clubhouse associated with the Project with a priority date of July 1, 1928. Use of the water associated with this water right and WR # 63-11612 is limited to a total combined diversion rate of 0.11 cfs.

Water Right # 63-11612—A licensed water right for 0.11 cfs of ground water, with a priority date of December 9, 1991, for domestic use at five (5) employee homes associated with the Project. Pursuant to conditions in the decree for Water Right # 63-26621, use of the water associated with this water right and Water Right # 63-26621 is limited to a total combined diversion rate of 0.11 cfs.

Water Right # 63-12391—A water right application for 0.45 cfs of ground water for domestic use at employee homes associated with the Project with a priority date of April 10, 1992. No protests have been filed to this application and it is currently pending before the IDWR.

E.2.1.1.1. Other Consumptive Uses

Records of the IDWR reflect the following water rights for consumptive uses within Project boundaries:

Water Right # 02-10062—A decreed water right, with a priority of June 28, 1934, in the name of United States Department of Interior—Bureau of Land Management (USDI-BLM) for 0.02 cfs for instream stockwater purposes from the Snake River.

Water Right # 63-03661—A licensed water right, with a priority date of May 5, 1953, in the name of USDI-BLM for the diversion of 2.0 acre feet annually (afa) from an unnamed stream tributary to the Snake River for stockwater storage.

Water Right # 02-02339—A licensed water right, with a priority of December 7, 1964, in the name of United Water Idaho, Inc. for the diversion of 11.0 cfs (limited to 2745 AF annually) of water from the Snake River for the irrigation of 610 acres of land. This water right is subject to an exchange agreement with the U.S. Bureau of Reclamation, approved by the IDWR, that provides that at times when the U.S. Bureau of Reclamation is releasing water from reservoirs on the Boise River for the purposes of salmon flow augmentation, United Water may divert up to 11 cfs from the Boise River provided it foregoes the diversion of a like amount of Snake River water under WR # 02-02339.

E.2.1.1.2. Subordination of Hydropower Rights

The current hydraulic capacity for the Swan Falls Project is 20,420 cfs. Decreed and licensed water rights for power purposes of 9,450 cfs, plus an approved water right permit for 6,550 cfs, have been issued by the State of the Idaho for the project, and water right claims are pending in the SRBA. Additionally, a water right claim for 4,420 cfs for power use, which is based upon beneficial use and has a priority date of October 1, 1983, has been filed in the SRBA. Under the Swan Falls Agreement, a contract between the Applicant and the State of Idaho entered into on October 25, 1984, the Applicant’s water rights for power purposes at the Swan Falls Project, and other specified Applicant hydropower projects on the middle Snake River that are identified below, entitle the Applicant to an unsubordinated right of 3,900 cfs average daily flow from April 1 to October 31 and 5,600 cfs average daily flow from November 1 to March 31, measured at the Murphy United States Geological Survey (USGS) gauging station located immediately below the Swan Falls Project at river mile (RM) 453.5. The Swan Falls Agreement further provides that the Applicant is entitled to the use of the waters of the Snake River to the full extent of its water rights. Pursuant to state legislation enacted in conjunction with the Swan Falls Agreement, any portion of the water rights for power purposes at the project in excess of the 3,900 and 5,600 cfs minimum flows referenced above are held in trust by the state, by and through the governor, for the use and benefit of the Applicant for power purposes and of the people of the state of Idaho.[1] The rights held in trust are subject to subordination to and depletion by future upstream beneficial users whose rights are acquired pursuant to state law, including compliance with the requirements of I.C. § 42-203C, which establishes criteria for reallocation of water held in trust. By the terms of the Agreement, the hydropower water rights at other Federal Energy Regulatory Commission (FERC) licensed hydropower projects owned by the Applicant on the middle Snake River upstream of the Swan Falls project (Bliss, FERC Project No. 1975; Lower Salmon Falls, FERC Project No.2061; Upper Salmon Falls, FERC Project No. 2777; Shoshone Falls, FERC Project No. 2778; Twin Falls, FERC Project No. 18; Lower Malad, FERC Project No 2776; and Upper Malad, FERC Project No. 2726) are also subject to the minimum flow and subordination provisions of the Swan Falls Agreement. A copy of the Swan Falls Agreement is already on file with the FERC.

E.2.2. Existing Water Quality

Swan Falls Reservoir is a small (approximately 12 miles long) run-of-river reservoir with water residence time generally less than one day (Figure E.2-1). The Snake River drains approximately 41,900 square miles above Swan Falls Dam. Beginning below C.J. Strike Dam, the Snake River flows through an extensive agricultural area before entering Swan Falls Reservoir. Numerous small, perennial, and intermittent streams and irrigation returns flow into this section of the Snake River along with several that flow directly into Swan Falls Reservoir.

Water quality problems related to temperature, excess nutrients, sediment, and flow alteration occur throughout the Snake River. Specifically, C.J. Strike Dam (36 river miles upstream of Swan Falls Dam) to approximately 65 river miles downstream of Swan Falls Dam, water quality issues related to temperature, sediment, bacteria, dissolved oxygen (DO), excess nutrients, pH, total dissolved gas (TDG), and flow alteration have been identified.

E.2.2.1. Applicable Water Quality Criteria and Stream Segment Classification

The segment of the Snake River that includes the Swan Falls Project is a navigable water of the United States. Designated beneficial uses in this segment of the Snake River include cold water

---

1. The Applicant is currently in litigation with the State of Idaho over the interpretation of the Swan Falls Agreement.

aquatic life; primary contact recreation; wildlife habitat; aesthetics; and domestic, agricultural, and industrial water supply. In the *Mid-Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load* (SR-SC TMDL), the state of Idaho addressed water quality in the reach of the Snake River that included the Swan Falls Reservoir (IDEQ 2003). Two sections of the Snake River that are listed as water quality limited, as defined under §303(d) of the Federal Clean Water Act (33 U.S.C. § 1313[d]), were evaluated during development of the SR-SC TMDL. The reach from C.J. Strike Dam (RM 494) downstream to Swan Falls Dam (RM 457.7) is listed for sediment. Downstream of Swan Falls Dam to the Idaho–Oregon border (RM 409 near Adrian, Oregon), the river is listed for bacteria, DO, nutrients, sediment, pH, and flow alteration (IDEQ 2003). The SR-SC TMDL recommended that sediment be delisted in the reach from C.J. Strike to Swan Falls dams, and concluded that no action was required for any pollutants in or upstream of Swan Falls Reservoir. Additionally, the SR-SC TMDL recommended that bacteria and pH be delisted. Idaho Department of Environmental Quality (IDEQ) has listed the Snake River from C.J. Strike Dam downstream to RM 425 on the §303(d) list for TDG.

In the reach below Swan Falls Dam to near Adrian, Oregon (RM 409), a nutrient total maximum daily load (TMDL) based on a total phosphorus (TP) target of 0.07 milligrams per liter (mg/L) has been established. The SR-SC TMDL states that available DO data were insufficient to develop a conclusive analysis of DO conditions when the SR-SC TMDL was developed, and the nutrient TMDL was proposed to address the DO listing in the reach below Swan Falls Dam (IDEQ 2003). The SR-SC TMDL adds that available data showed that DO conditions are closely linked to nutrient, organic matter, and algal levels. The cold water aquatic life DO criterion of 6.0 mg/L minimum applies at the inflow of Swan Falls, while cold water and hydroelectric DO criteria apply at the outflow (IDAPA n.d.). The hydroelectric DO criteria apply at the outflow from June 15 to October 15 and require that DO levels be above 3.5 mg/L as an instantaneous minimum; 4.7 mg/L as a 7-day mean minimum; and 6.0 mg/L as a 30-day mean. The cold water DO criterion applies at the outflow for the remainder of the year.

Cold water temperature criteria of 22 °C daily maximum with a daily average of 19 °C apply at Swan Falls Reservoir inflow and outflow (IDAPA n.d.). In addition, when natural background conditions exceed the numeric criteria, the numeric criteria no longer apply and temperature may not be increased above natural background (IDAPA n.d.). The SR-SC TMDL addresses temperature briefly, noting that high water temperatures during drought years and hot weather have been linked to mountain whitefish (*Prosopium williamsoni*) kills but proposed delaying the development of temperature TMDLs until additional data collection and analysis were conducted (IDEQ 2003). In 2007, IDEQ developed a temperature addendum addressing these delayed TMDLs on tributaries to the Snake River (e.g., Succor Creek and Castle Creek) (IDEQ 2007). Additionally, IDEQ has listed the Snake River from C.J. Strike Dam downstream to RM 425 on the §303(d) list for temperature.

Other general and cold water narrative and numeric criteria related to the identified water quality issues apply to this reach of the Snake River. Narrative standards include those related to floating, suspended, or submerged matter; excess nutrients; and oxygen-demanding materials. The narrative criteria state that surface waters shall be free of the above materials at levels that can cause nuisance aquatic growths, anaerobic conditions, or impair beneficial uses. Numeric criteria include the requirement that pH levels remain between 6.5 to 9.0 standard units and turbidity not exceed background turbidity by more than 50 nephelometric turbidity units (NTU). TDG is required to remain below 110% saturation (IDAPA n.d.).

E.2.2.2. Existing Water Quality Conditions Within and Downstream of the Swan Falls Project

The Applicant has collected data at the Swan Falls Project related to the majority of water quality issues that have been identified in this reach of the Snake River. These data are summarized in Technical Report E.2.2-A with the objective of describing existing Swan Falls inflow, outflow, and in-reservoir water quality conditions in relation to applicable state criteria and processes occurring in the reservoir. Snake River water quality issues are typically exasperated by low-water conditions. During these conditions, temperature and water residence time in the river and reservoirs are increased. Increases in primary productivity, phytoplankton levels, nutrient concentrations, and drifting clumps and mats of aquatic macrophytes and macroalgae are also commonly seen in low water years. Increases in primary productivity can lead to large diel DO swings (e.g., 4–6 mg/L) and DO ranging from highly supersaturated (e.g., near 200%) to below 6 mg/L in low water years. Higher water conditions typically relieve some of these conditions. Timing of the Applicant’s studies at Swan Falls Reservoir, in response to water quality issues and the development of information for the relicensing process, resulted in the majority of the data being collected during low water years, including 2003, the lowest water year on record from 1914 to 2006 (Table E.2-2).

E.2.2.2.1. Temperature

Water temperature measured in this reach of the Snake River can get very warm (i.e., >27 °C), and numeric criteria for temperature were exceeded at Swan Falls inflow, outflow, and in-reservoir locations. The majority of exceedences occurred from mid-June through early September, although some exceedences did occur in late May in 2003 and 2006 (Figure E.2-2). Temperature profiles collected in Swan Falls Reservoir during 2003 and 2004 showed nearly isothermal conditions longitudinally and vertically. Other studies of Swan Falls Reservoir report similar findings, where shallow water depth and short residence time allowed the entire water column in Swan Falls Reservoir to remain well mixed (Worth and Braun n.d., Worth 1994, IDEQ 2003). Worth and Braun (n.d.) characterized the reservoir as a simplified, lateral expansion of the Snake River channel. Slight exceptions to this pattern did occur, in the Applicant’s study, with surface temperatures approximately 0.5 °C warmer than the deeper locations on July 28, 2003, and longitudinal variations of approximately 1.0 °C occurring during spring and summer. However, when longitudinal differences were seen, there was no consistent pattern of warming or cooling from the inflow to the dam (Technical Report E.2.2-A).

Swan Falls Reservoir inflow temperatures were—depending on the year and season—warmer, cooler, and within the daily ranges of outflow temperature (Figure E.2-2). Continuous inflow temperature data were not available, so the Applicant was not able to compare daily maximums, minimums, and means at the inflow and outflow of the reservoir. The differences seen when comparing inflow and outflow data were related to factors that influence temperatures in rivers and in small, run-of-river reservoirs. Diel temperature patterns, residence time, longitudinal warming, and the timing of inflow sampling were all factors that influenced temperature patterns and comparisons of inflow and outflow data. The timing of the sampling (i.e., time of day) related to diel temperature patterns are important to consider when comparing inflow, outflow, and in-reservoir temperature measurements. Figure E.2-2 illustrates that instantaneous inflow temperatures, typically measured in the morning, frequently appeared near the daily minimum temperatures measured at the outflow. There were also periods in all four (2003–2006) years when inflow temperatures were below the daily minimum temperatures measured at the outflow.

As inflow water enters the slower moving, deeper, and less turbulent reservoir, it may become less responsive to daily solar and air temperature cycles. Being less responsive to temperature cycles may result in more heat retention through the reservoir and create times when inflow minimums are cooler than outflow. However, longitudinal warming normally occurs throughout the free-flowing reaches of the Snake River and, at a minimum, this amount of warming should be expected in small, shallow, run-of-river reservoirs such as Swan Falls Reservoir. Data from a 33-mile, free-flowing reach below Swan Falls Dam suggested that approximately 0.2 to 0.5 °C of longitudinal warming may occur through the 16-mile reach of the Snake River in the absence of Swan Falls Reservoir (Technical Report E.2.2-A).

Considering many of the processes that influence temperature in the free-flowing and impounded reaches of the Snake River, Swan Falls Dam did not appear to cause consistent warming or cooling patterns. On dates when inflow appeared cooler than outflow, the difference was likely related to the timing of inflow sampling timing and longitudinal warming. The dates when inflows appeared warmer than outflows were more difficult to explain; however, they do not constitute a negative project-related effect.

E.2.2.2.2. Dissolved Oxygen

DO conditions were variable through the study years, ranging from highly supersaturated (i.e., 200%) to below numeric criteria at both inflow and outflow locations. The lowest water year on record (2003) showed the most critical DO conditions. In 2003, inflow and outflow DO were below the cold water criterion 6% and 5% of the sampled days, respectively (Table E.2-3). A single, daily minimum outflow value of 3.4 mg/L, measured in July 2003, was below the 3.5 mg/L instantaneous hydroelectric criterion. This measurement in July 2003 was the only exceedence of the instantaneous minimum, 7-day mean minimum, or 30-day mean hydroelectric criteria during the eight years sampled. The SR-SC TMDL determined that insufficient data precluded a conclusive analysis of DO conditions at the time the document was developed (IDEQ 2003). Evaluating DO concentrations collected during this study using guidelines consistent with the SR-SC TMDL shows that DO criteria are not exceeded more than 10% of the time, even in extreme low water conditions. The SR-SC TMDL (IDEQ 2003) states that, based on Grafe et al. (2002), a violation of numeric criteria would occur only when greater than 10% of the measurements exceed the criteria.

The low water years of 2003, 2004, and 2005 showed large (i.e., 4–6 mg/L) daily DO cycles and inflow and outflow levels that were above saturation (Figure E.2-3). The medium-low water year of 2006 showed smaller (i.e., 2–4 mg/L) daily DO cycles and inflow and outflow levels that were closer to saturation. Continuous inflow DO was not available, so the magnitude of the inflow DO cycle was unknown; however, the instantaneous measures suggest either a much larger daily cycle occurred in the inflow, or DO levels can be lowered closer to saturation through the reservoir when inflow levels are so high. Processes that may contribute to lowering DO levels closer to saturation include settling and decay of suspended organic matter, increasing depth and decreasing benthic productivity in the reservoir, and exchanging oxygen with the atmosphere.

DO profiles measured in Swan Falls during 2003 and 2004 showed mixed vertical DO conditions and longitudinal DO gradients. The longitudinal DO gradients suggested that settling and decay of inflow-suspended organic matter may cause a reduction of DO in the upper end of Swan Falls Reservoir. This reduction appeared to be followed by DO increases downstream to Swan Falls Dam. Increasing algae levels through the reservoir appeared to support this increasing DO pattern (see section E.2.2.2.3.). Both Worth (1994) and Worth and Braun (n.d.) also noted downstream increases in DO throughout Swan Falls Reservoir. Potential influence from large attached and surface beds of aquatic macrophytes and algae along the banks of the river where inflow measurements were made—levels of saturation seen in the profile sampling—and inflow sample timing suggested that inflow DO measured at RM 474 was difficult to compare with the outflow daily range, especially in extreme low water years (Technical Report E.2.2-A). In 2006, higher flows appeared to result in overall DO levels that were closer to saturation and showed closer alignment between inflow and outflow DO.

E.2.2.2.3. Algae

Chlorophyll *a* was measured as an indicator of suspended algae (i.e., phytoplankton) biomass. Chlorophyll *a* typically reached a maximum in the spring during the lower water years with the highest value of 164 micrograms per liter (µg/L) in May of 2004 (Figure E.2-4). Chlorophyll *a* profiles measured in the reservoir in 2003 show algae were generally mixed vertically. However, longitudinal gradients in algae did occur throughout the reservoir, with increasing levels from inflow to the dam. These gradients followed the gradients seen for DO. Both Worth (1994) and Worth and Braun (n.d.) also noted increased DO and chlorophyll *a* concentrations moving downstream during low-water conditions. There were periods during spring and summer of all four study years when outflow chlorophyll *a* concentrations were higher than inflow concentrations, corresponding with the longitudinal gradients seen in-reservoir.

E.2.2.2.4. Nutrients

Phosphorus and nitrogen concentrations measured in various forms at inflow and outflow locations were used in an analysis of nutrient concentrations and loads entering and leaving Swan Falls Reservoir. Primary methods for nutrient collection were grab samples from the bank. However, drifting aquatic macrophytes and macroalgae were observed in the inflow to Swan Falls Reservoir. Also, large amounts of this material were routinely removed from the trash racks in front of the turbine intakes by using the trash rake and filling a dump truck (310 and 207 truck loads in 2005 and 2006, respectively). No material was visibly apparent in the turbine discharge. Collectively, this drifting material is referred to as coarse particulate organic matter (CPOM). The CPOM, and associated nutrients, were not captured by routine grab samples at the inflow location and appeared to typically be transported downstream in the form of large floating mats or obvious drifting clumps. This material was sampled near the inflow, and nutrients associated with this material were included in the nutrient loading analysis.

E.2.2.2.4.1. Phosphorus

Over all the years sampled, the average TP concentrations from May through September were above the 0.070 mg/L SR-SC TMDL target at both the inflow and outflow locations of Swan Falls. By analyzing concentrations at the outflow of the C.J. Strike Dam, the SR-SC TMDL determined that conditions upstream of Swan Falls Dam met the target, based on an average water year and seasonal (i.e., May–September) conditions (IDEQ 2003). Specifically, C.J. Strike Dam outflow TP datasets from 1999 and 2000 were used to compare with the target. The SR-SC TMDL showed that TP concentrations during 1999 and 2000 at C.J. Strike Dam were among the lowest measured since the mid-1990s (IDEQ 2003). This may be due, in part, to the fact that 1999 was preceded by three higher water years. During low and medium-low water years preceded by low water years (i.e., 2002 through 2005 were all low water years, see Table E.2-2), as in this study, the target would likely be exceeded. Comparisons of inflow and outflow nutrient concentrations indicated that annual patterns in phosphorus retention (e.g., sedimentation of organic and inorganic material), exports (e.g., sediment scour, sediment release), or inputs (e.g., tributary and CPOM contributions) were not sufficiently captured when comparing periodic water column grab samples. Phosphorus loading analysis provided a more comprehensive description of nutrient dynamics associated with Swan Falls Reservoir.

Analysis of phosphorus loadings included the nutrients associated with CPOM and nutrient contributions from small tributaries and irrigation drains. CPOM sampling data indicated that inflowing nutrients associated with drifting CPOM, which are not accounted for in grab samples, made up 5% of the total inflow TP load in 2004 and 12% of the total particulate phosphorus (particulate P) load. Loading analysis showed that bioavailable phosphorus (i.e., dissolved ortho-phosphate [ortho-P]) was retained, and particulate P was exported from the reservoir in each of the study years (Table E.2-4). This loading analysis supported the algae data and showed that phytoplankton growth and nutrient uptake occurred throughout Swan Falls Reservoir.

Retention of dissolved ortho-P and export of particulate P was also likely related to sediment retention during low flow periods and scour during higher flow periods. TP was slightly retained in 2003 and 2004 (i.e., 4% and 2%, respectively) and exported in 2005 and 2006 (Table E.2-4). TP export was highest in 2006 (27%) and monthly loads showed that the majority of export occurred during spring runoff periods (i.e., April and May). The time period of export supports the concept of retention of phosphorus during low flows and export during higher flows. Myers et al. (1998) reported similar phosphorus-loading findings in the free-flowing Snake River below Swan Falls Dam to Brownlee Reservoir during April and May of 1995. They concluded that substantial scour of sediment and associated phosphorus, due to above average flows preceded by low water conditions, was the cause of elevated loadings.

E.2.2.2.4.2. Nitrogen

The SR-SC TMDL did not establish targets for nitrogen concentrations (IDEQ 2003). Nitrogen concentrations followed the patterns seen with phosphorus and chlorophyll *a*, where the dissolved bioavailable ammonia form was reduced and organic forms were increased through Swan Falls Reservoir. Nitrogen loading analyses focused on total nitrogen (TN) and included estimates of nitrogen loading from drifting CPOM. In 2004, nitrogen associated with drifting CPOM accounted for approximately 3% of the total inflow TN load. However, nitrogen load estimates from minor tributaries and drains were not made due to lack of TN data from these sources. In

2004 and 2006, TN was exported by 6% and 4%, respectively (Table E.2-4). In 2003 and 2005, inflow TN was retained by 4% and 6%, respectively. It appears nitrogen is not retained nor exported to a similar degree as phosphorus. In addition, potential nitrogen loads from tributaries and drains that were unable to be estimated could account for 4% to 6% of the total inflow load (Hoelscher and Myers 2003).

E.2.2.2.5. Turbidity

The turbidity criterion of no more than 50 NTU above background applies at both inflow and outflow locations (IDAPA n.d.). Turbidity measured in the inflow and outflow were generally below the criterion (i.e., below 50 NTU) with the exception of one very high inflow spike (139 NTU) that coincided with a thunderstorm and heavy rain event. Overall, turbidity in the outflow appeared higher than inflow, which coincided with higher algae and particulate nutrient levels in the outflow.

E.2.2.2.6. pH

The pH criteria require levels to be within the range of 6.5 to 9.0 standard units (IDAPA n.d.). The SR-SC TMDL dataset showed that pH levels were within criteria and recommended delisting this segment of the Snake River for pH on the §303(d) list (IDEQ 2003). Levels of pH in the inflow and outflow during this study were generally similar, and criteria were periodically exceeded at both locations (Figure E.2-5). Levels above 9.0 were most common and coincided with periods of high primary productivity (as indicated by supersaturated DO concentrations, see section E.2.2.2.2.) and low water conditions. In 2006, a medium-low water year, pH levels were within the criteria and corresponded with DO that showed lower levels of primary productivity.

E.2.2.2.7. Total Dissolved Gas (TDG)

The TDG criterion of less than 110% saturation applies throughout the Snake River (IDAPA n.d.). TDG measured directly below the turbines and spillways at Swan Falls Reservoir were flow-weighted by turbine and spill flow in order to compare the criterion with TDG levels that would be representative of mixed conditions downstream of Swan Falls Dam. Flow weighting TDG levels to represent a mixed condition was also utilized in the *King Hill C.J. Strike Reservoir Subbasin Assessment and Total Maximum Daily Load* (IDEQ 2006).

In 1999, high Snake River flows combined with one Swan Falls turbine that was off-line for major repair resulted in high spill flow at Swan Falls Dam. In June of 1999, spill flow exceeded 19,000 cfs, while turbine flow through the single turbine was below 6,000 cfs. During the normal operation of two turbines, a spill flow of 19,000 cfs would occur only when Snake River flows were in the range of approximately 31,000–33,000 cfs. Snake River flows of this magnitude occur less than 1% of the time at Swan Falls Dam.

Even during these high-spill flows in 1999, TDG measurements showed that spill at Swan Falls Dam does not generate excessively high TDG. In 1999, TDG measured directly in spill flow immediately downstream of the spillway ranged from 104.0% to 112.4% saturation (Table E.2-5). In June of 1999, while spilling over 19,000 cfs, TDG was measured at 112.4% saturation directly below the spillway, while TDG in turbine outflow measured 109.7%. Flow-weighting of these TDG measurements, assuming normal operation of two turbines, resulted in TDG of 111.2% saturation and was the only occurrence of flow-weighted TDG exceeding the criterion. As noted above, turbine outflow TDG was high on this date (109.7% saturation).

E.2.3. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section E.2.4.3. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.2.4. Applicant’s Existing and Proposed Measures or Facilities

The Applicant has no existing measures specific to water quality in the project area. The Applicant proposes two new enhancement measures specific to water quality in the project area. These new measures include aquatic macrophyte (i.e., CPOM) removal at Swan Falls Dam and water temperature and DO monitoring in the outflow from the project. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC’s methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.2.4.1. Aquatic Macrophyte Removal

The Applicant proposes continued operation of the trash rake over the turbine intakes to remove aquatic macrophytes and debris from the river. This measure would remove nutrients and oxygen-demanding material from the river. Removal of this material would result in downstream decreases in floating or submerged matter, excess nutrients, and oxygen-demanding material. During 2005 and 2006, approximately 5,000 cubic yards of plant material and debris were removed from the river at the Swan Falls Powerhouse. The estimated annual operations and maintenance (O&M) cost is $10,000, for a total of $300,000 over a 30-year license term.

E.2.4.2. Temperature and Dissolved Oxygen (DO) Monitoring

The Applicant proposes to monitor temperature and DO in the outflow from Swan Falls Dam. The purpose of the monitoring would be to document and report temperature and DO conditions at the Swan Falls outflow. An automated system would be installed and operated to electronically store measurements every 10 minutes. Temperature and DO would be monitored from June 15 through October 5, and the data would be summarized for reporting on a monthly basis. The specific location of the system will be determined through the §401 certification process with IDEQ. Estimated capital cost for monitoring equipment is $25,000 in year 1. The annual O&M cost is estimated to be $5,000, for a total of $150,000 over 30 years.

E.2.4.3. Measures or Facilities Recommended by the Agencies

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. Often the comment letters did not clearly indicate specific recommended measures. However, the Applicant made a good-faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant's proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.2.4.3.1. Accepted or Conditionally Accepted Measures or Facilities

Of the recommended measures that the Applicant was able to identify in agency comment letters, there were none accepted.

E.2.4.3.2. Rejected Measures or Facilities and Explanations for Rejection

U.S. Fish and Wildlife Service comment letter dated December 21, 2007

FWS-7

> The Fish and Wildlife Service recommend IPC work with the Idaho Department of Environmental Quality to determine the location for a future water quality monitoring station in the Snake River between Swan Falls Dam and C.J. Strike Dam.

Response

The Applicant proposes to work with the IDEQ through the §401 certification process to determine the location and requirements for monitoring temperature and DO in the outflow from Swan Falls Dam. The need for additional monitoring will be investigated through the §401 certification process.

Shoshone–Bannock Tribes comment letter, dated December 21, 2007

SBT-7

> The Tribes recommend IPC provide funding of no less than 2.5 million dollars per year for development of a water quality improvement program, and an additional 15 million dollars per year to implement the program.

Response

A watershed improvement program is not proposed to mitigate Swan Falls' water quality effects because studies conducted to assess the impacts of the project do not indicate the existence of a project-related impact that would support the need for a watershed improvement program.

E.2.5. Continuing Impact on Water Quality

Previous characterizations of Swan Falls Reservoir as a simplified lateral expansion of the Snake River channel (IDEQ 2003, Worth and Braun n.d.) are supported by this study. Study results overall were biased towards low water years, which are known to exasperate water quality problems. Temperature and DO conditions remained relatively well-mixed vertically, even in extremely low water conditions. Temperatures in this reach of the Snake River can get very warm (i.e., >27 °C). However, the presence and operation of the Swan Falls Project did not appear to cause a consistent warming or cooling pattern. Inflow and outflow DO concentrations were commonly supersaturated due to high primary productivity, phytoplankton, benthic algae, and rooted and drifting macrophyte and macroalgae levels. The lowest water year on record (2003) showed the most critical DO conditions, with criteria being exceeded at both inflow and outflow locations. However, criteria were exceeded less than 10% of the time in the lowest water year on record. Study results indicate that DO may be decreased in the upper end of the reservoir and then increased downstream through the remainder of the reservoir.

Patterns of increased chlorophyll *a*, decreased dissolved bioavailable nutrients, and increased particulate nutrient concentrations in the outflow compared to inflow were consistent with algal growth in the reservoir. Based on nutrient loads, Swan Falls Reservoir likely retained total nutrients in low water years or lower flow periods and exported material during higher flow periods. Similar patterns of nutrient retention and export would be expected in free-flowing river reaches (Myers et al. 1998).

Levels of pH were very similar in the inflow and outflow and coincided with low water conditions and high primary productivity. Turbidity levels followed patterns of increased algae and particulate nutrients in the outflow.

Spill at Swan Falls Dam does generate TDG, which can exceed the 110% of saturation criterion directly in the spill flow. Flow-weighting to represent mixed TDG levels shows that spill generally does not result in criteria exceedences, with the exception of when turbine flow (and, therefore, upstream) TDG concentrations are near the 110% criteria.

E.2.6. Consultation

For a summary of consultation efforts to date for the Swan Falls Project, see Consultation Appendix.

LITERATURE CITED

Grafe, C. S., C. A. Mebane, M. J. McIntyre, D. A. Essig, D. H. Brandt, and D. T. Mosier. 2002. Idaho Department of Environmental Quality water body assessment guidance, 2nd edition—final. Idaho Department of Environmental Quality, Boise, ID.

Hoelscher, B., and R. Myers. 2003. Tributary pollutant sources in the Hells Canyon Complex. In: Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.2.2-1.

Idaho Administrative Procedures Act (IDAPA) 58.01.02. No date. Water quality standards and wastewater treatment requirements. Idaho Department of Environmental Quality, Idaho State Office, Boise, ID. 190 p.

Idaho Department of Environmental Quality (IDEQ). 2003. Mid-Snake River/Succor Creek subbasin assessment and total maximum daily load. IDEQ, Boise Regional Office, Boise, ID. 403 p.

Idaho Department of Environmental Quality (IDEQ). 2006. King Hill C.J. Strike Reservoir subbasin assessment and total maximum daily load. IDEQ, Boise Regional Office, Boise, ID. 403 p.

Idaho Department of Environmental Quality (IDEQ). 2007. Addendum to the Mid-Snake River/ Succor Creek subbasin assessment and total maximum daily load: South Fork Castle Creek bacteria analysis and Succor Creek and Castle Creek temperature total maximum daily loads. IDEQ, State Technical Services Office, Boise, ID. 53 p.

Myers, R., S. Parkinson, and J. Harrison. 1998. Tributary nutrient loadings to the Snake River, Swan Falls to Farewell Bend, March through October 1995. Idaho Power Company, Boise, ID. Technical Report AQ-98-HCC-001. 27 p.

Worth, D. F. 1994. Gradient changes in water quality during low flows in run-of-the-river and reservoir impoundments, lower Snake River, Idaho. Lake and Reservoir Management 11(3):217–224.

Worth, D. F., and K. Braun. No date. Water quality conditions in the lower Snake River during low river flows. Draft. Department of Health and Welfare, Idaho Division of Environmental Quality, Southwest Regional Office, Boise, ID. 34 p.

Table E.2-1 Consumptive water rights, priority date, source, use, and amount held by the Applicant in connection with the Swan Falls project, and other consumptive water rights at or downstream of the project.

Project	Water Right	Priority	Source	Use	Amount
Swan Falls—Idaho Power	02-00034—Beneficial Use Claim	01/01/1901	Snake River	Commercial Trash Chute	8.27 cfs
Swan Falls—Idaho Power	02-00035—Beneficial Use Claim	04/01/1905	Snake River	Irrigation	0.12 cfs
Swan Falls—Idaho Power	63-11612—License	12/09/1991	Groundwater	Domestic	0.11 cfs
Swan Falls—Idaho Power	63-26621 12391—Decree	07/01/1928	Groundwater	Domestic	0.11 cfs
Swan Falls—Idaho Power	63-12391—Application	04/10/1992	Groundwater	Domestic	0.45 cfs
USDI—BLM	02-10062	06/28/1934	Snake River	Stockwater	0.02 cfs
USDI—BLM	63-03661	05/05/1953	Unnamed Stream	Stockwater Storage	2.0 afa
United Water Idaho	02-02339	12/07/1964	Snake River	Irrigation	11.0 cfs

Table E.2-2 Water year categories and classification of study years based on Snake River mean annual flow and mean April–June flow in cubic feet per second (cfs) from the Snake River near Murphy, Idaho, gauge (station 13172500).

Water Year Category	Mean Annual Flow	Mean April–June Flow	Study Year (Annual Mean Flow)	Study Year (April–June Mean Flow)
Low	<8,300	<7,600	2003 (6,200) 2004 (6,300) 2002 (6,500) 1992 (6,600) 2005 (6,800) 1991 (7,300) 1990 (7,400) 1989 (8,100)	1992 (5,500) 2003 (5,800) 2004 (5,900) 2002 (6,100) 1991 (6,700) 1990 (6,800) 2005 (7,300) 1989 (7,400)
Medium-Low	8,300–9,600	7,600–10,100	2006 (9,300)	N/A
Medium	9,600–11,000	10,100–13,500	N/A	N/A
Medium-High	11,000–13,600	13,500–18,100	N/A	2006 (13,900)
High	>13,600	>18,100	N/A	N/A

Table E.2-3 Percentage of days sampled when Swan Falls Reservoir inflow or outflow dissolved oxygen (DO) exceeded applicable criteria. Values in parentheses show the percentage of the period that was sampled.

Sample Location and Criteria	1989	1990	1991	1992	2002	2003	2004	2005	2006
Swan Outflow									
Cold Water (October 16–June 14)	0 (29)	0 (55)	0 (77)	2 (77)	0 (44)	5 (73)	0 (78)	0 (80)	0 (72)
Hydro Instantaneous (June 15–October 15)	0 (70)	0 (93)	0 (68)	0 (61)	0 (48)	1 (72)	0 (76)	0 (94)	0 (80)
Hydro 7-Day (June 15–October 15)	0 (60)	0 (79)	0 (51)	0 (49)	0 (37)	0 (59)	0 (76)	0 (89)	0 (65)
Hydro 30-Day (June 15–October 15)	0 (31)	0 (51)	0 (24)	0 (28)	0 (11)	0 (56)	0 (8)	0 (71)	0 (12)
Swan Falls Reservoir Inflow[a]									
Cold Water (Year Round)	N/A	N/A	N/A	N/A	N/A	6 (5)	0 (6)	0 (7)	0 (5)

a. DO measurements were instantaneously collected every two weeks and do not necessarily represent daily minimums. However, percent exceedence is calculated for comparison with outflow.

Note:

“N/A” indicates data not available.

Table E.2-4 **Annual load summary for Swan Falls inflow and outflow nutrient loads. Total inflow load is the sum of inflow, inflow CPOM, and minor tributaries and drains. The difference between total inflow and outflow is shown as percent retention when negative numbers indicate export.**

Constituent/ Year	Inflow (10^5 kg/yr)[a]	Inflow CPOM (10^5 kg/yr)	Minor Tributaries and Drains	Total Inflow (10^5 kg/yr)	Outflow (10^5 kg/yr)	% Retention
2003						
TP	4.01	0.26[b]	0.14[c]	4.44	4.22	4
Ortho-P	1.38	N/A	N/A	1.38	1.24	10
Particulate P	2.58	0.26[b]	N/A	2.84	2.92	–3
Total N	73.58	2.98[b]	N/A	76.57	73.78	4
2004						
TP	4.44	0.26	0.14[c]	4.84	4.73	2
Ortho-P	2.29	N/A	N/A	2.29	2.03	12
Particulate P	1.97	0.26	N/A	2.23	2.61	–17
Total N	83.12	2.98	N/A	86.11	91.64	–6
2005						
TP	4.33	0.07	0.14[c]	4.55	4.83	–6
Ortho-P	1.86	N/A	N/A	1.86	1.68	10
Particulate P	2.40	0.07	N/A	2.47	3.08	–25
Total N	94.32	0.73	N/A	95.05	89.21	6
2006						
TP	6.33	0.06	0.14[c]	6.53	8.31	–27
Ortho-P	3.41	N/A	N/A	3.41	3.11	9
Particulate P	2.78	0.06	N/A	2.84	5.06	–78
Total N	119.81	0.97	N/A	120.78	125.91	–4

a. kg/yr = kilograms per year.

b. Estimated based on 2004 CPOM loads.

c. Estimated based on available data. (See Appendix 2 in Technical Report E.2.2-A.)

Note:

“N/A” indicates not applicable.

Table E.2-5 **Total dissolved gas (TDG) percent saturation, spill flow, turbine flow, and flow-weighted TDG below the spillway and turbines at Swan Falls Dam in 1999. During 1999, one turbine was off-line for major repair; therefore, flow-weighted TDG, assuming normal operation of two turbines, is also shown.**

Date	TDG % Saturation below Spillway	TDG % Saturation below Turbines	Daily Average Spill Flow (cfs)	Daily Average Turbine Flow (cfs)	Daily Average Total Flow (cfs)	Flow-Weighted TDG % Saturation	Flow-Weighted TDG % Saturation (2 Turbines)
3/03/99	109.3	105.2	N/A	N/A	15,900		
3/10/99	109.4	102.8	N/A	N/A	16,400		
3/16/99	112.0	104.6	N/A	N/A	11,700		
3/23/99	109.7	107.6	14,279	6,121	20,400	109.1	108.4
3/30/99	108.8	105.8	12,406	6,094	18,500	107.8	106.8
4/07/99	109.7	104.3	14,627	6,073	20,700	108.1	106.5
4/16/99	110.7	106.4	13,838	6,162	20,000	109.4	108.1
4/21/99	110.3	106.7	11,943	6,257	18,200	109.1	107.8
4/26/99	111.3	108.7	7,877	6,923	14,800	110.1	108.9
5/05/99	108.8	108.9	12,291	4,809	17,100	108.8	108.9
5/13/99	110.0	107.0	14,506	6,194	20,700	109.1	108.2
6/02/99	111.5	104.7	13,721	6,379	20,100	109.3	107.2
6/07/99	112.4	109.7	19,678	5,922	25,600	111.8	111.2
6/16/99	104.0	104.3	15,900	6,100	22,000	104.1	104.2

Note:
"N/A" indicates data not available.

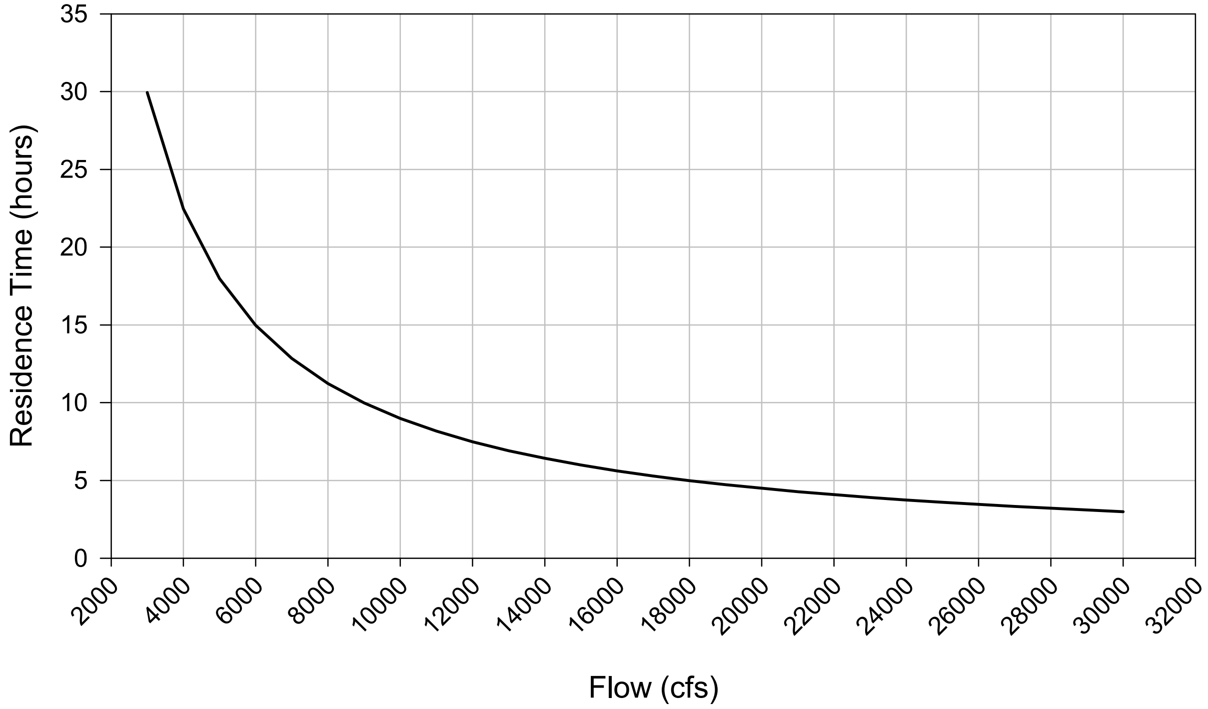


Figure E.2-1 **Swan Falls Reservoir residence time in hours related to Snake River flow.**

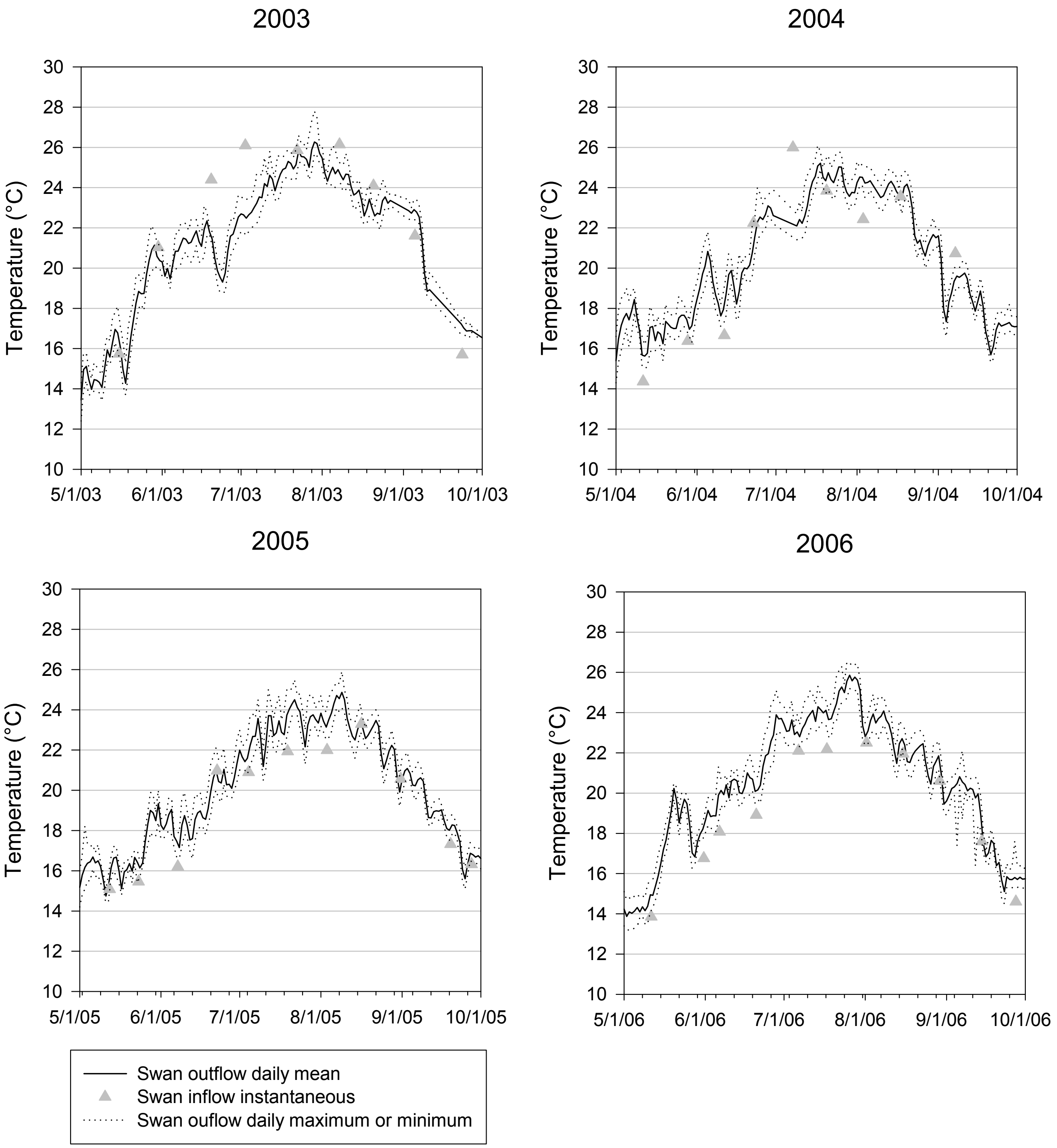


Figure E.2-2 Swan Falls Reservoir outflow daily minimum, maximum, and mean temperatures compared with instantaneous inflow temperatures from May through September 2003, 2004, 2005, and 2006.

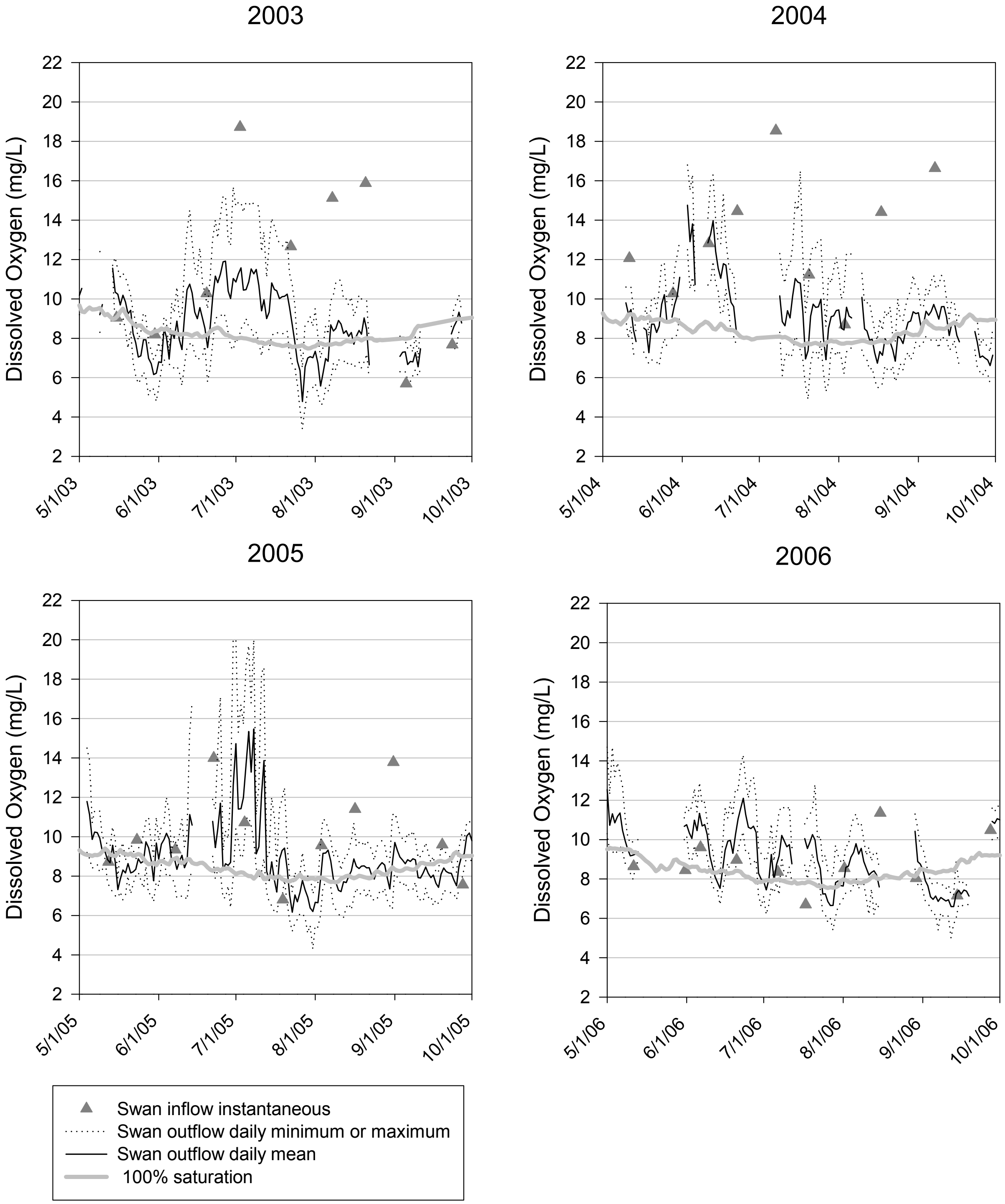


Figure E.2-3 Swan Falls Reservoir outflow daily minimum, maximum, and mean dissolved oxygen compared with instantaneous inflow (RM 474) from May through September 2003, 2004, 2005, and 2006.

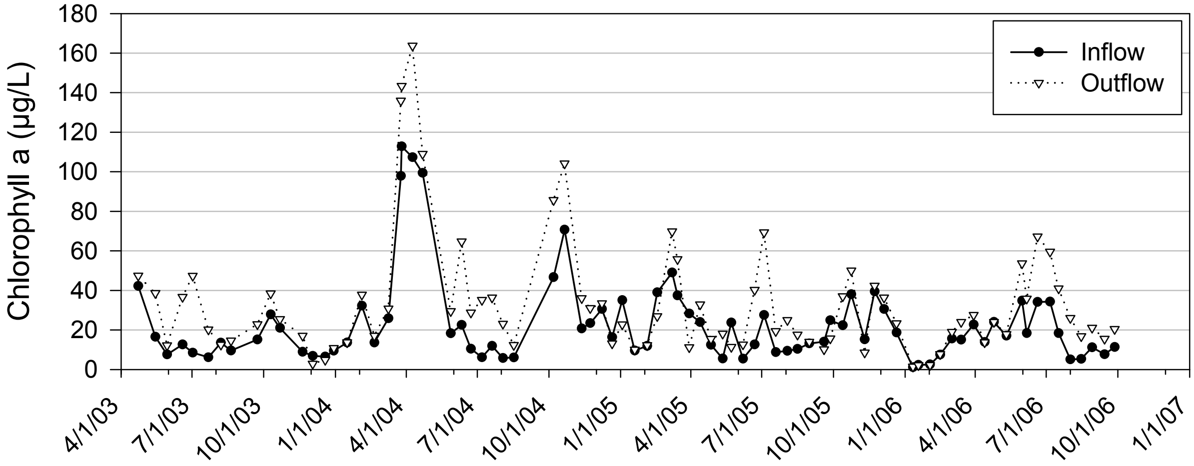


Figure E.2-4 **Swan Falls inflow (RM 474) and outflow (RM 457.7) chlorophyll *a* from April 2003 through October 2006.**

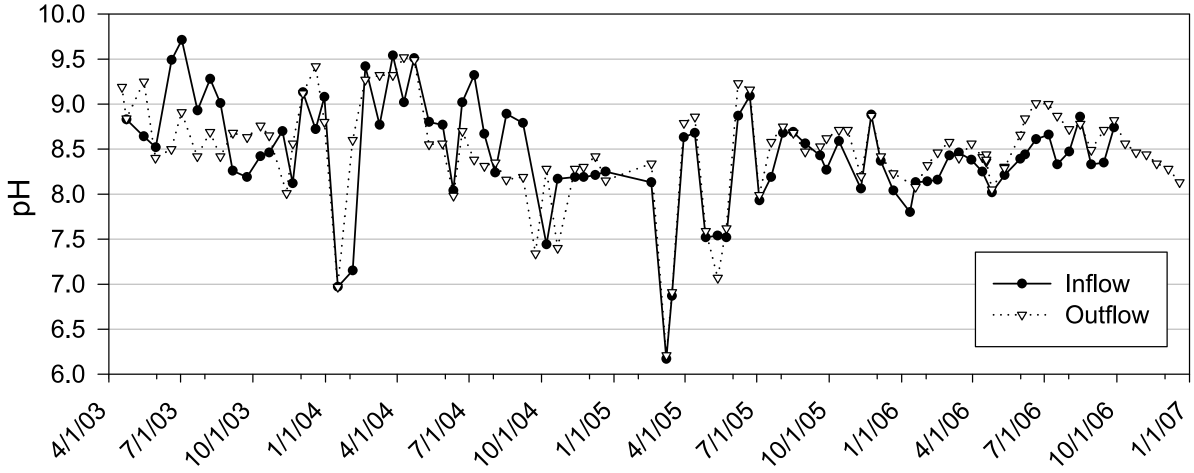


Figure E.2-5 **Swan Falls inflow (RM 474) and outflow (RM 457.7) pH in standard units from April 2003 through October 2006.**

This page left blank intentionally.

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(3)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f)(3) *Report on fish, wildlife, and botanical resources.* The report must discuss fish, wildlife, and botanical resources in the vicinity of the project and the impact of the project on those resources. The report must be prepared in consultation with any state agency with responsibility for fish, wildlife, and botanical resources, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service (if the project may affect anadromous fish resources subject to that agency's jurisdiction), and any other state or Federal agency with managerial authority over any part of the project lands. Consultation must be documented by appending to the report a letter from each agency consulted that indicates the nature, extent, and results of the consultation. The report must include:
>
> (i) A description of the fish, wildlife, and botanical resources of the project and its vicinity, and of downstream areas affected by the project, including identification of any species listed as threatened or endangered by the U.S. Fish and Wildlife Service (*See* 50 CFR 17.11 and 17.12);
>
> (ii) A description of any measures or facilities recommended by the agencies consulted for the mitigation of impacts on fish, wildlife, and botanical resources, or for the protection or improvement of those resources;
>
> (iii) A statement of any existing measures or facilities to be continued or maintained and any measures or facilities proposed by the applicant for the mitigation of impacts on fish, wildlife, and botanical resources, or for the protection or improvement of such resources, including an explanation of why the applicant has rejected any measures or facilities recommended by an agency and described under paragraph (f)(3)(ii) of this section.
>
> (iv) A description of any anticipated continuing impact on fish, wildlife, and botanical resources of continued operation of the project, and the incremental impact of proposed new development of project works or changes in project operation; and
>
> (v) The following materials and information regarding the measures and facilities identified under paragraph (f)(3)(iii) of this section;
>
> (A) Functional design drawings of any fish passage and collection facilities, indicating whether the facilities depicted are existing or proposed (these drawings must conform to the specifications of § 4.39 regarding dimensions of full-sized prints, scale, and legibility);
>
> (B) A description of operation and maintenance procedures for any existing or proposed measures or facilities;
>
> (C) An implementation or construction schedule for any proposed measures or facilities, showing the intervals following issuance of a license when implementation of the measures or construction of the facilities would be commenced and completed;
>
> (D) An estimate of the costs of construction, operation, and maintenance, of any proposed facilities, and of implementation of any proposed measures, including a statement of the sources and extent of financing; and
>
> (E) A map or drawing that conforms to the size, scale, and legibility requirements of § 4.39 showing by the use of shading, cross-hatching, or other symbols the identity and location of any measures or facilities, and indicating whether each measure or facility is existing or proposed (the map or drawings in this exhibit may be consolidated.)

E.3. REPORT ON FISH, WILDLIFE, AND BOTANICAL RESOURCES

This page left blank intentionally.

E.3.1. Fish Resources

E.3.1.1. Description of Fish Resources

Fish communities associated with the Swan Falls Project, the vicinity, and areas downstream of Swan Falls Dam comprise nine families (Table E.3.1-1). Native family representation is limited to five families of fish, including white sturgeon (Acipenseridae), salmon and trout (Salmonidae), minnows (Cyprinidae), sucker fish (Catostomidae), and sculpins (Cottidae). As is typical for fish fauna of the Pacific Northwest, native species in the Swan Falls Project area and vicinity are few, currently limited to only 13 species. The Cyprinidae family shows the greatest representation, with six native species. The richness of native species and diversity of life histories present upstream of the Swan Falls vicinity were reduced following initial construction of the Swan Falls Project in 1901. Swan Falls Dam served as a migration barrier to stocks of chinook salmon (*Oncorhynchus tshawytscha*). Native species richness and diversity were further reduced with the construction of the Hells Canyon Complex (HCC). These three dams (Hells Canyon, Oxbow, and Brownlee) became complete migration barriers, primarily for anadromous species such as Pacific salmon (*Oncorhynchus* spp.) and Pacific lamprey (*Lampetra tridentata*).

Following Euroamerican settlement of the region, many fish species were introduced to the Northwest, and specifically, within the Swan Falls vicinity. Sixteen introduced species are represented in five families of fish. The sunfish and black basses family (Centrarchidae) and the catfish family (Ictaluridae) represent the greatest number of introduced species. Clearly, construction of reservoir habitats along the Snake River has created favorable environments for many introduced species. However, even in free-flowing habitats of river sections, introduced species are common. Interactions of introduced and native species are not fully understood, but they could include predation, competition, and hybridization. These interactions may be reduced by temporal and spatial habitat differences and preferences among species.

In the early twentieth century, much of the fisheries research in the area downstream of Swan Falls Dam focused on monitoring fall chinook salmon spawning and outmigration. Stanford (1942) completed one of the first surveys describing the fish communities of the Snake River. Stanford (1942) conducted an early survey of the Snake River section that he described as the valley section (between Swan Falls Dam and the upper end of present-day

Brownlee Reservoir). He described this section as devoid of most native game fish and a catchall for a host of “imported species.” The survey mentioned several species, including largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* spp.), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), and brown bullhead (*Ameiurus nebulosus*), but it did not include any quantitative information.

E.3.1.1.1. Threatened and Endangered Species

The Endangered Species Act of 1973 (ESA) obligated the United States government to provide protection for plant and animal species in danger of extinction. In December 1992, the U.S. Fish and Wildlife Services (USFWS) determined endangered status for four Snake River molluscs: the Idaho springsnail (*Pyrgulopsis idahoensis*), the Utah valvata snail (*Valvata utahensis* Call), the Snake River physa snail (*Physa [Haitia] natricina* Taylor), and the Banbury Springs lanx (*Lanx* sp. Undescribed) (USFWS 1992). The USFWS also determined threatened status for the Bliss Rapids snail (*Taylorconcha serpenticola* Hershler, Frest, Johannes, Bowler, and Thompson). Effective September 5, 2007, the USFWS removed the Idaho springsnail from ESA protection because it is no longer considered a unique species that warrants listing (USFWS 2007). As a result of the Idaho springsnail delisting, no ESA-listed aquatic species are associated with the project area.

E.3.1.1.2. Anadromous Fish

Three species of anadromous fish were historically associated with the Swan Falls vicinity. Anadromous salmonids included steelhead (sea-run rainbow trout) and redband/rainbow trout (*Oncorhynchus mykiss*) and three stocks of chinook salmon (spring, summer, and fall stocks). Also, a single species of lamprey (Pacific lamprey) was associated with the Swan Falls vicinity. The mainstem Snake River below Swan Falls Dam was a primary production area for fall chinook salmon. No evidence exists that coho salmon (*Oncorhynchus kisutch*) were distributed upstream of the present-day Hells Canyon Dam site. Sockeye salmon (*Oncorhynchus nerka*) were historically present in the Payette River drainage downstream of the Swan Falls Project area. White sturgeon (*Acipenser transmontanus*) may have also exhibited some degree of anadromy in the Swan Falls vicinity.

In 1900 and 1901, The Trade Dollar Mining Company of Silver City, Idaho, constructed the Swan Falls Dam, which posed one of the first migration barriers for these migratory species. Although a fish ladder was installed during initial construction of Swan Falls Dam, it was not functional for salmon (Van Dusen 1903, Irving and Cuplin 1956, Lavier 1976). Swan Falls Dam became the upstream terminus for salmon in the Snake River. The dam blocked approximately 157 miles (253 kilometers [km]) of mainstem Snake River, or approximately 25% of the entire anadromous section of the Snake River (up to Shoshone Falls). Later, construction of mainstem dams in the Snake and Columbia rivers further limited migration of these species.

After the Applicant had taken ownership of the dam in 1916, the fish ladder was reconstructed in 1922. At the time, it was considered one of the best-constructed fish ladders (IDFG 1922). Unfortunately, the ladder proved ineffective at passing salmon around the dam, although some steelhead were apparently able to pass the dam. Irving and Cuplin (1956) reported that a small run of steelhead ascended the river to C.J. Strike Dam (constructed in 1952), which was a complete barrier. Still, very little production potential for steelhead existed between C.J. Strike and Swan Falls dams.

Pacific lamprey apparently could use the fish ladder to pass Swan Falls Dam. Stanford (1942) reported that “Pacific lamprey…were taken in the spring as it made its way with apparent ease, over the fishway or attempted to climb the lower face of the dam.” However, Irving and Cuplin (1956) made no mention of Pacific lamprey below C.J. Strike Dam. Considering the dates of Stanford’s and Irving and Cuplin’s writings, the fishway they referred to would have been the reconstructed fish ladder. It is unclear whether either of these species could use the original fishway to pass the dam. If they could not, then these fish would have been excluded above Swan Falls Dam for approximately 20 years until the new ladder was constructed. The ladder that was constructed in 1922 remained at the project until recently, when construction of the new powerhouse between 1990 and 1994 removed the ladder. Currently, there is no upstream fish passage available at Swan Falls Dam.

Fall chinook salmon continued to endure in the mainstem below Swan Falls Dam after 1901. The next downstream terminus was Brownlee Dam, constructed in 1958. In 1956, the diversion tunnel for use during Brownlee Dam construction was completed, along with temporary fish passage facilities to move adults around the construction area. When Brownlee Reservoir filled in May 1958, collection of adult fish was moved downstream to the construction site for Oxbow Dam, and then, in 1966, to below Hells Canyon Dam. However, shortly after Brownlee Dam construction, it became apparent that downstream collection efforts of juvenile outmigrants had failed. In December 1963, the Federal Power Commission, which later became the Federal Energy Regulatory Commission (FERC), ordered the Applicant to abandon the downstream collection efforts prior to the outmigration of 1964. Because of these events, Hells Canyon Dam became the terminus for wild production of anadromous fish. Anadromous fish were blocked from the Swan Falls vicinity.

Chapman and Chandler (2003) estimated predevelopment (pre-1900s) run sizes of as many as 450,000 fall chinook salmon that returned annually to the Snake River above its confluence with the Columbia River. Of those returning fall chinook salmon, about 270,000 were estimated to actually spawn upstream of the current HCC. Waples et al. (1991) estimated that, during the early twentieth century, only as many as 72,000 fall chinook salmon returned annually to the upper Snake River. These same authors concluded that, from the 1950s up until construction of Brownlee Dam, the annual upper Snake River escapement had dropped to about 30,000 fish. Escapement numbers before construction of the HCC are not available because the Brownlee fish trap provided the first counts for the Snake River. McNary Dam counts, which began in 1954, provided counts for Snake River and upper Columbia River fall chinook salmon. Counts of spawning grounds upstream of Brownlee Dam showed a relatively high redd count in 1947, which corresponded to high counts at Columbia River dams.

Richards (1973) estimated run sizes of fall chinook salmon in the Swan Falls reach at 2,695 fish before Celilo Falls on the Columbia River was inundated (1954–1956). Van Hyning (1968) suggested that abundance of fall chinook salmon was declining in the Marsing reach (Swan Falls Dam to Marsing Dam) and had reached a low in the early 1950s before inundation of Celilo Falls. Redd counts conducted by the USFWS support this conclusion, showing a decline from 3,804 redds in 1947 to 343 redds in 1949 (Zimmer 1950). After Celilo Falls was inundated, and before Brownlee Reservoir was filled (1957–1959), escapement to the reach above Brownlee Dam averaged 14,944 fish. Whether these higher returns could have been sustained is unknown. The extent to which land uses at that time were affecting the quality of spawning habitat below Swan Falls Dam is also unknown.

The feasibility of reintroducing anadromous fish was extensively evaluated as part of the HCC license application (IPC 2003). In a study of reintroduction alternatives, Chandler and Chapman (2003) determined that natural populations of anadromous fish would probably not sustain themselves upstream of the HCC, even with bypass or collection facilities at these dams, under conditions existing downstream of Hells Canyon Dam. Conditions along the migratory corridor in the lower Snake and Columbia rivers and in the ocean, together with ocean harvest and in-river adult survival, reduce smolt-to-adult returns to levels below those necessary to maintain basin production potential and, possibly, self-sustenance of a population. Most populations of anadromous fish in the Snake River Basin (below Hells Canyon Dam) have reached extremely low levels, a situation that has led to their protection under the ESA.

In addition, the quality of existing mainstem Snake River habitat upstream of Hells Canyon Dam—including the historic Marsing reach—is questionable in its ability to produce anadromous smolts. Currently, the Snake River is listed by the Environmental Protection Agency as impaired regarding nutrient and sediment levels. The Snake River below Swan Falls Dam contains high amounts of suspended sediments, which can cap redds with fine sediments during the incubation period. This cap can reduce the potential for oxygen-rich river water to move through the gravel, thereby reducing dissolved oxygen (DO) levels during the later part of incubation, especially if the fine sediment is high in organic matter and bacterial content (Chandler et al. 2003).

To evaluate present-day habitat conditions, the Applicant’s biologists studied historical spawning areas once used below Swan Falls Dam. Construction of simulated redds (sometimes referred to as artificial redds) suggested that survival of incubating eggs is questionable (Groves and Chandler 2005). These studies were expanded to include live eggs during the years of 2003–2004, 2004–2005, and 2005–2006 (November through March). The Applicant and Battelle Memorial Pacific Northwest National Laboratories (PNNL) conducted egg incubation studies in the Snake River. They used freshly fertilized (green) and developed (eyed) eggs of fall chinook salmon within egg baskets buried in simulated redds in both the historic spawning grounds downstream of the Swan Falls Dam (hereinafter referred to as the Swan Falls reach) and in the contemporary spawning areas downstream of the Hells Canyon Dam (hereinafter referred to as the Hells Canyon reach). The purpose of the study was to more fully assess and compare the potential for incubation survival within those two habitats.

Within the Swan Falls reach of the Snake River, a high level of mortality occurred within egg baskets planted in the simulated redds. Within the Hells Canyon reach, a much lower mortality of eggs was observed (Table E.3.1-2). These conditions appear to be strongly linked to the DO levels within the inter-redd environment (Table E.3.1-2). Data collected from simulated redds suggest that initial DO levels within the simulated redds were very similar to conditions within the water column in both the Swan Falls and Hells Canyon reaches. This result was expected, as the cleaning and redistribution of gravels during the construction of a redd would increase the permeability and the interaction of water from both the water column and the local, shallow hyporheic zone (Burner 1951, Vronskiy 1972, Chapman 1988). Also, in both reaches, as the incubation period progressed, the general trend was that DO in the simulated redds diverged from, and became less than, what was observed within the water column. However, within the Hells Canyon reach, this divergence was not as great or as quick to occur as that which was noted in the Swan Falls reach. Within the Hells Canyon reach, the difference between the DO levels of the water column and simulated redds increased slowly throughout the season, and tended to average <2 milligrams/liter (mg/L) during the post-hatch period (from about mid-January in each season). However, in the Swan Falls reach, the difference in DO between the water column and the simulated redds increased quickly, and during the post-hatch period was generally >4 mg/L. Actual values of DO within simulated redds of the Hells Canyon reach tended to be less variable and remained >8 mg/L during the post-hatch period while, in the Swan Falls reach, the DO levels of individual redds were highly variable and tended to be <8 mg/L throughout the post-hatch period.

Within the Swan Falls reach, the undisturbed hyporheic (measured from water extracted from vertical piezometers) around the artificial redds was virtually anoxic throughout the entire incubation period. The difference between the DO of the water column and the undisturbed hyporheic was consistently >9 mg/L. This result was very different than what was observed for the Hells Canyon reach, where the difference in DO in the two environments was generally <2 mg/L throughout the incubation period. It is likely that the natural, shallow hyporheic environment of the Swan Falls reach is disconnected from the water column because of the high intrusion of fine material within the intergravel spaces of the river bed. This intrusion prevents the exchange of water from the water column into the undisturbed, shallow hyporheic zone, which likely has a strong influence on the degradation of artificial redds created within this environment. However, in the spawning and incubation habitat of the Hells Canyon reach there appears to be a strong connection between the water column and the shallow hyporheic zone, which allows for substantial exchange of well oxygenated water between the two environments. This exchange may be the key to higher incubation survival throughout the Hells Canyon reach of the Snake River.

The reduced levels of DO within the gravels of the Swan Falls reach were similar to that reported by Groves and Chandler (2005). The reduced levels of DO (especially post-hatch) observed within the Swan Falls reach throughout the three years of study, as well as the presence of hydrogen sulfide (Groves and Chandler 2005), were likely the primary cause of reduced survival throughout the Swan Falls reach. Under these conditions, reintroduction of a self-sustaining population of fall chinook in the Swan Falls reach is not feasible.

E.3.1.1.3. White Sturgeon

White sturgeon are the largest, longest-lived freshwater or anadromous fish in North America (Scott and Crossman 1973) and are highly adapted to the large river systems in which they evolved. Their large size and opportunistic behavior enabled them to range widely in order to take advantage of scattered and seasonally available resources in these dynamic river habitats and in the ocean. Longevity and high fecundity allowed them to persist through changes in their environment and to capitalize on favorable spawning conditions when changes occurred (UCWSRI 2002). However, these population attributes that have proven adaptive for millions of years are now a liability. While large size and high fecundity make sturgeon a valuable fishery commodity, their longevity and delayed maturation make them extremely vulnerable to over-fishing (Beamesderfer and Farr 1997). Long life span and benthic feeding also make sturgeon susceptible to bioaccumulation of pollutants with potentially detrimental effects on health, growth, maturation, and recruitment.

In addition, critical habitats of white sturgeon have also been altered. The construction of dams has blocked movement and restricted white sturgeon to river fragments that may no longer provide the full spectrum of habitats necessary to complete their life cycles. Flow regulation has altered seasonal and annual fluctuations that provide behavioral cues and suitable spawning or rearing conditions (UCWSRI 2002). Similar threats have also faced other species of sturgeon such that sturgeon species are at risk (depleted, threatened, or extinct) almost everywhere they occur in temperate river systems of North America, Europe, and Asia (Smith 1990, Birstein 1993, UCWSRI 2002).

In the Snake River, white sturgeon are classified by the state of Idaho as a species of special concern (Moseley and Groves 1990). Factors that have played a role in white sturgeon decline in other river systems—altered habitat, pollution, historical exploitation, and population fragmentation by dams—have also contributed to the current status of white sturgeon in the Snake River. Of the nine isolated subpopulations in the Snake River in Idaho, only the Hells Canyon–Lower Granite and the Bliss–C.J. Strike reaches support viable populations (Cochnauer et al. 1985). In these reaches, abundance and population structure appear to be recovering from the impact of catch-and-keep fishing regulations prior to 1972. White sturgeon in these reaches appear to be well adapted to isolated conditions (Cochnauer 2002). However, Snake River reaches between Hells Canyon and Swans Falls dams and upstream of Bliss Dam contain small populations and little or no detectable natural recruitment.

Concern about the status, viability, and persistence of Snake River white sturgeon has been expressed by federal and state management agencies, Native American tribes, and nongovernmental organizations participating in the relicensing process for several of the Applicant’s hydroelectric projects. As a result, the Applicant has conducted white sturgeon surveys in the C.J. Strike–Swan Falls and Swan Falls–Brownlee reaches as part of relicensing efforts for C.J. Strike Dam and the HCC. These two efforts together encompass the entire vicinity of the Swan Falls Project area.

E.3.1.1.3.1. Above Swan Falls Dam

As part of the mitigation requirements for C.J. Strike Dam, the Applicant is currently conducting a population survey of white sturgeon between the C.J. Strike and Swan Falls dams. This survey is part of the long-term monitoring program for white sturgeon between the C.J. Strike and Swan Falls dams as identified in Measure 9.5.4 of the *White Sturgeon Conservation Plan* (WSCP) (IPC 2005, included as Technical Report E.3.1-D[1]). This survey is scheduled to be completed in mid-2007 with final reporting of results available in 2008. The Applicant completed the first population survey of white sturgeon within this reach from 1994 to 1996. During the first survey effort, the Applicant collected 654 white sturgeon (including 324 recaptures) from 33,747 setline, 448 gill net, and 129 angling hours of effort (Table E.3.1-3) (Lepla and Chandler 1997). The majority (95%) of white sturgeon were captured within the upper end of the reach between C.J. Strike Dam and river mile (RM) 483. Catch rates from RM 483 downstream to Swan Falls Dam were poor: only one white sturgeon was sampled in Swan Falls Reservoir (Figure E.3.1-1 and Figure E.3.1-2). The high concentration of white sturgeon in the vicinity of the tailrace may be related to increased foraging opportunities at C.J. Strike Dam. The abundance of white sturgeon in the C.J. Strike–Swan Falls reach was estimated at 726 fish (95% Confidence Interval [CI] 473-1565).

Of the captured white sturgeon, 328 were wild and 2 were of hatchery origin. Wild white sturgeon ranged in length from 71 centimeters (cm) to 253 cm total length (TL), and hatchery white sturgeon measured 76 to 92 cm TL. Length frequency histograms showed that the white sturgeon population below C.J. Strike Dam were comprised mostly of mid-sized and large white sturgeon. Wild (hatchery) white sturgeon collected by setlines showed 6.0% (0.4%) of the fish were less than 92 cm TL, 58.6% (0%) were between 92 and 183 cm TL, and 35.0% (0%) were greater than 183 cm TL. Mid-sized white sturgeon also dominated the gill-net histogram, with 16.4% (0.6%) measuring less than 92 cm TL, 68.0% (0%) measuring between 92 and 183 cm TL, and 15.0% (0%) measuring greater than 183 cm TL (Figure E.3.1-3). Rod-and-reel sampling produced similar results: fish ranged between 108 and 211 cm TL.

Mean relative weight for white sturgeon sampled in the C.J. Strike–Swan Falls reach was below average (88%) but similar to condition factors reported for sturgeon sampled in other riverine segments of the Snake River (Table E.3.1-4). Observed growth rates from recaptured white sturgeon in the C.J. Strike–Swan Falls reach showed slightly slower growth than white sturgeon

---

[1] For the purposes of this application, theWhite Sturgeon Conservation Plan has been submitted without technical appendices.

populations above C.J. Strike Dam (Table E.3.1-5). Annual mortality of sturgeon below C.J. Strike Dam was comparable with mortality estimates from other Snake River white sturgeon populations (Table E.3.1-6).

Ninety-one white sturgeon sampled in the C.J. Strike–Swan Falls reach (greater than 150 cm TL) were surgically examined to determine sex and stage of maturity. Although the ratio of males to females was nearly one-to-one (50.5% females to 49.5% males), only a few females (4%) were in reproductive readiness. By comparison, 13% of the females below Bliss Dam and 11% of the females below Hells Canyon Dam were reproductive during the Applicant's surveys. The annual number of spawning females in the population was estimated at seven fish (95% CI 4–17) (Lepla and Chandler 1997).

Survey results also indicated that some downstream movement of mid-sized and large white sturgeon had occurred from the Bliss–C.J. Strike reach. Six sturgeon (four wild and two hatchery) that had originally been sampled in the Bliss–C.J. Strike reach were recaptured below C.J. Strike Dam. Most of these individuals were relatively large (121–211 cm TL), suggesting that the sturgeon probably passed the project during spill events. Based on the recovery of these fish and a number of marked sturgeon in the Bliss–C.J. Strike reach, the Applicant estimated that 2% of the Bliss sturgeon population was migrating downstream annually (Applicant's unpublished data).

Of particular concern, the 1994–1996 survey highlighted that spawning was largely unsuccessful below C.J. Strike Dam based on the low abundance (6.4% [setline] and 17% [gill net]) of white sturgeon measuring less than 92 cm TL. A follow-up survey was conducted in 2001 to evaluate recruitment levels in response to normal and above-normal flows (1996–1999) in the middle Snake River. Despite the occurrence of high-flow years, no increase in the number of small white sturgeon was observed (Figure E.3.1-3). These results contrasted with post-drought recruitment trends observed upstream in the Bliss–C.J. Strike population, where numbers of small white sturgeon increased from 8% during 1991–1993 to 45% in 2000. The 2001 survey suggested that physical habitat below C.J. Strike Dam may not support white sturgeon reproduction, even during high-flow years. This information suggests that the white sturgeon population below C.J. Strike Dam is likely supported by recruitment from the more abundant sturgeon population that occurs in the upstream reach.

The Snake River downstream of C.J. Strike Dam consists mostly of low-gradient and shallow-run habitat intermixed with a few island complexes. There are, essentially, no significant rapids or narrow channels to create the turbulent and high-velocity conditions that are commonly associated with known white sturgeon spawning and incubation areas in the Bliss–C.J. Strike, Swan Falls–Brownlee, and Hells Canyon–Lower Granite reaches of the Snake River (Lepla and Chandler 2003). These conditions, to some extent, are found in a very limited area of the spillway and tailrace of C.J. Strike Dam.

The distribution and movement patterns of reproductive telemetered sturgeon indicated that the tailrace area was the only location used by these spawning sturgeon (Lepla and Chandler 1997). Results of an instream flow study indicated that project operations affect spawning habitat primarily during low- and normal-flow years (Lepla and Chandler 1997); however, the physical habitat does not appear to support sturgeon reproduction even during high-flow years. Despite the occurrence of five consecutive high-flow years from 1982–1986, and four consecutive high-flow years from 1996–1999, white sturgeon size composition has not changed appreciably over the past decade according to population assessments in 1989 (IDFG 1992), 1994–1996 (Lepla and Chandler 1997), and 2001 (Applicant's unpublished data) (Figure E.3.1-4). Time-series plots of white sturgeon spawning habitat from 1996 to 1999 also showed that project operations at C.J. Strike Dam had little effect on the amount of white sturgeon habitat during the spawning season in these years (Figure E.3.1-5). These results suggest that adequate spawning conditions are generally unavailable to sturgeon below C.J. Strike Dam, and neither improved water years or changes in project operations are expected to provide significant increases to recruitment. The overall low-gradient nature of this reach and lack of turbulent runs further suggest that, historically, white sturgeon probably spawned in other areas of the Snake River.

Powerhouse-related mortalities have also occurred at C.J. Strike Dam. Between 1996 and 2000, at least five white sturgeon mortalities have been reported in the tailwaters of C.J. Strike Dam as a result of blade-strike injury. It became apparent that some white sturgeon were entering the draft tube (where outflows from turbines enter the tailrace) when a turbine was offline. White sturgeon were injured as the unit returned online, either by blade strikes or by contact with concrete dividers as they exited the draft tube. In 2000, the Applicant began using compressed air blasts prior to unit start-ups in an effort to "clear" white sturgeon away from the turbine blades. As a result, no further powerhouse-related mortalities were reported following implementation of this protocol.

Between April 27 and May 17, 2004, a total of 13 white sturgeon carcasses were recovered from the forebay of Swan Falls Dam (36 river miles downstream of C.J. Strike Dam) (Figure E.3.1-6). Most (*n* = 12) were recovered on the following dates: April 27 (1), May 4 (1), May 6 (4), May 7 (2), May 10 (2), and May 13 (2). These carcasses were recovered by the mechanical trash rake, which consists of a telescoping arm and bucket that periodically collects and removes surface and subsurface (0 to 70 feet below water surface) debris from the intake screen, or trash rack. Swan Falls Plant operators indicated that all carcasses were collected from below the waterline (i.e., none were observed floating on the surface). On May 17, personnel working for the Applicant recovered the last white sturgeon carcass, which was found floating near the shoreline approximately 1 river mile upstream of Swan Falls Dam.

In general, most carcasses collected at the dam showed little sign of decomposition, suggesting that mortality was fairly recent, perhaps one to two days prior to their recovery. The floating carcass found on May 17, 2004, showed greater decomposition, which indicates that mortality likely occurred sometime the previous week. At the time of recovery, biological information was collected on 10 of the 12 carcasses[2]. Total lengths of these fish ranged from 167 to 223 cm; gonad inspections indicated that all 10 sturgeon (5 males and 5 females) were of reproductive condition. Passive Integrated Transponder (PIT) tags, which were detected in 5 carcasses, indicated that these individuals were originally tagged near C.J. Strike Dam during 1993, 1996, and 2001.

Of the 10 carcasses that were recovered, field necropsies were conducted on 8 fish, while 2 were frozen and transported to the Washington Animal Disease Diagnostic Laboratory at Washington State University (WSU) in Pullman, Washington. A complete report of the laboratory necropsy is available in Appendix 8 of the WSCP (IPC 2005). The carcasses were cut open during the field necropsies for visual inspection of the body cavity, and internal organs were examined for signs of abnormalities. No obvious internal injuries or infections of internal organs were observed. A

---

[2] Swan Falls Plant operators hauled the first two white sturgeon carcasses to a debris pile before the Applicant’s biologists could inspect the carcasses; plant operators estimated their lengths at between 6 and 7 feet.

fishing hook was found in the body cavity of one fish, but this hook did not appear to be the cause of mortality. Examination of stomach contents and digestive tracts of the four white sturgeon also indicated the presence of various food items, including clams, snails, and bony fish parts. Overall, field necropsies were inconclusive as to the likely cause(s) of mortality.

Seven of the white sturgeon had various external physical injuries, ranging from minor cuts and abrasions along the body to damaged pectoral/caudal fin-body joints and one head fracture. Three of the carcasses were also partially or completely severed. Plant operators indicated, however, that the carcasses were severed by the mechanical trash rake during removal. While the cause(s) of the other injuries remains speculative, one fish (May 17, 2004, carcass) had a significant fracture across the top of its skull. Because this fish was recovered upstream of the dam, the fracture could not have been caused by the trash rake. Although it is not known for certain, it cannot be ruled out that this injury resulted from a boat propeller postmortem or a draft tube injury from an upstream dam.

Laboratory evaluation of the male and female carcasses transported to WSU was also inconclusive as to definitive cause(s) of mortality. No significant gross lesions to suggest turbine trauma or symptoms of bacterial/viral agents were found in either fish. The female showed evidence of myolysis (tissue degeneration) near the dorsal fin, although the absence of tissue hemorrhage in surrounding tissue suggested that the myolysis occurred postmortem and was likely the result of injury sustained during trash rake removal. Histological testing could not explain the female's death. Histological evaluation of the male concluded that the physical injury to the pectoral fin-body joint had occurred antemortem. Although this injury was not significant enough to cause immediate mortality, it may have led to the male's death several days after the initial trauma.

Although the causes and events surrounding these mortalities remain unclear, the Applicant has concluded that environmental conditions—low DO levels, temperature, or chemical toxins—are unlikely to have been factors. Minimum hourly DO readings at C.J. Strike and Swan Falls dams never dropped below 7.0 mg/L when carcasses were being recovered; water temperatures (~16.5–19.0 °C) were not unsuitable. The only chemical known to have been used in the area recently is Acrolein, an algicide. Acrolein, also known as Magnicide-H, was used to clean canals near the town of Grand View, Idaho, during the week of May 10, 2004. Although Acrolein is very toxic to aquatic life, the timing of the application, proximity to the river, and protocols used to apply this chemical suggest that Acrolein was not a factor in the sturgeon mortalities (Dr. James Bake, Idaho Department of Agriculture, personal communication). To prevent unintended consequences, strict protocols have been employed during canal applications.

For instance, only small sections of the canals are treated at one time, and the application is highly diluted, thereby breaking down quickly. Acrolein chemically reacts (binds) with clays/organics, and canal flows are lowered to ensure that the application stays on the field.

Therefore, any fish species would need to be very close to the source application for it to be lethal. Given that the canal waters flow onto the fields before returning to the river and that sturgeon are not found within very small creeks, Acrolein would not appear to be a source of mortality for these fish. Most convincing, however, is that several sturgeon mortalities had already occurred before the canals were cleaned. No other toxins associated with pesticides for hay field applications that could be mobilized by canal waters were used during that time of year. The absence of mortality of other fish species, non-reproductive adult sturgeon, and immature juvenile sturgeon further suggest that environmental conditions were not causal factors.

As indicated above, blade-strike mortalities have been documented in the past in the tailrace of C.J. Strike Dam. As a result, the Applicant implemented an air-injection system, which automatically injects a forceful blast of air (approximately 4 minutes in duration) into the head case of each turbine prior to unit start-up as a means of clearing sturgeon away from the turbine blades. This system was operational in June 2000 and appeared to be successful. The absence of tailrace mortalities between 2000 and 2004 makes the recent mortalities in 2004 all the more confounding. Given the reporting record for past mortalities at C.J. Strike Dam, it seems improbable that such an event would have gone unnoticed.

Although it does not appear that C.J. Strike Project operations were connected to these latest mortalities and given the uncertainty surrounding this unusual event, the Applicant voluntarily modified the air injection system at C.J. Strike Dam in 2004–2005. Rather than providing a clearing blast, the Applicant installed a large capacity blower to completely compress the waterline below the turbine blades prior to unit start-ups. This procedure is automated and requires less than three minutes to essentially “push” the waterline below the turbine blades, thus effectively removing any potential contact of sturgeon with the turbine blades during start-up.

A large mortality event occurred again, however, in the spring of 2006. Between April 13 and May 20, 2006, 11 adult white sturgeon carcasses were recovered at the Swan Falls trash rack. No cause of death for any of the 11 fish was apparent. Although the timing, number, and life stages of these fish were similar to the 2004 mortality event, project operations at C.J. Strike Dam and the river’s hydrograph were very different. During 2004, there were no spill events at C.J. Strike Dam, and project units were cycled daily to meet power demands. The air injection system was operational during this time, and no start-up mortalities had occurred at C.J. Strike between 2000 and 2004, since the air injection was employed. In contrast, C.J. Strike Dam was spilling water in 2006 and all project units were on-line for upwards of one month, yet five sturgeon mortalities were recovered at the Swan Falls trash rack (Figure E.3.1-6). This indicates that these mortalities were not caused by unit starts but by some other, unknown source(s). In addition to the units being on-line for an extended period, air compression was used as a preventative measure prior to starting units. As an additional measure of safety, the Applicant also installed a sensor to prevent the turbines from starting if the unit has not been fully compressed with air. In an effort to understand the cause(s) of these mortality events, the Applicant will continue to coordinate its work with the regional Idaho Department of Fish and Game (IDFG) office and the White Sturgeon Technical Advisory Committee (WSTAC).

As a result of these mortality events, the Applicant began attaching transmitters on large, reproductive adult sturgeon in 2006 to monitor their locations during the spawning season in the event more unexplained deaths occur. In addition, operators at C.J. Strike Dam will physically look at the tailrace during unit starts (during the spawning season) to see if any deaths are caused by the project. The Applicant believes that it has implemented preventative measures that ensure restarting project units at C.J. Strike Dam will not kill white sturgeon. However, until further study is conducted, it is unknown at this time if additional measures are needed, or if these mortalities are related to the Applicant’s operations.

E.3.1.1.3.2. Below Swan Falls Dam

The Applicant sampled for white sturgeon between Swan Falls and Brownlee dams during 1996 and 1997 as part of relicensing efforts for the HCC. In the final license application for the HCC (IPC 2003), Lepla et al. (2003) provided a complete description of the population assessment for white sturgeon in this reach of the Snake River. During the 1996–1997 survey, the Applicant expended 16,752 setline, 268 gill net, and 18 angling hours of effort to capture 45 white sturgeon (including 3 recaptures) in the Swan Falls–Brownlee reach (Table E.3.1-3). Most white sturgeon (*n* = 34) were sampled within 8 miles of Swan Falls Dam, whereas 11 white sturgeon were captured near the upper end of Brownlee Reservoir between RM 326.6 and 331.6. Overall, catch rates for white sturgeon were poor regardless of the fishing gear used. The highest catch rates (0.065 fish/hour) for white sturgeon sampled with setlines was near Swan Falls Dam (Figure E.3.1-1), whereas gill nets captured white sturgeon at only three locations in the reach (Figure E.3.1-2). The abundance of white sturgeon greater than 70 cm TL between Swan Falls Dam and Walters Ferry was estimated at 155 individuals (95% CI 70–621), or 7 fish/km. Abundance of white sturgeon in Brownlee Reservoir was not estimated due to the low number of fish captured during random sampling.

White sturgeon metrics in this segment are characteristic of populations showing poor recruitment, with setline efforts yielding 4% of the fish measuring less than 92 cm TL, 26% measuring between 92 and 183 cm TL, and 70% measuring greater than 183 cm TL (Figure E.3.1-7). Gill-net gear showed a similar distribution, with the catch comprised only of mid-sized (79%) and large (21%) fish (Figure E.3.1-7).

Comparisons of length–weight relationships also showed that white sturgeon in this reach of the Snake River generally weighed less relative to their length and were slower growing as white sturgeon approached larger sizes (Figure E.3.1-8). The condition factor for the majority of white sturgeon in the Swan Falls–Brownlee reach was also below average (86%) but still similar to condition factors observed for white sturgeon in other riverine segments of the Snake River. Of particular interest was that the mean relative weight of white sturgeon captured in Brownlee Reservoir (82%) was lower than the mean relative weights of sturgeon sampled from riverine sections (Table E.3.1-4). Typically, the trends in relative weight show that sturgeon residing in Snake River reservoirs have higher condition factors than those captured in riverine sections. The low mean relative weight of Brownlee Reservoir white sturgeon is thought to be due in part to seasonally poor environmental conditions in Brownlee Reservoir; particularly, low DO levels (Klyashtorin 1974).

Comparing the current status of white sturgeon with results of earlier IDFG studies show that white sturgeon abundance in the Swan Falls–Brownlee reach has changed little over the past 30 years. Several surveys have reported low captures of white sturgeon (1 [Cochnauer 1983, Kruse-Malle 1993]; 25 [Reid et al. 1973]; 42 [Reid and Mabbot 1987]). Reid and Mabbot (1987) estimated the population of sturgeon greater than 100 cm TL between Swan Falls Dam and Walters Ferry at 137 to 173 individuals, a range that is similar to the current estimate of 155 individuals. Cochnauer (1983) concluded that this population was small and had been since the early 1970s. Will Reid hypothesized that increased fishing in response to stocking of channel catfish may have contributed to illegal harvest and mortality of sturgeon in this reach (Cochnauer, 1983).

Size composition has also remained similar to results of previous studies (Reid et al. 1973, Reid and Mabbot 1987), with sturgeon greater than 92 cm TL dominating both current and past length frequency histograms. From 1986 to 1987, the size composition of white sturgeon sampled in the Swan Falls–Brownlee reach showed that approximately 3% measured less than 92 cm TL, 23% measured between 92 and 183 cm TL, and 74% measured greater than 183 cm TL. These findings closely resembled the 1996–1997 setline length frequency data (Figure E.3.1-9). In addition, results from a 1995 IDFG mail survey of white sturgeon anglers showed a similar trend, with only 7% of the white sturgeon measuring less than 92 cm TL (IDFG 1996). Some recruitment to the population still occurs based on the continuing presence of a few, small white sturgeon and documented spawning in 1997 (Lepla and Chandler 2003). However, the number of available female spawners in the population is low (*n* = 7, 95% CI 3–29), and near-future recruitment will probably also remain low, perhaps below the levels necessary to sustain this population.

Although the absence of small fish may partly result from the low number of adult fish below Swan Falls, poor water quality also appears to contribute to low recruitment. Despite its length and habitat diversity, the Swan Falls–Brownlee reach remains one of the most degraded reaches of the Snake River. An examination of Idaho's and Oregon's § 303(d) lists show the magnitude of substandard water quality. In particular, the water quality of the Snake River in this reach is degraded relative to temperature, organic matter, and nutrients (Table E.3.1-7 and Table E.3.1-8). Water temperatures can exceed 25 °C in summer, and algae and organic matter are sometimes 10 times greater than levels that initiate concern. Phosphorus levels are typically double the target concentration identified in the draft *Snake River–Hells Canyon Total Maximum Daily Load* (TMDL) (IDEQ and ODEQ 2004, Myers et al. 2003). As a result, Brownlee Reservoir experiences severe water quality degradation, particularly in low and moderate water years, due to the extremely enriched, hypertrophic waters flowing into Brownlee Reservoir. In recent years, poor water quality in this reach has manifested itself in algae blooms and fish kills.

Degraded conditions are especially evident in the transition zone and hypolimnion of Brownlee Reservoir. During the moderate- to low-flow years, extensive and severe hypoxia has developed within those areas of the reservoir (Figure E.3.1-10). During low-flow years, low DO levels lethal to white sturgeon can comprise up to 80% of the bottom 2-meter layer in the transition zone of Brownlee Reservoir (Lepla et al. 2003). In worst-case scenarios, the transition area at the upstream end of the pool can become anoxic throughout the water column, an event that occurred during July 1990. At that time, Brownlee Reservoir experienced a fish kill: as many as 28 adult sturgeon were found dead, presumably because of anoxic conditions (DO < 1 mg/L) that trapped sturgeon in the upper end of the reservoir (IDFG 1990).

Modeling investigations by Jager et al. (2003) determined that, in Snake River segments with poor summer water quality, this factor dominated all others. The population viability analysis (PVA) model identified poor summer water quality to be the most important issue between Swan Falls and Hells Canyon dams. Further, the model predicted that the removal of other limiting factors in the reach would not be sufficient to reestablish recruitment in these populations unless water quality also improved (Jager et al. 2003). The effects of degraded water quality in riverine habitats on the development of early life stages of white sturgeon should be further investigated to determine whether contaminants and water temperature contribute to poor recruitment. For instance, studies conducted in the Kootenai River have shown very high mortality of incubating white sturgeon eggs when they are coated with suspended solids and then incubated in unfiltered water from the Kootenai River. Organic matter and contaminants from suspended solids and river water were likely the primary sources of bacteria and fungi that contributed to the low survival rate of these embryos (Kruse 2000). The Swan Falls–Brownlee reach receives very high organic loading from the surrounding watersheds (Harrison et al. 1999, Myers et al. 2003). This additional burden may affect the survival of incubating sturgeon eggs. Additionally, the bioaccumulation of contaminants in adult sturgeon may be passed through the eggs or sperm and affect embryo viability, although the overall effect of these pollutants on white sturgeon reproduction and survival are largely unknown.

E.3.1.1.4. Native Resident Salmonids

Salmonids that may be present in the Swan Falls Project area include wild redband trout, hatchery-stocked rainbow trout, and mountain whitefish (*Prosopium williamsoni*). Consistent with reports from the 1970s and later, very few observations of wild redband trout are associated with the Snake River in the Swan Falls area. Water temperatures during the summer months may become limiting to salmonid species. Although redband trout are often cited as being tolerant of high water temperatures (Behnke 1992, Zoellick 1999), these references are generally associated with small stream systems with diel temperature fluctuations that are often large. Because of its size, the Snake River has relatively minor temperature fluctuations; within this vicinity, it has very few coldwater sources that offer temperature refuge. However, very few sampling surveys have been conducted during the winter months in this section of the Snake River. Because water temperatures become more suitable for salmonids during the winter months, fluvial redband trout possibly move into the Snake River from tributaries associated with the Snake River in the Swan Falls Project vicinity over the winter period. The Applicant conducted monthly electrofishing surveys from October 2004 through March 2006, during which only four rainbow trout were sampled with only one classified as wild (Chapter 2 of Technical Report E.3.1-B).

Tributaries in the immediate vicinity of the project area include Castle and Sinker creeks above Swan Falls Dam and Rabbit and Reynolds creeks below Swan Falls Dam. Many of the streams that drain the northern face of the Owyhee Mountains support populations of redband trout in their higher elevations (Schill et al. 2004). Schill et al. (2004) subjectively described redband trout upstream of the Boise River confluence to Shoshone Falls as desert redband trout, which the state of Idaho and the Bureau of Reclamation consider to be a sensitive species. None of these streams are currently stocked with hatchery fish, although some trout stocking has occurred historically (Richter and Chandler 2004, Schill et al. 2004). The lower portions of many of these small streams can be highly degraded from irrigation returns and low flows. Irrigation diversions that are present in many of the smaller tributaries potentially block migrations. In its 1995 management plan (BLM 1995), the Bureau of Land Management (BLM) listed improvements for redband trout, such as improving riparian habitats in Sinker Creek, improving fish passage at a culvert under State Highway 78 at Sinker Creek, and working with other entities to improve water quality in the Snake River and its tributaries. The IDFG recently identified redband trout as probably the least-studied Idaho salmonid with a need to evaluate movement patterns, population boundaries and size, and basic demographics of desert redband trout within the vicinity of the Swan Falls Project (Schill et al. 2004).

Mountain whitefish are a native salmonid that occurs throughout the Snake River and its tributaries. Mountain whitefish catches below Swan Falls Dam have been relatively high in past Applicant fish surveys (all years pooled) (Figures E.3.1–3.11). However, mountain whitefish made up a substantial portion of a large fish kill that occurred below Swan Falls Dam in July 2002. The fish kill was primarily the result of high water temperatures that occurred during a prolonged period of high summer air temperatures. A similar mountain whitefish kill occurred in the Swan Falls reach during July 1990; it also was caused by excessive water temperatures (Reid 1990). The Swan Falls Project area was sampled monthly from October 2004 to March 2006. Of the 49 mountain whitefish the Applicant collected, the majority of fish were collected during the month of December, with no fish collected during the months of July, August, or September (Chapter 2 of Technical Report E.3.1-B).

E.3.1.1.5. Resident Nonsalmonids

In the early twentieth century, much of the fisheries research in the area downstream of Swan Falls Dam focused on monitoring fall chinook salmon spawning and outmigration. Stanford (1942) performed one of the first surveys describing the fish communities of the Snake River. Stanford (1942) conducted an early survey of the Snake River section that he described as the valley section (between Swan Falls Dam and the upper end of present-day Brownlee Reservoir). He described this section as devoid of most native game fish and a catchall for a host of “imported species.” The survey mentioned several species, including largemouth bass, crappie, bluegill, common carp, channel catfish, and brown bullhead, but it did not include any quantitative information.

It was not until the early 1970s, following the loss of anadromous species, that fish surveys were again conducted in the Swan Falls vicinity. Goodnight (1972) conducted a study that assessed angler use, fish populations, and water quality from C.J. Strike Reservoir downstream to Bernard Ferry (RM 437.1). He established five sections to sample. In the section from Grand View, Idaho (upstream of Swan Falls Reservoir), to Swan Falls Dam, Goodnight reported insignificant angling pressure and no checked fish in the creel. Abundant species were mountain whitefish, black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*), bridgelip sucker (*Catostomus columbianus*), common carp, northern pikeminnow (*Ptychocheilus oregonensis*) and peamouth (*Mylocheilus caurinus*). The section downstream of Swan Falls Dam to Bernard Ferry was an important warmwater fishery, primarily for channel catfish.

In 1973 and 1974, the same section that was surveyed by Stanford (1942) was again surveyed with electrofishing gear by the IDFG. The 1973 and 1974 surveys described fish species distribution and their relative abundance. Of the 16 or more fish species sampled, 9 were classified as game fish. Principal species were channel catfish, black crappie, smallmouth bass (*Micropterus dolomieu*), and largemouth bass, which collectively made up 35.3% of the total catch (Gibson 1974).

Sigler et al. (1972) examined the potential impact of mitigation of Swan Falls Dam and the proposed Guffey Dam on the Snake River ecosystem. The resulting report was in response to a joint development by the state of Idaho, represented by the Idaho Water Resource Board and the Applicant. The fish population in Swan Falls Reservoir was composed almost entirely of nongame species (97.9%). Sigler et al. (1972) believed that this composition reflected the poor habitat in this old reservoir. In contrast, the population in the river reach below Swan Falls Dam contained 26.5% game fish, a much better proportion in terms of angling potential.
Sigler et al. (1972) reported that rainbow trout were maintained through stocking efforts to C.J. Strike Reservoir and the reach below C.J. Strike Dam. Otherwise, the fish population was composed of warmwater species. Only one rainbow trout was collected in the reach below Swan Falls Dam, while none were collected in Swan Falls Reservoir. Native nongame fish made up the highest percentage of fish collected (63.9% in Swan Falls Reservoir and 50.8% in the reach below Swan Falls Dam).

Similar surveys by IDFG in 1972 and 1973 focused on the proposed Guffey Dam site below Swan Falls Dam. The purpose of these surveys was to assess fish distribution, relative abundance, and population age structure from the proposed Guffey Dam site upstream to Swan Falls Dam, in Swan Falls Reservoir, and in the backwaters of Swan Falls Reservoir upstream to Grand View (Reid et al. 1973). Swan Falls Reservoir contained a higher percentage of nongame fish (94.5%) than the reaches above or below (88.7% and 82.2%, respectively). Game fish in the reservoir were mountain whitefish and crappie. Significant game fish populations occurred in the free-flowing sections, and species diversity was greater in these areas. The most significant game fish populations (17.8%) were sampled in the reach below Swan Falls Dam. Principal game fish were channel catfish, black crappie, mountain whitefish, and smallmouth bass. The game fish in the reach above Swan Falls Reservoir consisted of mountain whitefish, bluegill, and crappie.

The IDFG sampled Swan Falls Reservoir for two days in June 1996 using primarily electrofishing gear (Allen et al. 1999). Eleven species were sampled. Smallmouth bass were the most numerous, followed by largescale suckers (*Catostomus macrocheilus*). Proportional stock density for smallmouth bass was 29. Allen et al. (1999) reported mean first-year growth at 90 millimeters (mm) TL, based on a sample of 62 smallmouth bass. Three hatchery rainbow trout were collected during the survey.

E.3.1.1.5.1. State Management Objectives

For the 2001 to 2006 period, management objectives identified by the IDFG for the Swan Falls Reservoir included determining fish population species composition and size structure and monitoring sturgeon population status and mortalities at Swan Falls Dam, if any (IDFG 2007). The species IDFG (2007) listed as present in the reservoir are largemouth bass, smallmouth bass, bullhead (*Ameiurus* spp.), yellow perch, bluegill, channel catfish, rainbow trout, crappie, pumpkinseed (*Lepomis gibbosus*), mountain whitefish, flathead catfish (*Pylodictis olivaris*), and sturgeon. IDFG reported that the primary fishery upstream from Walters Ferry consisted of smallmouth bass, channel catfish, and white sturgeon (IDFG 2001).

IDFG management objectives for the reach below Swan Falls Dam are to monitor bass and catfish population size, growth, and condition and to assess angler use, catch and harvest, and satisfaction (IDFG 2007). For the tributaries within the Swan Falls Project area only, Reynolds and Castle creeks are listed with management objectives. Reynolds Creek, located below Swan Falls Dam, is considered a coldwater creek with rainbow trout listed as the only species present. IDFG management direction for Reynolds Creek is to improve production of native redband trout by seeking improved range and riparian management through the BLM planning process. Castle Creek, located just above the backwaters of Swan Falls Reservoir, is classified as a mixed water type, with rainbow trout and black crappie present. The management direction for Castle Creek is to investigate the possibility of developing a reservoir in the lower reach to create a trophy trout fishery, while managing the headwaters for a low-yield, low-participation fishery on native redband trout.

E.3.1.1.5.2. Applicant Surveys

Between 1989 and 2003, the Applicant periodically conducted fish surveys in the vicinity of the Swan Falls Project (RM 440–477). The majority of data was collected using electrofishing gear; however, gill nets, trap nets, minnow traps, hoop nets, setlines, and beach seines were also used. The primary objectives of these surveys were to describe fish species composition, relative abundance, size and age structure, and relative weight. These previous surveys were generally divided into three segments: Swan Falls Below (RM 440–458), Swan Falls Reservoir (RM 458–469), and Swan Falls Above (RM 469–471.8). Richter and Chandler (2004) provided a summary report of findings associated with these surveys, and excerpts from that report are included in the following summary.

Beginning in 1989, electrofishing data were collected by the Applicant in the Swan Falls Project area (Table E.3.1-9). These early electrofishing surveys did not have set site distances. In 1992, electrofishing protocols were established that required a 100-meter shoreline distance per site and one netter. All sites were randomly selected by using marked shoreline miles on a map in 0.1-mile intervals. From 2003 through 2006, spring and fall sampling has occurred annually during the first week of April and September, respectively. This sampling is reported in Chapter 1 of Technical Report E.3.1-B. During the fall surveys only, scales from all game fish greater than 100 mm TL were collected.

Because electrofishing is an inefficient method for sampling some fish, such as channel catfish, several alternate methods to help describe the full community were employed (Table E.3.1-10).

Beach seines, gill nets, hoop nets, trap nets, setlines, and minnow traps were used at various times between 1989 and 1990. Separate studies were conducted to specifically describe the status of white sturgeon populations within the Swan Falls vicinity (see section E.3.1.1.3).

From 1989 through 2006, over 11,000 individual fish, representing 29 species and 9 families, were collected (Table E.3.1-1). By far, centrarchids were the most commonly collected, followed by catostomids and cyprinids (Figure E.3.1-12). Smallmouth bass were consistently the most abundant centrarchids encountered during electrofishing surveys (Figure E.3.1-11). Smallmouth bass and largescale suckers were ranked the top two species in abundance over all years sampled. The dominant species within the Swan Falls Below and Brownlee Above (RM 339–439.9) reaches were the same and were collected in similar proportions (Richter and Chandler 2004). Comparisons in catch rates between Brownlee Above and Swan Falls Below were not significantly different for the majority of fish sampled. They did differ for channel catfish, flathead catfish, pumpkinseed, white crappie (*Pomoxis annularis*), and warmouth (*Lepomis gulosus*), all of which had predominantly low catches relative to other species. For these species, the Brownlee Above section had significantly higher catch rates. The fish community between Swan Falls Dam and the upper end of Brownlee Reservoir had very similar species compositions. The Swan Falls Above reach had an extremely small sample, and trends were not the same as other sections.

Channel catfish may be underrepresented in the electrofishing surveys. However, as part of the white sturgeon studies within the project vicinity, random setline surveys also serve to represent catfish distribution and relative abundance among river sections in the project vicinity. Although overall catches were low with all gears, the river section below Swan Falls Dam had the highest relative abundance among the three river sections and Swan Falls Reservoir using randomly placed setlines (Table E.3.1-11). However, results of nonrandom gill-net sets (Table E.3.1-11) and random electrofishing suggest that the relative abundance of channel catfish may be higher in the lower portions of the river reach, above Brownlee Reservoir. For all the gears used, no catfish were captured in the river section upstream of Swan Falls Reservoir.

Shrader et al. (2003) conducted a tagging study of channel catfish in Brownlee Reservoir and portions of the Snake River above Brownlee Reservoir. Of 2,299 tagged channel catfish, 21% of those tagged in Brownlee Reservoir moved upstream into the Snake River above the reservoir, and 10 individual catfish migrated upstream as far as Swan Falls Dam. This finding suggests that the catfish population in this large reach of the Snake River is representative of one stock of fish. In fact, both Idaho and Oregon manage catfish in this reach as such.

E.3.1.2. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section 3.1.3.3. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.3.1.3. Applicant's Existing and Proposed Measures or Facilities

E.3.1.3.1. Existing Measures or Facilities to Be Continued or Maintained

E.3.1.3.1.1. Snake River White Sturgeon Conservation Plan

The Applicant proposed the WSCP (IPC 2005, included as Technical Report E.3.1-D) as a means of developing and implementing protection, mitigation, and enhancement (PM&E) measures directed at white sturgeon populations for impacts of mainstem Snake River hydroelectric projects operated by the Applicant. The WSCP evolved from the recognition that many aspects of Snake River white sturgeon life history and behavior were poorly understood and that factors influencing the health and viability of these populations likely differed among reaches. In addition, because little information was available for sturgeon populations in most of the river segments, how actions in one reach might influence the population in another reach was difficult to assess. From 1991 to 2001, the Applicant conducted sturgeon population assessments in the Snake River from Shoshone Falls downstream to the confluence of the Snake and Salmon rivers, including the vicinity of the Swan Falls Project. While obtaining information on population status and resource issues across many reaches has involved a substantial time commitment, this approach has allowed for the development of river measures that are anticipated to provide the greatest benefits overall to Snake River white sturgeon.

The WSTAC was also established in 1991 to provide technical guidance with white sturgeon research activities undertaken by the Applicant during relicensing efforts. Since its formation, representatives from state, federal, and tribal entities have participated in WSTAC meetings to review study results and resource issues affecting Snake River white sturgeon. Information presented at WSTAC meetings included the following: 1) status surveys of Snake River sturgeon populations, 2) limiting factors for each reach, and 3) modeled results of the PVA specific to reaches of the Snake River. In addition, WSTAC participants discussed potential PM&E measures. This information formed the basis on which the WSTAC developed recommended measures for the Applicant to include in the WSCP and to submit to FERC.

The WSCP is intended to serve as a master plan for guiding the implementation of feasible mitigation measures for Snake River white sturgeon populations impacted by the Applicant's hydroelectric projects. These measures are designed to help ensure the long-term persistence of white sturgeon and restore opportunities for beneficial use. The geographic scope of the WSCP includes the Snake River from Shoshone Falls (the natural upstream boundary at RM 614.0) downstream to Lower Granite Dam (RM 107.5). The WSCP describes measures and strategies for Snake River white sturgeon that the Applicant would implement once the plan was accepted and new project licenses were issued by FERC. Effective implementation of the WSCP would require continuing adaptation based on research and monitoring of sturgeon status, limiting factors, and population responses to potential mitigation measures. The WSCP should not be viewed as a management plan, nor is it intended to replace existing management plans for Snake River white sturgeon. The Applicant recognizes the management jurisdiction of the federal and state fish and wildlife agencies.

In July 2003, the WSCP was submitted concurrently to FERC with the *New License Application: Hells Canyon Hydroelectric Project* (IPC 2003). A final copy of the WSCP was later filed with FERC in August 2005 to comply with requirements in new license Articles (405, 407, and 408) for the Applicant's mid-Snake River projects between Shoshone Falls and C.J. Strike Dam (IPC 2005). On May 31, 2006, FERC approved the Snake River WSCP for the Shoshone Falls, Upper Salmon Falls, Lower Salmon Falls, Bliss, and C.J. Strike projects.

The Applicant also proposed measures for sturgeon in reaches of the Snake River from Swan Falls Dam downstream to Hells Canyon as part of the mitigation for the HCC. These measures would be implemented once a new license is issued for the HCC. The following descriptions are of those measures proposed (as defined in the WSCP [IPC 2005]) for white sturgeon between Swan Falls and Brownlee dams. A complete description of all measures proposed for Snake River white sturgeon can be found in the WSCP in Technical Report E.3.1-D.

Assessment of water quality-related impacts on early life stages of white sturgeon— Measure 9.6.1 of the WSCP (IPC 2005) proposes to assess water quality-related impacts on early life stages of white sturgeon. Comparison of population assessments (Reid et al. 1973, Reid and Mabbot 1987, Lepla et al. 2003) has shown that sturgeon abundance between Swan Falls and Brownlee dams has changed little since the 1970s and that the population still consists primarily of subadult and adult fish (section 4.6.2 of the WSCP [IPC 2005]). Despite the presence of suitable hydrology and physical habitats expected to support population maintenance and growth (Chandler and Lepla 1997), sturgeon recruitment in this reach of the Snake River has been largely unsuccessful (Lepla et al. 2003). Results of a PVA model of factors controlling white sturgeon recruitment in the Snake River indicated that water quality was the primary factor limiting sturgeon between Swan Falls and Brownlee dams and that restoring recruitment would be unattainable unless water quality conditions were improved (Jager et al. 2003).

Degraded water quality in the lower section of this reach (Brownlee Reservoir) has historically impacted white sturgeon. During July 1990, at least 28 adult white sturgeon were killed near the upper end of the reservoir (transition zone) as a result of lethal DO conditions of less than 1 mg/L (Reid 1990). High summer temperatures combined with high nutrient loading have been identified as contributors to the lethal conditions. Brownlee Reservoir's in-reservoir processing of these nutrient influxes, coming from agricultural activity and municipal wastes flowing in from the surrounding watersheds, typically culminates in severely degraded water quality during dry and normal hydrologic years. Only in wet hydrologic years are summer inflows high enough to prevent large amounts of algae from accumulating and producing anoxic conditions in the reservoir (Myers et al. 2003).

Improvements to water quality in the riverine section between Swan Falls Dam and Brownlee Reservoir are currently being developed through the middle Snake River–Succor Creek and Snake River–Hells Canyon TMDL processes (IDEQ 2003, IDEQ and ODEQ 2004). Pursuant to §303 of the Clean Water Act (33 U.S.C. §1313[d]), pollutants identified in the § 303(d) listing of the river segment between Swan Falls Dam and Brownlee Reservoir include bacteria, pesticides, nutrients, nuisance algae, mercury, sediment, temperature, and DO. However, given the basin size and complexity of issues encompassed by these TMDLs (varying hydrology, pollutant processing, transport characteristics, anthropogenic influences, and others), the extent of, and time frame for, water quality improvements are uncertain. Additionally, the effects that degraded water quality has had on white sturgeon recruitment in the riverine section of this reach are still poorly understood. Further investigation regarding degraded water quality in riverine habitats associated with early life stage development should be conducted to determine whether contaminants and water temperature are contributing to poor recruitment.

For instance, studies conducted in the Kootenai River have shown very high mortality of incubating white sturgeon eggs that have been coated with suspended solids and then incubated in unfiltered water from the Kootenai River. Organic matter and contaminants from suspended solids and river water were likely the primary sources of bacteria and fungi and contributed to low survival of the embryos (Kruse 2000). The Swan Falls–Brownlee reach receives very high organic loading from the surrounding watersheds (Harrison et al. 1999, Myers et al. 2003). This additional burden may be affecting the survival of incubating sturgeon eggs. Additionally, the bioaccumulation of contaminants in adult sturgeon may be passed through the eggs or sperm and affect the embryos, although the overall effect of these pollutants on sturgeon reproduction and survival is largely unknown.

Identifying the impact that degraded water quality has on early life stage survival may lead us to a clearer understanding of the mechanisms influencing recruitment within the sturgeon population. Such information would be useful for determining appropriate measures to restore white sturgeon in the Swan Falls–Brownlee reach. For instance, if study results show that water quality is not limiting early life stage survival, then translocation efforts (Measure 9.6.3 of the WSCP [IPC 2005] or below) to increase sturgeon productivity may be a desirable option. However, if early life survival cannot be supported under existing water quality conditions, then hatchery supplementation (Measure 9.6.4 of the WSCP [IPC 2005]) using conservation aquaculture practices may be an interim measure to increase population abundance until habitats are restored.

Under implementation of Measure 9.6.1 of the WSCP (IPC 2005), the impacts of degraded water quality in the Swan Falls–Brownlee reach would be evaluated for the egg, larval, and young-of-year (YOY, referred to as age-0) life stages of white sturgeon. Evaluations on egg survival would focus primarily on contaminant exposure associated with riverine habitats during spawning and incubation. This task could be accomplished by comparing contaminant uptake and survival rates for incubating eggs between natural in-river conditions and controlled laboratory environments. A combination of field and laboratory treatment groups would be used to determine contaminant uptake of embryos when the embryos are exposed to river bottom sediments, suspended solids (organics), and river water. Field treatment groups would be de-adhesed with river bottom sediments associated with spawning areas below Swan Falls Dam and reared on-site with filtered and unfiltered river water. Laboratory treatment groups would be de-adhesed with clean, neutral media and reared on filtered water for control comparisons. Bioassays of treatment groups would also be conducted to determine the bioaccumulated contaminant concentrations (metals, organochlorine pesticides, and polychlorinated biphenyls [PCBs, a family of highly toxic compounds that have been banned in the United States]), resulting from parental contribution, river bottom de-adhesion media, and suspended solids in river water.

The effect of water quality on larval and YOY survival would focus primarily on water temperature. During 2002, peak summer temperatures in the lower river above Brownlee Reservoir were as high as 28.8 °C, a level that may prove lethal for early life stages of white sturgeon. Laboratory trials would be conducted to determine mortality rates associated with increasing water temperatures. Temperature tolerances of larval and age-0 sturgeon would be compared with temperature regimes occurring in the Swan Falls–Brownlee reach to determine whether existing conditions were limiting survival and recruitment for early life stages of white sturgeon.

White sturgeon eggs, larvae, and age-0 sturgeon needed for laboratory and field experiments could be obtained by spawning a reproductive female and male sturgeon from the Swan Falls–Brownlee reach. The laboratory work could be performed by a suitable research facility with the necessary equipment to maintain desired water temperatures and fish culture expertise to spawn, incubate, and rear white sturgeon.

Translocation of reproductive-sized white sturgeon to increase spawner abundance and population productivity—Measure 9.6.3 in the WSCP (IPC 2005) proposes to translocate reproductive-sized white sturgeon to increase spawner abundance and population productivity. Based on the 1996–1997 population assessment for the Swan Falls–Brownlee reach, the white sturgeon population within this segment of the Snake River was low in abundance and displayed little evidence of recruitment (Lepla et al. 2003). Catch rates and overall numbers of sturgeon sampled in this reach were very low, with most fish captured near the upper end of the reach between Swan Falls and Walters Ferry. Recruitment levels appear to have remained poor since earlier IDFG surveys (Reid et al. 1973, Reid and Mabbot 1987): the population consisted primarily of subadult and adult sturgeon, and few fish were less than 92 cm TL. The continuing presence of some small sturgeon indicates that recruitment is occurring at very low levels. The estimated number of annual female spawners in the population was also low, suggesting that future recruitment levels will probably remain low. These recruitment levels may be below those necessary to sustain this population without intervention.

Reproductive-sized sturgeon could, therefore, be translocated (if supported by management agencies) to potentially improve white sturgeon productivity between Swan Falls and Brownlee dams. Adult translocation would increase the number of mature fish within the population, thereby increasing opportunities for natural production. The feasibility of this measure, however, may first depend on improving water quality within this reach. As discussed previously, severe water quality degradation, particularly in the lower river and in Brownlee Reservoir, appears to be limiting white sturgeon in this reach. PVA-model simulations have indicated that water quality is the primary factor limiting white sturgeon recruitment in the Swan Falls–Brownlee reach (Jager et al. 2003). Specifically, DO levels in the transition zone of Brownlee Reservoir should be improved before translocation efforts are undertaken.

Implementation of translocation efforts would also depend on study results from Measure 9.6.1 of the WSCP (IPC 2005), which evaluates whether degraded water quality conditions associated with riverine habitats are limiting early life stage survival of white sturgeon. If study results show that water quality conditions are not limiting early life stage survival and that natural production can be supported under existing conditions, then translocation of reproductive-sized sturgeon to the Swan Falls–Brownlee reach could be used as a method to increase spawn numbers and restore sturgeon productivity. Initially, reproductive-sized sturgeon would be translocated to the Swan Falls–Brownlee reach on an experimental basis. Such efforts would likely involve a two-phased approach similar to the approach described for translocation in the C.J. Strike–Swan Falls reach (Measure 9.5.1 of the WSCP [IPC 2005]). During Phase 1, the Applicant would begin relocating reproductive sturgeon to evaluate spawning success of transplanted spawners. Radio telemetry would be used to monitor spawning behavior and identify key spawning locations. After spawning was complete, the Applicant would attempt to recapture telemetered spawners to surgically confirm whether those selected individuals had spawned. Pending successful spawning, Phase 2 efforts would begin which involves relocating only "reproductive-size" sturgeon to increase spawner abundance and population productivity. A population assessment would be conducted following Phase 2 translocation to evaluate recruitment success.

For planning purposes, if study results indicated that water quality would not be limiting, Phase 1 efforts would operate on an experimental basis for 2 to 4 years to determine whether transported adults spawned in the Swan Falls–Brownlee reach. If spawning was confirmed, translocation efforts would continue on an annual basis (Phase 2) for a period of 10 years. After that time, the feasibility of translocation to enhance population productivity and recruitment would be reviewed based on a population assessment. If study results indicated feasibility, the translocation efforts would continue on an annual basis for the duration of the new license for the HCC or until target goals were met. Periodic reviews of the translocation program would be based on future population assessments.

Develop experimental conservation aquaculture plan[3]**—**Measure 9.6.4 of the WSCP (IPC 2005) proposes conservation aquaculture as a potential option for rebuilding the white sturgeon population between Swan Falls and Brownlee dams. Conservation aquaculture represents an adaptive approach that prioritizes preservation of wild populations, their locally adapted gene pools, phenotypes, and behaviors (Anders 1998). Sturgeon conservation aquaculture has been implemented in the Kootenai River (USFWS 1999) and is being explored as a potential means for rebuilding sturgeon populations in the upper reaches of the Columbia River Basin

---

[3] The intent of the WSTAC is not to enter into a conservation aquaculture program without first fully exploring the restoration of quality habitat and/or genetic implications of hatchery supplementation.

(UCWSRI 2002). Evaluations of released, hatchery-produced sturgeon species in several systems indicate that hatchery-produced sturgeon can survive to adulthood and contribute to fisheries and spawning populations, particularly in depressed populations (Secor et al. 2000, Smith et al. 2002). Demographic modeling suggests that using hatchery-produced fish might be an effective means to restore populations because survival rates at critical, early life stages can be increased manyfold over wild survival rates (Gross et al. 2002). Also, abundances can be more rapidly recovered because degraded and lost spawning and nursery habitats can be “circumvented” by rearing early life stages in artificial environments (Ireland et al. 2002).

A potential application for conservation aquaculture in the Snake River could, therefore, be periodic supplementation of the Swan Falls–Brownlee reach to increase population size and genetic variability if natural recruitment could not be obtained under existing habitat conditions and population demographics. Hatchery-spawned and reared offspring from wild adults could be used as a potential tool to bypass current recruitment bottlenecks and replace failed natural recruitment. Although conservation aquaculture holds promise for sturgeon, such programs are largely experimental and should remain adaptive as they have yet to demonstrate long-term effectiveness in preserving sturgeon populations. Using hatchery programs may prove to be effective for restoring juvenile and adult abundances; however, there is no guarantee that such efforts would catalyze natural recovery. Restoring habitats suitable for natural recruitment would also be required (Secor et al. 2002).

The decision to develop a conservation aquaculture program for the Swan Falls–Brownlee reach would, therefore, largely depend on results from the assessment on early life stage survival (Measure 9.6.1 of the WSCP [IPC 2005]) and the management directives by the IDFG and the Oregon Department of Fish and Wildlife (ODFW). For instance, if study results from Measure 9.6.1 of the WSCP (IPC 2005) show that natural production cannot be supported under existing water quality conditions, and improving conditions appears unlikely, then opportunities to develop a conservation aquaculture program for the Swan Falls–Brownlee reach may be investigated with the IDFG and ODFW. Hatchery supplementation could be used as a potential tool to bypass current recruitment bottlenecks and replace failed natural recruitment as an interim measure to maintain adequate population size and genetic variability until water quality conditions became adequate to support natural recruitment.

A conservation aquaculture program should also contain measures that minimize both genetic risks to existing wild sturgeon populations in the Snake River and demographic risks of removing broodstock on the productivity of source populations. Careful design incorporating broodstock collection, mating protocols, and release numbers should be considered to balance family groups and avoid genetic swamping. Protocols should include actions that minimize the risk of inbreeding and reduce the potential for selecting maladaptive traits in the released sturgeon. Protocols should also be established requiring selective marking of the hatchery fish with PIT tags and/or removal of various scute patterns to differentiate release groups and assist with future evaluations of survival rates, condition factors, growth rates, and movement behaviors. These follow-up population assessments (Measure 9.6.5 of the WSCP [IPC 2005]) would help determine whether the hatchery program provided the intended benefits and information for adaptive management. The plan should also incorporate protocols for fish health to limit disease risks in hatchery and wild fish. The program would also require the Applicant to contract with a facility that has the necessary equipment and sturgeon culture expertise to spawn, incubate, and rear white sturgeon.

Conduct periodic population assessments—Measure 9.6.5 of the WSCP (IPC 2005) proposes to conduct periodic, long-term monitoring of white sturgeon between Swan Falls and Brownlee dams. Past population assessments (Reid et al. 1973, Reid and Mabbot 1987, Lepla et al. 2003) between Swan Falls and Brownlee dams have shown that white sturgeon abundance is low and that recruitment levels have remained poor. As efforts to increase sturgeon abundance (either through natural or artificial means) are undertaken, periodic population assessments would be necessary to monitor population changes and determine the effectiveness of the implemented measures. These assessments would allow the approach to remain adaptive and provide the means to determine whether alternative mitigation measures were warranted. For planning purposes at this time, the Applicant anticipates that population assessments would be conducted at least every 10 years for the duration of a new license for the HCC, realizing, however, that assessments will ultimately be conducted at time frames based on the evaluation needs of a specific mitigation measure.

Monitor genotypic frequencies—Measure 9.6.6 of the WSCP (IPC 2005) proposes to monitor genotypic frequencies of white sturgeon in the Snake River from Shoshone Falls to Lower

Granite Dam which includes the project vicinity of Swan Falls Dam. The Applicant, with input from geneticists, would monitor genotypic frequencies of Snake River white sturgeon for comparison with current information. This monitoring program would use existing wild juvenile and adult white sturgeon genetics information, collected by the Applicant, during the 1996–2001 field seasons, as a baseline data set. The levels of genetic diversity found within and among the various reaches of the Snake River would help establish desired future conditions for each reach. Sampling would consist of collection of a small (1 square centimeter) amount of fin tissue from sturgeon following an agreed-upon sampling regime. Geneticists from the University of Idaho, Center for Salmonid and Freshwater Species at Risk, or another qualified facility would process the samples (extract deoxyribonucleic acid [DNA]) and interpret the results.

The most recent genetic information for Snake River white sturgeon was collected by the Applicant and analyzed at the University of Idaho (Anders and Powell 1999, 2002; Anders et al. 2000). Only those reaches where significant reproduction was known to occur (Bliss–C.J. Strike and Hells Canyon–Lower Granite populations) were used in the analysis. Additional Applicant samples collected from other Snake River reaches would be analyzed and interpreted to further establish a baseline for genetic diversity. Future collections would target the progenies of the fish that were included in the baseline data set. Under natural conditions, the Applicant would not expect any changes in genotypic frequencies to occur within the period of a new project license or longer period. However, implementation of some measures (e.g., translocation) may potentially alter genetic frequencies and increase diversity at a faster rate than what might naturally occur. Other potential measures, such as amplifying successful family group genes through artificial propagation, may decrease genetic diversity. Identifying such measures and their future potential for maintaining or enhancing genetic diversity is key to implementing a successful plan.

E.3.1.3.2. New Measures or Facilities Proposed by the Applicant

The applicant proposes the following measures or facilities for aquatic resources at the Swan Falls Project area. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.3.1.3.2.1. Resident Fish Population Monitoring

The Applicant proposes to monitor the fish population in Swan Falls Reservoir and the 15-mile reach below Swan Falls dam using boat-mounted electrofishing gear every 5 years in the spring and fall. Basic population characteristics, such as species enumeration, relative abundance, condition, and proportional stock density, will be assessed. This monitoring will enable establishment of long-term trends in fish populations. Data collected during these surveys will be reported to the IDFG in accordance with scientific collection permit reporting requirements. The estimated operations and maintenance (O&M) cost for this measure is $7,000, beginning in year 5 of the new license term and continuing every 5th year thereafter, for a total of $42,000 over a 30-year period.

E.3.1.3.3. Measures or Facilities Recommended by the Agencies

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. Often the comment letters did not clearly indicate specific recommended measures. However, the Applicant made a good-faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant's proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.3.1.3.3.1. Accepted or Conditionally Accepted Measures or Facilities

The Fish and Wildlife Service comment letter, dated December 21, 2007

FWS-16

> The Service recommends that the Applicant work with other fishery managers in the Columbia River Basin who are considering and operating white sturgeon conservation hatcheries to share information and experiences on how this strategy might best be implemented in the Snake River Basin.

Response

The Hells Canyon final license application has proposals to focus on the reach of the Snake River between Swan Falls Dam and Brownlee Dam to first confirm and document whether or not water quality is impairing successful recruitment of white sturgeon in this reach. If it is determined that successful reproduction is limited by water quality, then the Applicant proposes to present this information to the WSTAC and discuss management options, including the potential of a white sturgeon conservation hatchery. If fish management agencies determine that a white sturgeon conservation hatchery should be implemented, then the Applicant will fully evaluate conservation strategies relative to hatchery management for white sturgeon. This evaluation will involve contacts with others in the Columbia Basin and elsewhere who can share their experiences in developing such conservation hatchery measures.

E.3.1.3.3.2. Rejected Measures or Facilities and Explanations for Rejection

The Shoshone–Bannock Tribes comment letter, dated December 21, 2007

SBT-6

> In the Final License Application for the Swan Falls Project the Tribes recommend that the Idaho Power Company provide sufficient funding to facilitate the development of a Comprehensive Fish Management Plan and commence with reasonable reintroduction efforts, similar to those recommended by the tribes and ODFW, upon license issuance.

Response

The Applicant does not support the Shoshone–Bannock recommendation that the Applicant commence reintroduction of anadromous fish or the recommendation to develop a Comprehensive Fish Management Plan. Consistent with the findings in the Hells Canyon final license application and FERC staff recommendations associated with the Final Environmental Impact Statement on the Hells Canyon license, the Applicant continues to believe that the likelihood of successful reintroduction, even within tributaries that have some suitable habitat, is very low. The evidence in the record demonstrates that fish in the Salmon River Basin (for example the Middle Fork of the Salmon River), even in the most pristine of habitats, are not sufficiently meeting their production potential and are still protected by the ESA. It stands to reason that any attempt to reintroduce fish upstream of the Hells Canyon Project or the Swan Falls Project will only face greater obstacles and difficulties than are faced by those populations in the Salmon River Basin. Any reintroduced fish will need to be collected and then transported below Hells Canyon Dam and then face the same difficulties that fish in the Salmon River face. Smolt-to-adult returns would not be sufficient to sustain such a program without significant hatchery support. The state of the habitat to support incubating salmonids in the mainstem Snake River associated with the Swan Falls project also needs to substantially improve in order to support mainstem spawning activity. Until that time, anadromous fish considerations associated with Swan Falls relicensing cannot be supported.

SBT-8

> The Tribes recommend that Idaho Power Company develop a sturgeon hatchery at Swan Falls to partially mitigate the continuing destruction of sturgeon fish runs caused by the Project.

Response

The reach of the Snake River between Swan Falls Dam and Brownlee Dam has been severely impacted by many factors unrelated to project operations that have impaired water quality. The Applicant believes there is sufficient habitat in this reach to support a self-sustaining population of white sturgeon were it not for these non-project water quality problems. As previously discussed, the Hells Canyon final license application has proposals to focus on this reach of the Snake River to first try to confirm and document that water quality is impairing successful recruitment of white sturgeon in this reach. If it is determined that successful reproduction is limited by water quality, then the Applicant proposes to present this information to the WSTAC and discuss management options, including the potential of a white sturgeon conservation hatchery.

E.3.1.4. Anticipated Impacts on Fish Resources

E.3.1.4.1. Anticipated Impacts of Continued Operation on Fish Resources in the Swan Falls Vicinity

E.3.1.4.1.1. White Sturgeon

White sturgeon and mountain whitefish habitat in the Snake River below Swan Falls Dam (Swan Falls reach) was described using three magnitudes of water year (low, medium, and high) using data collected by Anglin et al. (1992) (Technical Report E.2.3-A). Actual flows in the Swan Falls reach were used to model habitat under low (2001), medium (2000), and high (1996) water conditions. Discharge from the C.J. Strike Hydropower Plant (located approximately 36 river miles upstream) influences operations at Swan Falls Dam and the resulting discharge in the Swan Falls reach. In general, Swan Falls Reservoir serves as a re-regulation pool for C.J. Strike Dam operations. Flow changes at C.J. Strike Dam generally take seven to eight hours before influencing Swan Falls Dam operations.

Habitat availability for white sturgeon early life stages—spawning, incubation, and larvae—is driven by magnitude of water year (low, medium, or high) in the Swan Falls reach, an effect observed in other reaches of the middle Snake River (Chandler and Lepla 1997, Brink 2000, Brink and Chandler 2000). Early life stage white sturgeon habitat increases with discharge and, therefore, was higher in total availability under the medium and high water years. Modeled habitat for spawning was present in the greatest amount, totaling approximately one-quarter to one-third of the Swan Falls reach area. Swan Falls Dam operations caused daily habitat fluctuations that were generally between 5% and 10% of the reach area. Regardless of water year, less than 10% of the Swan Falls reach area was suitable habitat for white sturgeon incubation and larvae. Daily fluctuations in habitat for these life stages were generally 2% to 3% of the total Swan Falls reach area across all three water year conditions (Technical Report E.2.3-A).

Habitat for YOY, juvenile, and adult white sturgeon was affected little by Swan Falls operations. Modeled habitat for these life stages was not affected by magnitude of water year. The habitat versus discharge relationships for these life stages were relatively flat across the range of operations at Swan Falls Dam (flows up to 15,000 cubic feet per second [cfs]). Hourly habitat availability for YOY and adult sturgeon was near maximum levels, regardless of water year. Juvenile white sturgeon habitat was also near maximum levels during the low and medium water years, but showed very low to zero habitat during very high water periods of the high water year. This trend was most likely due to model uncertainty at very high discharges (flows exceeding 20,000 cfs). Daily habitat fluctuations were typically less than 1% of the area across all magnitudes of water year for these later life stages of white sturgeon (Technical Report E.2.3-A).

Daily fluctuations of white sturgeon habitat, particularly for the early life stages, can be expected with continued operation of the Swan Falls Hydropower Project. Habitat descriptions under low, medium, and high water-year conditions showed that daily fluctuations in habitat occurred under all water years (Technical Report E.2.3-A). Modeled habitat availability for early white sturgeon life stages fluctuated more than the rearing to adult life stages. It is unlikely that daily fluctuations up to 5% to 10% of the spawning habitat and 2% to 3% of the incubation and larvae habitat are limiting the population of sturgeon in the Swan Falls reach. Lepla and Chandler (2003) documented some recruitment in this reach, although female spawner availability was low and near-future recruitment would probably remain low, perhaps below the levels necessary to sustain this population. Jager et al. (2003), using a PVA, determined that poor summer water quality was possibly the main factor limiting the population of white sturgeon in the Swan Falls reach. Further, the model predicted that removing other limiting factors in the reach would not be sufficient to reestablish recruitment in these populations unless water quality also improved (Jager et al. 2003).

E.3.1.4.1.2. Mountain Whitefish

Modeled habitat for early mountain whitefish life stages—spawning and fry—showed opposite relationships to magnitude of water year. Spawning habitat was shown to increase with flow, while fry habitat decreased across higher discharges. Whitefish spawning habitat, modeled for the last three months of each flow year, accounted for about 1.5% to 3% of the Swan Falls reach area. Daily fluctuations in habitat from Swan Falls operations totaled about one-third to one-half of this spawning habitat. Generally, for the three magnitudes of flow, hourly mountain whitefish spawning habitat was available in low amounts, averaging 45% to 63% of maximum modeled habitat levels. Fry habitat showed a decreasing trend across higher discharges and, therefore, was least available during the high water year. Whitefish fry averaged 98% of maximum modeled habitat levels during the low water year and 31% during the high water year. Daily fluctuations in habitat from Swan Falls operations were generally 2% to 4% of the reach area (Technical Report E.2.3-A).

Modeling for mountain whitefish juvenile and adult habitat accounted for 7% to 10% of the Swan Falls reach. Juvenile and adult habitat was stable at low to medium discharge levels but decreased during periods of high discharge associated with the high water year of 1996. Daily fluctuations in both juvenile and adult habitat from Swan Falls operations were low, typically accounting for about 2% of the reach area.

Daily fluctuations of mountain whitefish habitat are expected under continued operations at the Swan Falls project. Magnitude of water year showed varied results for the four life stages with the least habitat available for spawning across all water years. Spawning whitefish habitat was lowest during the low water year, but habitat fluctuations caused by operations were very low (< 0.6% of the Swan Falls reach area). It is unknown if daily fluctuations in habitat limit mountain whitefish in the Swan Falls reach. The fry life stage exhibited the largest fluctuations in modeled habitat, which were still less than 4% of the reach area. Similar to white sturgeon, summer water quality may be more limiting to mountain whitefish than daily fluctuations in habitat from Swan Falls Dam operations. Mountain whitefish constituted a substantial portion of a large fish kill that occurred below Swan Falls Dam in July 2002. The fish kill was primarily caused by high water temperatures that occurred during a prolonged period of high summer air temperatures. A similar mountain whitefish kill occurred in the Swan Falls reach during July 1990; it also was caused by excessive water temperature (Reid 1990).

E.3.1.4.2. Anticipated Impacts of Continued Operations on Threatened and Endangered Species

No threatened or endangered aquatic species are associated with the project area; therefore, no impacts are anticipated.

E.3.1.5. Materials and Information on Measures and Facilities

All materials and information regarding existing measures and facilities to be continued or maintained by the Applicant are included in section E.3.1.3.1. All materials and information regarding measures and facilities proposed by the Applicant are included in section E.3.1.3.2.

E.3.1.6. Consultation

For a summary of consultation efforts to date for the Swan Falls Project, see the Consultation Appendix.

LITERATURE CITED

Allen, D. B., S. P. Yundt, and B. J. Flatter. 1999. Regional fisheries management investigations. 1996 Job Performance Report. Idaho Department of Fish and Game, Southwest Region, Boise, ID. Project F 71 R 21. 234 p.

Anders, P. J. 1998. Conservation aquaculture and endangered species: can objective science prevail over risk anxiety? Fisheries 23(11):28–31.

Anders, P. J., and M. S. Powell. 1999. Assessing genetic variability among populations of Columbia Basin white sturgeon. Annual report to the U.S. Department of Energy. Bonneville Power Administration, Portland, OR. Contract 99-BI-16061, Project No. 99-22.

Anders, P. J., and M. S. Powell. 2002. Population structure and mitochondrial DNA diversity of North American white sturgeon (*Acipenser transmontanus*): an empirical expansive gene flow model. In: P. J. Anders, editor. Chapter 3, Conservation biology of white sturgeon (*Acipenser transmontanus*). Ph.D. dissertation. University of Idaho, Moscow, ID. 38 p.

Anders, P. J., C. R. Gelok, and M. S. Powell. 2000. Assessing genetic variation among Columbia Basin white sturgeon populations. Annual report to the U.S. Department of Energy. Bonneville Power Administration, Portland, OR. Contract 99-BI-16061, Project No. 99-22.

Anglin, D. R., T. R. Cummings, and A. E. Ecklund. 1992. Swan Falls instream flow study. U.S. Fish and Wildlife Service, Vancouver, WA. 256 p.

Beamesderfer, R. C. 1993. A standard weight (*Ws*) equation for white sturgeon. California Fish and Game 79(2):63–69.

Beamesderfer, R. C., and R. A. Farr. 1997. Alternatives for the protection and restoration of sturgeons and their habitat. In: V. J. Birstein, J. R. Waldman, and W. E. Bemis, editors. Sturgeon biodiversity and conservation. Kluwer Academic Publishers, Dordrecht, The Netherlands. p. 407–417.

Behnke, R. 1992. Native trout of western North America. American Fisheries Society, Bethesda, MD. American Fisheries Society Monograph 6.

Birstein, V. J. 1993. Sturgeons and paddlefishes: threatened fishes in need of conservation. Conservation Biology 7:773–787.

Brink, S. R. 2000. Wetted streambed area below Lower Salmon Falls (updated Lower Salmon Falls instream flow study). Response to the Federal Energy Regulatory Commission Additional Information Request No. 16. Idaho Power Company, Boise, ID.

Brink, S. R., and J. A. Chandler. 2000. Project flows (Bliss instream flow study). Response to the Federal Energy Regulatory Commission Additional Information Request No. 1(a). Idaho Power Company, Boise, ID.

Bureau of Land Management (BLM). 1995. Snake River Birds of Prey National Conservation Area: draft management plan. U.S. Department of the Interior, Bureau of Land Management, Bruneau Resource Area, Lower Snake River District Office, Boise, ID. 179 p.

Burner, C. J. 1951. Characteristics of spawning nests of Columbia River salmon. U.S. Fish and Wildlife Service Fishery Bulletin 52:96–110.

Chandler, J. A., and D. Chapman. 2003. Evaluation of reintroduction alternatives. Revised version. In: J. A. Chandler, editor. Chapter 11, Feasibility of reintroduction of anadromous fish above or within the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Complex Hydroelectric Project. Idaho Power, Boise, ID. Technical Report E.3.1-2.

Chandler, J. A., and K. B. Lepla. 1997. Instream flow evaluations of the Snake River from C.J. Strike Dam to the confluence of the Boise River. In: Volume 1, Technical appendices for C.J. Strike Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-C.

Chandler, J. A., P. A. Groves, and P. A. Bates. 2003. Existing habitat conditions of the mainstem Snake River habitat formerly used by anadromous fish. Revised version. In: J. A. Chandler, editor. Chapter 5, Feasibility of reintroduction of anadromous fish above or within the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-2.

Chapman, D., and J. A. Chandler. 2003. Historical abundance of anadromous fish upstream of the Hells Canyon Complex. Revised version. In: J. A. Chandler, editor. Chapter 6, Feasibility of reintroduction of anadromous fish above or within the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-2.

Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1–21.

Cochnauer, T. G. 1983. Abundance, distribution, growth, and management of white sturgeon (*Acipenser transmontanus*) in the middle Snake River, Idaho. Ph.D. dissertation. University of Idaho, Moscow, ID.

Cochnauer, T. G. 2002. Response to catch and release regulations on white sturgeon—now what? In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, editors. Biology, management, and protection of North American sturgeon. Symposium 28. American Fisheries Society, Bethesda, MD. p. 83–87.

Cochnauer, T. G., J. R. Lukens, and F. E. Partridge. 1985. Status of white sturgeon, *Acipenser transmontanus*, in Idaho. In: P. P. Binkowski and S. I. Doroshov, editors. North American sturgeons: Biology and aquacultural potential. Dr. W. Junk Publishers, Dordrecht, The Netherlands.

Coon, J. C., R. R. Ringe, and T. C. Bjornn. 1977. Abundance, growth, distribution, and movements of white sturgeon in the mid-Snake River. Forest, Wildlife, and Range Experiment Station, Idaho Water Resources Research Institute, University of Idaho, Moscow, ID. Contribution 97.

Gibson, H. R. 1974. Survey of fish populations in the Snake River from (1) Brownlee flowline to proposed Guffey Dam site (near Murphy, Idaho); (2) Grand View, Idaho to C.J. Strike Dam. Idaho Department of Fish and Game, Boise, ID. F-63-R-3. 35 p.

Goodnight, W. H. 1972. Snake River fisheries investigations. Job I-a. Survey of angler use and fish harvest in the Snake River—Bernards Ferry upstream to C.J. Strike Reservoir. Job I-b. Survey of fish populations, access and water quality in the Snake River—Bernards Ferry to and including C.J. Strike Reservoir. Idaho Department of Fish and Game, Boise, ID. 45 p.

Gross, M., J. Repka, C. Robertson, D. Secor, and W. Van Winkle. 2002. Sturgeon conservation: insights from elasticity analysis. In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, editors. Biology, management, and protection of North American sturgeon. Symposium 28. American Fisheries Society, Bethesda, MD. p. 13–29.

Groves, P. A., and J. A. Chandler. 2005. Habitat quality of historic Snake River fall chinook salmon spawning locations and implications for incubation survival. Part 2: intra-gravel water quality. River Research and Applications 21:469–483.

Harrison, J., S. Wells, R. Myers, S. Parkinson, and M. Kasch. 1999. 1999 status report on Brownlee Reservoir water quality and model development. Draft technical report. Idaho Power Company, Boise, ID. 70 p.

Idaho Department of Environmental Quality (IDEQ [formerly Idaho Division of Environmental Quality]). 1998. Idaho's 1998 § 303(d) list. IDEQ, Idaho State Office, Boise, ID. 13 p.

Idaho Department of Environmental Quality (IDEQ). 2003. Mid-Snake River/Succor Creek subbasin assessment and TMDL. IDEQ, Boise Regional Office, Boise, ID. 403 p.

Idaho Department of Environmental Quality (IDEQ) and Oregon Department of Environmental Quality (ODEQ). 2004. Snake River–Hells Canyon total maximum daily load (TMDL). Revised version. IDEQ, Boise Regional Office, Boise, ID, and ODEQ, Pendleton Office, Pendleton, OR. 638 p.

Idaho Department of Fish and Game (IDFG). 1922. Ninth biennial report of the Fish and Game Warden of the State of Idaho 1920–1921. IDFG, Boise, ID.

Idaho Department of Fish and Game (IDFG). 1990. Letter to the Office of the Governor from Will Reid, IDFG Fisheries Program Coordinator. Dated August 3, 1990.

Idaho Department of Fish and Game (IDFG). 1992. Idaho white sturgeon management plan. Draft plan. IDFG, Boise, ID.

Idaho Department of Fish and Game (IDFG). 1996. Sturgeon newsletter 4:1–4.

Idaho Department of Fish and Game (IDFG). 2001. Fisheries management plan, 2001–2006. IDFG, Boise, ID.

Idaho Department of Fish and Game (IDFG). 2007. Fisheries management plan, 2007–2012. IDFG, Boise, ID.

Idaho Power Company (IPC). 2003. New license application: Hells Canyon Hydroelectric Project. 6 CD-ROM set. IPC, Boise, ID.

Idaho Power Company (IPC). 2005. Snake River white sturgeon conservation plan. IPC, Boise, ID. 201 p., plus appendices.

Ireland, S. C., P. J. Anders, and J. T. Siple. 2002. Conservation aquaculture: an adaptive approach to prevent extinction of an endangered white sturgeon population. In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, editors. Biology, management, and protection of North American sturgeon. Symposium 28. American Fisheries Society, Bethesda, MD. p. 211–222.

Irving, R. B, and P. E. Cuplin. 1956. The effects of hydroelectric developments on the fishery resources of the Snake River. Idaho Department of Fish and Game, Boise, ID. 168 p.

Jager, H., K. Lepla, J. A. Chandler, R. Myers, W. Van Winkle, A. Sullivan, and M. Bevelhimer. 2003. Population viability model for Snake River white sturgeon. In: K. Lepla, editor. Chapter 3, Status and habitat use of Snake River white sturgeon associated with the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-6. 42 p.

Klyashtorin, L. B. 1974. The sensitivity of young sturgeons to oxygen deficiency. Journal of Ichthyology 16:677–682.

Kruse, G. O. 2000. The effects of contaminants on reproduction, embryo development and related physiological processes in Kootenai River white sturgeon, *Acipenser transmontanus*. Richardson. M.Sc. thesis. University of Idaho, Moscow, ID.

Kruse-Malle, G. O. 1993. White sturgeon evaluations in the Snake River. Job performance report. Idaho Department of Fish and Game, Boise, ID. Project F-73-R-15.

Lavier, D. C. 1976. Distribution of salmon and steelhead in the Columbia River Basin, 1850–1976: summary of data from maps prepared for the Columbia Fisheries Project, Pacific Northwest Regional Commission, Washington Department of Game, Olympia, WA.

Lepla, K. B., and J. A. Chandler. 1995a. A survey of white sturgeon in the Lower Salmon Falls reach of the Snake River, Idaho. In: Volume 1, Technical appendices for new license application: Upper Salmon Falls, Lower Salmon Falls, and Bliss. Idaho Power Company, Boise, ID. 31 p. Technical Report E.3.1-B.

Lepla, K. B., and J. A. Chandler. 1995b. A survey of white sturgeon in the Bliss reach of the middle Snake River, Idaho. In: Volume 1, Technical appendices for new license application:

Upper Salmon Falls, Lower Salmon Falls, and Bliss hydroelectric projects. Idaho Power Company, Boise, ID. Technical Report E.3.1-E.

Lepla, K. B., and J. A. Chandler. 1997. Status of white sturgeon in the C.J. Strike reach of the middle Snake River, Idaho. In: Volume 1, Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-B. 71 p.

Lepla, K. B., and J. A. Chandler. 2003. Physical habitat use and water quality criteria for Snake River white sturgeon. Revised version. In: K. Lepla, editor. Chapter 2, Status and habitat use of Snake River white sturgeon associated with the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Complex Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-6.

Lepla, K. B., J. A. Chandler, and P. Bates. 2003. Status of Snake River white sturgeon associated with the Hells Canyon Complex. Revised version. In: K. Lepla, editor. Chapter 1, Status and habitat use of Snake River white sturgeon associated with the Hells Canyon Complex. Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.1-6. 74 p.

Lepla, K. B., J. Anderson, and P. Bates. 2002. An assessment of white sturgeon in the Shoshone Falls–Upper Salmon Falls reach of the Snake River. Idaho Power Company, Boise ID. 48 p.

Lepla, K., P. Bates, and B. Bentz. 2004. Stock assessments of Snake River white sturgeon below Upper and Lower Salmon Falls dams, Idaho. Idaho Power Company, Boise, ID. 30 p.

Lukens, J. R. 1981. Snake River sturgeon investigations (Bliss Dam upstream to Shoshone Falls). Idaho Department of Fish and Game, Boise, ID. 24 p.

Lukens, J. R. 1985. Hells Canyon white sturgeon investigations. Job performance report. Idaho Department of Fish and Game, River and Stream Investigations, Boise, ID. Project F-73-R-7.

Moseley, R., and C. Groves. 1990. Rare, threatened, and endangered plants and animals of Idaho. Idaho Department of Fish and Game, Natural Heritage Section, Boise, ID.

Myers, R., J. Harrison, S. K. Parkinson, B. Hoelscher, J. Naymik, and S. E. Parkinson. 2003. Pollutant transport and processing in the Hells Canyon Complex. Revised version. In: Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.2.2-2.

Reid, W. 1990. Idaho Department of Fish and Game letter to the Office of the Governor, dated August 3, 1990. Available from: Idaho Department of Fish and Game, Boise, ID.

Reid, W. W., and B. Mabbot. 1987. Regional fisheries management investigations: Region 3 (Boise) river and stream investigations. Idaho Department of Fish and Game, River and Stream Investigations, Boise, ID. Federal Aid to Fish Restoration Project F-71-R-11.

Reid, W. W., W. H. Goodnight, and B. B. Bowler. 1973. Survey of fish populations in the Snake River above Brownlee Reservoir. Idaho Department of Fish and Game, Boise, ID. Federal Aid in Fish Restoration Project F-63-R-2.

Richards, M. 1973. Average run size by time period. In: Testimony before Federal Power Commission for Idaho Department of Fish and Game on issue of substitution of spring chinook for fall chinook in hatchery compensation programs in Project 1971. Exhibits MRR 1–3. Available from: Idaho Power Company, Boise, ID.

Richter, T., and J. A. Chandler. 2004. Swan Falls fish community. Draft. Idaho Power Company, Boise, ID.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa, Canada. Bulletin 184.

Schill, D. J., E. R. J. Mamer, and F. S. Elle. 2004. Population studies of desert redband trout. Annual progress report for the 2002 Cooperative Study Agreement. Idaho Department of Fish and Game. Boise, ID. IDFG Report Number 04-03.

Secor, D. H., V. Arevyev, A. Nikolaev, and A. Sharov. 2000. Restoration of sturgeons: lessons from the Caspian Sea sturgeon ranching program. Fish and Fisheries 1:215–230.

Secor, D. H., P. J. Anders, W. Van Winkle, and D. A. Dixon. 2002. In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, editors. Biology, management, and protection of North American sturgeon. Symposium 28. American Fisheries Society, Bethesda, MD. p. 39.

Shrader, T., B. Moody, and M. Buckman. 2003. Population dynamics and management of channel catfish in Brownlee Reservoir, Snake River, Oregon. North American Journal of Fisheries Management 23:822–834.

Sigler, W. F., M. L. Wolfe, W. T. Helm, and J. M. Neubold. 1972. Potential impact and assessment of mitigation of Swan Falls and Guffey dams on the Snake River ecosystem. Prepared for Idaho Water Resources Board, Idaho.

Smith, T. I. J. 1990. Culture of North American sturgeons for fishery enhancement. National Marine Fisheries Service Technical Report 85:19–27.

Smith, T. I. J., M. R. Collins, W. C. Post, and J. W. McCord. 2002. Stock enhancement of shortnose sturgeon: a case study. In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, editors. Biology, management, and protection of North American sturgeon. Symposium 28. American Fisheries Society, Bethesda, MD.

Stanford, L. M. 1942. Preliminary studies in the biology of the Snake River. Ph.D. dissertation. University of Washington, Seattle, WA. 119 p.

U.S. Environmental Protection Agency (USEPA). 2001. EPA's additions to the 1998 Idaho §303(d) list. USEPA, Region X, Seattle, WA. 3 p.

U.S. Fish and Wildlife Service (USFWS). 1992. Endangered and threatened wildlife and plants: determination of endangered or threatened status for five aquatic snails in south central Idaho. Federal Register 57:59244–59257.

U.S. Fish and Wildlife Service (USFWS). 1999. Recovery plan for the Kootenai River population of white sturgeon (*Acipenser transmontanus*). USFWS, Region 1, Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2007. Endangered and threatened wildlife and plants: Final Rule to remove the Idaho Springsnail (Pyrgulopsis(=Fontelicella) idahoensis) from the list of endangered and threatened species. Federal Register 72:43560–43563.

Upper Columbia White Sturgeon Recovery Initiative (UCWSRI). 2002. Upper Columbia white sturgeon recovery plan. Draft plan. British Columbia Ministry of Water, Land, and Air Protection, Nelson, BC.

Van Dusen, H. 1903. Annual report: Department of Fisheries, State of Oregon. Oregon State Printer, Salem, OR.

Van Hyning, J. M. 1968. Factors affecting the abundance of fall chinook salmon in the Columbia River. Ph.D. dissertation. Oregon State University, Corvallis, OR. 424 p.

Vronskiy, B. B. 1972. Reproductive biology of the Kamchatka River chinook salmon (*Oncorhynchus tshawytscha* Walbaum). Journal of Ichthyology 12:259–273.

Waples, R. S., R. P. Jones, Jr., B. R. Beckman, and G. A. Swan. 1991. Status review for Snake River fall chinook salmon. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA. NOAA Technical Memorandum NMFS-F/NWC-201. 73 p.

Zimmer, P. D. 1950. A three-year study of fall chinook salmon spawning areas in Snake River above Hells Canyon Dam site. U.S. Fish and Wildlife Service. Region 1. Portland, OR.

Zoellick, B. W. 1999. Stream temperatures and the elevational distribution of redband trout in southwestern Idaho. Great Basin Naturalist 59:136–143.

Table E.3.1-1 Fish sampled in Swan Falls Reservoir and tailrace from 1989 through 2006, including species codes, family, common and scientific names, and native or nonnative status.

Code	Family Name	Common Name	Scientific Name	Status
WS	Acipenseridae	White sturgeon	*Acipenser transmontanus*	Native
WF	Salmonidae	Mountain whitefish	*Prosopium williamsoni*	Native
RB	Salmonidae	Rainbow trout	*Oncorhynchus mykiss*	Native
RB	Salmonidae	Redband trout	*Oncorhynchus mykiss*	Native
CM	Cyprinidae	Chiselmouth	*Acrocheilus alutaceus*	Native
CP	Cyprinidae	Common carp	*Cyprinus carpio*	Nonnative
DS	Cyprinidae	Speckled dace	*Rhinichthys osculus*	Native
FH	Cyprinidae	Fathead minnow	*Pimephales promelas*	Nonnative
PM	Cyprinidae	Peamouth	*Mylocheilus caurinus*	Native
SF	Cyprinidae	Northern pikeminnow	*Ptychocheilus oregonensis*	Native
RS	Cyprinidae	Redside shiner	*Richardsonius balteatus*	Native
TC	Cyprinidae	Tui chub	*Gila bicolor*	Nonnative
UC	Cyprinidae	Utah chub	*Gila atraria*	Native
SKB	Catostomidae	Bridgelip sucker	*Catostomus columbianus*	Native
SKL	Catostomidae	Largescale sucker	*Catostomus macrocheilus*	Native
BH	Ictaluridae	Bullhead spp.	*Ictalurus* spp.	Nonnative
CC	Ictaluridae	Channel catfish	*Ictalurus punctatus*	Nonnative
FHC	Ictaluridae	Flathead catfish	*Pylodictis olivaris*	Nonnative
TM	Ictaluridae	Tadpole madtom	*Noturus gyrinus*	Nonnative
KB	Cyprinodontidae	Banded killifish	*Fundulus diaphanus*	Nonnative
WC	Centrarchidae	White crappie	*Pomoxis annularis*	Nonnative
BC	Centrarchidae	Black crappie	*Pomoxis nigromacularus nnnegronegronigromaculatus*	Nonnative
BG	Centrarchidae	Bluegill	*Lepomis macrochirus*	Nonnative
LMB	Centrarchidae	Largemouth bass	*Micropterus salmoides*	Nonnative

Table E.3.1-1 Fish sampled in Swan Falls Reservoir and tailrace from 1989 through 2006, including species codes, family, common and scientific names, and native or nonnative status. (Continued)

Code	Family Name	Common Name	Scientific Name	Status
SMB	Centrarchidae	Smallmouth bass	*Micropterus dolomieui*	Nonnative
PS	Centrarchidae	Pumpkinseed	*Lepomis gibbosus*	Nonnative
WM	Centrarchidae	Warmouth	*Lepomis gulosus*	Nonnative
YP	Percidae	Yellow perch	*Perca flavescens*	Nonnative
S	Cottidae	Sculpin spp.	*Cottus* spp.	Native
MS	Cottidae	Mottled sculpin	*Cottus bairdi*	Native

Table E.3.1-2 Mean dissolved oxygen values (DO, mg/L) pre- and post-hatch, and respective mean survival from eyed- and green-egg baskets planted in the Swan Falls and Hells Canyon reaches of the Snake River: 2003–2006. (N.S. = no samples)

		Eyed Eggs			Green Eggs		
Study Year	Reach	Mean D.O. Pre-Hatch	Mean D.O. Post-Hatch	Mean Survival	Mean D.O. Pre-Hatch	Mean D.O. Post-Hatch	Mean Survival
2003 to 2004	Swan Falls	9.5	5.9	0.23	N.S.	N.S.	N.S.
	Hells Canyon	10.1	10.6	0.83	N.S.	N.S.	N.S.
2004 to 2005	Swan Falls	9.6	7.4	0.17	7.1	5.9	0
	Hells Canyon	9.4	10.3	0.79	9.2	10.5	0.55
2005 to 2006	Swan Falls	10.6	6.9	0	8	7.2	0
	Hells Canyon	9.7	9.7	0.56	9	9.2	0.38

Table E.3.1-3 Summary of effort and catch for white sturgeon sampled by the Applicant in the Snake River between C.J. Strike and Brownlee dams.

Reach	Survey Year	Gear	Hours of Effort	Catch	CPUE (fish/hour)	Reference
C.J. Strike–Swan Falls	1994–1996	Setline	33,747	340	0.010	Lepla and Chandler (1997)
		Gill net	448	267	0.596	
		Angling	129	47	0.364	
Swan Falls–Brownlee	1996–1997	Setline	16,752	32	0.002	Lepla et al. (2003)
		Gill net	268	12	0.045	
		Angling	18	1	0.055	

Table E.3.1-4 Mean relative weights based on fork length measurements for white sturgeon populations in the Snake River between Shoshone Falls and Lower Granite dams.

River Segment	Year	Mean Relative Weight All Fish (*N*)	Mean Relative Weight Reservoir (*N*)	Mean Relative Weight River (*N*)	Reference
Shoshone Falls–Upper Salmon Falls	2001	100% (215)	88% (4)	100% (211)	Lepla et al. (2002)
	1980 to 1981	104% (10)	–	104% (10)	Lukens (1981)
Upper Salmon Falls–Lower Salmon Falls	2004	89% (19)	89% (19)	–	Lepla et al. (2004)
Lower Salmon Falls–Bliss	2004	84% (45)	–	84% (45)	Lepla et al. (2004)
	1992 to 1993	90 (31)	97% (8)	87% (22)	Lepla and Chandler (1995a) IPC (unpublished data)
	1980 to 1981	105% (11)	–	105% (11)	Lukens (1981)
Bliss–C.J. Strike	2000	96% (186)	98% (146)	88% (38)	Applicant (unpublished data)
	1991 to 1993	100% (534)	101% (455)	91% (79)	Lepla and Chandler (1995b)
	1979 to 1981	91% (560)[a]	–	–	Beamesderfer (1993)
C.J. Strike–Swan Falls	2001	85% (148)	–	85% (148)	Applicant (unpublished data)
	1994 to 1996	88% (314)	83% (1)	88% (313)	Lepla and Chandler (1997)
Swan Falls–Brownlee	1996 to 1997	86% (37)	82% (10)	87% (27)	Lepla et al. (2003)
	1973	86% (1)	–	86% (1)	Reid et al. (1973)
Oxbow–Hells Canyon	1998	93% (2)	93% (2)	–	Lepla et al. (2003)
	1992	93% (7)	93% (7)	–	ODFW (unpublished data)
Hells Canyon–Salmon River	1997 to 2000	88% (568)	–	88% (568)	Lepla et al. (2003)

Table E.3.1-4 Mean relative weights based on fork length measurements for white sturgeon populations in the Snake River between Shoshone Falls and Lower Granite dams. (Continued)

River Segment	Year	Mean Relative Weight All Fish (*N*)	Mean Relative Weight Reservoir (*N*)	Mean Relative Weight River (*N*)	Reference
Hells Canyon–Lower Granite[b]	1997 to 2000	88% (1,247)	95% (269)	87% (978)	Lepla et al. (2003)
	1982 to 1984	89% (394)	–	89% (394)	Lukens (1985)
	1972 to 1975	90% (600)	–	90% (600)	Coon et al. (1977)

a. Relative weight based on total length as reported in Beamesderfer (1993).

b. Population data combined from the Applicant and Nez Perce Tribe sturgeon surveys.

Table E.3.1-5 Observed mean annual growth (cm fork length [FL]/year) of tagged white sturgeon in the Snake River. Size categories are: small = less than 92 cm, mid = 92 to 183 cm, large = greater than 183 cm.

		Wild			Hatchery		
Reach	All Recaptures (n)	Small (n)	Mid (n)	Large (n)	Small (n)	Mid (n)	Large (n)
Shoshone Falls–Upper Salmon Falls	7.3 (92)	–	–	–	7.2 (70)	7.4 (22)	–
Upper Salmon–Lower Salmon Falls	5.8 (1)	–	–	–	–	5.8 (1)	–
Lower Salmon Falls–Bliss	7.2 (55)	–	10.9 (1)	–	7.1 (43)	7.9 (10)	–
Bliss–C.J. Strike	5.5 (130)	5.5 (2)	6.1 (59)	3.7 (34)	6.1 (33)	7.8 (2)	–
C.J. Strike–Swan Falls	5.2 (124)	5.0 (6)	5.5 (96)	3.3 (18)	6.3 (4)	–	–
Hells Canyon–Lower Granite							
The Applicant/Nez Perce Tribe data (1997–2000)	3.2 (150)	1.8 (78)	5.1 (62)	3.3 (10)	–	–	–
Lukens (1985)	3.4	–	–	–	–	–	–
Coon et al. (1977)	1–3	~ 1	–	–	–	–	–

Table E.3.1-6 Total annual mortality (A) and survival (S) estimates for white sturgeon sampled in the Snake River between Shoshone Falls and Lower Granite dams.

Reach	Survey Year	Ages	Annual Survival (S)	Annual Mortality (A)	Reference
Shoshone Falls–Upper Salmon Falls	2001	8–13	0.88	0.12	Lepla et al. (2002)
Bliss–C.J. Strike	2000	7–21	0.87	0.13	IPC (unpublished data)
	1991–1993	12–22	0.87	0.13	Lepla and Chandler (1995b)
	1979–1981	16–30	0.96	0.04	Cochnauer (1983)
C.J. Strike–Swan Falls	1994–1996	12–21	0.90	0.10	Lepla and Chandler (1997)
Hells Canyon–Salmon River	1997–2000	6–12	0.87	0.13	Lepla et al. (2003)
Hells Canyon–Lower Granite	1982–1984	7–25	0.87	0.13	Lukens (1985)
	1972–1975	7–20	0.74	0.26	Coon et al. (1977)

Table E.3.1-7 List of water quality impaired segments in the Snake River that exceed Idaho water quality standards or do not support their designated beneficial uses. (Source: IDEQ 1998 [formerly Idaho Division of Environmental Quality], USEPA 2001.)

River Segment	Idaho §303(d) Listed Pollutants	Designated Beneficial Uses[a]
Snake River: RM 614.7 to 606.4 (Shoshone Falls to Rock Creek)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 606.4 to 599.1 (Rock Creek to Cedar Draw Creek)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 599.1 to 594.2 (Cedar Draw Creek to Clear Lakes Bridge)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 594.2 to 591.5 (Clear Lakes Bridge to Mud Creek)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 591.5 to 591.4 (Mud Creek to Deep Creek)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 586.1 to 581.4 (Upper Salmon Falls Reservoir)	Dissolved oxygen, flow alteration, sediment	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 579.6 to 573.0 (Lower Salmon Falls Reservoir)	Dissolved oxygen, flow alteration, sediment	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 565.0 to 560.0 (Bliss Reservoir)	Bacteria, dissolved oxygen, flow alteration, NH_3, sediment	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 559.9 to 556.6 (Cassia Gulch to Big Pilgrim Gulch)	Nutrients, sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 556.6 to 544.9 (Big Pilgrim Gulch to King Hill)	Sediment, temperature	Cold water biota, salmonid spawning, primary contact recreation
Snake River: RM 544.9 to 512.8 (King Hill to C.J. Strike Reservoir at Hwy 51 Bridge)	Sediment	Cold water biota, domestic water supply, primary contact recreation, special resource water
Snake River: RM 512.8 to 494.0 (C.J. Strike Reservoir)	Nutrients, pesticides	Cold water biota, primary contact recreation, special resource water
Snake River: RM 494.0 to 471.0 (C.J. Strike Reservoir to Castle Creek)	Sediment	Cold water biota, domestic water supply, primary contact recreation, special resource water
Snake River: RM 471.0 to 457.7 (Castle Creek to Swan Falls)	Sediment	Cold water biota, domestic water supply, primary contact recreation, special resource water
Snake River: RM 457.7 to 396.4 (Swan Falls to Boise River inflow)	Bacteria, dissolved oxygen, flow alteration, nutrients, pH, sediment	Cold water biota, domestic water supply, primary contact recreation, special resource water

Table E.3.1-7 List of water quality impaired segments in the Snake River that exceed Idaho water quality standards or do not support their designated beneficial uses. (Source: IDEQ 1998 [formerly Idaho Division of Environmental Quality], USEPA 2001.) (Continued)

River Segment	Idaho §303(d) Listed Pollutants	Designated Beneficial Uses[a]
Snake River: RM 396.4 to 351.6 (Boise River inflow to Weiser River inflow)	Bacteria, nutrients, pH, sediment	Cold water biota, primary contact recreation, domestic water supply
Snake River: RM 351.6 to 347 (Weiser River inflow to Scott Creek inflow)	Bacteria, nutrients, pH, sediment	Cold water biota, primary contact recreation, domestic water supply
Snake River: RM 347 to 285 (Brownlee Reservoir, Scott Creek to Brownlee Dam)	Dissolved oxygen, mercury, nutrients, pH, sediment	Cold water biota, primary contact recreation, domestic water supply, special resource water
Snake River: RM 285 to 272.5 (Oxbow Reservoir)	Nutrients, sediment, pesticides	Cold water biota, primary contact recreation, domestic water supply, special resource water
Snake River: RM 272.5 to 247 (Hells Canyon Reservoir)	Not listed	Cold water biota, primary contact recreation, domestic water supply, special resource water
Snake River: RM 247 to 188 (Hells Canyon Dam to Salmon River inflow)	Temperature[b]	Cold water biota, primary contact recreation, domestic water supply, special resource water, salmonid spawning

a. All Snake River waters have the additional, designated beneficial uses of agricultural water supply, industrial water supply, wildlife habitats, and aesthetics.

b. EPA addition to the 1998 Idaho §303(d) list, January 2001 (USEPA 2001).

Table E.3.1-8 List of water quality impaired segments in the Snake River that exceed State of Oregon water quality standards or do not support their designated beneficial uses.

River Segment	Oregon §303(d) Listed Pollutants	Designated Beneficial Uses
Snake River: RM 409 to 395 (Upstream Snake River—Owyhee Basin)	Mercury, temperature	Public/private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning (trout), resident fish (warm water) and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics
Snake River: RM 395 to 335 (Upstream Snake River to Farewell Bend—Malheur Basin)	Mercury, temperature	Public/private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning (trout), resident fish (warm water) and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics
Snake River: RM 335 to 260 (Brownlee Reservoir, Oxbow Reservoir, Upper Half of Hells Canyon Reservoir—Powder Basin)	Mercury, temperature	Public/private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics, hydropower
Snake River: RM 260 to 188 (Lower Half of Hells Canyon Reservoir, Downstream to Snake River—Grande Ronde Basin)	Mercury, temperature	Public/private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics, anadromous fish passage, commercial navigation and transport

Table E.3.1-9 Number of sites and effort for electrofishing sampling by river section and year.

			Effort	
River Section[a]	Year	Number of Sites	Distance (m)	Time (hours)
Reach below Swan Falls Dam (RM 440–457.7)				
	1989	12	2,725	1.06
	1990	20	8,250	2.87
	1995	10	1,000	0.81
	1996	8	800	0.37
	1997	11	1,100	0.67
	2000	17	1,700	2.08
	2004[b]	93	9,300	3.32
	2005	19	1,900	1.10
	2005[b]	360	36,000	13.26
	2006[b]	90	9,000	2.99
Swan Falls Reservoir (RM 457.7–469)				
	1989	17	4,425	2.47
	1990	21	10,120	5.34
	1995	6	600	0.61
	2000	16	1,600	1.98
	2003	24	2,400	1.97
	2004	23	2,327	2.44
	2004[b]	37	3,700	2.23
	2005	27	2,700	1.61
	2005[b]	157	15,700	7.36
	2006	24	2,400	1.98
	2006[b]	36	3,600	1.10
Reach above Swan Falls (RM 469–477)				
	1995	5	500	0.37

Table E.3.1-9 Number of sites and effort for electrofishing sampling by river section and year. (Continued)

			Effort	
River Section[a]	Year	Number of Sites	Distance (m)	Time (hours)
	2000	4	400	0.44
	2004	23	2,327	2.44
	2004[b]	38	3,800	1.57
	2005	2	200	0.09
	2005[b]	159	15,900	5.99
	2006	24	2,400	1.98
	2006[b]	48	4,800	0.84
Sinker Creek (RM 462)				
	1990	1	100	0.19

a. These reaches are not necessarily the same as those delineated in Technical Appendix E.3.1-B, Chapter 1.

b. Effort reported for collections targeted for salmonids only.

Table E.3.1-10 Number of sites and effort for sampling conducted with methods other than electrofishing sampling by river section and year.

River Section[a]	Year	Number of Hauls, Traps, or Nets	Time (hours)
Reach below Swan Falls Dam			
Minnow trap	1989	24	43.9
Swan Falls Reservoir			
Beach seine	1990	19	
Gill net	1990	2	12.1
Hoop net	1989	1	19.0
Minnow trap	1989	72	1,104.0
	1990	48	896.0
Trap net	1990	2	35.8
Setline	1990	4	24.8

a. These reaches are not necessarily the same as those delineated in Technical Appendix E.3.1-B, Chapter 1.

Table E.3.1-11 Catch, hours of effort, and catch per unit of effort (hours, CPUE) of channel catfish by gill nets and setlines among four sections of the Snake River within the vicinity of Swan Falls Dam.

	Gill Nets			Setlines		
Reach	Catch	Hours	CPUE (fish/ hour)	Catch	Hours	CPUE (fish/hour)
Brownlee Above	18	14.45	1.2500	1	2,647.5	0.0004
Swan Falls Below	12	42.80	0.2800	5	6,050.0	0.0008
Swan Falls Reservoir	1	101.80	0.0098	3	6,488.0	0.0005
Swan Falls Above	0	20.50	0.0000	0	2,395.0	0.0000

This page left blank intentionally.

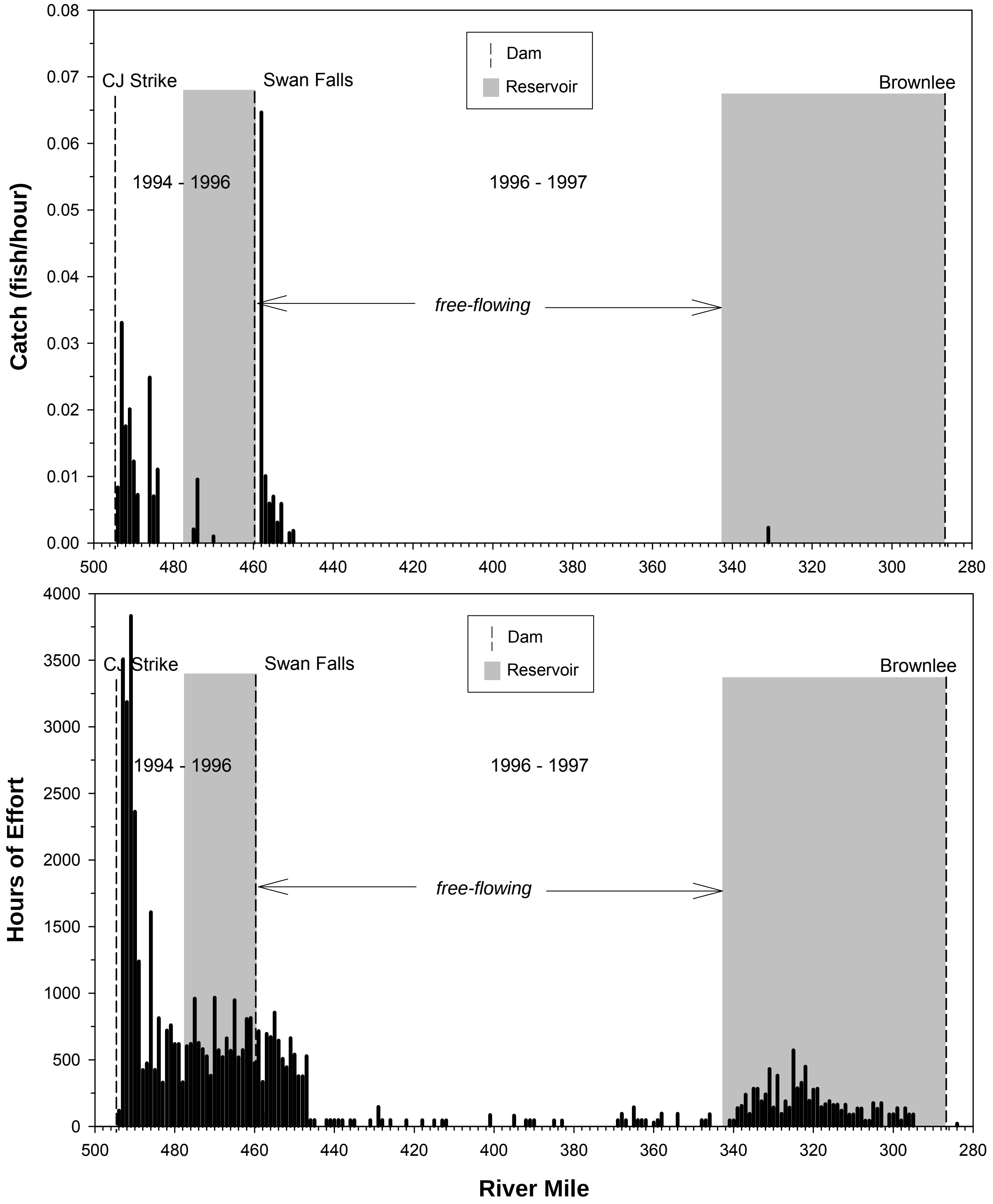


Figure E.3.1-1 **Catch rates of, and hours of effort expended for, white sturgeon sampled with setlines in the Snake River between C.J. Strike and Brownlee dams.**

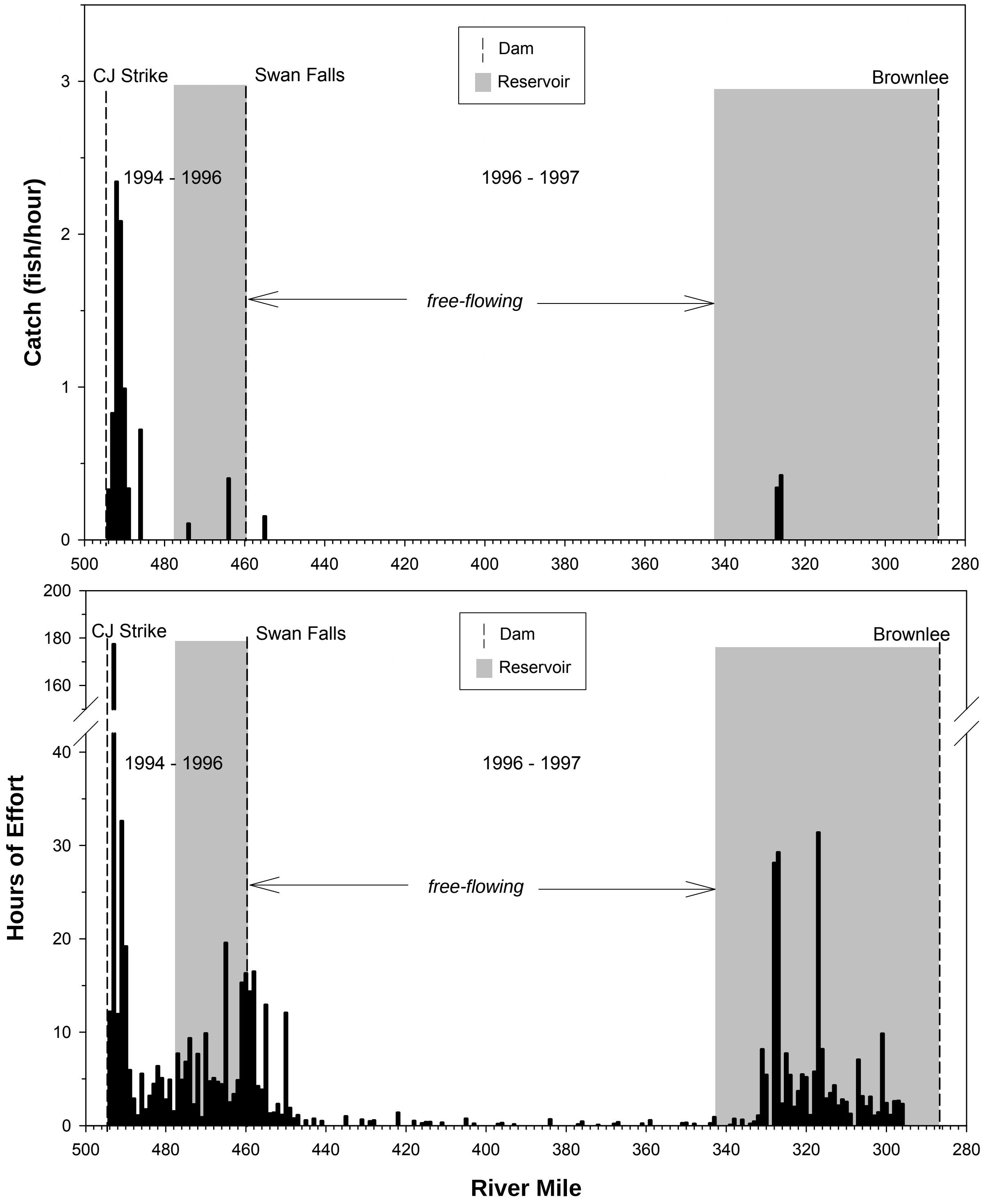


Figure E.3.1-2 Catch rates of, and hours of effort expended for, white sturgeon sampled with gill nets in the Snake River between C.J. Strike and Brownlee dams.

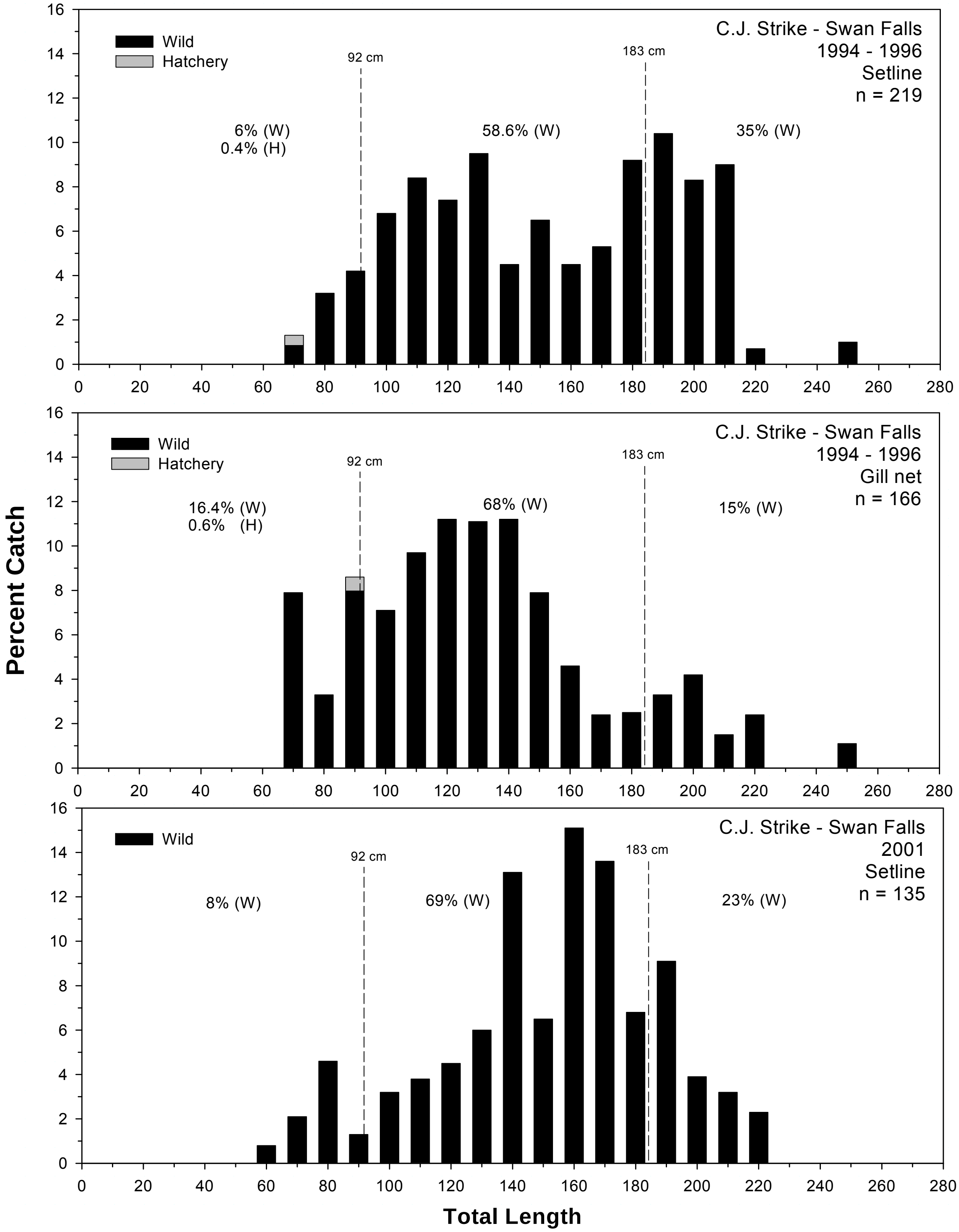


Figure E.3.1-3 Size distributions of white sturgeon sampled with setlines and gill nets in the C.J. Strike–Swan Falls reach of the Snake River during 1994–1996 and 2001.

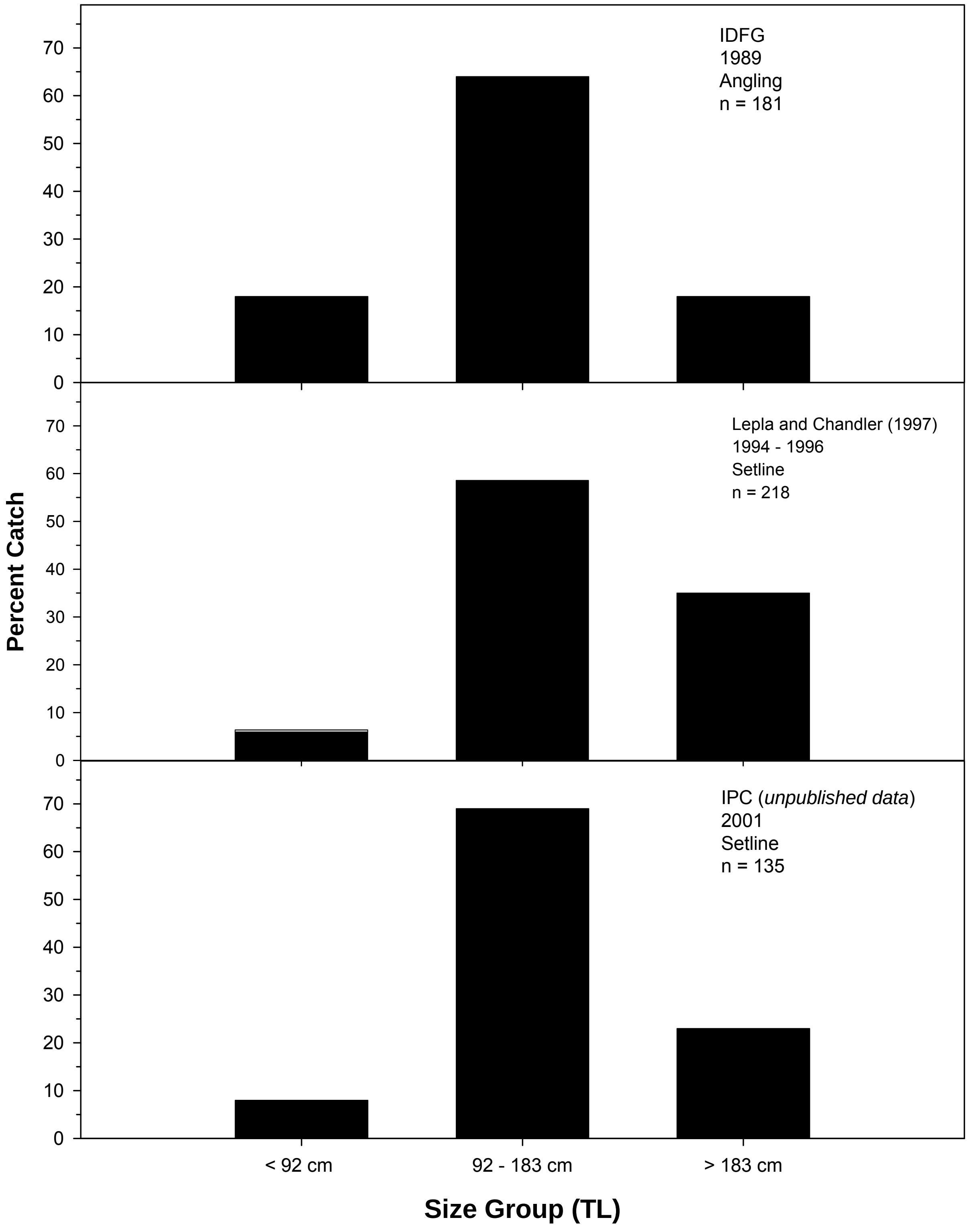


Figure E.3.1-4 Size composition of white sturgeon sampled in the C.J. Strike–Swan Falls reach of the Snake River.

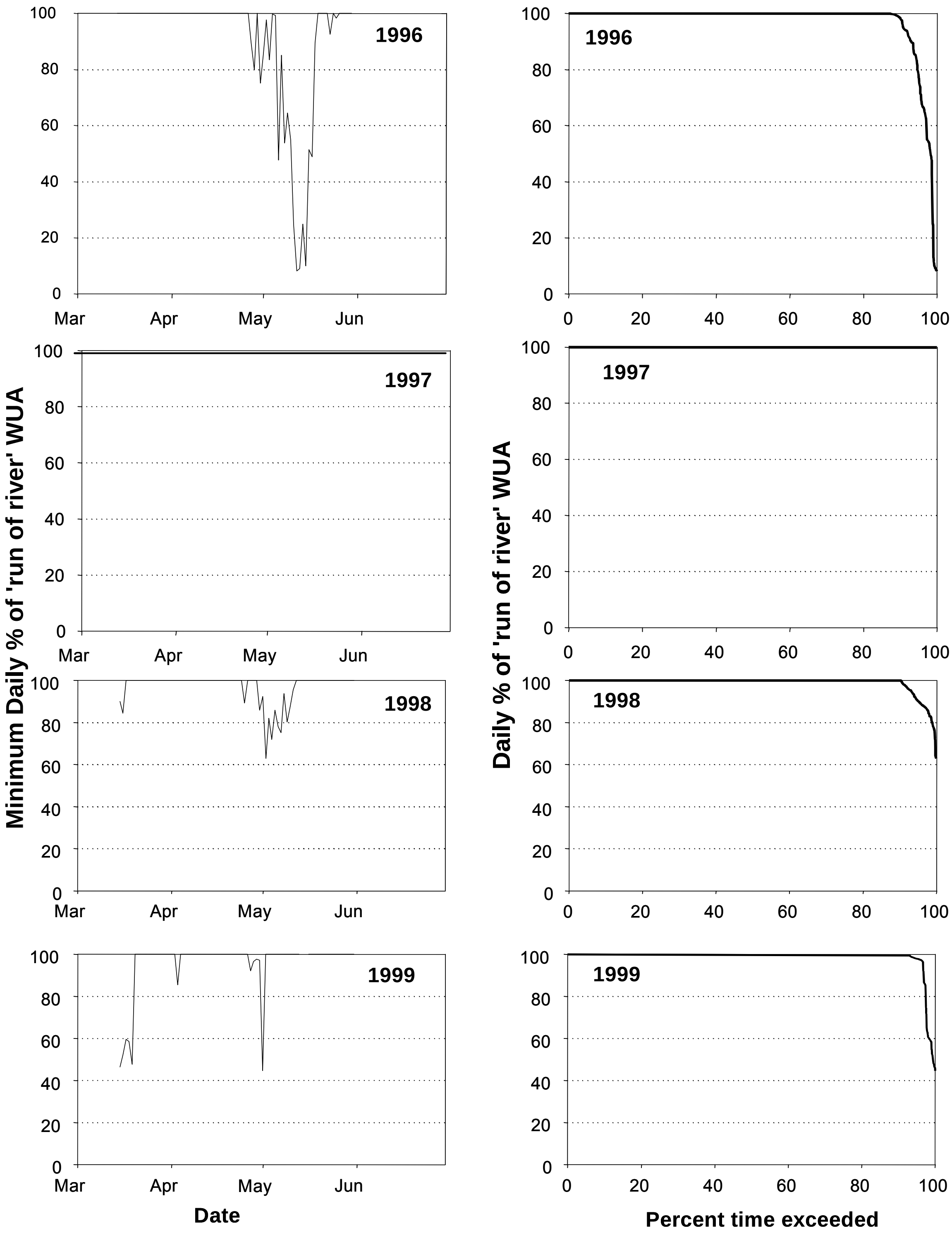


Figure E.3.1-5 **Daily weighted usable area (WUA) expressed as minimum daily percentage of run-of-river WUA and percentage-exceeded curve for minimum daily percentage of run-of-river WUA for the white sturgeon spawning periods during 1996 to 1999 below C.J. Strike Dam.**

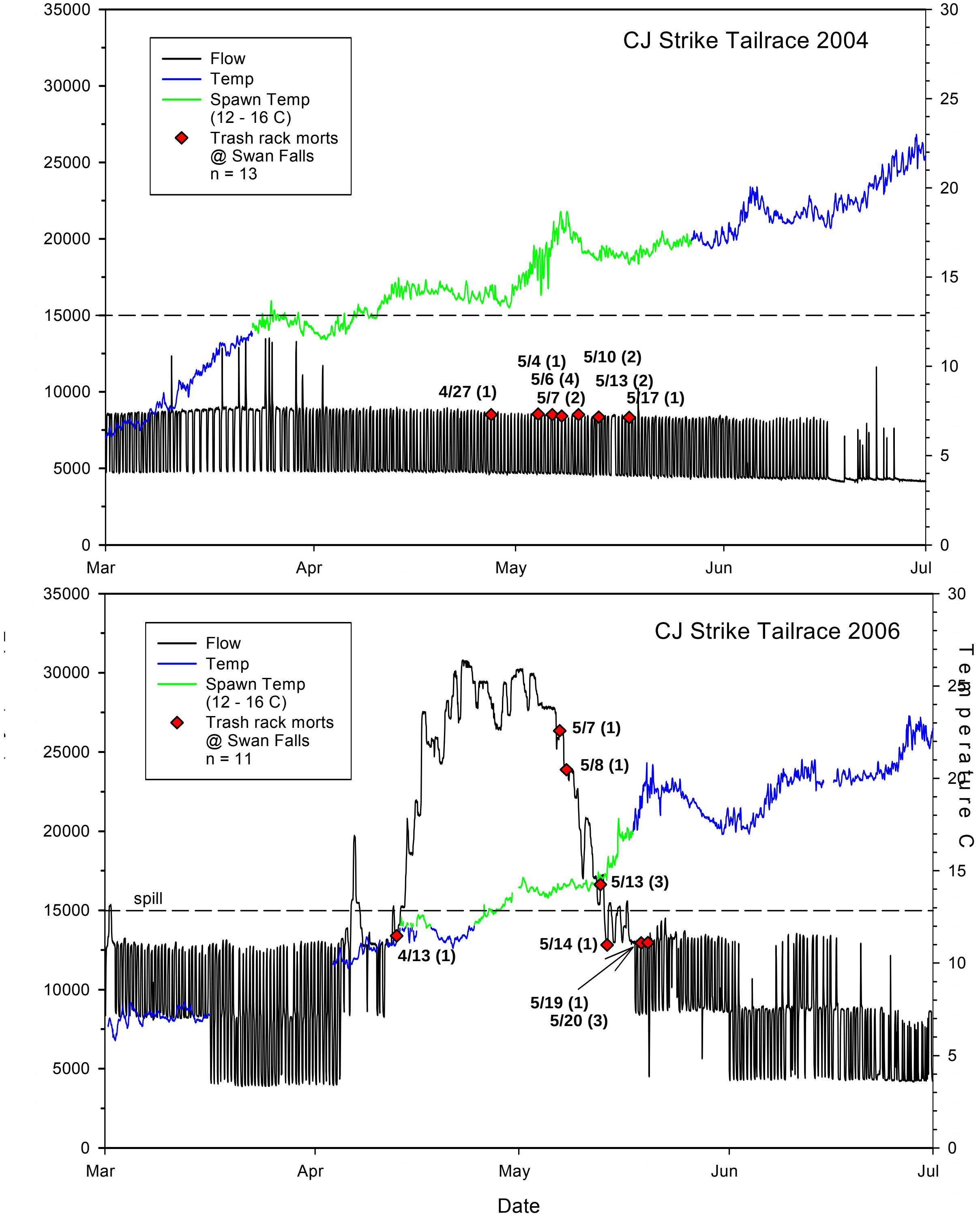


Figure E.3.1-6 River hydrograph at C.J. Strike Dam during two mortality events of white sturgeon.

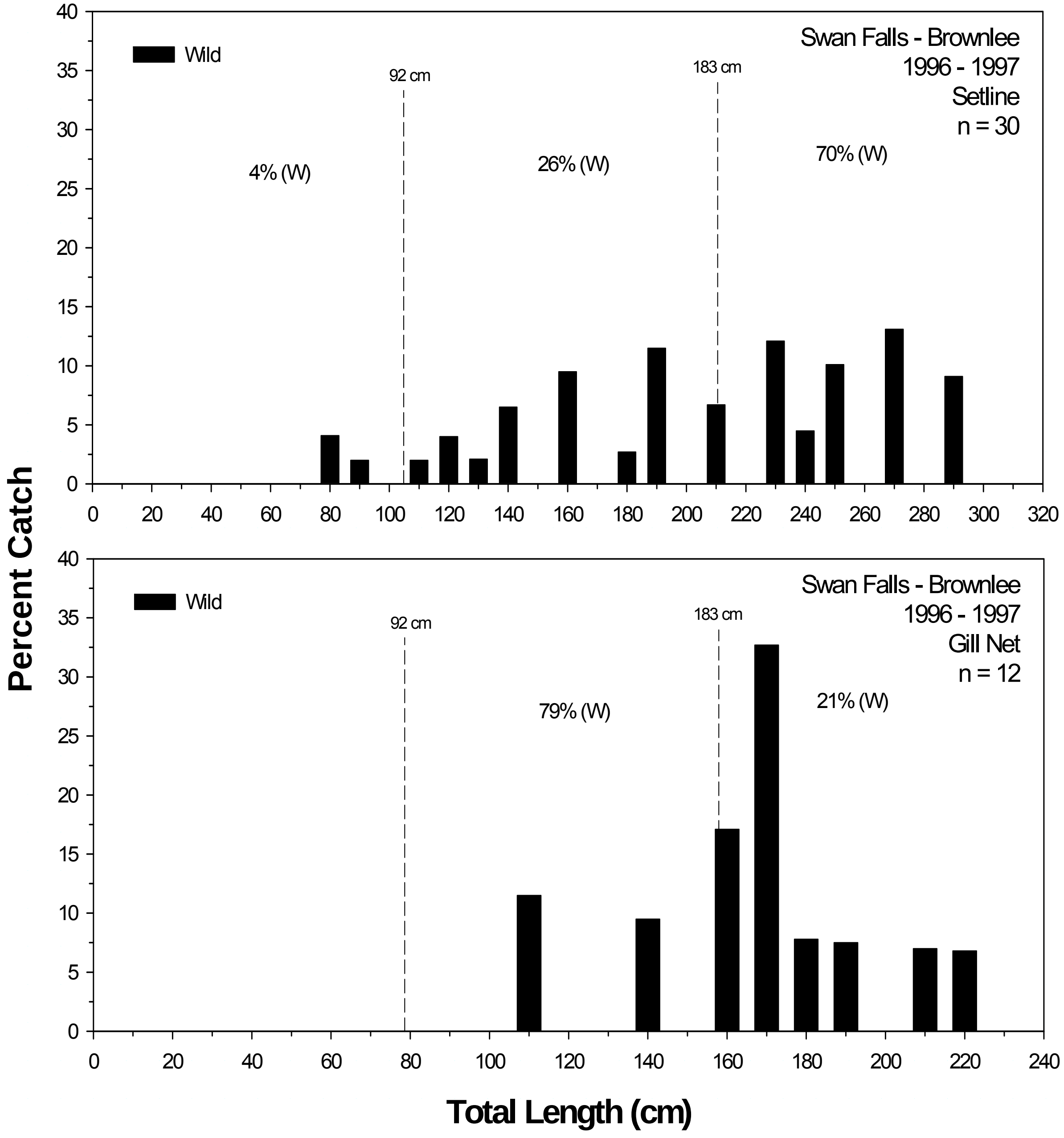


Figure E.3.1-7 **Size distributions of white sturgeon sampled with setlines and gill nets in the Snake River between Swan Falls and Brownlee dams during 1996–1997.**

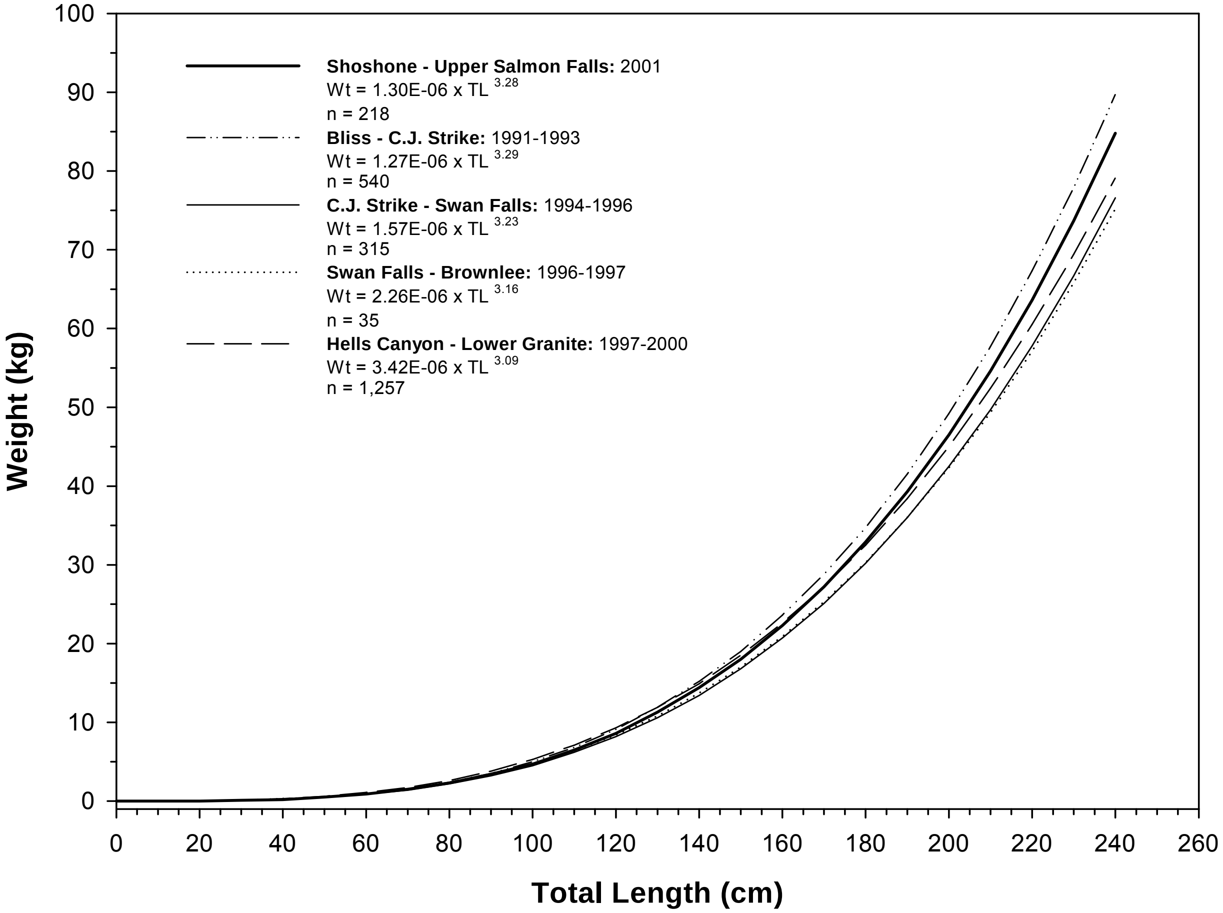


Figure E.3.1-8 **Length–weight relationships for white sturgeon in Snake River reaches between Shoshone Falls and Lower Granite Dam.**

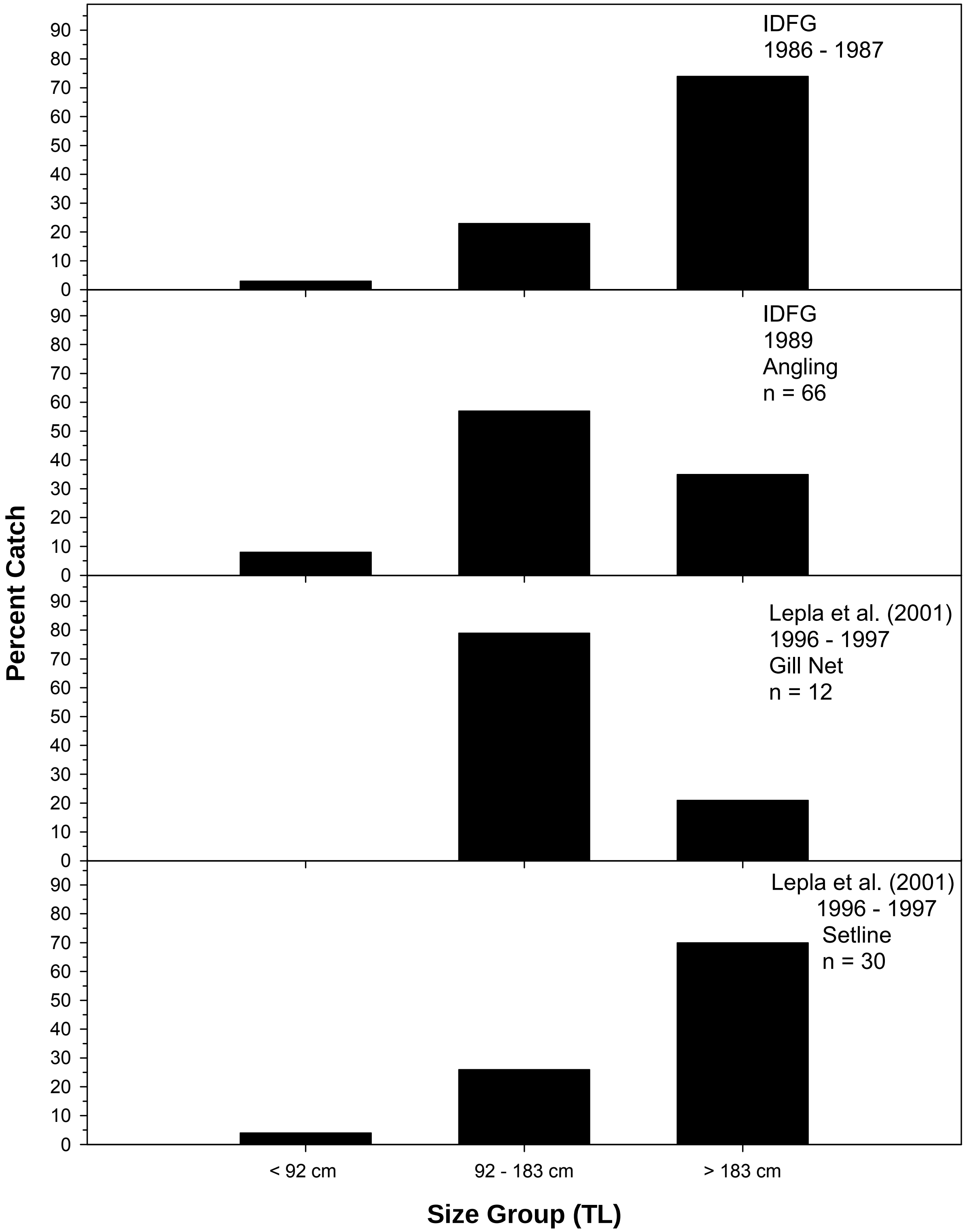


Figure E.3.1-9 **Size composition of white sturgeon sampled in the Swan Falls–Brownlee reach of the Snake River.**

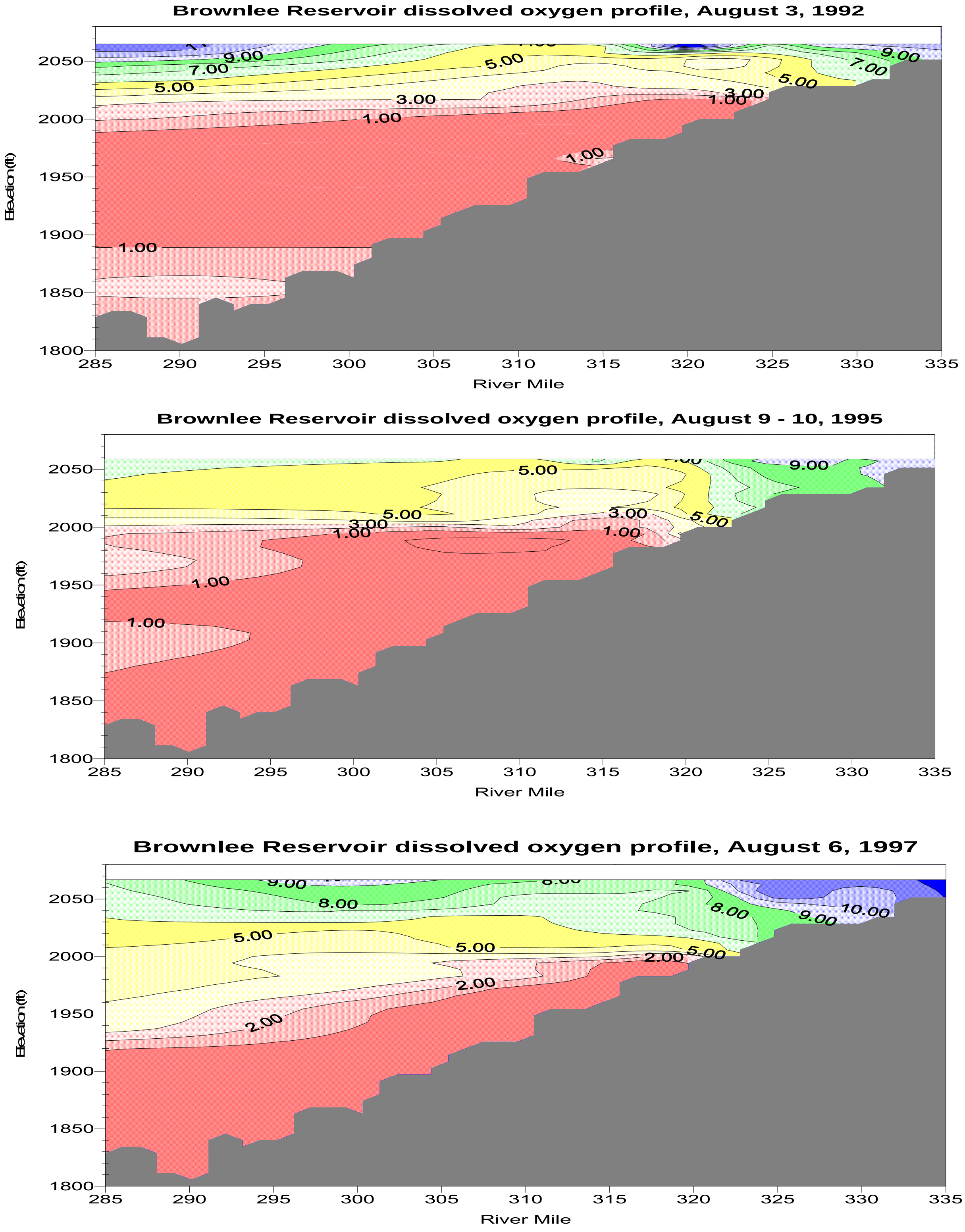


Figure E.3.1-10 Dissolved oxygen (DO) isopleths for Brownlee Reservoir representing low (1992), medium (1995), and high (1997) hydrologic years. (Source: Myers et al. 2003).

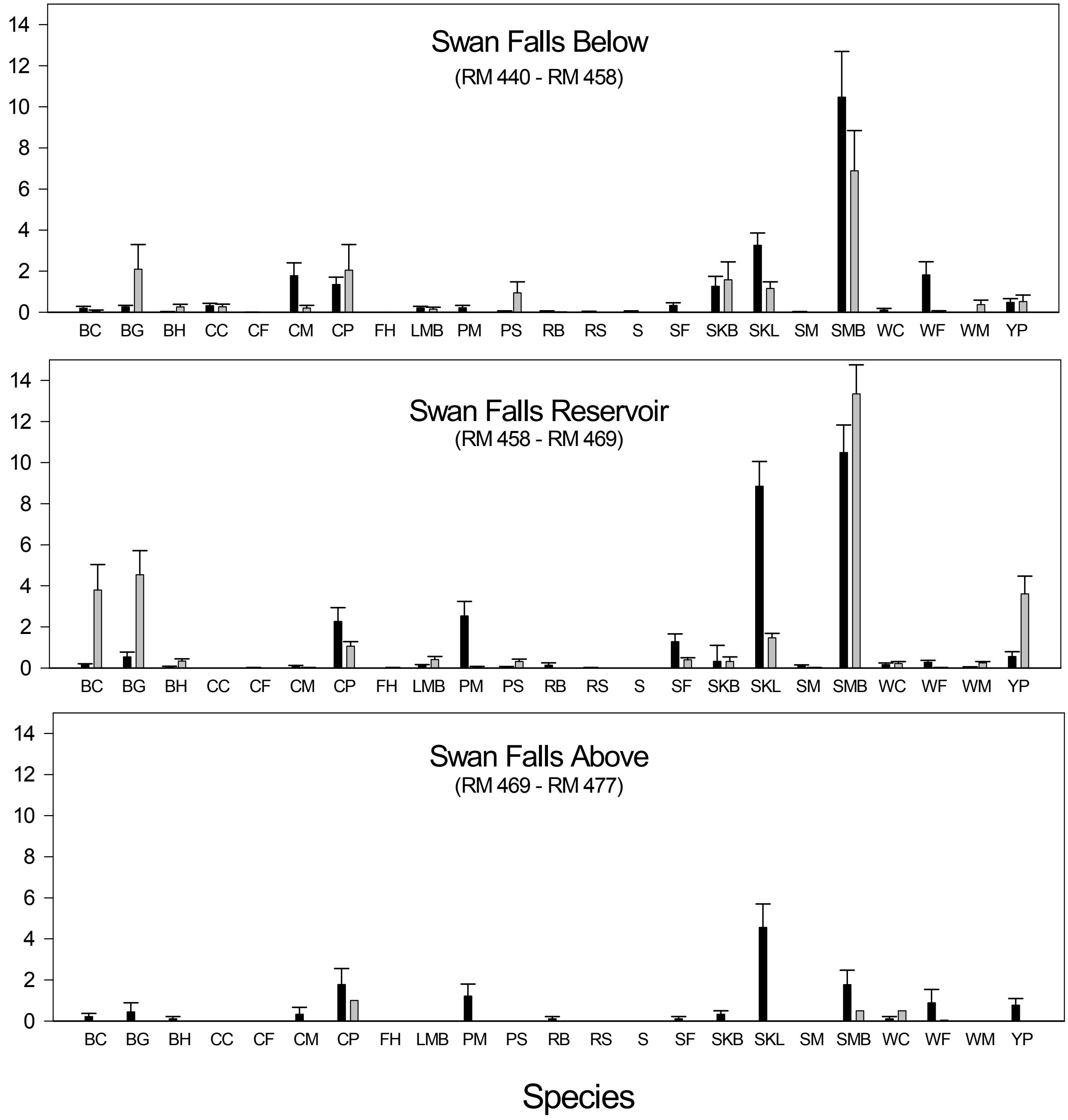


Figure E.3.1-11 **Mean catch per unit effort (CPUE) (electrofishing only) of all years sampled (1989–2003 and 2004–2006) for selected species (see Table E.3.1-1 for scientific and common names and species codes).**

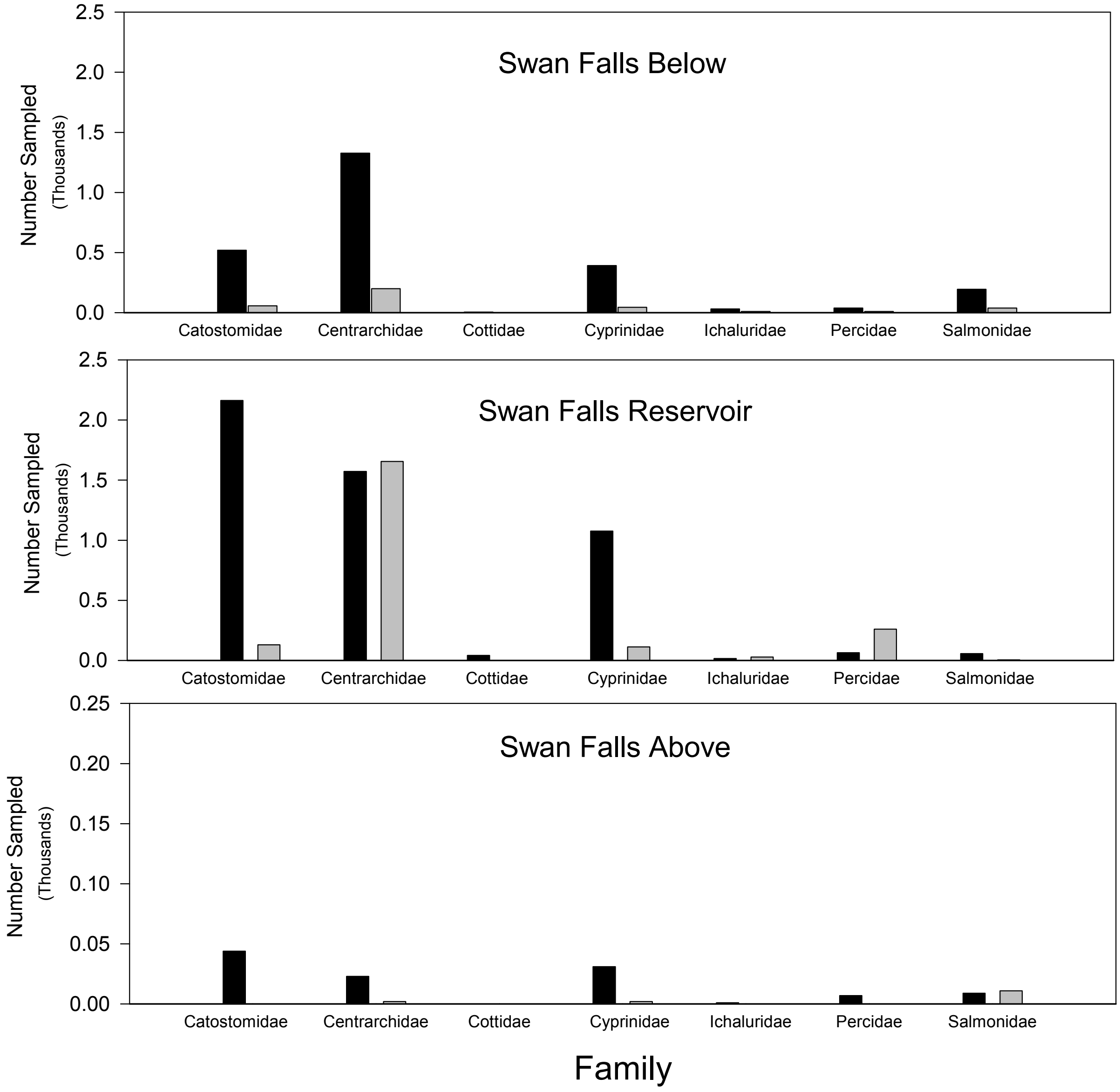


Figure E.3.1-12 Number of fish sampled by family in the Swan Falls Project area, 1989–2003 (■) and 2004–2006 (▨).

E.3.2. Wildlife Resources

E.3.2.1. Description of Wildlife Resources

The Swan Falls Hydroelectric Project and relicensing study area are located within the Snake River Birds of Prey National Conservation Area (NCA), managed by the Bureau of Land Management (BLM) (Exhibit E.1, Figure E.1-1). For wildlife and botanical investigations, the Swan Falls study area was defined as all lands below the canyon rim within 0.5 miles of the reservoir (river) centerline, from river mile (RM) 471.0 to RM 447.2, encompassing 12,045.3 acres (Table 4 in Technical Report E.3.3-A). The Swan Falls Federal Energy Regulatory Commission (FERC) project boundary is entirely enclosed by the Swan Falls study area and covers approximately 2,191.8 acres (Tables 5 and 6 in Technical Report E.3.3-A). The acreages of lands both within the Swan Falls study area and the Swan Falls FERC project boundary are small compared to lands designated as the NCA. Currently, the NCA encompasses 483,706 acres of public land along 81 miles of the Snake River (J. Sullivan, Snake River Birds of Prey NCA Manager, personal communication, July 21, 2004). The area is located in Ada, Canyon, Elmore, and Owyhee counties in southwestern Idaho.

The uniqueness of the Snake River Canyon and adjoining upland desert has been recognized since the 1940s (Olendorff and Kochert 1977). The Snake River Canyon, where Swan Falls Dam is located, supports one of the highest densities of noncolonial nesting raptors in the world (BLM 1979, Olendorff et al. 1989). In 1971, the Secretary of the Interior designated approximately 26,311 acres of public land along the Snake River as the Snake River Birds of Prey Natural Area under Public Land Order 5133 (USGS 1996). During the 1970s, the BLM identified the importance of foraging habitat on the benchlands to birds of prey nesting in the canyon. Based on this information, the Secretary of the Interior established the Snake River Birds of Prey Area under Public Land Order 5777 in 1980. On August 4, 1993, Congress enacted Public Law 103-64 providing permanent protection to the area, which was renamed the Snake River Birds of Prey National Conservation Area. According to the Act, this area was established "to provide for the conservation, protection, and enhancement of raptor populations and habitats and the natural and environmental resources and values therewith, and the scientific, cultural, and educational resources and values of the public lands in the conservation area."

The NCA, including the Swan Falls study area, has been extensively studied during the past 40 years. Research started in the mid-1960s when Hickman (1968) surveyed nesting golden eagles (*Aquila chrysaetos*) in southeastern Oregon and southwestern Idaho. In the late 1960s and 1970s, research was conducted on prairie falcons (*Falco mexicanus*) and golden eagles (Beecham 1970, Kochert 1972, Ogden 1973). In 1972, the BLM initiated a raptor research project to investigate the ecology of raptors and their prey, culminating in a research publication by the BLM (BLM 1979). This document formed the basis for protecting the NCA and defines its boundaries. During the 1980s, various cooperative research projects were conducted between the BLM and industry (Holthuijzen 1989, Engel and Young 1992). Also, establishment of the Raptor Research Center at Boise State University, The Peregrine Fund's World Center for Birds of Prey in Boise, and the Raptor Research and Technical Assistance Center—now known as the Snake River Field Station—fostered investigations in the NCA. During the early 1990s, the BLM and Idaho Army National Guard embarked on an ambitious research program to investigate relationships between vegetation, prey, and raptor abundance and productivity (USGS 1996). The investigations over the past 40 years have resulted in numerous publications and extensive knowledge about wildlife and vegetation in the NCA. The following description of wildlife resources in the study area is based on the extensive research conducted in the NCA.

E.3.2.1.1. Nongame Birds

During the mid-1990s, passerine birds on the benchlands of the NCA were studied (USGS 1996, Knick and Rotenberry 1995). These investigations elucidated habitat relationships of species occupying shrublands, with a particular emphasis on sagebrush-obligate species. Sagebrush-dominated cover types are relatively species poor and dominated by a small number of species. Common species found in the project vicinity were the long-billed curlew (*Numenius americanus*), horned lark (*Eremophila alpestris*), grasshopper sparrow (*Ammodramus savannarum*), lark sparrow (*Chondestes grammacus*), western meadowlark (*Sturnella neglecta*), Brewer's sparrow (*Spizella brewerii*), sage sparrow (*Amphispiza belli*), white-crowned sparrow (*Zonotrichia leucophrys*), and sage thrasher (*Oreoscopte montanus*) (USGS 1996). Other passerines detected were the black-throated sparrow (*Amphispiza bilineata*), rock wren (*Salpinctes obsoletus*), and canyon wren (*Catherpes mexicanus*) (Knick and Rotenberry 1995).

The long-billed curlew, horned lark, grasshopper sparrow, lark sparrow, and western meadowlark showed an affinity to grassland cover types. These species benefited from disturbance of the shrubland vegetation. In contrast, the Brewer's sparrow, sage sparrow, and white-crowned sparrow preferred shrub cover and increasing patch size (i.e., decreasing levels of disturbance of the landscape) (USGS 1996).

Fragmentation of shrub-steppe habitat has major consequences for shrub-steppe obligates (Rotenberry and Wiens 1980). In the NCA, only small patches of shrubland remain within large expanses of annual grasslands. Populations of shrubland species declined because the amount of suitable habitat declined, reproduction was lower, or mortality was higher in remaining shrub habitats. Native shrub-steppe plant communities in the Great Basin and on the Snake River Plain have been irrevocably changed by alien plant invasion coupled with increased fire frequency. These invasions and increased fire frequencies have led to the establishment of exotic annuals, especially cheatgrass (*Bromus tectorum*[1]). These changes subject the native vegetation to frequent wildfires and ultimately lead to the conversion of shrub-steppe plant communities to annual grasslands. This transition of shrubland to grassland dominated by exotic annual vegetation benefits grassland or generalist species such as horned larks and western meadowlarks. In contrast, shrubland-obligate species—such as Brewer's sparrows, sage sparrows, and sage thrashers—decline.

Bird communities associated with riparian habitats along the Snake River and Swan Falls Reservoir have not been specifically described in the study area. A species list of birds occurring in the NCA, including the Swan Falls study area, has been compiled by the BLM (BLM 1995, 2006). However, riparian bird communities in the study area are likely similar to those described for the C.J. Strike Reservoir, which is located approximately 36 river miles upstream of Swan Falls Dam. Holthuijzen (1997a) reported that seven avian species were commonly observed in riparian habitat in more than one season: the mallard (*Anas platyrhynchos*), red-winged blackbird (*Agelaius phoenicus*), black-billed magpie (*Pica pica*), yellow-rumped warbler (*Dendroica coronata*), white-crowned sparrow, northern flicker (*Colaptes auratus*), and song sparrow (*Melospiza melodia*). Eight additional species were relatively common in one season: the

---

[1] Nomenclature follows the U.S. Department of Agriculture, Natural Resources Conservation Service database (NRCS 2007).

mourning dove (*Zenaida macroura*), European starling (*Sturnus vulgaris*), cinnamon teal (*Anas cyanoptera*), chipping sparrow (*Spizella passerina*), American robin (*Turdus migratorius*), dark-eyed junco (*Junco hyemalis*), American wigeon (*Anas americana*), and Canada goose (*Branta canadensis*). Species diversity was highest in the spring (137 species) and declined through the fall (120 species) and winter (69 species). Avian densities were highest in the winter compared with those for fall and spring, which were similar (Holthuijzen 1997a).

E.3.2.1.2. Upland Game Birds

Specific surveys for upland game birds are limited in the study area and vicinity. Habitat conditions in the Swan Falls study area are similar to those at C.J. Strike Reservoir, and upland game bird communities are likely to be similar. Sunderman et al. (1997a) reported four species of upland game birds present in the C.J. Strike area: California quail (*Callipepla californica*), mourning dove, ring-necked pheasant (*Phasianus colchicus*), and gray partridge (*Perdix perdix*). California quail were most abundant, followed by mourning dove, ring-necked pheasant, and gray partridge. California quail were more abundant in riparian habitat than in upland habitat, but ring-necked pheasant and mourning dove had abundances similar to each other and in each habitat type. Ring-necked pheasant densities of 0.1 birds per hectare (ha) were reported (BLM 1979). In addition, chukars (*Alectoris chukar*) were also present in the Swan Falls study area (A. Holthuijzen, Idaho Power Company [IPC], personal observation), but information on population numbers or densities is not available.

E.3.2.1.3. Waterfowl

During the winters of 1989 through 1992 (September through March), the Applicant conducted waterfowl surveys upstream of Swan Falls Dam to C.J. Strike Dam (Holthuijzen 1997b). Surveys were not conducted downstream of Swan Falls Dam. Information was gathered on waterfowl composition, numbers, and distribution upstream of Swan Falls Dam. Waterfowl numbers at Swan Falls Reservoir rapidly increased from September (11 birds/river mile) through December (98 birds/river mile), peaked in January (110 birds/river mile), and dropped quickly through March (57 birds/river mile) (Figure E.3.2-1). Waterfowl concentrated directly above the dam site (RM 459), but much lower numbers were observed between RM 460 and 467 (Figure E.3.2-2). In this reach, the Snake River passes through a relatively narrow canyon, with steep slopes and sparse riparian vegetation fringing the reservoir. Waterfowl numbers then increased between RM 468 and 470 where the Snake River enters a broad plain, the river widens, and agricultural activity increases, offering field foraging opportunities for ducks and geese.

Twenty-six species of waterfowl were reported during the surveys. The most common species observed was the American coot (*Fulica Americana*, 36% of all observations), followed by the mallard (*Anas platyrhynchos*, 31%), common goldeneye (*Bucephala clangula*, 18%), American widgeon (*Anas americana*, 5%), Canada goose (3%), common merganser (*Mergus merganser*, 2%), bufflehead (*Bucephala albeolus*, 2%), and teal (*Anas* spp., 1%) (Figure E.3.2-3). All other species comprised less than 2% of the number of waterfowl counted.

Analysis of the foraging guild composition indicated that dabblers (e.g., mallards and American widgeons) comprised 36% of all waterfowl, followed by surface dippers (e.g., American coot, 36%) and divers (e.g., common goldeneye, common merganser, and bufflehead; 22%). Dabblers dominated the waterfowl community in September, declined through February, and increased in March (Figure E.3.2-4). Divers showed an opposite trend, moving into the area in increasing numbers during the winter months, while the composition of surface dippers remained relatively constant over time.

Detailed surveys were not conducted downstream of Swan Falls Dam. The reach of the Snake River between Swan Falls Dam and Walters Ferry passes through a steep-walled canyon and has a relatively steep slope and fast-running waters. Such conditions make this reach unattractive to dabblers and surface dippers. However, small numbers of divers may be found in this reach. Below Walters Ferry, the Snake River enters a broad plain, developing a more braided channel with many islands. This area is cultivated and provides foraging opportunities for ducks and geese. Numbers of wintering waterfowl increase substantially in this reach.

E.3.2.1.4. Raptors

A diverse assemblage of densely nesting raptors occurs along 130 kilometers (km) of the Snake River Canyon between Hammett and Walters Ferry. A 1990 survey, emphasizing the canyon portion of the NCA, including the study area, documented 594 pairs of raptors from

13 species (Carpenter 1996). The unusual density and diversity is primarily due to an abundance of cliff nesting sites close to a plentiful prey base, principally Piute ground squirrels (*Spermophilus mollis*) and black-tailed jackrabbits (*Lepus californicus*).

Twenty-five raptor species use the NCA during some portion of their life cycles (BLM 1995, 2006; Carpenter 1996). All of these species can be found in the study area and vicinity. Sixteen species nest in the canyon or surrounding upland areas, and the remaining nine use the area during migration or winter. The most common diurnal nesting species include the prairie falcon, golden eagle, red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and northern harrier (*Circus cyaneus*). Less common are the ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni)*, and turkey vulture (*Cathartes aura*). Common nonbreeding species present during migration or winter are the osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), rough-legged hawk (*Buteo lagopus*), sharp-shinned hawk (*Accipiter striatus*), and Cooper's hawk (*Accipiter cooperii*). Uncommon to rare are the peregrine falcon (*Falco peregrinus*), merlin (*Falco columbarius*), gyrfalcon (*Falco rusticolus*), and Northern goshawk (*Accipiter gentilis*) (Carpenter 1996). Seven species of owls have been recorded to breed in the region. They are the common barn owl (*Tyto alba*), western screech-owl (*Otus kennicottii*), great-horned owl (*Bubo virginianus*), burrowing owl (*Athene cunicularia*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), and northern saw-whet owl (*Aegolius acadicus*). The barred (*Strix varia*) and snowy (*Nyctea scandiaca*) owls are the only nonbreeding owls present, and they are rarely observed (BLM 1995, Carpenter 1996).

Raptors use a variety of habitats for hunting. The most plentiful and commonly used habitats are the shrub-steppe and grasslands, although farmland and riparian areas are also important foraging habitats. Cliffs and talus slopes provide foraging habitat for golden eagles and red-tailed hawks (Carpenter 1996). The most significant prey for the golden eagle, prairie falcon, red-tailed hawk, and ferruginous hawk is the Piute ground squirrel and black-tailed jackrabbit (Steenhof and Kochert 1985, 1988). Other important prey items include mountain cottontail (*Sylvilagus nuttallii*), gophers (*Geomys* spp), voles (Muridae), mice (*Mus* spp.), rats (*Rattus* spp.), reptiles, and passerines (Carpenter 1996).

In the NCA, raptors primarily nest on cliffs, but they also use power poles, other artificial structures, trees, and the ground. Raptors nest from early February to late August. Golden eagles, great horned owls, and northern saw-whet owls are the earliest nesters, typically laying eggs by the first week of March. Most species lay their eggs between late March and late April. Swainson's hawks are the latest nesters, typically laying their eggs in early May. Mean hatch dates for all species range from early April to mid-June, and mean fledgling dates range from the first week of May to late July (Carpenter 1996, USGS 2006).

In the vicinity of the Swan Falls study area (Halverson Lake to Black Butte; RM 448 to 478), maximum cliff-nesting densities were 1.5 pairs/km of cliff from 1990 to 1994 (Carpenter 1996). More than half of the nesting pairs were prairie falcons (0.88 pairs/km). Using unpublished data from the BLM and U.S. Geological Survey (USGS), the mean number of nesting territories within 2.5 km of the Snake River was calculated for four raptor species from 1990 through 1994 and for prairie falcons in 2002. The data were tabulated by 10-km survey units, starting near Walters Ferry (RM 442) and ending about 8 km upstream of Swan Falls Reservoir (RM 478). The four nesting species included the prairie falcon, golden eagle, red-tailed hawk, and ferruginous hawk. Territory densities were highest near Swan Falls Dam (unit 5) with an average of 50.4 nesting territories within a 10-km stretch (Table 3.2-1 and Figure E.3.2-5). The second highest mean density of 41.6 territories was reported in unit 6 along Swan Falls Reservoir. Prairie falcons make up about 71% of all nesting pairs during the 1990–1994 nesting seasons. Common ravens (*Corvus corax*) also nest among the raptors. Ecologically, this species occupies a similar niche as raptors by nesting on cliffs and pursuing similar prey species. When ravens are included, average nesting densities increase (Table 3.2-1). Long and high sections of cliffs, which provide an abundance of nesting opportunities—at least along part of the surveyed reach—enable nesting birds to space their nests both vertically and horizontally.

Conversion of native shrub-steppe habitat to annual grasslands may affect densities of nesting raptors by decreasing the abundance and densities of principal prey animals. Numbers of prairie falcon pairs declined significantly between 1967 and 1997 (Steenhof et al. 1999), while golden eagle territories decreased significantly between 1971 and 1994 (Steenhof et al. 1997). In 2002, however, nesting surveys showed 217 nesting pairs of prairie falcon, the highest number ever reported in the NCA (Kochert and Steenhof 2003). This number may reflect an abundance of ground squirrels. In the Swan Falls study area, prairie falcon numbers were similar to means from the 1990–1994 study period, with the exception of one 10-km section (unit 8) where territory numbers doubled (Table 3.2-1). Falcon numbers in other surveyed 10-km stretches (specifically, units 5 and 6) remained fairly stable over time (Kochert and Steenhof 2003). In 2002, golden eagles occupied 30 of 40 historical territories. Although there is a negative trend from 1971 to 2002, the number of occupied territories has remained relatively stable since 1979 (Kochert and Steenhof 2003). Eleven golden eagle territories were found in the Swan Falls study area (Kochert and Steenhof 2003).

E.3.2.1.5. Small- and Medium-Sized Mammals

Piute ground squirrels and black-tailed jackrabbits are a primary prey of many raptors in the NCA (BLM 1979; Collopy 1983; Steenhof and Kochert 1985, 1988; Marti et al. 1993; USGS 1996). Changes in the distribution and abundance of these prey species may affect populations of raptor species in the NCA that depend on these mammals for prey (USGS 1996). Extensive research has been conducted in the NCA on density, distribution, habitat relationships, and food habits of the Piute ground squirrel. The black-tailed jackrabbit has been studied to a lesser extent (USGS 1996). The following information is compiled from research conducted in the NCA.

Piute ground squirrels are mainly found on the benchlands in high numbers and only on the north side of the Snake River in the NCA. They are rarely found within the Snake River Canyon. Ground squirrels usually emerge in late January and early February. In the next three to four months, they mate, raise young, and store sufficient reserves to sustain themselves through estivation (8–9 months). Young are born in early March, emerge from natal burrows in early April, disperse in late April and early May, and descend into their burrows between mid to late June (Yensen and Sherman 2003).

Ground squirrel densities, estimated annually for 1975 to 1982 and 1991 to 1994 (USGS 1996), declined during periods of drought. Grassland sites showed generally higher densities than sites that were dominated by big sagebrush (*Artemisia tridentata*), winterfat (*Krascheninnikovia lanata*), or mixed sagebrush–winterfat. Densities were lowest in shadscale saltbush (*Atriplex confertifolia*), which has little understory grass cover. Reproduction was also highest in grassland sites than in other habitats. Sandberg bluegrass (*Poa secunda*) was the most important food item for the ground squirrel. Winterfat was important where available. Studies of ground squirrels indicate that sites containing native shrubs could provide better long-term stability for ground squirrel populations at the landscape level than could sites containing exotic annuals or native perennial grasslands. Conversion to annual grasslands resulting from large range fires during the past few decades may provide an even less stable food resource for ground squirrels since exotic annuals are more sensitive to drought than perennial vegetation. Therefore, without the stabilizing effect of shrublands intermixed with other vegetation cover types, ground squirrel numbers may undergo wide variations and significantly influence raptor species that depend on the ground squirrels for prey.

Black-tailed jackrabbits are found in the entire NCA. Throughout their range, including the NCA, jackrabbit populations fluctuate periodically, reaching peak densities every 7 to 12 years. Jackrabbit populations in the NCA peaked in 1971, 1979 to 1981, and 1990 to 1992 (USGS 1996). During low population years, May to June densities ranged between 0.01 and 0.16 jackrabbits/ha. During years of high populations, densities ranged from 0.20 to 0.38 jackrabbits/ha. Regional and local distributions of jackrabbits are related to shrublands used for food and cover from predators. Primary food for jackrabbits in the upper Snake River Plain is grasses and forbs during the spring and summer and shrubs during the fall and winter (Johnson and Anderson 1984, Anderson and Shumar 1986). Jackrabbits do not use habitats burned by large fires and containing little shrub cover. Loss of approximately 50% of the shrublands in the NCA since 1980 could affect both the local and regional abundance of jackrabbits. Successive declines in jackrabbit densities through three population peaks may be the result of increased grasslands in the NCA since the 1970s.

Other medium-sized mammals occurring in the NCA and Swan Falls study area are the mountain cottontail (*Sylvilagus nutallii*) and the yellow-bellied marmot (*Marmota flaviventris*). Canyon areas support higher cottontail densities than areas in the desert plateau. Canyon talus and riparian sites have higher densities than areas along the canyon rim. Estimated densities in the canyon were 3.7 rabbits/ha (BLM 1979). Yellow-bellied marmots are found in the study area and the NCA when there is sufficient topographic diversity for burrow sites and adequate foraging habitat. Burrow sites are found mainly on talus slopes. Most marmot colonies are found in the canyon where open water sources are available and riparian vegetation is present. Marmots are not found on the benchland in upland cover types. Densities at marmot colonies were estimated at 10 to 16 marmots/ha (BLM 1979). Adult marmots emerge in February and estivate in June and July.

Small mammals present in the project vicinity are the deer mouse (*Peromyscus maniculatus*), Ord's kangaroo rat (*Dipodymus ordii*), Great Basin kangaroo rat (*Dipodymus microps*), Great Basin pocket mouse (*Perognathus parvus*), least chipmunk (*Eutamias minimus*), canyon mouse (*Peromyscus crinitus*), grasshopper mouse (*Onychomys leucogaster*), western harvest mouse (*Reithrodontomys megalotis*), bushy-tailed woodrat (*Neotoma cinerea*), and desert woodrat (*Neotoma lepida*) (BLM 1979). A list of small mammals found in the NCA, including the Swan Falls study area, is included as Appendix G of the draft management plan prepared by the BLM (1995). The deer mouse showed the highest relative abundance of all species mentioned above (BLM 1979). Deer mouse densities ranged from 0 to 136.2 individuals/ha (Table 8 in BLM 1979). Also, deer mice had a higher abundance in the canyon talus cover than in any other cover type. Kangaroo rats were more numerous near farms or road edges, and Great Basin pocket mice were more abundant in canyon talus. Least chipmunks were trapped only in sagebrush areas, while canyon mice were restricted to the canyon.

Ten bat species have been reported in the NCA: spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), western pipistrelle (*Pipistrellus hesperus*), little brown myotis (*Myotis lucifugus*), Yuma myotis (*Myotis yumanensis*), California myotis (*Myotis californicus*), eastern small-footed myotis (*Myotis leibii*), long-legged myotis (*Myotis volans*), big brown bat (*Eptisicus fuscus*), and pallid bat (*Antrozous pallidus*) (Appendix G in BLM 1995). Little is known about numbers and distribution of these species in the NCA and the Swan Falls study area.

E.3.2.1.6. Furbearers and Mammalian Predators

Twelve species of furbearers and mammalian carnivores have been reported in or near the study area: coyote (*Canis latrans*), badger (*Taxidea taxus*), eastern spotted skunk (*Spilogale putorius*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), mink (*Mustela vison*), bobcat

(*Felis rufus*), long-tailed weasel (*Mustela frenata*), river otter (*Lutra canadensis*), mountain lion (*Puma concolor*), beaver (*Castor canadensis*), and muskrat (*Ondatra zibethicus*) (Appendix F in BLM 1995).

Specific information on relative density and distribution is unavailable for furbearers and mammalian carnivores in the study area and vicinity, with the exception of the coyote (Hornocker et al. 1978) and badger (Messick and Hornocker 1981). Hornocker et al. (1978) were unable to determine clear trends in coyote abundance in the NCA in the late 1970s. Coyote abundance typically tracks black-tailed jackrabbit abundance. Hornocker et al. (1978) determined that jackrabbits were, by far, the most important prey item in the diet of coyotes in the NCA during the late 1970s. Thus, the relative abundance of coyotes probably peaked in 1971, 1979 to 1981, and 1990 to 1992 when jackrabbit populations reached high levels. The loss of shrub habitat in the NCA and a decline in the relative abundance of the shrub-dependent jackrabbit may have impacted coyote populations. However, the coyote is a habitat generalist and preys on a wide variety of animals in the NCA (Hornocker et al. 1978); it likely switched to other prey when jackrabbits declined. Unfortunately, recent estimates of relative abundance of coyotes in the NCA are not available. Messick and Hornocker (1981) studied the ecology of the badger population in the NCA in the mid-1970s and estimated a density of between two and six resident badgers/ square kilometer (km^2). Densities were even higher when juveniles were dispersing. Piute ground squirrels were the major prey for badgers in the NCA. However, food habits varied seasonally and yearly, with an inverse relationship between Piute ground squirrels and other prey items (Messick and Hornocker 1981). They concluded that the badger was a widely distributed, adaptable species, despite its extreme morphological specialization.

The only other information available on furbearers and carnivores was collected in the vicinity of C.J. Strike Reservoir (Edelmann and Holthuijzen 1997). In this study, scent posts were used to detect the presence of target species. Coyotes were detected in both riparian and upland cover types. All other species showed a distinction in detection between upland and riparian cover types. Skunks and raccoons were moderately important in riparian habitats. However, skunks contributed only slightly to the composition in upland cover types, and river otters were absent. Mink, bobcat, and weasel were detected in riparian habitat.

E.3.2.1.7. Big Game

Big game species occurring in the study area and vicinity include mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*). White-tailed deer (*Odocoileus virginianus*) may also occur in the study area because small numbers were documented upstream in the vicinity of C.J. Strike Reservoir. These animals are likely progeny from a reintroduction effort in the mid-1980s (Sunderman et al. 1997b). However, the species is not listed by the BLM as occurring in the NCA (BLM 1995). The BLM does list the mountain lion as occurring in the NCA (BLM 1995), but an Idaho State University range distribution map does not show that the species is present in the Swan Falls study area (ISU 2004a). Mountain lions and black bears (*Ursus americanus*) may occasionally pass through the area (BLM 2006).

There are over 100 resident mule deer along the Snake River in the NCA (BLM 1995, 2006). Although mule deer occur in the study area, little is known about the number and distribution. Deer browse on a wide variety of woody plants, primarily during the winter when snow covers grasses and forbs. Sagebrush is a common browse plant. They graze heavily on various grasses and forbs during spring, summer, and fall.

From 1990 to 1994, some information on ungulates was collected just upstream of the study area, around C.J. Strike Reservoir (Sunderman et al. 1997b), using line transect survey methods and incidental observations. Generally, population numbers of big game species were considered to be low. Two state hunting units (Units 38 and 40) are in the study area. In 1991, Units 38 and 40 were considered to have low deer densities, with the exception of riparian areas along the Snake River that provide some of the best deer habitat in the state (Scott 1991). In 2002, about 800 deer were harvested on both the northern (Unit 38) and southern (Unit 40) sides of the Snake River (IDFG 2004).

Small groups of pronghorn are found in the NCA (BLM 1995), typically on the benchlands above the Snake River Canyon. The species prefers grasslands, shrub-steppe, and foothills with vegetation less than 2 feet in height and expansive range. Pronghorn are found in arid regions with less than 10 to 12 inches of snow cover in the winter, but they are often within about 4 miles of water (ISU 2004b). The Idaho Army National Guard operates the Orchard Training Area, located a few kilometers north of the Swan Falls Reservoir. Currently there are about 50 resident pronghorn in the NCA (IDARNG 2004, BLM 2006). The lack of year-round water sources probably limits their occurrence. In 2001, two water guzzler sites were constructed in the southern portion of the Orchard Training Area to provide a year-round water supply for the pronghorn and other small mammals residing in the area. Over a five-year period in similar habitat near C.J. Strike Reservoir, pronghorn were observed only once, indicating their rare occupancy of the area (Sunderman et al. 1997b). In 2002, 25 pronghorn were harvested in Unit 40 (IDFG 2004), but this harvest was likely far south of the river in the Owyhee canyonlands. No hunts are offered north of the Snake River in Unit 38 due to low population numbers.

E.3.2.1.8. Reptiles and Amphibians

Nine species of snakes (western rattlesnake [*Crotalus viridis*], Great Basin gopher snake [*Pituophis melanoleucus deserticola*], striped whipsnake [*Masticophis taeniatus*], racer [*Coluber constrictor*], rubber boa [*Charina bottae*], longnose snake [*Rhinocheilus lecontei*], night snake [*Hypsiglena torquata*], western terrestrial garter snake [*Thamnophis elegans*], and western ground snake [*Sonora semiannulata*]); eight species of lizards (Great Basin collared lizard [formerly known as the Mojave black-collared lizard, *Crotaphytus bicinctores*], longnose leopard lizard [*Gambelia willizenii*], western whiptail [*Cnemidophorus tigris*], desert horned lizard [*Phrynosoma platyrhinos*], short-horned lizard [*Phrynosoma douglasii*], western fence lizard [*Sceloporus occidentalis*], sagebrush lizard [*Sceloporus graciosus*], and side-blotched lizard [*Uta stansburiana*]); and seven species of amphibians (Great Basin spadefoot [*Spea intermontana*], western toad [*Bufo boreas*], Woodhouse’s toad [*Bufo woodhousii*], western chorus frog [*Pseudacris triseriata*], Pacific chorus frog [*Pseudacris regilla*], northern leopard frog [*Rana pipiens*], and bullfrog [*Rana catesbeiana*]) are found in the study area and vicinity (Appendix F in BLM 1995).

In the late 1970s, Great Basin gopher snakes and western rattlesnakes were the two most frequently encountered snake species in the NCA, followed by the striped whipsnake (Diller and Johnson 1982). However, results of a drift fence census indicate that night snakes and western rattlesnakes were the most abundant snakes, with densities of 3.8 and 1.9 snakes/ha, respectively (Table 7 in Diller and Johnson 1982). The Great Basin gopher snake, striped whipsnake, longnose snake, and racer all showed lower densities according to results of the drift fence census (Table 7 in Diller and Johnson 1982). Western rattlesnakes, night snakes, and striped whipsnakes primarily selected rocky areas (Diller and Johnson 1982, Diller and Wallace 1986). Rattlesnakes were most often found in rocky outcrops and on the canyon rim; they occurred much less often in talus slopes. Whipsnakes and night snakes were all found in rocky habitat as well as in a variety of other habitats. Racers and western terrestrial garter snakes, which are more restricted in their distribution, are mainly associated with riparian habitats and agricultural lands. The western ground snake appears to be the most restricted species and is always associated with a talus or scree slope. The Great Basin gopher and longnose snakes could be encountered in any habitat in the study area vicinity and did not appear to have an obvious habitat preference (Diller and Wallace 1981, Diller and Johnson 1982). Snake activity peaks in late May, drops off sharply in June, and then remains at a consistently low level throughout the rest of the summer and early fall. By late October, most snakes are in hibernation.

The side-blotched lizard was the most frequently encountered lizard in the NCA (7.5 individuals/ha), followed by the western fence lizard (5.4 individuals/ha), western whiptail (2.5 individuals/ha), leopard, desert horned, and Great Basin collared lizards (1.4, 1.2, and 1.0 individuals/ha, respectively). Habitats with the highest lizard densities had a relatively low percentage of vegetative cover and many areas of open ground or rocks. The canyon rim and shadscale saltbush communities showed the highest density and diversity of lizards (Diller and Johnson 1982). Drift fence studies conducted in the NCA in the late 1970s (Diller and Johnson 1982) were repeated at the same locations in the late 1990s (Cossel 2003) to evaluate reptile status between the study periods. Although there was little change in species occurrence, results of the two studies were significantly different, likely because of the effects of climatic conditions between those time periods.

Specific information on density and habitat associations of amphibians occurring in the NCA is not available.

E.3.2.1.9. Threatened or Endangered Wildlife Species

State and federal agencies use many designations for species that are rare, have questionable status, or have special conservation needs, but are not listed by the U.S. Fish and Wildlife Service

(USFWS) as threatened, endangered, or candidate species. Collectively, for the purposes of this study, all species with either federal or state special designations are labeled as species of special concern. Designations for species of special concern are found in Table E.3.2-2.

Under the Endangered Species Act (ESA), an endangered species is one in danger of extinction throughout all or a significant portion of its range. A threatened species is one likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Candidate species are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher-priority listing activities. Candidate species receive no statutory protection under the ESA. A wildlife species designated as a threatened, endangered, or candidate species is managed by the USFWS. The USFWS Snake River Basin Field Office also maintains a list of species of concern for which information supports tracking their status and threats.

The Idaho Department of Fish and Game (IDFG) defines endangered species as those in danger of extinction throughout all or a significant portion of their Idaho range. A threatened species is one that is likely to be classified as endangered in the foreseeable future throughout all or a significant portion of its Idaho range. The IDFG uses similar terminology for special status species, also calling them species of special concern. These species are defined as native species that are either low in numbers or limited in distribution, or that have suffered significant habitat losses (IDCDC 2004a). Three subcategories of species of special concern are identified: priority, peripheral, and undetermined status. Priority species are those that meet one or more of the criteria set forth under the ESA and for which Idaho currently contains, or formerly constituted, a significant portion of those species' range. Peripheral species are those that meet one or more of the criteria above, but whose populations in Idaho are on the edge of their breeding range. Finally, undetermined status species are those that may be rare in the state and for which there is little information on population status, distribution, and/or habitat requirements.

In addition, the BLM has definitions for sensitive species occurring or potentially occurring on federal lands under its jurisdiction (IDCDC 2004b). The BLM's policy is to conserve threatened and endangered species and the ecosystems on which they depend. Similarly, it is BLM policy to manage candidate species and their habitats to ensure that BLM actions do not contribute to the need to list any candidate species as threatened or endangered. Sensitive (or special status) species designated by the BLM are to be managed under the same policy as candidate species. Protocols for special status species, established by the BLM in 2003, consist of five categories (Types 1–5).

Fifty-two species with an endangered, threatened, candidate, or other special status designation by federal or state agencies are likely to be present in the Swan Falls study area or vicinity (Table E.3.2-2).

E.3.2.1.9.1. Threatened, Endangered, and Candidate Species

Two state-threatened species, the peregrine falcon and the bald eagle, are found in the study area. One candidate species, the yellow-billed cuckoo (*Coccyzus americanus*), has the potential to occur in the study area (Table E.3.2-2). Both the peregrine falcon and bald eagle are listed as endangered by the state. Both species nest in Idaho (BLM 1979) but not in the study area and vicinity.

The peregrine falcon breeds on every continent except Antarctica. In North America, the peregrine falcon breeds locally in Alaska and in the West, but it is absent from much of the middle and eastern parts of the country. Critical habitat components for this species are suitable nest sites, usually cliffs overlooking open areas having an adequate food supply (Csuti et al. 1997). Historically, the peregrine falcon bred throughout Idaho. The densest population was in the southeast. One historical peregrine falcon nest site was located near the former confluence of the Bruneau and Snake rivers (Bechard et al. 1987), but it has not been occupied since the 1950s (BLM 1995). The species is an uncommon to rare migrant in the study area and vicinity (BLM 1995).

The peregrine falcon was listed as an endangered species in 1970 because of population declines due to the negative impacts of dichloro-diphenyl-trichloroethane (DDT)[2] and its metabolites on reproduction and survival. Restrictions were subsequently placed on the use of organochlorine

---

[2] DDT is an organochlorine insecticide that has been banned from use in the United States because of its environmental persistence and tendency to accumulate in animal body fats.

pesticides in the United States and Canada, and reproductive rates of most surviving peregrine falcon populations in North America have improved. The wild population was augmented with the release of captive-bred peregrine falcons at hacking sites. Peregrine falcons have recovered throughout most of their range. On August 25, 1999, the peregrine falcon was removed from the federal list of endangered and threatened wildlife (64 Federal Register [FR] 46542–46558). Objectives for the minimum number of breeding pairs and productivity that were outlined in the recovery plans for each of four regions were met or exceeded. The IDFG continues to monitor peregrine populations.

The bald eagle breeds from Alaska and Canada south to California and Florida. Bald eagles are found along coasts, rivers, lakes, and marshes with nearby tall trees or cliffs for nesting. Bald eagles feed mainly on fish, carrion, various waterbirds, and small mammals. Numbers of eagles in the continental United States decreased dramatically in the last 200 years. In response to this decline, the bald eagle was declared in 1973 to be endangered in 43 of the 48 contiguous states and threatened in the remaining states (41 FR 28525–28527). Effective August 8, 2007, the bald eagle has been removed from the federal list of endangered and threatened wildlife in the lower 48 states of the United States (72 FR 37346-37372). In Idaho, 116 occupied territories were found in 2006 (Sallabanks 2006). The bald eagle is an uncommon to common wintering bird along portions of the Snake River and other bodies of water in Idaho (BLM 1979, Groves and Marks 1985, Taylor and Trost 1987, Stephens and Sturts 1998). Bald eagles winter in small numbers in the study area (BLM 1995, Holthuijzen 1997c). However, the species does not nest in the study area and vicinity. The closest nest is at the Deerflat National Wildlife Refuge.

The yellow-billed cuckoo breeds over much of the United States and northern Mexico. It was formerly a common breeding species along the Columbia River west of the Cascades; however, the species has declined in the western United States since the 1930s. The yellow-billed cuckoo was petitioned for listing and is currently a candidate species for endangered listing (July 25, 2001, 66 FR 3861138626). The species prefers large riparian forests, especially those with cottonwood (*Populus* spp.) overstories and willow (*Salix* spp.) understories. Preserves in the West should include riparian areas with dense stands of cottonwood and willow with an average tree height of 10 to 15 meters (m) (Anderson and Laymon 1989). Territory size averages 20 to 24 ha. The yellow-billed cuckoo historically bred in southern Idaho, but no current information is available (Stephens and Sturts 1998). The species was reported on islands in and near the NCA (BLM 2006).

E.3.2.1.9.2. Special Status Species

Amphibians and Reptiles—Nine amphibian and reptile species that are of special concern potentially occur in the Swan Falls study area (Table E.3.2-2). These include the northern leopard frog, Woodhouse's toad, western toad, western ground snake, ringneck snake (*Diadophis punctatus*), longnose snake, night snake, common garter snake (*Thamnophis sirtalis*), and Great Basin collared lizard.

The northern leopard frog ranges throughout most of the southern Canadian provinces and in the United States from the Northeast through the Midwest and the Great Plains into portions of the Pacific Northwest and the Southwest. The status of the species in Idaho is largely unknown, but it appears to have declined in distribution and abundance statewide. Scattered observations are reported from the middle reaches of the Snake River (IDFG 2005). The species occurs in and around wet meadows, potholes, and riparian areas with abundant vegetation cover (Leonard et al. 1993). Threats to the northern leopard frog include loss and degradation of wetland and riparian habitat, pollution, water developments, and introduction of exotic predators, such as bullfrog and bass (*Micropterus* spp.) (IDFG 2005).

The Woodhouse's toad ranges from the eastern seaboard of the United States, and west as far as Montana and the southeast corner of California. Disjunct populations occur along the Snake River in Idaho and Oregon. The status of the species is unknown, other than that it occurs as isolated populations within limited areas (Marshall et al. 1996). Woodhouse's toads have been trapped in pit-fall traps in riparian habitat and talus slopes in the NCA (Diller and Johnson 1982). The species prefers riparian habitats, sagebrush flats, and fields, but requires shallow ponds or pools for breeding. Threats to Woodhouse's toads include water impoundment and diversion, habitat conversion, and pollution (IDFG 2005).

The western toad ranges from southern Alaska to northern Baja California and west from the Pacific Coast to western Montana. The species is declining in at least part of its range (Corn and

Fogelman 1984, Carey 1993, Leonard et al. 1993). The status of the species in Idaho is unknown, but populations are declining in the western United States. (Peterson et al. 1992). They have not been reported in the Swan Falls study area (BLM 2006). Adult toads are largely terrestrial (Nussbaum et al. 1983), but require areas of water for breeding. The western toad is most common near marshes and small lakes, but is also found in dry forest and shrubby thickets (Leonard et al. 1993). Western toads, like many other amphibians, are sensitive to environmental changes, particularly wetland losses caused by human development and disturbances to natural habitat.

The western groundsnake occurs primarily in the southwestern states and, in Idaho, is found only in the Snake River Canyon from Bruneau to Marsing (Diller and Wallace 1981, Stebbins 1985, IDFG 2005). Western groundsnakes have been reported in Canyon, Ada, Owyhee, and Elmore counties (Slater 1941, Tanner 1941, Linder and Fichter 1977, Diller and Wallace 1981). Diller and Wallace (1981) collected western groundsnakes from one site in Canyon County, ten sites in Ada County, five sites in Elmore County, and six sites in Owyhee County. They considered the western groundsnake less abundant than the long-nosed or the night snake in the NCA (Diller and Wallace 1981). Western groundsnakes appear to be rare but locally abundant in suitable habitat. This snake is fossorial in habit and preys upon a variety of invertebrates (Vitt and Ohmart 1978). The western groundsnake has restricted habitat requirements and was collected only in or near talus or scree slopes (Diller and Wallace 1981). Threats to the species are primarily due to habitat loss and, potentially, off-road vehicle (ORV) use in suitable habitat (IDFG 2005).

The ringneck snake is found from southern Washington and Idaho to northern Baja California and the southern part of the Mexican Plateau (Stebbins 1985). In arid parts of the West, the species is restricted to mountains and watercourses where it may descend in desert areas to 2,400 feet. Although reported in the NCA, the species in not known to occur specifically in the study area (BLM 1995, Groves et al. 1997).

The long-nosed snake is also a southwestern species, and the distribution in Idaho is not well known. Long-nosed snakes have been reported in Canyon, Ada, Elmore, and Owyhee counties (Diller and Wallace 1981). It was reported to be much more abundant on the south side of the Snake River than on the north side (Diller and Johnson 1982). Although Diller and

Wallace (1981) suggest that this species is not very rare in southwestern Idaho, current trends are unknown. The species was collected in areas adjacent to various agricultural lands, rocky and sandy areas, open desert land, and riparian habitats (Diller and Wallace 1981). Beck and Peterson (1995) found the snake in shrub-steppe areas with numerous rodent burrows, which it uses for cover and hibernation (Beck and Peterson 1995). The species feeds primarily on lizards and rodents. Threats to this species include conversion from native habitats to exotic, annual grasslands or agricultural and urban lands (Beck and Peterson 1995, IDFG 2005).

The night snake occurs throughout much of the western states. Its distribution in Idaho is not precisely known, but likely occurs in the southern counties of Ada, Cassia, Canyon, Elmore, Franklin, Gooding, Jerome, Lincoln, Minidoka, Oneida, and Power (Stebbins 1985, Laurance and Reynolds 1984). Diller and Wallace (1981) collected night snakes in Gem, Canyon, Ada, Elmore, and Owyhee counties. In southwestern Idaho, night snakes were collected in rocky areas along the canyon rim of the Snake River, at the base of terrace slopes, and in shadscale saltbush and greasewood (*Sarcobatus vermiculatus*) communities (Diller and Johnson 1982; Diller and Wallace 1981, 1986). In the NCA, the night snake was the third most-captured snake species (Diller and Wallace 1981). Little is known about the life history or ecology of the night snake because the species is strictly nocturnal. Small vertebrates (lizards, salamanders, toads, frogs, and arthropods) have been reported to be prey of this species (Vitt and Ohmart 1978). The side-blotched lizard was the most common prey of the night snake in the NCA (Diller and Wallace 1986).

The common garter snake is widespread throughout much of the United States, excluding some of the southwestern states (Stebbins 1985). In Idaho, the common garter snake is less common than the western terrestrial garter snake, but is generally distributed in a similar pattern. The species was reported in the NCA (BLM 1995). However, during extensive reptile surveys around C.J. Strike Reservoir, the common garter snake was never found (Beck 1997). The common garter snake is highly adaptable and can survive extreme environmental conditions (Nussbaum et al. 1983). Its most common habitats include meadows, marshes, woodlands, hillsides, and along streams and in drainage ditches. In arid regions, garter snakes stay close to water and will not be found far from a stream or pond (Bartlett and Bartlett 2001). The common garter snake is an active diurnal snake and forages on land or in quiet pools, generally avoiding swift water. A wide variety of vertebrate prey, including small mammals, birds, lizards, and amphibians, has been reported. The species hibernates underground, in or under surface cover, at times with other snake species.

The Great Basin collared lizard is found in southeastern Oregon and southwestern Idaho and south through western Nevada, western and southern Utah, and extreme northwestern Arizona to southeastern California and Baja California (Leonard et al. 1993). Little is known about the status and distribution of this lizard in Idaho. It is uncommon in the NCA (BLM 1995, 2006). The collared lizard is typically found on hillsides with boulders and rock piles and on talus slopes at the bases of cliffs where vegetation is usually sparse and short. Threats to this species likely include loss or alteration of suitable habitat, including rock quarrying and ORV use (Pope and Munger 2003, IDFG 2005).

Birds—Twenty-eight bird species that are of special concern occur or potentially occur in the study area or vicinity (Table E.3.2-2). These include four species of waterbirds (trumpeter swan [*Cygnus buccinator*], American white pelican [*Pelecanus erythrorhynchos*], Barrow's goldeneye [*Bucephala inslandica*], and black tern [*Chlidonias niger*]); four species of wading birds (great egret [*Casmerodius albus*], white-faced ibis [*Plegadis chihi*], long-billed curlew, and Wilson's phalarope [*Phalaropes tricolor*]); one upland game bird (greater sage grouse [*Centrocercus urophasianus*]); six species of diurnal and nocturnal raptor species (northern goshawk, ferruginous hawk, Swainson's hawk, prairie falcon, western burrowing owl [*Athene cunicularia hypugaea*], and short-eared owl); two species of woodpeckers (Lewis' woodpecker [*Melanerpes lewis*] and red-naped sapsucker [*Sphyrapicus nuchalis*]); and eleven passerine species (loggerhead shrike [*Lanius ludovicianus*], cordilleran flycatcher [*Empidonax occidentalis*], willow flycatcher [*Empidonax traillii*], calliope hummingbird [*Stella calliope*], sage thrasher, grasshopper sparrow, black-throated sparrow, Brewer's sparrow, sage sparrow, green-tailed towhee [*Pipilo chlorurus*], and Brewer's blackbird).

The trumpeter swan was formerly abundant and geographically widespread. However, its numbers and distribution were greatly reduced during the early fur trade and European settlement (Mitchell 1994). Numbers have steadily increased with modern conservation, including protection from shooting, habitat preservation, and restoration programs (Mitchell 1994). Fifteen to 25 pairs of trumpeter swans breed in southeast Idaho and near Fairfield in the south-central part of the state (IDFG 2005). About 2,500 to 3,000 trumpeters winter in southeast Idaho, as birds migrate into the area from Canada. Trumpeters are occasionally seen in winter or on migration in the middle Snake River. The USFWS and IDFG introduced the species in the NCA in the winter of 1990 as part of an ongoing program to disperse the wintering population of swans (BLM 1995), but those birds did not return to breed there. Trumpeters require areas of slow, shallow water with abundant aquatic vegetation for feeding. Winter requirements are similar, but waters must remain ice-free. In Idaho, trumpeter populations are still at risk from continued loss of wintering habitat, concentration of wintering flocks at relatively few sites, lead poisoning, and lack of migration in several wild and restored flocks. These swans are found along the Snake River from Swan Falls upstream and in adjoining pools and marshes (BLM 1995).

The American white pelican breeds in discontinuous colonies ranging from northern California and southern Oregon northeast to southwestern Montana. Although pelican numbers were low in the early- to mid-1900s, populations have recovered in general (Evans and Knopf 1993). In Idaho, there are two breeding colonies in the southeast, at Minidoka National Wildlife Refuge and Blackfoot Reservoir (IDFG 2005). Total number of breeding birds was estimated to range from 550 to 590 in 1993 (Trost and Gerstell 1994), but current estimates are about 2,700 birds (Ivey and Herziger 2005). Nonbreeding pelicans are often observed in, or in the vicinity of, the Swan Falls study area. Pelicans forage for fish in shallow water, in open areas within marshes, along lake or river edges, on or below rapids, and less commonly in deep waters of rivers and lakes (Evans and Knopf 1993). The species requires both permanent water and isolation from human disturbance and mammalian predators for successful breeding. Current threats to the species are habitat loss and human disturbance at nesting colonies.

There are three populations of Barrow’s goldeneye: a large population breeding and wintering mostly west of the Rocky Mountains and two small populations in eastern North America and Iceland (Savard 1987). The breeding range of the western population extends throughout boreal forest habitats from interior and south-central Alaska and western Yukon southward through British Columbia and southwestern Alberta, into Washington and western Montana (Campbell et al. 1990, USFWS 1999). Savard (1987) suggests that the western population supports approximately 100,000 to 180,000 birds and may account for 60 to 90% of the world’s population. This population is believed to be stable or decreasing slightly, although data is sparse outside of British Columbia and existing estimates conflict (Savard 1987). Trends are also difficult to determine because, in the United States and Canada, aerial surveys do not distinguish Barrow’s goldeneye and common goldeneye (Savard 1987). Breeding Barrow’s goldeneyes are most abundant in the central aspen parkland of British Columbia, where estimates are 70,000 to 126,000 birds (Bellrose 1976, Munro and Goodchild 1981). In the southern edge of the range, including Oregon, California, and Idaho, they breed at alpine and subalpine lakes up to 2,400 m in elevation (Campbell et al. 1990, Groves et al. 1997, Stephens and Sturts 1998), but breeding numbers are unknown (Bellrose 1976). The winter range of Barrow’s goldeneye primarily covers the Pacific Coast from Alaska to California (Campbell et al. 1990), with higher densities believed to exist in Puget Sound (Savard 1987). Winter abundance has been poorly documented. In Idaho, the species winters locally, with records for 9 of 28 latilong survey blocks in western and southern Idaho (Stephens and Sturts 1998). Barrow’s goldeneye frequently winters along the Snake River in southern Idaho. During winter waterfowl surveys at C.J. Strike Reservoir and the unimpounded reach between C.J. Strike Dam and Swan Falls Dam, the species was occasionally reported in small numbers (Holthuijzen 1997b).

In the Northwest, the black tern breeds from Canada south to northern Nevada, northern Utah, and east of the Cascade Range. The species migrates along the Snake River in spring and fall (BLM 1995) to breed south of the Snake River Plain and in the northern panhandle. The species requires aquatic habitats with extensive stands of emergent vegetation and large areas of shallow, open water (DeGraaf and Rappole 1995). Black terns nest in emergent vegetation over water. In Idaho, they nest in scattered nesting areas in marshes of the eastern part of the state. Black terns are impacted by wetland loss and degradation (Ehrlich et al. 1992). In Idaho, overall numbers are low (68–91 nesting pairs), but the population appears to be stable (Trost and Gerstell 1994). The species was observed in the NCA (BLM 1995) and at C.J. Strike Reservoir and vicinity in small numbers in spring, fall, and summer (Holthuijzen 1997a). The species is likely to pass through the Swan Falls study area in spring and fall during migration.

The great egret occurs in scattered locations throughout North America, with breeding concentrated in the southeast and Texas. In general, the species has recovered from severe population declines in the early 1900s when its feathers were highly prized. Great egrets breed locally in various areas of the west, particularly Oregon, Nevada, California, and Idaho. In Idaho, known breeding locations are on, or south of, the Snake River Plain (Trost and Gerstell 1994). They are rare nesters in Idaho, with numbers estimated from 17 to 26 nests (Trost and Gerstell 1994). Great egrets were observed in the NCA and in small numbers at C.J. Strike Reservoir and vicinity during spring, fall, and summer (Holthuijzen 1997c). The great egret is likely a habitat generalist, as it can successfully nest and forage in a wide range of conditions (McCrimmon et al. 2001). In general, they require open water or wetland habitat near woodlands or thickets for nesting and freshwater marshes and ponds for foraging (Trost and Gerstell 1994, DeGraaf and Rappole 1995). Current threats to the species are the potential effects of pesticides and other contaminants and human disturbance at nesting colonies (IDFG 2005).

The white-faced ibis breeds locally in northeastern California, southeastern Oregon, northern Nevada and Utah, Wyoming, western Montana, and southern Idaho. The species reaches its northern limit of breeding at the northern boundary of the Snake River Plain (Trost and Gerstell 1994). The white-faced ibis inhabits primarily freshwater wetlands, especially cattail (*Typha* spp.) and bulrush (*Scirpus* spp.) marshes, although it also feeds in flooded hay meadows and agricultural fields (Ryder and Manry 1994). In eastern Idaho, extensive flood irrigation has increased foraging habitat for the white-faced ibis (Trost 1985). The number of colonies in Idaho has increased from five to seven from 1984 through 1994 (Trost and Gerstell 1994). The total number of nests was estimated between 3,300 and 4,700 in Idaho. The species is often seen in ponds or irrigated fields in the NCA (BLM 1995).

Long-billed curlews were historically abundant over much of the prairie regions of North America. However, extensive market hunting and loss of habitat exterminated the species from eastern North America in the latter part of the nineteenth century. Numbers continued to decline in western North America through the early part of the twentieth century (Bent 1929), but stabilized by the 1930s, apparently as a result of reduced hunting and grazing pressure. Furthermore, long-billed curlews began to exploit newly created habitat, such as annual grasslands and irrigated lands in the west (Cochran and Anderson 1987). Currently, in the Northwest and in western Idaho, the greatest density of breeding long-billed curlews is found in annual grasslands (Pampush 1980, Redmond et al. 1981, Redmond and Jenni 1986). An estimated 2,500 to 3,500 nesting pairs breed in the central Snake River Basin (Pampush 1980).

Long-billed curlews nest in varying densities in grasslands of the NCA and are frequently observed in the Swan Falls study area (BLM 1995; IPC, unpublished data). For nesting, long-billed curlews require short grass, bare ground, areas of shade, and abundant invertebrate prey (Pampush 1980). Long-billed curlews use four main habitat types in the northwest: 1) annual grasslands, 2) mixed-grass meadows, 3) saltgrass–greasewood, and 4) sagebrush–bluebunch wheatgrass (*Pseudoroegneria spicata*)–Sandberg bluegrass (Pampush 1980). Current threats to curlews in Idaho are habitat loss, particularly to human development and agriculture, and recreation (Jenni et al. 1981, Dugger and Dugger 2002).

Wilson's phalarope has a large breeding range, mainly in the interior portion of western North America and the Great Lakes region. The species winters broadly, but locally, across western and southern South America and in the southern United States (Colwell and Jehl 1994). The species' breeding range contracted in the early twentieth century, likely linked to the loss of prairie wetlands. Current range shifts are likely influenced by loss of wetlands and drought. Wilson's phalarope is a fairly common, but local, summer visitor and breeder in southern Idaho at marshes and wet meadows at lower elevations (Larrison et al. 1967, Burleigh 1972, Stephens and Sturts 1998). The species was reported in the NCA (BLM 1995) and at C.J. Strike Reservoir (Holthuijzen 1997c). Wilson's phalaropes feed on small aquatic invertebrates in freshwater or hypersaline environments. Loss of wetlands remains the largest threat to the species (IDFG 2005).

The greater sage grouse, which is dependent on sagebrush-dominated rangelands, was historically widespread in southern Idaho. Currently, the status of the greater sage grouse is of concern to wildlife managers because of general population declines across its range. The Columbia Basin population of the western sage grouse (*Centrocercus urophasianus phaios*) in Washington is listed as a candidate species with listing warranted but precluded (May 7, 2001, 66 FR 22984–22994). Because sage grouse were historically abundant in the shrub-steppe habitats of the western United States, efforts have recently been undertaken to understand causes for population declines (Willis et al. 1993, Marshall et al. 1996). Declines are associated with habitat loss due to cultivation, sagebrush control, wildfire, and livestock grazing (Marshall et al. 1996). Populations have been documented to occur in, and south of, the NCA (BLM 1995). Historically, sage grouse leks were found in the NCA but not in the study area (SAIC 2001).

The northern goshawk ranges from forested regions in the subarctic to temperate North America, Europe, and Asia. In North America, the species breeds as far south as the Appalachian and Sierra Nevada Mountains and through the Rocky Mountain region into Mexico. Goshawks nest in a variety of forest habitats including old-growth forests, which lead to recent concerns of potential population declines due to forest management (Squires and Reynolds 1997). In Nevada, goshawks hunted in open sagebrush adjacent to riparian aspen (*Populus tremuloides*) stands (Younk and Bechard 1994). Northern goshawks migrate through the NCA in spring and fall, and a small number of birds winter in wooded areas (BLM 1995).

The ferruginous hawk's breeding range is the most restricted of all North American buteos. The species breeds in arid, semi-arid, and grassland regions of western North America and is reported to be in decline throughout much of its range. This decline has been attributed to the conversion of grasslands for agricultural purposes, loss of resting sites, control of natural fires, declines in prey populations, and human disturbances (Harlow and Bloom 1987, Marshall et al. 1996). In Idaho, ferruginous hawks were always limited to the southern portion of the state (Bechard et al. 1986). In the NCA, population fluctuations of ferruginous hawks appear to be tied to the availability of prey, primarily Piute ground squirrels and black-tailed jackrabbits. Nest sites are available on natural and artificial structures. In 1994, 18 ferruginous hawk nests were found on the benchlands of the NCA (Lehman et al. 1998). Habitat loss due to agricultural development remains the primary threat to the species.

The Swainson's hawk preys on a variety of small mammals, birds, and insects and has a distribution similar to that of the ferruginous hawk. Swainson's hawks were formerly considered quite common in arid and semiarid habitats, including grasslands, but recently their populations have declined dramatically (Harlow and Bloom 1987). In historical times, Swainson's hawks were common nesters in northern Idaho counties where populations appear to have declined, although the current status is unknown (Bechard et al. 1986). In southern Idaho, Swainson's hawks are found in hay and pasture lands across the Snake River Plain (Bechard et al. 1986). Distribution and density of the southern Idaho population appear to be limited mainly by the availability of suitable nesting trees. Scarcity of trees has historically limited nesting of the Swainson's hawk in the NCA. Currently, about 10 pairs of Swainson's hawks nest in the NCA (Bechard 2003), but no nesting has been reported in the study area.

The prairie falcon is largely restricted to western North America (Palmer 1988). The species breeds from southeastern British Columbia south to Baja California and east to northern Texas. In winter, prairie falcons can occur eastward in the Great Plains and south to central Mexico (DeGraaf and Rappole 1995, Steenhof 1998). The species primarily inhabits arid lands, typified by open, treeless terrain (Palmer 1988). Prairie falcons are locally common, but they have shown a long-term decline in the western part of their range (DeGraaf and Rappole 1995). Due to the abundance of cliff nesting sites in close proximity to a plentiful prey base, prairie falcons are the most numerous raptor species nesting in the NCA (BLM 1995, 2006). In fact, prairie falcon nesting densities in the NCA are higher than in any other area reported in the literature, and the NCA may provide nesting habitat for up to 5% of the world's prairie falcons (BLM 1979, 2006). For several years, concerns have been raised over the long-term effects of the conversion of native shrub-steppe habitat within the NCA to annual grasslands. Long-term monitoring in the NCA has indicated that the number of prairie falcon pairs declined significantly between 1967 and 1997 (Steenhof et al. 1999). In 2002, the USGS conducted abundance surveys for prairie falcons in the NCA (Kochert and Steenhof 2003). They located 217 pairs of prairie falcons, which was the highest ever reported and slightly higher than that recorded in 1976 (205 pairs) and 1977 (206 pairs). The high numbers for 2002 probably reflect a high annual abundance of ground squirrels. Although numbers of pairs increased from 1994 levels, the number of falcons has shown more year-to-year variability in certain stretches of the canyon (Kochert and Steenhof 2003).

The western burrowing owl ranges from southwestern Canada south to Tierra del Fuego, Chile. This species is increasing in the western United States (DeGraaf and Rappole 1995). Optimum habitat is typified by short vegetation and the presence of fresh, small, mammal burrows (Zarn 1974). The species is found in open grasslands, especially prairie, plains, and savanna, and sometimes in open areas such as vacant lots near human habitation (e.g., campuses, airports, golf courses, perimeters of agricultural fields, banks of irrigation canals). Burrowing owls spend much time perching on the ground or on low perches such as fence posts or dirt mounds. The species nests and roosts in abandoned burrows dug by mammals or, in some places, in lava cavities. It rarely excavates its own burrow, preferring to enlarge or modify existing burrows. Burrowing owls concentrate their nocturnal foraging effort in areas with a high abundance of small mammals, which account for the bulk of their caloric intake (Wellicome 1997). The upland benchlands in the study area appear to be suitable to burrowing owls because the species prefers heavily grazed habitats for nesting (Rich 1986, DeGraaf and Rappole 1995). The burrowing owl is considered common in the NCA, inhabiting open country using burrows dug by other animals or natural cavities in rock outcroppings (USGS 1996). However, the species is not reported to nest in the Swan Falls study area.

The short-eared owl has a circumpolar distribution. It is found throughout much of North America and Eurasia. In North America, the species breeds from northern Alaska to central California and winters over much of its breeding range from southern Canada south to southern Baja California (Holt and Leasure 1993). The species breeds in open habitats, excluding forests, and in some desert areas. The distribution of the species is patchy and irregular in some areas. Short-eared owls are almost always associated with open country that supports cyclic populations of small mammals, typically large expanses of prairie and coastal grasslands, heathlands, shrub-steppe, and tundra. The species appears secure in the western United States. Breeding Bird Survey (BBS) data show no significant change in short-eared owl numbers in the Northwest mountain states and western Canadian provinces, but significant declines have occurred in areas of southern Idaho, Oregon, and Washington (Holt and Leasure 1993). Local owl numbers often fluctuate greatly. Nesting habitat and nomadism make the species particularly vulnerable to habitat loss at any season (Holt and Leasure 1993). The species is resident throughout Idaho when suitable habitat is available (Stephens and Sturts 1998). The species nests in the NCA and is associated with habitats near agriculture that have deep soils (BLM 1995). However, the nesting density of short-eared owls in the NCA is low (much less than 1 pair/10 km^2) (BLM 1995).

Lewis’ woodpeckers range from British Columbia to southern New Mexico and eastern Colorado. Unlike most woodpecker species, the Lewis’ woodpecker is an aerial insectivore and requires openings for its foraging maneuvers. The species is found in open country with scattered trees rather than dense forest. Open or park-like ponderosa pine (*Pinus ponderosa*) forests are probably the major breeding habitat. They are also found along edges of pine and juniper stands and in deciduous forests, especially riparian cottonwoods (DeGraaf et al. 1991). In Idaho, the species breeds throughout the state. BBS data for Idaho indicate that population trends have decreased from 1966 to 2000, although limited numbers were observed and trends were not significant

(Sauer et al. 2001). The Lewis' woodpecker has been reported to occur in the NCA (BLM 1995), including the study area (A. Holthuijzen, the Applicant, personal observation).

Red-naped sapsuckers breed in the Rocky Mountain region from south-central British Columbia, southwestern Alberta, and western Montana south to east-central California, southern Nevada, central Arizona, southern New Mexico, and extreme western Texas (AOU 1998). During the nonbreeding season, the species is found in southern California, southern Nevada, central Arizona, and central New Mexico south to southern Baja California (AOU 1998). In the inland West, the species inhabits montane, coniferous forests mixed with deciduous groves, particularly aspen, cottonwood, paper birch (*Betula papyrifera*), and willow. The red-naped sapsucker is considered a keystone species because it creates nest cavities and sap wells that are used by other birds, mammals, and insects. Locally common, populations are apparently stable to increasing, but there is concern over the loss of aspen and cottonwood nesting habitat and large snags for nest cavities. In the Northern Rockies, the species is most abundant in cottonwood and aspen forests, but it has also been observed in other riparian cover types and in harvested conifer forests. In the Pacific Northwest, the species typically breeds in aspen, riparian cottonwood, ponderosa pine, mixed conifer, and white fir (*Abies concolor*) forests (Bull 1978). During migration and winter, the species is found in various forest and open woodland habitats, parks, orchards, and gardens (AOU 1998). The species was reported in the NCA (BLM 1995).

Loggerhead shrikes are widely distributed in North America. They range from southern Canada to Mexico and from coast to coast. Southern populations are largely resident, while northern populations are at least partially migratory (Miller 1931, Bent 1965). Concern was expressed during the 1980s that loggerhead shrike populations were declining (Davis and Morrison 1987, Morrison 1981). Mild to precipitous declines have been observed in most parts of the United States (Davis and Morrison 1987). The Pacific Coast and the Southwest, however, seem to have stable to slightly declining populations (Morrison 1981, Davis and Morrison 1987). Burleigh (1972) considered the loggerhead shrike a fairly common summer resident in the southern part of Idaho. Stephens and Sturts (1998) recorded loggerhead shrikes as nesting and wintering birds throughout most of southern Idaho. However, no long-term data are available on population trends in southern Idaho, although habitat appears to be ample for the species. The species prefers open habitat (Bent 1965). The more open the habitat, the better suited it is for shrike occupancy (Brooks and Temple 1990). The species nests in dense shrubs or trees between 1 and 10 m above the ground (Miller 1931, Bent 1965). In southern Idaho, loggerhead shrikes are found in open, arid country where sagebrush dominates (Burleigh 1972). In southwestern Idaho, loggerhead shrike nests are normally found in big sagebrush (*Artemisia tridentata* Nutt.), greasewood, and antelope bitterbrush (*Purshia tridentata*) (Woods 1993, Woods and Cade 1996). The shrike has been a common nester in shrub habitats in the NCA. However, nesting populations have been reduced by the loss of shrub habitat from wildfires (USGS 1996, BLM 2006).

The cordilleran flycatcher breeds from southeastern Washington, southwestern Alberta, northern Idaho, western Montana, Wyoming, and western South Dakota south to northern California, Nevada, Arizona, and Mexico. This species breeds in cool forests and woodlands near cliffs and in shady canyon bottoms, especially along streams in montane, coniferous forests (Groves et al. 1997). The species is invariably associated with water courses and openings in timber. Little information on the population status of the species exists. BBS data showed no significant long-term trend at any level of geographic partition (Lowther 2000). The cordilleran flycatcher was probably reported in the NCA during migration because nesting habitat does not exist in the NCA.

Willow flycatchers breed from central British Columbia and southern Alberta east to southern Wisconsin, southern Quebec, central Maine, and Nova Scotia south to southern California, western and central Texas, Arkansas, northern Georgia, and Virginia. The species occurs in a variety of habitats ranging from brushy fields to willow thickets along streams, as well as the edges of gallery forests along rivers or streams (DeGraaf and Rappole 1995). The species is restricted to water courses and vulnerable to a variety of human activities that may alter or degrade such habitats (Sedgwick 2000). In the West, riparian breeding habitat is degraded by livestock grazing and willow control (Taylor and Littlefield 1986, Saab et al. 1995). This species is of high concern to resource management agencies (Saab and Rich 1997). BBS data show a significant decreasing population trend in Idaho from 1966 to 2000 (Sauer et al. 2001). The willow flycatcher has been reported in the NCA (BLM 1995, Holthuijzen 1997a).

The calliope hummingbird breeds in mountains from central British Columbia and southwestern Alberta south through Washington, Oregon, Nevada, and California and east to northern

Wyoming, Colorado, and Utah. The species is found in open, montane forests and willow and alder (*Alnus* spp.) thickets. Its diet includes insects; spiders; and the nectar of currant (*Ribes* spp.), paintbrush (*Castilleja* spp.), columbine (*Aquilegia* spp.), penstemons (*Penstemon* spp.), and gilias (*Gilia* spp.) (Csuti et al. 1997, Groves et al. 1997). The calliope hummingbird was reported in the NCA (BLM 1995).

Sage thrashers breed in arid, sagebrush-steppe areas of the western United States, and migrate south to winter in the southwestern states, Baja California, and northern Mexico. Although the distribution of the species is similar to that before European settlement, conversions of sagebrush-steppe for agriculture and development has eliminated nesting habitat and caused local extinctions. Sage thrashers are sagebrush obligates, generally dependent on large patches and expanses of sagebrush-steppe for successful breeding (Reynolds et al. 1999). The presence of thrashers is positively correlated with sagebrush and shrub cover, shrub patch size, and bare ground, and negatively correlated with spiny hopsage (*Grayia spinosa*), bud sagebrush (*Picrothamnus desertorum*), grasses, and exotic plant species (Wiens and Rotenberry 1981, Knick and Rotenberry 1995). Therefore, there is concern that the introduction and spread of noxious weeds that may compete with native vegetation decreases the suitability of the habitat for nesting thrashers. Where suitable sagebrush habitat remains, the species populations are mostly stable. For example, sage thrasher densities during the breeding season in the Great Basin have been recorded as high as 30 to 40 birds/100 ha (Wiens and Rotenberry 1981, Medin 1992). Nevertheless, loss and fragmentation of sage thrasher habitat through conversion and alteration of big sagebrush stands are a major threat to the species.

The grasshopper sparrow has a spotty breeding range from British Columbia to the Southeast. Grasshopper sparrows reportedly nest throughout southern Idaho, including the Snake River Plain and in the eastern portion of the NCA (BLM 2006). The species has exhibited significant declines throughout its range, including the western states and Idaho (Sauer et al. 2005). Grasshopper sparrows are found in grasslands, old fields, and cultivated fields (Groves et al. 1997). Declines are attributed to loss, conversion, and deterioration of native grasslands, as well as incompatible management of agricultural grasslands and hayfields (Vickery 1996). For example, early season mowing often results in reproductive failure for nesting grassland birds (Vickery 1996). Livestock grazing may also reduce or completely exclude grasshopper sparrow populations in arid areas (Bock and Webb 1984, Saab et al. 1995).

Black-throated sparrows are found in the Great Basin, Mojave, and Colorado deserts. The species nests throughout southern Idaho (Stephens and Sturts 1998), typically occurring in a narrow zone between valley or playa floors and steep rocky areas, mountain ranges, or escarpments (Bent 1965). In Idaho, the species breeds on barren and grassy hillsides with scattered sagebrush and rabbitbrush (*Chrysothamnus* sp.), horsebrush (*Tetradymia* sp.), shadscale saltbush, and greasewood (Johnson et al. 2002). The species is at the northern edge of its range in Idaho (Johnson et al. 2002). The black-throated sparrow is a scarce and local summer resident in southern Idaho (Burleigh 1972, Stephens and Sturts 1998), including the NCA (BLM 1995). BBS data from 1966 to 1999 show an annual decline for the species. However, no specific information is available for southern Idaho. The species nests in the NCA and has been found nesting in the study area (A. Holthuijzen, the Applicant, personal observation).

The Brewer’s sparrow breeds from southwestern Yukon, generally east of the Cascades and coastal range to southern California, central Arizona, and southwestern South Dakota. The species winters from the interior of southern California to central Texas and south into Mexico. Although once common, Brewer’s sparrows are now declining over much of its range, including Idaho (Sauer et al. 2005). Brewer’s sparrows are common nesting birds in suitable sagebrush stands in the NCA (BLM 2006). Brewer’s sparrows prefer brushland and sagebrush for nesting and desert scrub and creosote bush (*Larrea tridentata*) in winter. The species is strongly associated with sagebrush-steppe communities, where it is the dominant bird species. Threats to the species are mainly from conversion and degradation of shrub-steppe habitats (IDFG 2005).

The sage sparrow breeds in arid areas of the West and winters in the southern United States to northern Mexico (Martin and Carlson 1998). BBS data from 1966 to 2005 indicate a stable trend throughout the range, but sharply declining populations in some regions, including Idaho (Sauer et al. 2005). Sage sparrows were reported in 36 of 119 survey sites in the NCA (BLM 2006). As its name suggests, the sage sparrow is a sagebrush obligate, and declines in sage sparrow populations are tied to declines in sagebrush habitat. Sage sparrows prefer semi-open habitats with clumped shrubs 1 to 2 m tall (Petersen and Best 1985, Martin and

Carlson 1998), sagebrush cover of 11% to 14% (Rich 1980), and sparse grass cover (Rotenberry and Wiens 1980, Wiens and Rotenberry 1981, Larson and Bock 1984). During migration and winter, sage sparrows will use a broader range of habitats, including arid plains with sparse bushes, grasslands and open areas with scattered brush, mesquite (*Prosopis* spp.), and riparian scrub (Meents et al. 1982, Repasky and Schluter 1994, Martin and Carlson 1998).

The green-tailed towhee breeds from southeastern Washington, southern Idaho, southwestern Montana, and northwestern and southeastern Wyoming south through the interior mountains to southern California, southern Nevada, and central Arizona. In Idaho, the green-tailed towhee is found mainly south of the Snake River Plain in southwestern Idaho and east through the south-central counties (Dobbs et al. 1998). Generally, the species inhabits relatively arid and brushy foothills with shrubs such as sagebrush, snowberry (*Symphoricarpos* spp.), wild rose (*Rosa* spp.), spirea (*Spirea* spp.), mountain mahogany (*Cercocarpus* spp.), manzanita (*Arctostaphylos* spp.), and chokecherry (*Prunus virginiana*) (Dobbs et al. 1998). The species has been reported in the NCA (BLM 1995).

Brewer’s blackbirds breed from the interior of central British Columbia to the western Great Lakes, south to northwestern Baja California, southern Nevada, western and northern Texas, and northern Iowa. It winters throughout most of the western and southern states and into Mexico. The species nests throughout most of Idaho, winters in low-elevation areas (Stephens and Sturts 1998), and is a year-round resident in the NCA (BLM 2006). The species has exhibited declines throughout much of its range, particularly during the recent period of 1980 to 2005 (Sauer et al. 2005). Numbers in Idaho are reported to have declined 3.1% during this same period. The species uses a variety of open habitats, including areas of human habitation and agricultural lands; old fields and pastures; shrubby and bushy areas, especially near water; and riparian woodlands (Martin 2002). Brewer’s blackbirds nest in bushes and trees or on the ground, near open water, in marshes, fields, and urban areas.

Mammals—Eight mammal species that are of special concern occur, or potentially occur, in the Swan Falls study area or vicinity (Table E.3.2-2). These are the Townsend’s big-eared bat, spotted bat, Yuma myotis, long-legged myotis, California myotis, western pipistrelle, Piute ground squirrel, and pygmy rabbit (*Brachylagus idahoensis*).

The Townsend's big-eared bat occurs throughout western North America from British Columbia to southern Mexico, and east to South Dakota, western Texas, and Oklahoma. The species is widely distributed throughout the Intermountain region. In Idaho, the largest known populations are associated with the lava flows in the southwest (Genter 1986, Wackenhut 1990, ISCE 1995), but numbers appear to be declining (Wackenhut 1990). Roost sites have also been identified throughout Idaho in mines and caves (ISCE 1995). Occasional sightings are reported in the NCA during summer (BLM 1979). Townsend's big-eared bats use juniper (*Juniperus* spp.)/pine (*Pinus* spp.) forests, shrub-steppe habitats, deciduous forests, and mixed coniferous forests at elevations from sea level to 3,300 m (10,825 feet). The critical requirement in all habitat types is the availability of suitable sites for maternity colonies, hibernation, and roosting, particularly caves and abandoned mines. Roost sites also include crevices and overhanging cliffs. The primary threat to the species is human disturbance at maternity colonies, roost sites, and hibernacula (Spahr et al. 1991, Csuti et al. 1997).

The range of the spotted bat is restricted to western North America and northern Mexico (Hall 1981). Little is known about the status and abundance of the spotted bat (Fenton et al. 1987, IDFG 2005). In Idaho, spotted bats are known to occur in steep, narrow canyons in the southwestern portion of the state (IDFG 2005). Spotted bats have been seen along the Snake River from C.J. Strike Reservoir to Swan Falls Dam (BLM 1995). Spotted bats occur in arid areas, usually in riparian corridors with canyons and cliffs where they roost in cracks and crevices (Poché and Bailie 1974, Poché and Ruffner 1975, Woodsworth et al. 1981, Leonard and Fenton 1983, IDFG 2005). Poché (1981) suggested that the spotted bat may select a narrow range of roosting parameters including absence of forests or trees, availability of cliffs, little annual rainfall, and mild winters with a few nights where temperatures drop below freezing. Spotted bats appear to feed mainly on moths (Poché 1981, Fullard et al. 1983, Leonard and Fenton 1984, Wai-Ping and Fenton 1989). The breeding period is believed to occur during March and April, with a single young born sometime from June through August (Poché 1981). The Swan Falls study area appears to provide suitable spotted bat habitat; the climate is arid, suitable roosting cliffs are available, and winters are generally mild.

The Yuma myotis ranges from southwest British Columbia to southern Colorado, Arizona, and northwestern New Mexico. In Idaho, the species is reported from a variety of habitats throughout the state, but is almost always associated with water (Groves et al. 1997). The Yuma myotis was reported in the NCA (BLM 1995). These bats generally occur near ponds and rivers and do not appear to be adapted to arid environments (Wilson and Ruff 1999). The Yuma myotis utilizes caves and human structures for roosting, but the species' status is unknown (Marshall et al. 1996). The long-legged myotis ranges from southeastern Alaska to central Mexico. The species inhabits coniferous forests, but it is also found in riparian and desert habitats (Warner and Czaplewski 1984). The bat is likely to occur throughout Idaho. Information on the status of the species in Idaho is not available, but the long-legged myotis has been reported in the NCA (BLM 1995).

The California myotis is found along the western edge of North America, ranging as far north as British Columbia, south to middle America, and east along the western border of Texas (Hall 1981). The species roosts in caves, crevices, and mines (Groves and Marks 1985). The California myotis has been reported in the NCA (BLM 1995).

The western pipistrelle ranges from southern Washington and eastern Oregon, south along the coast of California to Baja California, and west through Arizona and western Mexico (Hall 1981). Although not well documented, the species is found in southwestern Idaho, primarily in canyons and cliffs near water (Groves et al. 1997). It has been collected at Salmon Creek (Hall 1981) and Reynolds Creek (Lewis and Wackenhut 1996) in southern Idaho. The species has also been reported in the NCA (BLM 1995). This tiny bat roosts singly or in small numbers in caves, cliffs, rock crevices, and buildings (Groves and Marks 1985, Groves et al. 1997).

The Piute ground squirrel occurs in southern Idaho and extreme southeastern Oregon (Yensen and Sherman 2003). Three subspecies have been identified (Rickart 1987, Yensen and Sherman 2003), two of which are found in the study area and vicinity. *S. m. idahoensis* occurs north of the Snake River and south of the Payette River and Boise Mountains. *S. m. mollis* is found in Idaho south of the Snake River from Murphy to Pocatello and in southeastern Oregon, Nevada, and Utah. *S. m. artemisiae* occurs on the Snake River Plain north of the Snake River from Bliss east to Dubois. The species occurs primarily in arid high-desert habitats such as sagebrush, shadscale saltbush, or greasewood communities (Davis 1939). Piute ground squirrels inhabit areas with well-drained soils, such as ridge tops and hillsides. They are solitary, but high densities are found in areas with abundant food. Extensive basic research on the Piute ground squirrel has been conducted in the NCA where the species is an important prey item, especially for prairie falcons, but also for other birds of prey and ground predators such as badgers (BLM 1979, 1995). Population surveys have not been conducted, and all three subspecies are probably of conservation concern (Yensen and Sherman 2003). Populations of *S. m idahoensis* can fluctuate erratically. The population status of *S. m. mollis* is unknown. *S. m. artemisiae* has disappeared from much of its former range due to agricultural conversion and habitat degradation (Yensen and Sherman 2003). The latter subspecies, although found in the NCA, is not present in the Swan Falls study area.

Pygmy rabbits are found in seven western states. The geographic range of the species includes most of the Great Basin and some adjacent intermountain areas of the western United States (Green and Flinders 1980a). Pygmy rabbit populations do not seem to be cyclic as other leporids. They seem unable to quickly respond reproductively to favorable environmental conditions (Wilde 1978, Green and Flinders 1980a). Populations of pygmy rabbits do, however, appear susceptible to rapid declines and local extirpation (Weiss and Verts 1984). Population densities apparently vary in several orders of magnitude from less than 1 to 45 rabbits/ha (Green and Flinders 1980a). Pygmy rabbits are unique because they dig shallow burrows in deep, loose soils within dense or clumped stands of big sagebrush (Green and Flinders 1980a,b; Weiss and Verts 1984). Big sagebrush provides cover and, to a large extent, food (Wilde 1978; Green and Flinders 1980a,b; White et al. 1982a,b). This close association with big sagebrush may pose a threat to the species. Fragmentation of sagebrush communities will ultimately affect existing populations. Pygmy rabbits will also occupy greasewood stands (Davis 1939). Pygmy rabbits have been observed in the NCA during jackrabbit surveys. The highest population count was in 1987 when there were 27 sightings (Doremus and Bolln 1987). The species appears to be limited to dense big sagebrush stands along Swan Falls Road in the vicinity of Initial Point (BLM 1995), which is located outside the Swan Falls study area. However, a 1996 fire in the vicinity of Initial Point may have led to the extinction of this population. All remaining large patches of big sagebrush have been searched in recent years by the BLM with no sign of pygmy rabbits (BLM 2006).

E.3.2.1.9.3. FERC-Permitted Transmission Lines and Associated Service Roads

The Swan Falls Project includes a 138-kilovolt (kV) transmission line that is 1.2 miles long. The Applicant conducted a study to identify existing botanical and wildlife resources along the transmission-line corridor and service roads and evaluate the potential impacts of operation and maintenance (O&M) activities on these resources (Technical Report E.3.3-D).

A 138-kV wood pole, H-frame transmission line (Swan Falls Tap [Line 954]) connects the Swan Falls Power Plant with the transmission grid. The Swan Falls Tap extends from the power plant east for 1.2 miles, rising out of the canyon and across the plain, to connect with the Strike Junction–Caldwell 138-kV transmission line (Line 920) (Figures 1 and 2 in Technical Report E.3.3-D). The Swan Falls Tap is located within the Snake River Birds of Prey NCA, which is managed by the BLM.

Three poles are located below the canyon rim; two of the poles are accessed via service roads behind a locked gate, and one pole is accessed via a paved road. The transmission line extends up the canyon wall and is connected to a pole at the canyon rim. This pole is accessed by driving cross-country 100 m from Swan Falls Road. Another pole is located immediately east of Swan Falls Road and can be accessed from the road's edge. Three poles are located east of Swan Falls Road; two of these poles are accessed by driving cross-country (150 m and 90 m from Swan Falls Road) and the last pole is accessed via the Line 920 service road.

The Swan Falls Tap was built in 1993 to accommodate increased power production resulting from a major modification of the Swan Falls Power Plant. Those portions of the Swan Falls Tap located on federal lands are permitted by a BLM right-of-way (ROW) grant (No. IDI-29012). The ROW width is 50 feet; 25 feet on either side of the centerline. The BLM grant expires in 2013. The Swan Falls Tap serves no other purpose than to transmit power from the power plant to the interconnected transmission system.

The Applicant performs maintenance activities to keep its transmission lines operational and in good repair. Maintenance activities for this line can include the following: annual inspection, line patrol, pole inspection, groundline treatment, and general maintenance. Currently, no timing restrictions apply to when work can occur.

No field surveys were conducted for this analysis other than a walk-through of the ROW. However, there are many sources of information available. The NCA conducted extensive field research from the early 1970s to mid-1990s. Early studies focused on prairie falcons, golden eagles, and other raptors in the area. From 1990 through 1994, the BLM and Idaho Army National Guard conducted a research program investigating the effects of military training and fire in the NCA (USGS 1996). The research provided extensive knowledge about relationships among vegetation, prey, and raptor abundance and productivity. More recently, the BLM's Boise District Office prepared a *Draft Resource Management Plan/Environmental Impact Statement* (Draft RMP/EIS) for the NCA (BLM 2006). The Draft RMP/EIS sets forth the proposed management direction for the approximate 483,700-acre NCA and provides a detailed description of botanical and wildlife resources. In the following, potential impacts to wildlife species are discussed. For detailed information about wildlife species associated with the transmission line, reference is made to section 5 of Technical Report E.3.3-D (Wildlife Resources).

Potential impacts of O&M activities associated with the Swan Falls Tap to special status wildlife species were evaluated on a spatial and temporal basis. Currently, O&M activities could occur in any month. Normal inspections and minor maintenance activities would not be expected to disturb wildlife to the extent that they would disrupt normal daily activities. Even climbing inspections, which occur only every 10 years, would last for just a few hours at each pole and should not noticeably disrupt wildlife. Pole replacements and emergency repairs, however, could disturb wildlife during critical life stages such as nesting. Potential impacts and avoidance measures are discussed below for those animal groups that would be sensitive to O&M activities.

Benchland nesters—Four special status bird species (long-billed curlew, short-eared owl, Brewer's sparrow, and sage sparrow) have the potential to be disturbed during the nesting season by activities on the benchland section of the transmission line structures. If O&M work took several hours, it would have the potential to keep birds off eggs or away from young and could result in nesting failure. At most, this would involve very few nests, as the ROW includes only 0.73 acres and 9 structures.

Cliff-nesting raptors—One or two nesting prairie falcon pairs could potentially be disturbed by work at the rim tower if it occurred between March and June. The conductors may also pose a slight collision risk to fledging young and adults pursuing prey or territory intruders. However, no collisions have been documented to date. No electrocution risk is present with Line 954 as raptor-safe specifications were followed when it was constructed.

Wintering Raptors—Bald eagles and goshawks may use the trees in Swan Falls Park for night roosting or day perching from November to March. Towers 2 and 3 are upslope of these trees; therefore, O&M activities at these towers would be more disturbing to raptors using the trees than the people present below them. However, any disturbance would be temporary and would only cause the birds to move to another perch for the duration of the activities.

In conclusion, the Applicant's O&M activities have minimal potential to disturb wildlife resources within the vicinity of the Swan Falls Tap.

E.3.2.2. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section 3.2.3.3. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.3.2.3. Applicant's Existing and Proposed Measures or Facilities

E.3.2.3.1. Existing Measures or Facilities to Be Continued or Maintained

FERC issued the following article regarding the Swan Falls Project (FERC No. 503) on December 22, 1982:

> Article 38. Licensee shall, after consultation with the U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and the Idaho Department of Fish and Game, develop a plan to ensure protection of raptors from electrocution through the appropriate design of the transmission towers and appropriate spacing of conductors. Further, Licensee shall, within

> 1 year from the date of the issuance of this license, file with the Commission a report on its plan and, for approval, recommended measures to ensure protection of raptor species. Agency letters of comment on the report and recommendations shall be included in the filing.

As required under Article 38 of the license, the Applicant developed a plan to prevent the accidental electrocution of raptors. This plan was approved by FERC on January 13, 1984. In 1990, while the new Swan Falls Power Plant was built, the Applicant installed a new, 1.2-mile-long, 138-kV transmission line (Line 954) under the previous license. This transmission line was built according to guidelines provided by the Avian Power Line Interaction Committee (1996). On December 18, 1994, the Applicant filed "As-Built" Exhibits A, F, and G with FERC for approval. These exhibits, pertaining to Line 954 that was built appurtenant to the Swan Falls Project, were supplemented on April 16 and August 2, 1996, and on July 1, 1997. On November 12, 1997, FERC issued an order amending the license and approving the transmission line as built.

In January 1985, the Applicant requested FERC's permission to postpone work on the Swan Falls Power Plant until the additional capacity was needed. An order amending the license, issued on April 30, 1987, granted this request. Subsequently, on April 24, 1989, the Applicant requested that FERC amend the license and allow the Applicant to replace the existing powerhouse and generating units. FERC issued an order amending the license on December 8, 1989. Although FERC issued additional articles in this amended order, none of these articles pertained to wildlife resources.

E.3.2.3.2. New Measures or Facilities Proposed by the Applicant

The following existing wildlife measures would be maintained over the life of the new license. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.3.2.3.2.1. Protect, Enhance, and Restore Riparian Habitat.

Justification

The Applicant determined that proposed operations of the Swan Falls Hydroelectric Project, recreation, O&M activities, road use, and land management activities affect riparian habitat (Technical Report E.3.2-A) and associated wildlife resources, such as neotropical migrants, special status species, and special plant communities (Technical Reports E.3.2-B, E.3.2-C, and E.3.3-C). Specifically, the Applicant determined that plant operations impact 2.0 acres of riparian habitat downstream of Swan Falls Dam (Technical Reports E.3.2-A and E.3.2-C). Furthermore, recreational activities impact an estimated 3.72 acres of riparian habitat (Figure E.3.2-6, panels A and B). The Applicant did not report any impacts in the ROW associated with the Swan Falls Tap, running from the Swan Falls Power Plant to the bench above the canyon (Technical Report E.3.3-D).

Goal

The Applicant proposes measures to protect and enhance riparian resources on Applicant-owned lands and other lands within the FERC project boundary to ameliorate identified impacts to riparian habitat.

Description

Impacts to riparian habitats are mainly related to hydroelectric operations and recreation (e.g., creation of trails, trampling of vegetation). These impacts will continue through the license period. The acreage directly impacted by hydroelectric operations downstream of Swan Falls Dam is relatively small compared to recreational impacts (2.0 acres compared with 3.72 acres). The rapid growth of the Treasure Valley is likely to increase the pressure on the Swan Falls study area because it is easily accessible from surrounding communities and provides year-round recreational opportunities.

In the following, specific measures are described to alleviate identified impacts.

Plant Native Riparian Species—Because ongoing hydroelectric operations and human use of the study area impact riparian habitat (Technical Reports E.3.2-A and E.3.2-B), the Applicant proposes to enhance and restore riparian habitat along 4.7 miles of shoreline (Figure E.3.2-6, panel A). The Applicant proposes using a mix of native species that would be selected in consultation with resource agencies.

Restore Channel Flow at Island below Swan Falls Dam—Changes in flows, possibly associated with deepening the tailrace when the new Swan Falls Powerhouse was constructed, silted in the existing culvert that provides water to the channel around the island (Figure E.3.2-6, panel A). The Applicant proposes to restore water to the channel to enhance and restore riparian vegetation. Siltation is likely to remain a problem in the future, and placement of a culvert may not be a viable option. Other engineering options will be explored to provide water to the channel.

Protect Riparian Habitat at Lay-Down Yard—The Applicant removes macrophytes from the river at the power plant. Removed plant materials are deposited at the lay-down yard for further processing and, ultimately, disposal. However, the disposal site has encroached on riparian habitat fringing the lay-down yard (Figure E.3.2-6, panel A). The Applicant proposes to remove any disposed plant materials along the top of the embankment and restore impacted riparian habitat. Also, the Applicant proposes to move the disposal area away from the embankment to avoid future impacts to riparian habitat. Lastly, the Applicant proposes to install a barrier that will avoid any accidental spillage of disposed plant material down the embankment and prevent future impact on riparian vegetation.

Restore Riparian Habitat Impacted by Human Use—Existing developed recreation sites are associated with the Applicant’s boat launches upstream and downstream of Swan Falls Dam (graveled roads and parking areas). In addition, several existing, impromptu sites provide access to the reservoir and river. The Applicant proposes to improve these recreation sites (see section E.5.4). Visitor use of the Swan Falls area has impacted riparian habitats associated with both developed and impromptu sites. The Applicant proposes site plans for all delineated sites (see section E.5 [Report on Recreational Resources]). The Applicant proposes to decommission and revegetate about 3.7 acres of roadbed and impacted riparian habitat using native riparian species. The Applicant will restrict vehicular access to delineated sites using strategically placed boulders and berms.

Associated Benefits

Proposed actions will directly benefit riparian habitat and species that either directly or indirectly depend on this habitat, including special status species (Technical Reports E.3.2-B, E.3.2-C, E.3.3-A, E.3.3-B, and E.3.3-C). The expansion of the impromptu road system, both upstream and downstream of Swan Falls Dam on Applicant-owned lands, has impacted soil resources and caused significant soil erosion, potentially affecting water quality. Furthermore, the existence of an ever-extending road system impacts the visual quality of the area. Cultural resources are present in the area and may be impacted by unrestricted vehicular access. Delineating designated recreation sites, restricting vehicular traffic to designated areas, decommissioning impromptu trails, and revegetating areas will protect and enhance riparian habitat and species depending on such habitat, minimize soil erosion, enhance visual values and recreational enjoyment of the area, and enhance water quality and aquatic resources.

Implementation or Construction Schedule

Time Frame	**Action**
Within 1 year after license is issued	*Planning Phase*
	Develop site-specific plans that include the following: • Goals and objectives • Implementation schedule • Monitoring schedule
Within 2 years after license is issued	*Implementation Phase*
	Develop engineering designs, if required
	Develop project plans
	Implement projects
Beginning 4 years after license is issued and continuing for the life of the license	*Adaptive Monitoring Phase*
	Implement monitoring
	Adapt ongoing projects as needed
	Update management and site plans as needed
	Produce monitoring reports

Cost Estimate

Project	Time Frame (yrs)	Annual Cost ($)		Total Cost ($)	
		O&M	Capital	O&M	Capital
Protect, enhance, and restore riparian habitat					
Plant native riparian species					
Develop plan	Year 1	8,000		8,000	
Implement plan	Annually from years 2–10	15,071		135,639	
Monitor	Year 2 and at 5-year increments through year 30	5,714		40,000	
Report	Year 2 and at 5-year increments through year 30	3,714		26,000	
Subtotal				*209,639*	
Restore channel flow					
Develop plan	Year 1		8,000		8,000
Implement plan	Year 2		63,000		63,000
Report	Year 2 and at 5-year increments	571		4,000	
Subtotal				*4,000*	*71,000*
Restore riparian habitat at lay-down yard					
Develop plan	Year 1	4,000		4,000	
Implement plan	Year 2	18,000		18,000	
Report	Year 3	2,000		2,000	
Subtotal				*24,000*	
Restore riparian habitat impacted by human use					
Develop plan	Year 1	6,000		6,000	
Implement plan	Annually from years 2–10	2,956		26,600	
Monitor	Year 2 and at 5-year increments	2,857		20,000	
Report	Year 2 and at 5-year increments	2,857		20,000	
Subtotal				*72,600*	
Total				**310,239**	**71,000**

Location Map

Reference is made to Figure E.3.2-6, panels A and B, for location of the various riparian enhancement measures described above.

E.3.2.3.2.2. Protect, Enhance, and Restore Upland Habitat

Justification

The Applicant determined that recreation, O&M activities, road use, and land management activities affect upland habitat and species dependent on these habitats (Technical Reports E.3.2-B, E.3.2-C, E.3.3-A, E.3.3-B, and E.3.3-C). Recreational activities impact 33.48 acres of upland habitat in the study area. The Applicant did not report any impacts in the ROW associated with the Swan Falls Tap, which runs from the Swan Falls Power Plant to the bench above the canyon (Technical Report E.3.3-D).

Goal

The Applicant proposes measures to protect and enhance upland habitat resources on Applicant-owned lands and other lands within the FERC Project Boundary to ameliorate identified impacts to upland habitat.

Description

Impacts to upland habitats are caused by some O&M activities, but mainly by recreators (Technical Reports E.3.2-B, E.3.2-C, E.3.3-A, E.3.3-B, and E.3.3-C). Both causes of impacts will continue throughout the license period. The total upland acreage impacted by recreational activities on Applicant-owned lands is estimated at 33.5 acres. The rapid growth of the Treasure Valley will only increase the pressure on the Swan Falls study area, because it is easily accessible from surrounding communities and provides year-round recreational opportunities.

Specific plans or projects to alleviate identified impacts are described below.

Protect and Enhance Upland Habitat—Ongoing O&M operations and recreational use of the study area will continue to impact upland habitat (Technical Reports E.3.2-B and E.3.2-C). The Applicant proposes to enhance and restore 33.5 acres of upland habitat (Figure E.3.2-6, panel B). The Applicant proposes to use a mix of native species that would be selected in consultation with resource agencies when specific site plans are developed.

The following specific actions are included in these measures:

(i) In 2004, a fence was built by the Applicant south of the boat launch area upstream of Swan Falls Dam to restrict vehicular traffic to Applicant-owned lands upstream of the boat launch (Figure E.3.2-6, panel B). Unrestricted access during past years significantly impacted both upland and riparian habitats. The Applicant proposes to maintain this fence during the term of the new license. Also, a rock barrier was placed on the road leading to the fence, but this has been only partially effective. The Applicant proposes to improve the rock barrier to restrict ORV use of the area between the existing rock barrier and the fence (Figure E.3.2-6, panel B).

(ii) There is increased ORV use of the area east of the graveled road leading to the boat launch upstream of the Swan Falls Power Plant, impacting upland habitat (Figure E.3.2-6, panel B). Also, much of this area burned in previous years and is largely dominated by annual grasses. The Applicant proposes to fence the road to the upstream boat launch (1,245 feet) to restrict access and further damage to upland habitat. In addition, the Applicant proposes to revegetate about 32.7 acres over time, seeding in small patches of land (0.10–0.25 acres) with native grasses and shrubs.

(iii) Trails used by ORV users have proliferated in the downstream reach, and ORV users have pioneered a trail through the boulder fields. The Applicant proposes to block these trails with strategically placed boulders to avoid any further impact to upland habitat (Figure E.3.2-6, panel A).

(iv) Recreators have pioneered several impromptu sites in the boulder field east of the road leading downstream of Swan Falls Dam (Figure E.3.2-6, panel A). ORV use and trails have multiplied around these sites, impacting upland habitat. The Applicant proposes to improve several of these impromptu sites (see section E.5 [Report on Recreational Resources]) to minimize further impact to natural resources. The Applicant will restrict ORV use around these sites by strategically placed boulders and signage.

Restore Upland Habitat Impacted by Human Use—Existing, developed recreation sites are associated with the boat launches upstream and downstream of Swan Falls Dam (graveled roads and parking areas). In addition, several existing, impromptu sites provide access to the reservoir and river. The Applicant proposes to improve these recreation sites (see section E.5.4). Visitor use of the Swan Falls area has impacted upland habitats associated with both developed and impromptu sites. The Applicant proposes specific actions to limit and restrict vehicular access to upland habitat by using strategically placed boulders, for example. The Applicant proposes to decommission and revegetate 33.5 acres of roadbed and associated uplands using native upland species.

Associated Benefits

Proposed actions will directly benefit upland habitat and species that depend on this habitat, including special-status species (Technical Reports E.3.2-B, E.3.2-C, E.3.3-A, E.3.3-B, and E.3.3-C). The expansion of the impromptu road system, both upstream and downstream of Swan Falls Dam on Applicant-owned lands, has impacted soil resources and caused significant soil erosion, potentially affecting water quality. Furthermore, the existence of an ever-extending road system impacts the visual quality of the area. Cultural resources are present in the area and may be impacted by unrestricted vehicular access. Delineation of designated recreation sites, restriction of vehicular traffic to designated areas, decommissioning of impromptu trails, and revegetation efforts will protect and enhance upland habitat, species depending on such habitat, minimize soil erosion, enhance visual values, recreational enjoyment of the area, and enhance water quality and aquatic resources.

Implementation or Construction Schedule

Time Frame	**Action**
Within 1 year after license is issued	*Planning Phase*
	Develop site-specific plans that include the following: • Goals and objectives • Implementation schedule • Monitoring schedule
Within 2 years after license is issued	*Implementation Phase*
	Develop engineering designs, if required
	Develop project plans
	Implement projects
Beginning 4 years after license is issued and continuing for the life of the license	*Adaptive Monitoring Phase*
	Implement monitoring
	Adapt ongoing projects as needed
	Update management and site plans as needed
	Produce monitoring reports

Cost Estimate

Project	**Time Frame (yrs)**	**Annual Cost ($)**		**Total Cost ($)**	
		O&M	**Capital**	**O&M**	**Capital**
Protect, enhance, and restore upland habitat					
Protect and enhance upland habitat					
Develop plan	Year 1	6,000		6,000	
Implement plan	Annually from years 2–10	7,094		63,850	
Monitor	Year 2 and at 5-year increments through year 30	2,857		20,000	
Report	Year 2 and at 5-year increments through year 30	2,857		20,000	
Subtotal				*109,850*	

Project	**Time Frame (yrs)**	**Annual Cost ($)**		**Total Cost ($)**	
		O&M	**Capital**	**O&M**	**Capital**
Restore upland habitat impacted by human use					
Develop plan	Year 1	8,000		8,000	
Implement plan	Annually from years 2–10	14,782		133,038	
Monitor	Year 2 and at 5-year increments through year 30	2,857		20,000	
Report	Year 2 and at 5-year increments through year 30	2,857		20,000	
Subtotal				*181,038*	
Total				**290,888**	

Location Map

Reference is made to Figure E.3.2-6, panels A and B, for location of the various upland enhancement measures described above.

E.3.2.3.3. Measures or Facilities Recommended by the Agencies

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. The comment letters often did not clearly indicate specific recommended measures. However, the Applicant made a good faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant's proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases, the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.3.2.3.3.1. Accepted or Conditionally Accepted Measures or Facilities

Idaho Department of Fish and Game comment letter, dated December 21,2007

IDFG-6 and 8

> IDFG recommends that IPC evaluate the effectiveness of the proposed measures following implementation, and commit to enhancing initial efforts if they fail to achieve the desired outcome. IDFG recommends that IPC develop a monitoring program.

Response

The Applicant agrees with the IDFG that one of the important components of successful restoration efforts will be to limit motorized traffic to designated roads and trails. The Applicant intends to monitor the effectiveness of the proposed protection and enhancement measures of both upland and riparian habitat as stated in sections E.3.2.3.2.1. (Protect, Enhance, and Restore Riparian Habitat), E.3.2.3.2.2. (Protect, Enhance, and Restore Upland Habitat) in the FLA.

E.3.2.3.3.2. Rejected Measures or Facilities and Explanations for Rejection

Of the recommended measures that the Applicant was able to identify in agency comment letters, there were none rejected.

E.3.2.4. Anticipated Impacts on Wildlife Resources

The Applicant evaluated operational impacts of the C.J. Strike Project downstream of C.J. Strike Dam to Swan Falls Dam for the C.J. Strike final license application (IPC 1998). Mitigation was proposed in that license application to offset project-related impacts. FERC directed the Applicant to conduct additional evaluations of project operations downstream of the C.J. Strike Project (Wulforst et al. 2000). In C.J. Strike Article 412 (Riparian Habitat Acquisition), FERC ordered the Applicant to acquire at least 170 acres of riparian habitat to mitigate for downstream operational impacts of the project. Therefore, no impact studies were conducted for the reservoir reach of the Swan Falls study area. However, there were other project-related impacts that take place adjacent to the reservoir that are evaluated and discussed in the following.

E.3.2.4.1. Swan Falls Project and Vicinity

Recreational use of the Swan Falls study area has increased substantially since the 1980s. For example, in 1984, the total number of visitors was estimated at 6,000; this number increased to 11,000 in 1987 (Holthuijzen 1989). In 1996, the Applicant estimated the total annual number of recreation days at 17,699 (IPC 1997, 2003). Recreational use of Applicant-owned lands within the Swan Falls–FERC project boundary is considered one of the major challenges to developing a balanced resource management plan and implementing such a plan as proposed in the Applicant's protection, mitigation, and enhancement (PM&E) measures.

The Applicant conducted a study to evaluate potential conflicts or impacts between human-use activities, including the Applicant's O&M and recreational activities, and natural resources in the vicinity of the Swan Falls Hydroelectric Project (Technical Report E.3.2-B). Furthermore, the Applicant used this evaluation to develop and aid in the implementation of site-specific PM&E measures to protect and enhance cultural and natural resources.

The Applicant's assessment of human use on cultural and natural resources included the following elements: creating spatially explicit data layers using a geographic information system (GIS); classifying human use based on the average hours of monthly use; developing sensitivity ratings, periods, and levels for cultural and natural resources; and conducting a spatial analysis of the study area and relative risk assessment of cultural and natural resources in relation to human use.

Three types of human-use data were evaluated in this study: land- and water-based recreational use associated with both visually distinct, dispersed sites and general use zones; activities associated with the Applicant's hydropower facilities and housing areas; and primary road use. Three types of resource data were used to assess interactions with human activities: cultural resources; special status wildlife species (shrubland birds, shrubland herptiles, grassland herptiles, riparian dwellers, shorebirds, winter waterbirds, winter raptors, cliff dwellers, and talus reptiles); and special status plant species. Archaeological data were collected as part of a cultural survey of the Swan Falls study area (Technical Report E.4-A). Each cultural site was classified using a sensitivity rating, which was based on the potential to be disturbed and eligibility to be included in the National Register of Historic Places (Appendix 1 in Technical Report E.3.2-B), resulting in 42 sites for the human-use study area (section 4.2. in Technical Report E.3.2-B). In consultation with the BLM, the Applicant identified 27 special status wildlife species, including 2 rare species. Ten species inhabit cliff or talus for nesting or year-round cover, 10 are riparian dwellers, 7 depend on shrubland, grassland, or a combination of these cover types, and 3 are wintering waterbirds (section 4.3.1. in Technical Report E.3.2-B). Information collected by the Applicant on special status plant species was also used (Technical Report E.3.3-C).

A GIS model was employed to evaluate all human-use sites within a resource-dependent distance of each cultural site, special status plant occurrence, or special status animal habitat. Based on this analysis, a sensitivity index was determined for each cultural site, special status plant, or animal habitat group occurrence. Subsequently, a risk value was calculated for each interaction between each cultural site, special status plant, or animal habitat group occurrence and a human-use site. Finally, for each human-use site and resource combination, all risk values were combined into a cumulative risk index. Twelve of the 42 cultural sites evaluated were considered to be at risk to human activities (section 6.1. in Technical Report E.3.2-B). Three sites were considered to be at Very High risk, two at High risk, and seven at Moderate risk.

Monitoring of these sites appears to be prudent and is evaluated in the “Historic Properties Management Plan” (Technical Report E.4.1-B) developed by the Applicant. Special status wildlife and plant species can be potentially impacted by roads and recreation sites, both directly and indirectly (sections 6.2.1. and 6.3.1. in Technical Report E.3.2-B). The Applicant’s proposed conceptual PM&E measures address such impacts by restricting vehicular traffic, delineating recreation sites, rehabilitating areas impacted by human activities, and performing general habitat restoration and enhancement measures (sections 6.2.4. and 6.3.4. in Technical Report E.3.2-B). The site-specific spatial analysis and evaluation of potential risks of human use to both special status plant and animal species conducted by the Applicant will aid in the development of site-specific PM&E measures in the study area, preferably by avoiding or otherwise minimizing potential impacts to special status species.

E.3.2.4.2. Downstream of the Swan Falls Project

The Applicant's proposed operation of the Swan Falls Project may affect the persistence and establishment of perennial riparian vegetation along shorelines of the Snake River. Therefore, one issue for relicensing is the potential impact of future operations on riparian habitat for wildlife species. Specifically, the extent (acreage) of riparian habitat (i.e., cover types) impacted by proposed operations was assessed, and information from the study was used for the development of proposed PM&E of wildlife habitat in the study area (Technical Report E.3.2-A).

The evaluation area for this study was the shoreline fluctuation zone in the river reach downstream of Swan Falls Dam to the Guffey Bridge. The fluctuation zone is a polygon that follows the contours formed by the characteristic maximum and minimum daily flows, extending from Swan Falls Dam to Guffey Bridge. Shoreline geometry and stage-discharge relationships defined the lateral (or upslope) boundaries of the evaluation area. The evaluation period (June 1 to August 31) was the growing season for riparian vegetation.

CHEOPS®, a simulation package for hydropower systems, was used to model flow data to simulate proposed operations. Average daily minimum and maximum flows for the three runoff years (i.e., high, medium, and low runoff years) from 15 minutes of CHEOPS output were calculated and then averaged to determine characteristic flows. The modeled, characteristic daily minimum and maximum flows for proposed operations of the Swan Falls Project were 6,885 cubic feet per second (cfs) and 7,458 cfs, respectively (Table 1 in Technical Report E.3.2-A). Subsequently, stage-discharge relationships were determined for each of the 45 cross sections in the downstream reach below Swan Falls Dam using the characteristic flows as input to MIKE 11-GIS®. The cross-sectional elevation data was used to determine the vertical width of the fluctuation zone, which averaged 0.26 feet. This vertical distance resulted in an average width of 1.3 feet, given the slope of the land. Given the length of the downstream reach, 2.89 acres of land were calculated to be in the fluctuation zone (Table 2 in Technical Report E.3.2-A). The fluctuation zone was intersected with the cover-type map to calculate the acres of each cover type impacted by the fluctuation zone. Of the 2.89 acres in the fluctuation zone, 2.00 acres were riparian cover types: 0.76 acres of *Emergent Herbaceous Wetland*, 0.60 acres of *Shore and Bottomland Wetland*, and 0.69 acres of *Scrub-Shrub Wetland* (Table 2 in Technical Report E.3.2-A). It was estimated that 0.87% of riparian vegetation in the downstream reach of the Swan Falls study area would be impacted by proposed operations (Table 2 in Technical Report E.3.2-A).

The list of species of special concern that are or may be present in the study area is extensive (Table 1 in Technical Report E.3.2-C). Therefore, the list was reviewed and prioritized. All federally listed species that occur in the study area were evaluated, and other species of special concern were carefully screened to determine which species to select for further evaluation and analysis.

The original list of 52 species of special concern was narrowed down to 30 species with the highest potential for interaction with the Swan Falls Project (Table 2 in Technical Report E.3.2-C). Of these, two threatened species, the peregrine falcon and the bald eagle, are found in the study area. One candidate species, the yellow-billed cuckoo, has the potential to occur in the study area. Three amphibians, five reptiles, fourteen additional bird species, and five mammals were also evaluated. To determine potential impacts on the 30 species, each species' status, habitat requirements, and conservation threats were evaluated in relation to impacts of downstream flow fluctuations to riparian cover types (Table 2 in Technical Report E.3.2-A). Species habitat associations were summarized by cover types mapped for the study area as shown in Figures 2.1 through 2.6 in Technical Report E.3.3-A. Riparian vegetation cover types in the Swan Falls study area are *Emergent Herbaceous Wetland, Shore and Bottomland Wetland*, *Scrub-Shrub Wetland,* and *Forested Wetland*. There are 13 species that use one or more of these cover types as their primary habitat (Table 2 in Technical Report E.3.2-C). These are the northern leopard frog, Woodhouse's toad, western toad, common garter snake, bald eagle, trumpeter swan, great egret, Wilson's phalarope, yellow-billed cuckoo, Brewer's blackbird, spotted bat, Yuma myotis, and western pipistrelle. Eleven species could be affected by the potential loss of 2.00 acres of riparian vegetation in the fluctuation zone for proposed operations of the Swan Falls Project. Daily fluctuations due to load following could result in the short-term displacement of individuals from the fluctuation zone; however, daily fluctuations impacting

2.00 acres of riparian vegetation would not be expected to negatively affect species productivity, survival, or persistence in the Swan Falls study area.

E.3.2.5. Materials and Information on Measures and Facilities

All materials and information regarding existing measures and facilities to be continued by the Applicant are included in section E.3.2.3.1. All materials and information regarding measures and facilities proposed by the Applicant are included in section E.3.2.3.2.

E.3.2.6. Consultation

For a summary of consultation efforts to date for the Swan Falls Hydroelectric Project, see the Consultation Appendix.

E.3.2.7. Literature Cited

American Ornithologists' Union (AOU). 1998. Checklist of North American birds. 7th edition. Allen Press, Lawrence, KS. 829 p.

Anderson, B. W., and S. A. Laymon. 1989. Creating habitat for the yellow-billed cuckoo (*Coccyzus americanus*). U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. General Technical Report PSW-110. p. 468–472.

Anderson, J. E., and M. L. Shumar. 1986. Impacts of black-tailed jackrabbits at peak population densities on sagebrush-steppe vegetation. Journal of Range Management 39:152–155.

Avian Power Line Interaction Committee. 1996. Suggested practices for raptor protection on power lines: the state of the art in 1996. Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

Bartlett, R. D., and P. Bartlett. 2001. Garter and ribbon snakes: facts & advice on care and breeding. Reptil keeper's guide. Barron's Educational Series, Inc., New York, NY.

Bechard, M. J. 2003. Adult turnover, productivity, and nest-tree status of Swainson's hawks in and adjacent to the Snake River Birds of Prey National Conservation Area. U.S. Department of the Interior, Bureau of Land Management, Boise, ID. Technical Bulletin No. 03-2. 19 p.

Bechard, M. J., D. Beig, and R. P. Howard. 1987. Historical nest sites of the peregrine falcon (*Falco peregrinus anatum*) in Idaho. Department of Biology, Boise State University, Boise, ID. 34 p.

Bechard, M. J., K. D. Hague-Bechard, and D. H. Porter. 1986. Historical and current distributions of Swainson's and ferruginous hawks in southern Idaho. Department of Biology, Boise State University, Boise, ID. 58 p.

Beck, J. M. 1997. Presence and relative abundance of amphibians and reptiles in the C.J. Strike study area. In: Volume 2, Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power. Boise, ID. Technical Report E.3.2-K. 40 p.

Beck, J. M., and C. R. Peterson. 1995. Movements and habitat selection of the longnose snake (*Rhinocheilus lecontei*) in southwestern Idaho. Idaho State University, Pocatello, ID.

Beecham, J. J. 1970. Nesting ecology of the golden eagle in southwestern Idaho. M. Sc. thesis, University of Idaho, Moscow, ID. 48 p.

Bellrose, F. C. 1976. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, PA.

Bent, A. C. 1929. Life histories of North American shore birds. Vol. 2. U.S. National Museum Bulletin No. 146. Smithsonian Institute, Washington, D.C. 412 p.

Bent, A. C. 1965. Life histories of North American wagtails, shrikes, vireos, and their allies. Dover Publications., New York, NY. 411 p.

Bock, C. E., and B. Webb. 1984. Birds as grazing indicator species in southeastern Arizona. Journal of Wildlife Management 48:1045–1049.

Brooks, B. L., and S. A. Temple. 1990. Dynamics of a loggerhead shrike population in Minnesota. Wilson Bulletin 102:441–450.

Bull, E. L. 1978. Specialized habitat requirements of birds: snag management, old growth, and riparian habitat. In: R. M. DeGraaf, editor. Proceedings of the workshop on nongame bird habitat management in the coniferous forests of the western United States. U.S. Department of Agriculture Forest Service Pacific Northwest Forest and Range Experiment Station. General technical report PNW-64. p. 74–82.

Bureau of Land Management (BLM). 1979. Snake River Birds of Prey special research report. U.S. Department of the Interior, BLM, Boise District, Boise, ID. 142 p.

Bureau of Land Management (BLM). 1995. Snake River Birds of Prey National Conservation Area: draft management plan. U.S. Department of the Interior, BLM, Bruneau Resource Area, Lower Snake River District Office, Boise, ID. 179 p.

Bureau of Land Management (BLM). 2006. Snake River Birds of Prey National Conservation Area Draft Resource Management Plan and Environmental Impact Statement. U.S. Department of the Interior, BLM, Boise District Office, Boise, ID. ID-111-2006-EIS-1740.

Burleigh, T. D. 1972. Birds of Idaho. Caxton Printers, Caldwell, ID. 467 p.

Campbell, R. W., N. K. Dawe, D. McTaggart-Cowan, J. M. Cooper, J. W. Kaiser, and M. C. E. McNall. 1990. The birds of British Columbia. Volume 1. Non Passerines: introduction and loons through waterfowl. Royal British Columbia Museum, Victoria, BC and Environment Canada, Canadian Wildlife Service, Delta, BC. 514 p.

Carey, C. 1993. Hypothesis concerning the causes of disappearance of boreal toads from the mountains of Colorado. Conservation Biology. 7:355–362.

Carpenter, L. 1996. Raptor populations: general overview. Chapter 4A. In volume 2 Bureau of Land Management/Idaho Army National Guard Research Project Final Report., U.S. Department of the Interior, National Biological Service, Boise, ID. 10 p.

Cochran, J. F., and S. H. Anderson. 1987. Comparison of habitat attributes at sites of stable and declining long-billed curlew populations. Great Basin Naturalist 47:459–466.

Collopy, M. W. 1983. A comparison of direct observations and collections of prey remains in determining the diet of golden eagles. Journal of Wildlife Management 47:360–368.

Colwell, M. A., and J. R. Jehl. 1994. Wilson's phalarope (*Phalaropus tricolor*). In: A. Poole and F. Gill, editors. The Birds of North America, No. 83. Academy of Natural Sciences, Washington, D.C., American Ornithologists' Union. Philadelphia, PA.

Corn, P. S., and J. C. Fogelman. 1984. Extinction of montane populations of the northern leopard frog (*Rana pipiens*) in Colorado. Journal of Herpetology 18:147–152.

Cossel, J. O. 2003. Changes in reptile populations in the Snake River Birds of Prey Area, Idaho between 1978–79 and 1997–98: the effects of weather, habitat, and wildlife. Ph.D. dissertation, Idaho State University, Pocatello, ID. 133 p.

Csuti, B., A. J. Kimerling, T. A. O'Neil, M. M. Shaughnessy, E. P. Gaines, and M. M. P. Huso. 1997. Atlas of Oregon wildlife: distribution, habitat, and natural history. Oregon State University Press, Corvallis, OR. 492 p.

Davis, D. E., and M. L. Morrison. 1987. Changes in cyclic patterns of abundance in four avian species. American Birds 41:1341–1343.

Davis, W. B. 1939. The recent mammals of Idaho. Caxton Printers, Caldwell, ID. 400 p.

DeGraaf, R. M., and J. H. Rappole. 1995. Neotropical migratory birds: natural history, distribution, and population change. Cornell University Press, Ithaca, NY. 676 p.

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and rangeland birds of the United States. U.S. Department of Agriculture Forest Service, Agricultural Handbook No. 688, Washington, D.C. 625 p.

Diller, L. V., and D. R. Johnson. 1982. Ecology of reptiles in the Snake River Birds of Prey Area. U.S. Department of Interior, Bureau of Land Management, Boise District, Boise, ID. 107 p.

Diller, L. V., and R. L. Wallace. 1981. Additional distribution records and abundance of three species of snakes in southwestern Idaho. Great Basin Naturalist 41:154–157.

Diller, L. V., and R. L. Wallace. 1986. Aspects of the life history and ecology of the desert night snake (*Hypsiglena torquata deserticola*): Colubridae, in southwestern Idaho. Southwest Naturalist 31:55–64.

Dobbs, R. C., P. R. Martin, and T. E. Martin. 1998. Green-tailed Towhee (*Pipilo chlorurus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 368. Academy of Natural Sciences, Washington D.C.; American Ornithologists' Union, Philadelphia, PA. 24 p.

Doremus, J., and J. Bolln. 1987. Abundance of black-tailed jackrabbits and kangaroo rats in the Snake River Birds of Prey Area. In: K. Steenhof, editor. Snake River Birds of Prey restoration project annual report, U.S. Department of the Interior, Bureau of Land Management, Boise, ID. p. 115–120.

Dugger, B. D., and K. M. Dugger. 2002. Long-billed curlew (*Numenius americanus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 628, The Birds of North America, Inc., Philadelphia, PA.

Edelmann, F. B., and A. M. A. Holthuijzen. 1997. Presence and relative abundance of mammalian carnivores and furbearers in the C.J. Strike study area. In: Volume 2. Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power, Boise, ID. Technical Report E.3.3-H. 36 p.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in jeopardy: the imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. Stanford University Press, Stanford, CA. 259 p.

Engel, K. A., and L. S. Young. 1992. Movements and habitat use by common ravens from roost sites in southwestern Idaho. Journal of Wildlife Management 56:596–602.

Evans, R. M., and F. L. Knopf. 1993. American white pelican (*Pelecanus erythrorhynchos*). In: A. Poole and F. Gill, editors. The birds of North America, No. 57. Academy of Natural Sciences, Washington D.C.; American Ornithologists’ Union, Philadelphia, PA. 24 p.

Fenton, M. B., D. C. Tennant, and J. Wyszecki. 1987. Using echolocation calls to measure the distribution of bats: the case of *Euderma maculatum* (Vespertilionidae): use in orientation and communication. Journal of Mammalogy. 68:142–144.

Fullard, J. H., M. B. Fenton, and C. L. Furlonger. 1983. Sensory relationships of moths and bats sampled from two Nearctic sites. Canadian Journal of Zoology 61:17532–17537.

Genter, D. L. 1986. Wintering bats of the upper Snake River plain: occurrence in lava-tube caves. Great Basin Naturalist 46:241–244.

Green, J. S., and J. T. Flinders. 1980a. *Brachylagus idahoensis*. Mammalian Species 125:1–4.

Green, J. S., and J. T. Flinders. 1980b. Habitat and dietary relationships of the pygmy rabbit. Journal of Range Management 33:136–142.

Groves, C. R., B. Butterfield, A. Lippincott, B. Csuti, and J. M. Scott. 1997. Atlas of Idaho's wildlife: integrating gap analysis and natural heritage information. Idaho Department of Fish and Game, Nongame and Endangered Wildlife Program, Boise, ID. 372 p.

Groves, C. R., and J. S. Marks. 1985. Annotated checklist of Idaho vertebrates. Tebiwa 22:10–27.

Hall, E. R. 1981. The mammals of North America. John Wiley and Sons, Inc. New York, NY. 1,181 p.

Harlow, D. L., and P. H. Bloom. 1987. Raptor status reports: buteos and the golden eagle. In: Proceedings of the western raptor management symposium and workshop. National Wildlife Federation, Washington, D.C. p. 102–110.

Hickman, G. L. 1968. The ecology and breeding biology of the golden eagle in southwestern Idaho and southeastern Oregon. U.S. Department of the Interior, Bureau Sport Fisheries and Wildlife, Division of Wildlife Services. 194 p.

Holt, D. W., and S. M. Leasure. 1993. Short-eared owl (*Asio flammeus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 62. The Academy of Natural Sciences, Washington D.C., and The American Ornithologists' Union, Philadelphia, PA. 24 p.

Holthuijzen, A. M. A. 1989. Behavior and productivity of nesting prairie falcons in relation to construction activities at Swan Falls Dam. Final report. Idaho Power, Boise, ID. 77 p.

Holthuijzen, A. M. A. 1997a. An investigation of nongame bird communities in the C.J. Strike study area. In: Volume 2, Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power, Boise, ID. Technical Report E.3.2-A. 102 p.

Holthuijzen, A. M. A. 1997b. An investigation of wintering waterfowl in the C.J. Strike study area. In: Volume 2, Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power, Boise, ID. Technical Report E.3.2-C. 52 p.

Holthuijzen, A. M. A. 1997c. An investigation of threatened and endangered animal species and species of special concern in the C.J. Strike study area. In: Volume 3, Technical appendices for new license application: C.J. Strike Hydroelectric Project. Idaho Power, Boise, ID. Technical Report E.3.2-L. 60 p.

Hornocker, M. G., S. Cherry, J. P. Messick, J. S. Whitman, and J. Copeland. 1978. Dynamics of predation upon a raptor prey base in the Snake River Birds of Prey Natural Area, Idaho. U.S. Department of the Interior, Bureau of Land Management, Boise, ID. Contract No. 52500-CT5-1004.

Idaho Army National Guard (IDARNG). 2004. Integrated natural resources management plan. Available at http://emomil.state.id.us/INRMP2004.htm.

Idaho Conservation Data Center (IDCDC). 2004a. Idaho Department of Fish and Game, Boise ID. Web page [state designations]. <http://fishandgame.Idaho.gov/tech/CDC.idfg_temporary.cfm> Accessed: August 17, 2004.

Idaho Conservation Data Center (IDCDC). 2004b. Bureau of Land Management special status species. Web page about BLM designations. <http://fishandgame.Idaho.gov/tech/CDC/blm.cfm> Accessed: August 17, 2004.

Idaho Department of Fish and Game (IDFG). 2004. 2002 state harvest records. <http://www2.state.id.us/fishgame/ hunt/programsinfo/genharv.htm> Accessed: January 8, 2004.

Idaho Department of Fish and Game (IDFG). 2005. Idaho comprehensive wildlife conservation strategy. Idaho Conservation Data Center, IDFG, Boise, ID. Available at http://fishandgame.idaho.gov/cms/tech/CDC/cwcs.cfm.

Idaho Power Company (IPC). 1997. Swan Falls Hydroelectric Project, Form 80 recreation use report. Filed with the Federal Energy Regulatory Commission in April 1997. IPC, Boise, ID. 7 p.

Idaho Power Company (IPC). 1998. New License Application for C.J. Strike Hydroelectric Project, FERC Project No. 2055. Exhibits A–H and Technical Appendices, Volumes 1–9. Idaho Power, Boise, ID.

Idaho Power Company (IPC). 2003. Swan Falls Hydroelectric Project, Form 80 recreation use report. Filed with the Federal Energy Regulatory Commission in April 2003. IPC, Boise, ID. 7 p.

Idaho State Conservation Effort (ISCE). 1995. Habitat conservation assessment and conservation strategy for the Townsend's big-eared bat. ISCE, Boise, ID. Draft Report No. 1. 63 p.

Idaho State University (ISU). 2004a. Mountain lion. Digital Atlas of Idaho. <http://imnh.isu.edu/digitalatlas/bio/mammal/mamfram.htm> Accessed January 8, 2004.

Idaho State University (ISU). 2004b. Pronghorn. Digital Atlas of Idaho. <http://imnh.isu.edu/digitalatlas/bio/mammal/mamfram.htm> Accessed January 8, 2004.

Ivey, G. L., and C. P. Herziger, coordinators. 2005. Intermountain west waterbird conservation plan—a plan associated with the waterbird conservation for the Americas initiative. Version 1.0. U.S. Fish and Wildlife Service Pacific Region, Portland, OR.

Jenni, D. A., R. L. Redmond, T. K. Bicak. 1981. Behavioral ecology and habitat relationships of long-billed curlew in western Idaho. Department of Interior, Bureau of Land Management, Boise District, Boise, ID.

Johnson, M. J., C. van Riper, and K. M. Pearson. 2002. Black-throated sparrow (*Amphispiza bilineata*). In: A. Poole and F. Gill, editors. The birds of North America, No. 637. The Birds of North America, Inc., Philadelphia, PA.

Johnson, R. D., and J. E. Anderson. 1984. Diets of black-tailed jackrabbits in relation to population density and vegetation. Journal of Range Management 37:79–83.

Knick, S. T., and J. T. Rotenberry. 1995. Landscape characteristics of fragmented shrub steppe habitats and breeding passerine birds. Conservation Biology 9:1059–1071.

Kochert, M. N. 1972. Population status and chemical contamination in golden eagles in southwestern Idaho. M. Sc. thesis. University of Idaho, Moscow. 102 p.

Kochert, M. N. and K. Steenhof. 2003. Long-term nesting population and productivity changes of prairie falcons and golden eagles in the Snake River Birds of Prey National Conservation Area: 2002 report. U.S. Geological Service Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise, ID. 34 p.

Larrison, E. J., J. L. Tucker, and M. T. Jollie. 1967. Guide to Idaho birds. Journal of the Idaho Academy of Science 5:1–220.

Larson, D. L., and C. E. Bock. 1984. Determining avian habitat preferences by bird-centered vegetation sampling. In: J. Verner, M. L. Morrison, and C. J. Ralph, editors. Wildlife 2000: modeling habitat relationships of terrestrial vertebrates. University of Wisconsin Press, Madison, WI. p. 37–43.

Laurance, W. F., and T. D. Reynolds. 1984. Conformation and expansion of the reported distribution of two species of Idaho herptiles. Great Basin Naturalist 44:313–316.

Lehman, R. N., L. B. Carpenter, K. Steenhof, and M. N. Kochert. 1998. Assessing relative abundance and reproductive success of shrub-steppe raptors. Journal of Field Ornithology 69(2):244–256.

Leonard, M. L., and M. B. Fenton. 1983. Habitat use by spotted bats (*Euderma maculatum*, Chiroptera: Vespertilionidae): roosting and foraging behavior. Canadian Journal of Zoology 61:1487–1491.

Leonard, M. L., and M. B. Fenton. 1984. Echolocation calls of *Euderma maculatum* (Vespertilionidae): use in orientation and communication. Journal of Mammalogy 65:122–126.

Leonard, W. P., H. A. Brown, L. L. C. Jones, K. R. McAllister, and R. M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Seattle, WA. 168 p.

Lewis, L., and M. C. Wackenhut. 1996. 1995 Idaho bat status survey report. Idaho State Conservation Effort, Boise, ID. 11 p.

Linder, A. D., and E. Fichter. 1977. The amphibians and reptiles of Idaho. Idaho State University Press, Pocatello, ID.

Lowther, P. E. 2000. Pacific-slope flycatcher (*Empidonax difficilis*) and cordilleran flycatcher (*Empidonax occidentalis*). In: A. Poole and F. Gill, editors. The birds of North America, No. 556. Academy of Natural Sciences, Washington, D.C.,American Ornithologists' Union. Philadelphia, PA.

Marshall, D. B., M. W. Chilcote, and H. Weeks. 1996. Species at risk: sensitive, threatened, and endangered vertebrates of Oregon. 2nd edition. Oregon Department of Fish and Wildlife, Portland, OR.

Marti, C. D., K. Steenhof, M. N. Kochert, and J. S. Marks. 1993. Community trophic structure: the roles of diet, body size, and activity time in vertebrate predators. Oikos 67:6–18.

Martin, J. W., and B. A. Carlson. 1998. Sage sparrow (*Amphispiza belli*). In: A. Poole and F. Gill, editors. The birds of North America, No. 326. Academy of Natural Sciences, Washington D.C.; American Ornithologists' Union, Philadelphia, PA. 20 p.

Martin, S. G. 2002. Brewer's Blackbird (*Euphagus cyanocephalus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 616. The Birds of North America, Inc., Philadelphia, PA.

McCrimmon, D. A., J. C. Ogden, and G. T. Bancroft. 2001. Great egret (*Ardea alba*). In: A. Poole and F. Gill, editors. The birds of North America, No. 570. The Birds of North America, Inc., Philadelphia, PA.

Medin, D. E. 1992. Birds of a Great Basin sagebrush habitat in east-central Nevada. U.S. Department of Agriculture, Forest Service, Ogden, UT. Research Paper INT-45.

Meents, J. K., B. W. Anderson, and R. D. Ohmart. 1982. Vegetation relationships and food of sage sparrows wintering in honey mesquite habitat. Wilson Bulletin 94:129–138.

Messick, J. P., and M. G. Hornocker. 1981. Ecology of the badger in southwestern Idaho. Wildlife Monographs 76:1–53.

Miller, A. H. 1931. Systematic revision and natural history of the American shrikes (*Lanius*). University of California Publications in Zoology 38:11–242.

Mitchell, C. D. 1994. Trumpeter swan (*Cygnus buccinator*). In: A. Poole and F. Gill, editors. The birds of North America, No. 105. Academy of Natural Sciences, Washington, D.C.; American Ornithologists' Union, Philadelphia, PA. 24 p.

Morrison, M. L. 1981. Population trends of the loggerhead shrike in the United States. American Birds 35:754–757.

Munro, W. T., and S. T. Goodchild. 1981.Preliminary duck management plan for British Columbia. Province of British Columbia, M.O.E.

Natural Resources Conservation Service (NRCS). 2007. Plants database. U.S. Department of Agriculture, NRCS, National Plant Data Center. Baton Rouge, LA. <http://plants.usda.gov/>. Accessed on: July 1, 2007.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University of Idaho Press, Moscow, ID. 332 p.

Ogden, V. T. 1973. Nesting density and reproductive success of the prairie falcon (*Falco mexicanus*) in southwestern Idaho. M. Sc. thesis, University of Idaho, Moscow, ID. 43 p.

Olendorff, R. R., D. D. Bibles, M. T. Dean, J. R. Haugh, and M. N. Kochert. 1989. Raptor habitat management under the U.S. Bureau of Land Management multiple-use mandate. Raptor Research Report 8:1–80.

Olendorff, R. R., and M. N. Kochert. 1977. Land management for the conservation of birds of prey. In: R. D. Chancellor, editor. World conference on birds of prey. International Council for Bird Preservation, Vienna, Austria. p. 294–307.

Palmer, R. S. 1988. Prairie falcon. In: Handbook of North American birds. Yale University Press, New Haven, CT. p. 407–423.

Pampush, G. J. 1980. Status report on the long-billed curlew in the Columbia and northern Great Basins. U.S. Fish and Wildlife Service, Portland, OR. 55 p.

Peterson, C. R., E. D. Koch, and P. S. Corn. 1992. Monitoring amphibian populations in Yellowstone and Grand Teton National Parks. Unpublished report to University of Wyoming, National Park Service Research Center. 37 p.

Petersen, K. L., and L. B. Best. 1985. Nest-site selection by sage sparrows. Condor 87:217–221.

Poché, R. M. 1981. Ecology of the spotted bat (*Euderma maculatum*) in southwest Utah. Utah Division of Wildlife Research. 78 p.

Poché, R. M., and G. L. Bailie. 1974. Notes on the spotted bat (*Euderma maculatum*) from southwest Utah. Great Basin Naturalist 34:254–256.

Poché, R. M., and G. A. Ruffner. 1975. Roosting behavior of male *Euderma maculatum* from Utah. Great Basin Naturalist 35:121–122.

Pope, V., and J. C. Munger. 2003. Threats to collared lizards in Idaho. Idaho Bureau of Land Management. Boise, ID. Technical Bulletin No. 03-4.

Redmond, R. L., T. K. Bicak, and D. A. Jenni. 1981. An evaluation of breeding season census techniques for long-billed curlews (*Numenius americanus*). Studies in Avian Biology 6:197–201.

Redmond, R. L., and D. A. Jenni. 1986. Population ecology of the long-billed curlew (*Numenius americanus*) in western Idaho. Auk 103:755–767.

Repasky, R. R., and D. Schluter. 1994. Habitat distributions of wintering sparrows along an elevational gradient: tests of the food, predation, and microhabitat structure hypotheses. Journal of Animal Ecology 63:569–582.

Reynolds, T. D., T. D. Rich, and D. A. Stephens. 1999. Sage thrasher (*Oreoscoptes montanus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 463. The Birds of North America, Inc., Philadelphia, PA.

Rich, T. 1986. Habitat and nest-site selection by burrowing owls in the sagebrush steppe of Idaho. Journal of Wildlife Management 50:548–555.

Rich, T. D. 1980. Territorial behavior of the sage sparrow: spatial and random aspects. Wilson Bulletin 92:425–438.

Rickart, E. A. 1987. Mammalian species: *Spermophilus townsendii*. American Society of Mammologists 268:1–6.

Rotenberry, J. T., and J. A. Wiens. 1980. Habitat structure, patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. Ecology 61:1228–1250.

Ryder, R. A., and D. E. Manry. 1994. White-faced Ibis (*Plegadis chihi*). In: A. Poole and F. Gill, editors. The birds of North America, No. 130. Academy of Natural Sciences, Washington, D.C.; American Ornithologists' Union, Philadelphia, PA. 24 p.

Saab, V. A., C. E. Bock, T. D. Rich, and D. S. Dobkin. 1995. Livestock grazing effects in western North American. In: T. E. Martin and D. M. Finch, editors. Ecology and management of neotropical migratory birds: a synthesis and review of critical issues. Oxford University Press. New York, NY. p. 311–353.

Saab, V. A., and T. D. Rich. 1997. Large-scale conservation assessment for neotropical migratory land birds in the Interior Columbia River Basin. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.Portland, OR. General Technical Report PNW-399. 57 p.

Sallabanks, R. 2006. Idaho bald eagle nesting report 2006. Idaho Department of Fish and Game. Boise, ID. 36 p.

Sauer, J. R., J. E. Hines, and J. Fallon. 2001. The North American breeding bird survey results and analysis 1966–2000. Version 2001.2. U.S. Geological Survey Patuxent Wildlife Research Center, Laurel, MD.

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American breeding bird survey results and analysis 1966–2005. Version 6.2.2006. U.S. Geological Survey Patuxent Wildlife Research Center, Laurel, MD.

Savard, J. R. 1987. Status report on Barrow’s goldeneye. Canadian Wildlife Service and Yukon Region. Technical Report Service No. 23. 81 p.

Science Applications International Corporation (SAIC). 2001. An assessment of sage grouse and sharp-tailed grouse habitat in transmission line corridors associated with the Hells Canyon hydroelectric complex. In: Technical appendices for new license application: Hells Canyon Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.2-9/10. 84 p.

Scott, M. D. 1991. Mule deer management plan 1991–1995. Idaho Department of Fish and Game, Boise, ID. 79 p.

Sedgwick, J. A. 2000. Willow flycatcher (*Empidonax traillii*). In: A. Poole and F. Gill, editors. The birds of North America, No. 533. Academy of Natural Sciences, Washington, D.C.; American Ornithologists' Union, Philadelphia, PA.

Slater, J. R. 1941. The distribution of amphibians and reptiles in Idaho. College of Puget Sound, Tacoma, WA. Occasional Papers in Biology 14:78–109.

Spahr, R., L. Armstrong, D. Atwood, and M. Rath. 1991. Threatened, endangered, and sensitive species of the Intermountain Region. U.S. Department of Agriculture, Forest Service, Fisheries and Wildlife Management, Intermountain Region, Ogden, UT.

Squires, J. R., and R. T. Reynolds. 1997. Northern goshawk (*Accipiter gentilis*). In: A. Poole and F. Gill, editors. The birds of North America, No. 298. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Stebbins, R. C. 1985. A field guide to western reptiles and amphibians. Houghton Mifflin, Boston, MA. 279 p.

Steenhof, K. 1998. Prairie falcon (*Falco mexicanus*). In: A. Poole and F. Gill, editors. The birds of North America, No. 346. The Birds of North America, Inc., Philadelphia, PA.

Steenhof, K., and M. N. Kochert. 1985. Dietary shifts of sympatric buteos during a prey decline. Oecologia 66:1–16.

Steenhof, K., and M. N. Kochert. 1988. Dietary responses of three raptor species to changing prey densities in a natural environment. Journal of Animal Ecology 57:37–48.

Steenhof, K., M. N. Kochert, L. B. Carpenter, and R. N. Lehman. 1999. Long-term prairie falcon population changes in relation to prey abundance, weather, land uses, and habitat conditions. Condor 101:28–42.

Steenhof, K., M. N. Kochert, and T. L. McDonald. 1997. Interactive effects of prey and weather on golden eagle reproduction. Journal of Animal Ecology 66:350–362.

Stephens, D. A., and S. H. Sturts. 1998. Idaho bird distribution. Special Publication No. 13, Idaho Museum of Natural History, Pocatello, ID. Special Publication No. 13. 77 p.

Sunderman, N., F. B. Edelmann, and A. M. A. Holthuijzen. 1997a. Presence and relative abundance of upland game birds in the C.J. Strike Study Area. In: Volume 2, Technical appendices for C.J. Strike Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.2-B. 34 p.

Sunderman, N., F. B. Edelmann, and A. M. A. Holthuijzen. 1997b. Presence and relative abundance of big game in the C.J. Strike Study Area. In: Volume 2, Technical appendices for C.J. Strike Hydroelectric Project. Idaho Power Company, Boise, ID. Technical Report E.3.2-J. 28 p.

Tanner, W. W. 1941. The reptiles and amphibians of Idaho, No. 1. Great Basin Naturalist 2:87–97.

Taylor, D. M., and C. D. Littlefield. 1986. Willow flycatcher and yellow warbler response to cattle grazing. American Birds 40:1169–1173.

Taylor, D. M., and C. H. Trost. 1987. Status of rare birds in Idaho. Murrelet 68:69–93.

Trost, C. H. 1985. Status and distribution of colonial nesting waterbirds in Idaho. In: Special report to Idaho Department of Fish and Game. Idaho Department of Fish and Game, Boise, ID.

Trost, C. H., and A. Gerstell. 1994. Status and distribution of nesting waterbirds in southern Idaho. In: Special report to the nongame and endangered wildlife program. Idaho Department of Fish and Game, Boise, ID. 106 p.

U.S. Fish and Wildlife Service (USFWS). 1999. Population status and trends of sea ducks in Alaska. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 137 p.

U.S. Geological Survey (USGS). 1996. Effects of military training and fire in the Snake River Birds of Prey National Conservation Area. Bureau of Land Management/Idaho Army National Guard research project final report. U.S. Department of the Interior, Geological Survey, Biological Research Division, Snake River Field Station, Boise, ID. 130 p.

U.S. Geological Survey (USGS). 2006. Shrub Map. U.S. Department of the Interior, USGS, Snake River Field Station, Boise, ID. <http://sagemap.wr.usgs.gov/shrubmap_home.htm>.

Vickery, P. D. 1996. Grasshopper sparrow (*Ammodramus savannarum*). In: A. Poole and F. Gill, editors. The Birds of North America, No. 239. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Vitt, L. J., and R. D. Ohmart. 1978. Herpetofauna of the lower Colorado River: Davis Dam to the Mexican border. Proceedings of the Western Foundation of Vertebrate Zoology 2:35–72.

Wackenhut, M. C. 1990. Bat species over-wintering in lava-tube caves in Lincoln, Gooding, Blaine, Bingham, and Butte Counties, Idaho. MS thesis, Idaho State University, Pocatello, ID.

Wai-Ping, V., and M. B. Fenton. 1989. Ecology of the spotted bat (*Euderma maculatum*) roosting and foraging behavior. Journal of Mammalogy 70:617–622.

Warner, R. M., and N. J. Czaplewski. 1984. *Myotis volans*. Mammalian Species 224:1–14.

Weiss, N. T., and B. J. Verts. 1984. Habitat and distribution of pygmy rabbits (*Sylvilagus idahoensis*) in Oregon. Great Basin Naturalist 44:563–571.

Wellicome, T. I. 1997. Reproductive performance of burrowing owls (*Speotyto cunicularia*): effects of supplemental food. In: J. L. Lincer and K. Steenhof, editors. The burrowing owl: its biology and management. Raptor Research Report No. 9. Raptor Research Foundation. p. 68–73.

White, S. M., B. L. Welch, and J. T. Flinders. 1982a. Monoterpenoid content of pygmy rabbit ingesta. Journal of Range Management 35:107–109.

White, S. M., J. T. Flinders, and B. L. Welch. 1982b. Preference of pygmy rabbits (*Brachylagus idahoensis*) for various populations of big sagebrush (*Artemisia tridentata*). Journal of Range Management 35:724–726.

Wiens, J. A., and J. T. Rotenberry. 1981. Habitat associations and community structure of birds in shrub-steppe environments. Ecological Monographs 5:21–41.

Wilde, D. B. 1978. A population analysis of the pygmy rabbit (*Sylvilagus idahoensis*) on the INEL site. Ph.D. dissertation, Idaho State University, Pocatello, ID. 172 p.

Willis, M. J., G. P. Keister, Jr., D. A. Immell, D. M. Jones, R. M. Powell, and K. R. Durbin. 1993. Sage grouse in Oregon. Oregon Department of Fish and Game, Portland, OR. Wildlife Research Report 15. 71 p.

Wilson, D. E., and S. Ruff, editors. 1999. The Smithsonian book of North America mammals. Smithsonian Institution Press, Washington, D.C.

Woods, C. P. 1993. Variation in loggerhead shrike nest composition between two shrub species in southwest Idaho. Journal of Field Ornithology 64:352–357.

Woods, C. P., and T. J. Cade. 1996. Nesting habitat of the loggerhead shrike in sagebrush. Condor 98:75–81.

Woodsworth, G. C., G. P. Bell, and M. Fenton. 1981. Observations of the echolocation, feeding behaviour, and habitat use of *Euderma maculatum* (*Chiroptera: Vespertilionidae*) in southcentral British Columbia. Canadian Journal of Zoology 59:1099–1102.

Wulforst, J., G. Annandale, and A. M. A. Holthuijzen. 2000. Terrestrial effects of load following. Response to the Federal Energy Regulatory Commission Additional Information Request No. 13. Idaho Power Company, Boise, ID.

Yensen, E., and P. W. Sherman. 2003. Ground-dwelling squirrels of the Pacific Northwest. U.S. Fish and Wildlife Service, Snake River Fish and Wildlife Office, Boise, ID. 28 p.

Younk, J. V., and M. J. Bechard. 1994. Breeding ecology of the northern goshawk in high-elevation aspen forests of northern Nevada. In: W. M. Block, M. L. Morrison, and M. H. Reiser, editors. The northern goshawk: ecology and management. Proceedings of the symposium of the Cooper Ornithological Society; April 14–15, 1993; acramento, CA. Studies in Avian Biology 16:119–121.

Zarn, M. 1974. Burrowing Owl: *Speotyto cunicularia hypugaea*. Habitat management series for unique or endangered species. Bureau of Land Management Denver Service Center, Denver, CO. Report No. 11. 25 p.

This page left blank intentionally.

Table E.3.2-1 Mean number of nesting territories of five diurnal bird of prey species by 10-km survey unit in the Snake River canyon near the Swan Falls Project, 1990–1994 and 2002. See Figure E.3.2-5 for unit locations.

	10-km Survey Unit						
Species	**3**	**4**	**5**	**6**	**7**	**8**	**All**
2002							
Prairie Falcon	0.0	25.0	39.0	29.0	17.0	21.0	131.0
1990–1994							
Prairie Falcon	0.8	21.2	42.0	29.8	13.4	11.0	118.2
Golden Eagle	0.0	3.0	1.0	3.0	2.0	2.0	11.0
Red-tailed Hawk	1.0	1.6	7.2	7.0	6.4	5.4	28.6
Ferruginous Hawk	0.0	0.0	0.2	1.8	3.4	3.2	8.6
All Raptor Species	1.8	25.8	50.4	41.6	25.2	21.6	166.4
Common Raven	2.0	8.2	19.2	14.0	9.2	7.2	59.8
All Species	3.8	34.0	69.6	55.6	34.4	28.8	226.2

Table E.3.2-2 Endangered, threatened, candidate, and special status species known or suspected to occur in the Swan Falls study area.

Taxon	IDCDC[a] Rank	IDFG[b] Status	USBLM[c] Status	USFWS[d] Status	Observed in Study Area[e] or Vicinity
Amphibians					
Northern leopard frog	G4/S3	SC	2	SC	+
Rana pipiens					
Woodhouse's toad	G5/S3	U	3	SC	+
Bufo woodhousii					
Western toad	G4/S4	SC	3	SC	+
Bufo boreas					
Reptiles					
Groundsnake	G5/S3	SC	3	SC	+
Sonora semiannulata					
Ringneck snake	G5/S1?	SC	5	SC	+
Diadophis punctatus					
Long-nosed snake	G5/S3	SC	3	SC	+
Rhinocheilus lecontei					
Night snake	G5/S3		5		+
Hypsiglena torquata					
Common garter snake	G5/S5		3	SC	+
Thamnophis sirtalis					
Great Basin collared lizard	G5/S2	SC	3	SC	+
Crotaphytus bicinctores					
Birds					
Trumpeter swan	G4/S1B	SC	3	SC	+
Cygnus buccinator					

Table E.3.2-2 Endangered, threatened, candidate, and special status species known or suspected to occur in the Swan Falls study area. (Continued)

Taxon	IDCDC[a] Rank	IDFG[b] Status	USBLM[c] Status	USFWS[d] Status	Observed in Study Area[e] or Vicinity
American white pelican	G3/S1	SC	2		+
Pelecanus erythrorhynchos					
Barrow's goldeneye	G5/S3		5		+
Bucephala islandica					
Black tern	G4/S2	SC	3		+
Chlidonias niger					
Great egret	G5/S1	SC			+
Casmerodius albus					
White-faced ibis	G5/S2	P	4		+
Plegadis chihi					
Long-billed curlew	G5/S3	P	5	SC	+
Numenius americanus					
Wilson's phalarope	G5/S4		5		+
Phalaropes tricolor					
Greater sage grouse	G4/S3		2	SC	+
Centrocercus urophasianus					
Northern goshawk	G5/S4	U	3	SC	+
Accipiter gentilis					
Ferruginous hawk	G4/S3	P	3	SC	+
Buteo regalis					
Swainson's hawk	G4/S4		5		+
Buteo swainsoni					
Prairie falcon	G5/S5		3	SC	+
Falco mexicanus					

Table E.3.2-2 Endangered, threatened, candidate, and special status species known or suspected to occur in the Swan Falls study area. (Continued)

Taxon	IDCDC[a] Rank	IDFG[b] Status	USBLM[c] Status	USFWS[d] Status	Observed in Study Area[e] or Vicinity
Peregrine falcon	G4/S1	E	3		+
Falco peregrinus					
Bald eagle	G3/S3	E	1		+
Haliaeetus leucocephalus					
Burrowing owl	G4/S3	P	5	SC	+
Athene cunicularia					
Short-eared owl	G5/S5		5		+
Asio flammeus					
Yellow-billed cuckoo	G5/S1	SC	1	C	?
Coccyzus americanus					
Lewis' woodpecker	G4/S4		3	SC	+
Melanerpes lewis					
Red-naped sapsucker	G5/S5		5		+
Sphyrapicus nuchalis					
Loggerhead shrike	G4/S3	SC	3	SC	+
Lanius ludovicianus					
Cordilleran flycatcher	G5/S5		5		+
Empidonax occidentalis					
Willow flycatcher	G5/S4		3	SC	+
Empidonax traillii					
Olive-sided flycatcher	G4/S4		3		+
Contopus cooperi					
Calliope hummingbird	G5/S5		3		+
Stella calliope					

Table E.3.2-2 Endangered, threatened, candidate, and special status species known or suspected to occur in the Swan Falls study area. (Continued)

Taxon	IDCDC[a] Rank	IDFG[b] Status	USBLM[c] Status	USFWS[d] Status	Observed in Study Area[e] or Vicinity
Sage thrasher	G5/S5		5		+
Oreoscoptes montanus					
Grasshopper sparrow	G4/S3		5	SC	+
Ammodramus savannarum					
Black-throated sparrow	G5/S2		4	SC	+
Amphispiza bilineata					
Brewer's sparrow	G4/S4		3	SC	+
Spizella breweri					
Sage sparrow	G5/S4		3	SC	+
Amphispiza belli					
Green-tailed towhee	G5/S5		5		+
Pipilo chlorurus					
Brewer's blackbird	G5/S5		5		+
Euphagus cyanocephalus					
Cassin's finch	G5/S5		5		+
Carpodacus cassinii					
Mammals					
Townsend's big-eared bat	G4/S2?	SC	3	SC	+
Corynorhinus townsendii					
Spotted bat	G4/S4	SC	3	SC	+
Euderma maculatum					
Western small-footed myotis	G4/S4?		5		+
Myotis ciliolabrum					
Yuma myotis	G5/S3?	U	5	SC	+
Myotis yumanensis					

Table E.3.2-2 Endangered, threatened, candidate, and special status species known or suspected to occur in the Swan Falls study area. (Continued)

Taxon	IDCDC[a] Rank	IDFG[b] Status	USBLM[c] Status	USFWS[d] Status	Observed in Study Area[e] or Vicinity
Long-legged myotis	G5/S3	U	5		+
Myotis volans					
Fringed Myotis	G5/S1	SC	3		+
Myotis thysanodes					
California myotis	G5/S1?	U	4		+
Myotis californius					
Western pipistrelle	G5/S1?	SC	5	SC	+
Pipistrellus hesperus					
Piute ground squirrel	G?/S?		3		+
Spermophilus mollis					
Pygmy rabbit	G4/S3	SC	2	SC	+
Brachylagus idahoensis					

a. Heritage program ranks: G = global rank indicator; T = trinomial rank indicator; S = state rank indicator; 1 = critically imperiled; 2 = imperiled due to rarity; 3 = very rare and local throughout its range or found locally; 4 = apparently secure; and 5 = demonstrably secure.

b. IDFG ranks: SC = species of concern; T/E = threatened/endangered; S = sensitive; and U = unknown status.

c. BLM ranks: Type 1 = threatened, endangered, proposed, and candidate species; Type 2 = rangewide/globally imperiled species; Type 3 = regional/state imperiled species; Type 4 = peripheral species; and 5 = watch list.

d. USFWS (federal) status: LE = listed endangered; LT = listed threatened; SC = species of concern.

e. Based on BLM 2006.

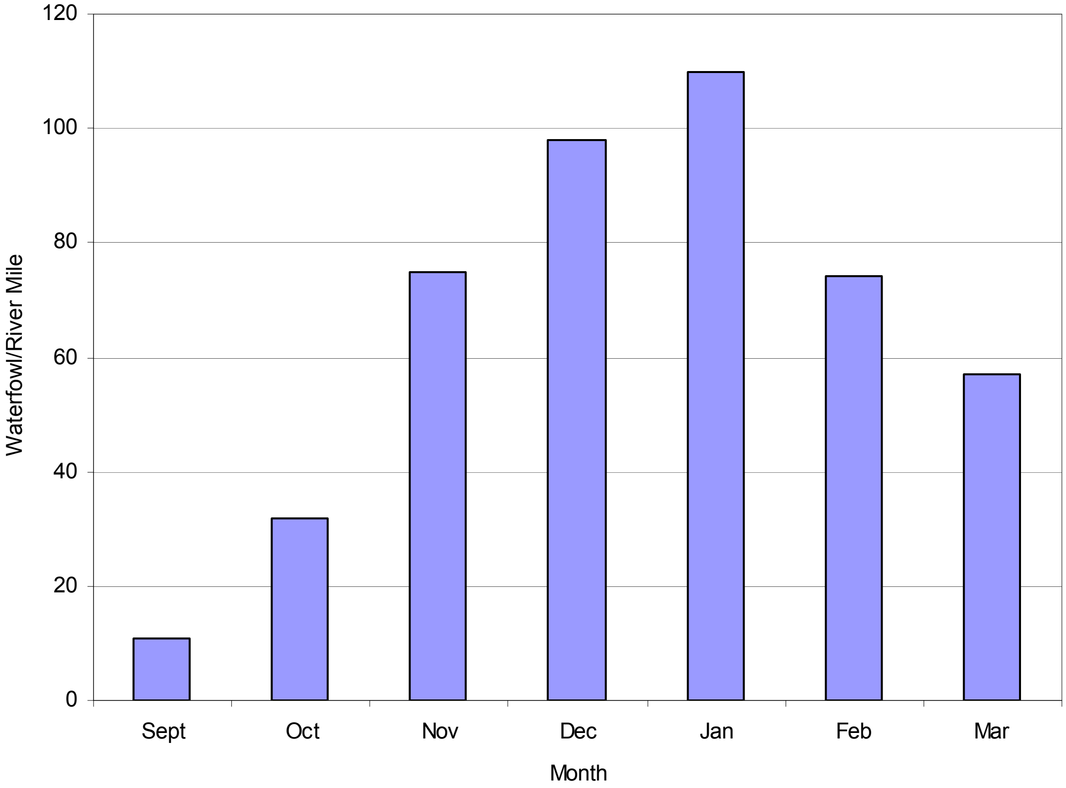


Figure E.3.2-1 Average numbers of waterfowl per river mile in the Swan Falls study area, September through March 1989–1992.

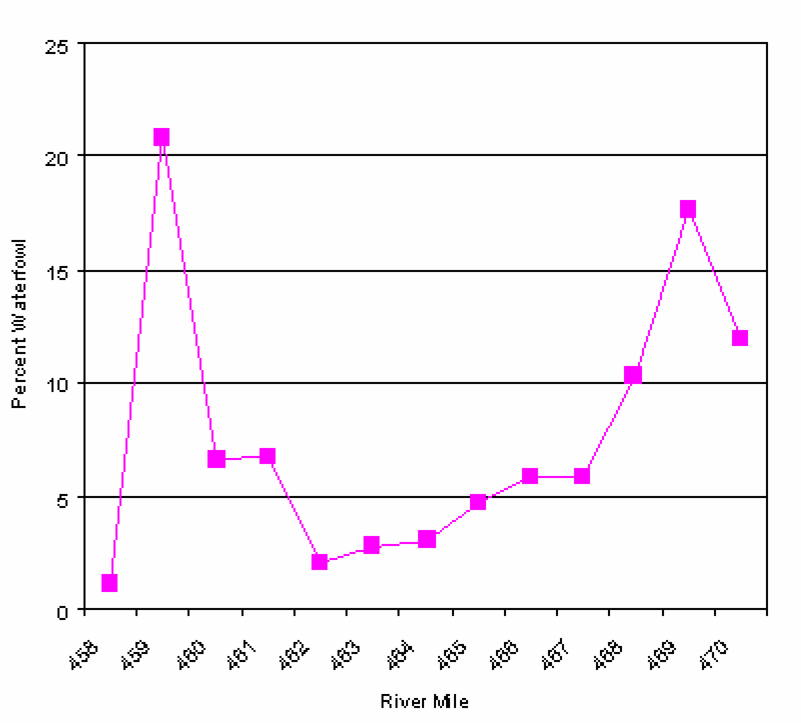


Figure E.3.2-2 **Relative distribution of waterfowl in the Swan Falls study area, September through March 1989–1992.**

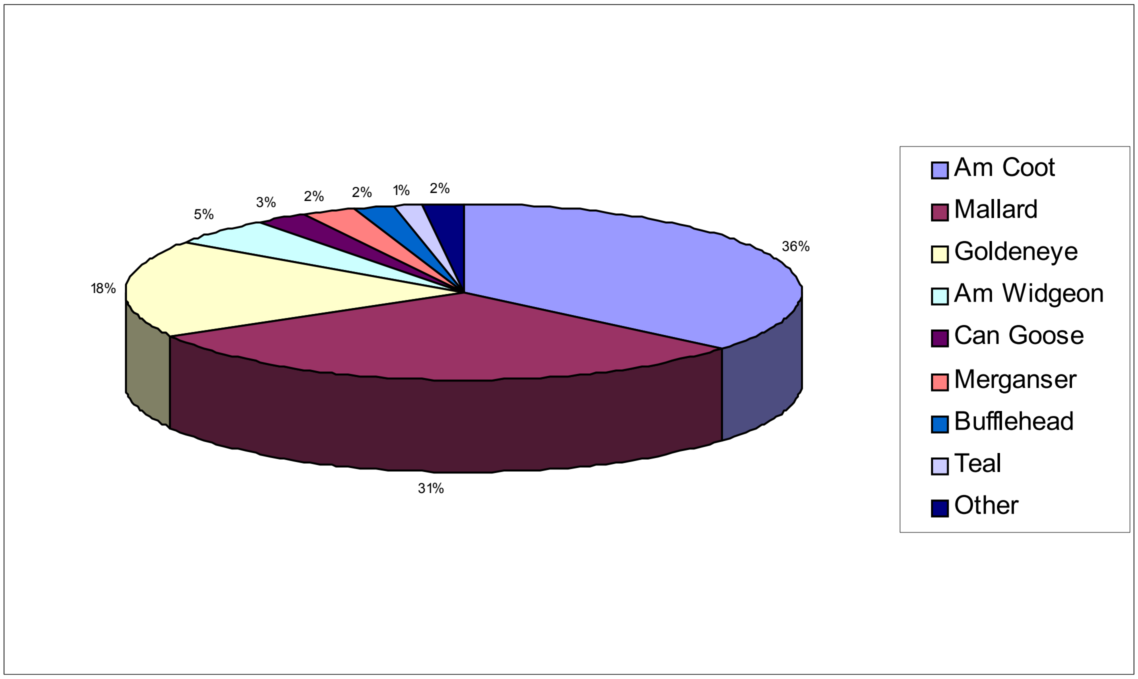


Figure E.3.2-3 Composition of wintering waterfowl in the Swan Falls study area, September through March 1989–1992.

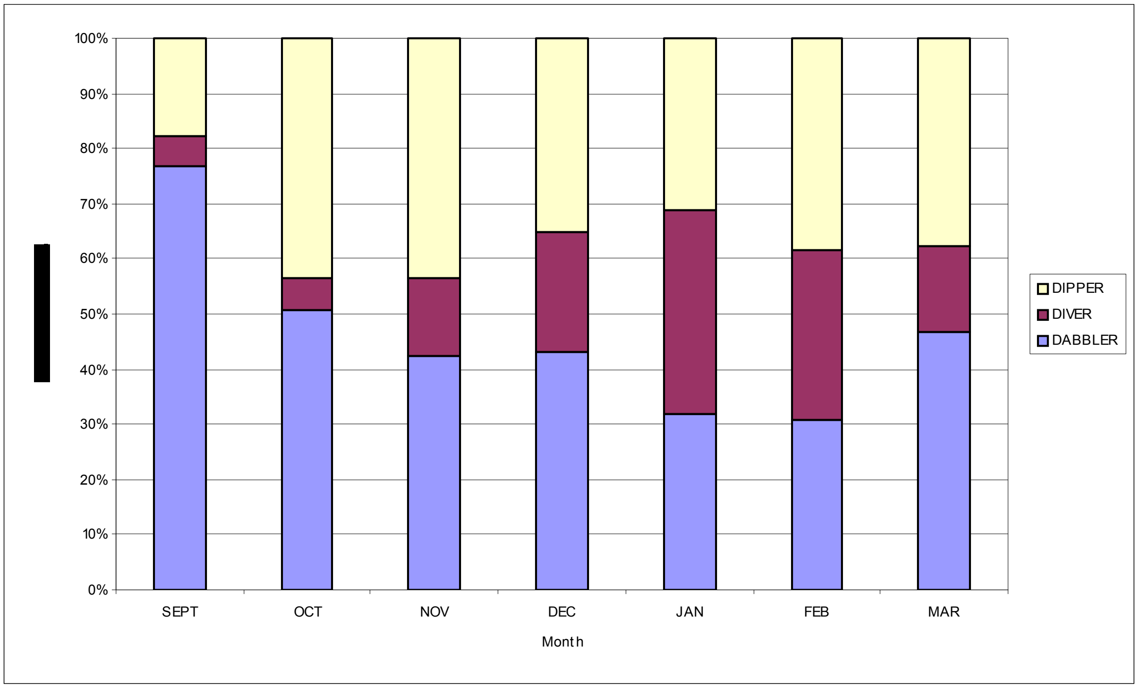


Figure E.3.2-4 Foraging guild composition of wintering waterfowl in the Swan Falls study area, September through March 1989–1992.

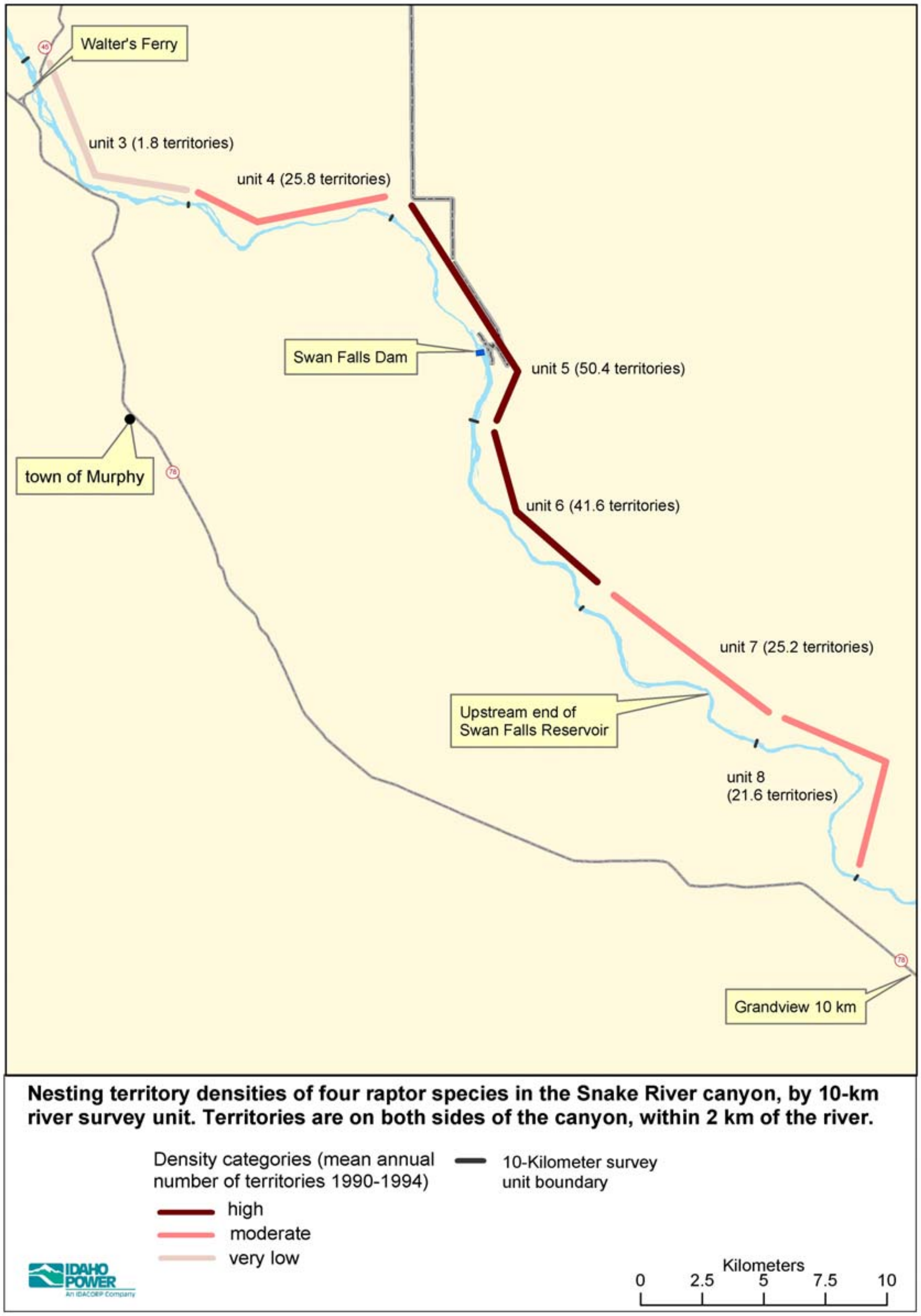
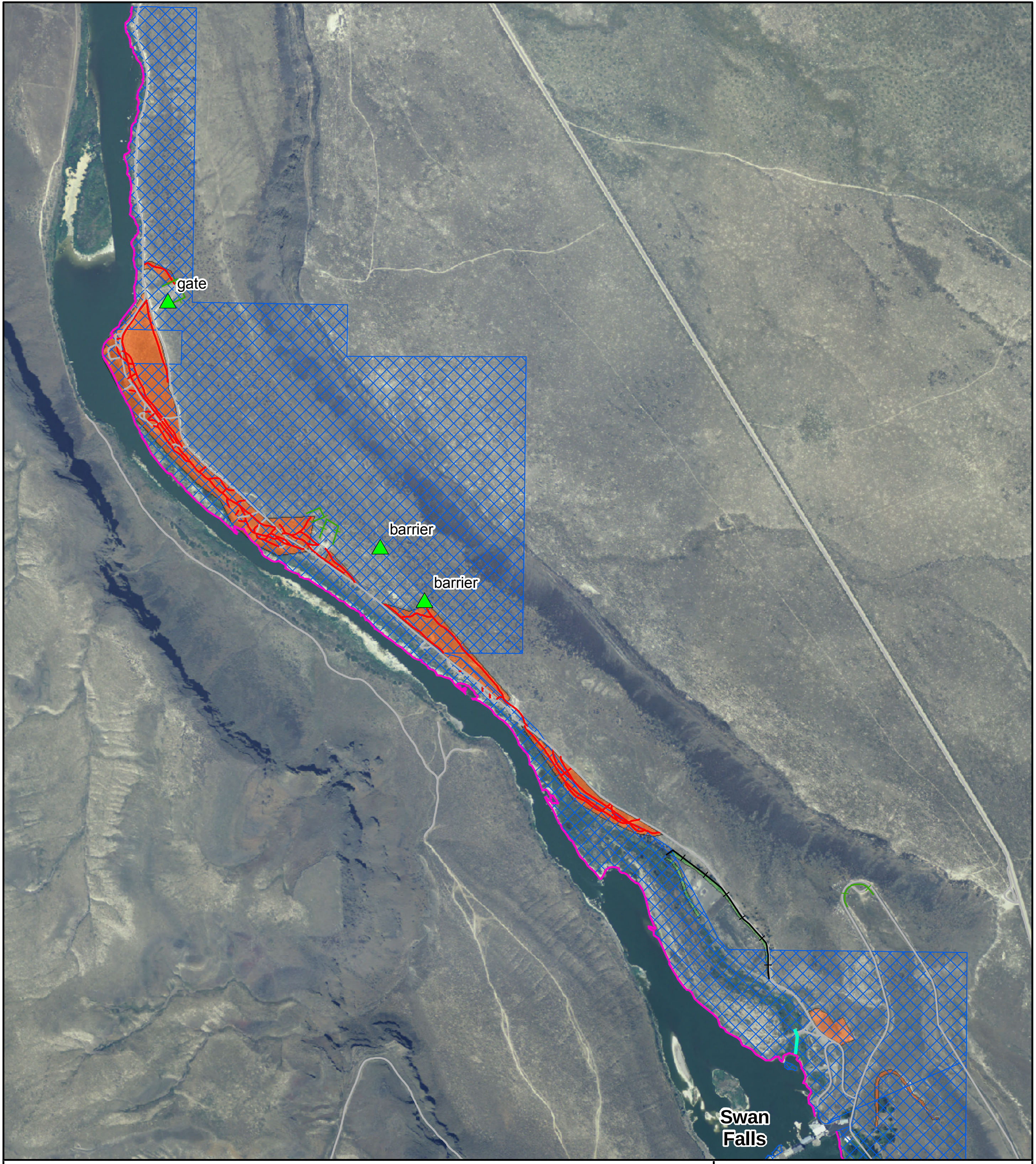
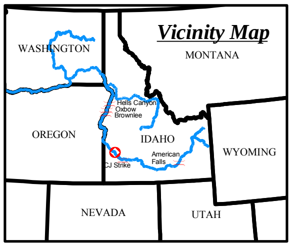


Figure E.3.2-5 Nesting territory densities of four raptor species in the Snake River Canyon, by 10-km river survey unit. Territories are on both sides of the canyon, within 2 km of the river.

Theme: \\fresno\Enviro_GIS\Terrestrial\SwanFalls\VegetationPME\Mxds\PME_326AB.mxd





IDAHO POWER
An IDACORP Company

Features Legend

- 🟧 Reclaim Impact Areas
- ▨ Revegetation Areas
- 🟩 Plant Visual Barriers
- ▨ WeedControl
- ▨ Shoreline Enhancement
- ∧ Reclaimed Road Beds
- ∧ Other Roads
- ∧ New Fence
- ∧ Replace Fence
- — Culvert

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503
IDAHO POWER COMPANY, BOISE, ID 2007

Figure E.3.2-6 A

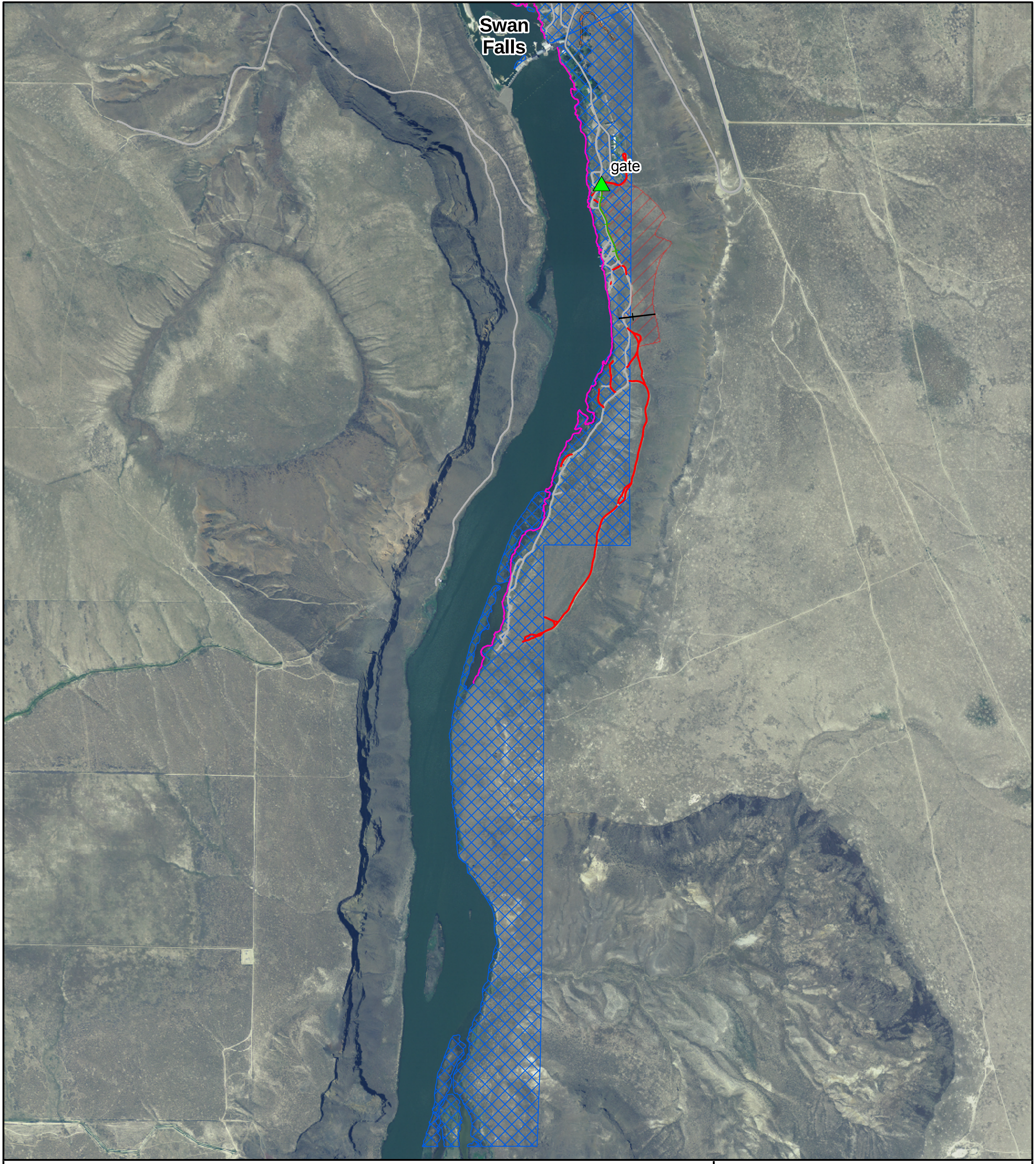
Proposed Protection, Mitigation and Enhancement (PM&E) measures for the Swan Falls Hydroelectric Project.

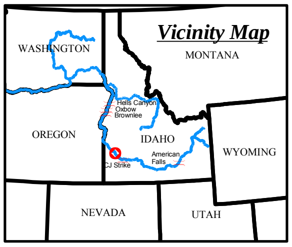
0 380 760 1,520 2,280 Feet

09/07/07

This page left blank intentionally.

Theme: \\fresno\Enviro_GIS\Terrestrial\SwanFalls\VegetationPME\Mxds\PME_326AB.mxd





Features Legend

🟧 Reclaim Impact Areas	Reclaimed Road Beds
▨ Revegetation Areas	Other Roads
🟩 Plant Visual Barriers	New Fence
▨ WeedControl	Replace Fence
🟪 Shoreline Enhancement	Culvert

IDAHO POWER
An IDACORP Company

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503
IDAHO POWER COMPANY, BOISE, ID 2007

Figure E.3.2-6 B

Proposed Protection, Mitigation and Enhancement (PM&E) measures for the Swan Falls Hydroelectric Project.

0 650 1,300 2,600 3,900 Feet

09/07/07

This page left blank intentionally.

E.3.3. Botanical Resources

E.3.3.1. Description of Botanical Resources

E.3.3.1.1. Botanical Resources of Upstream, Reservoir, and Downstream Reaches

The history of landscape-level vegetation changes in southwest Idaho has been well studied and documented. By 1900, excessive livestock grazing and other disturbance factors (Quinney 1999, Yensen 1982) had significantly modified the pre-settlement sagebrush steppe habitat of the Snake River Plain. Non-native, invasive plant species were becoming established in the area, most likely beginning in the late 1800s with *Salsola kali*[1] (Russian thistle), which spread via the Snake River (Yensen 1982). By the 1930s, *Bromus tectorum* (cheatgrass), an exotic winter annual, was well established in the understory of the shrub steppe in southern Idaho (Quinney 1999). By providing a readily ignitable, nearly continuous carpet of vegetative material across the landscape, cheatgrass became a major factor in increasing both the frequency and intensity of wildfires on the Snake River Plain. Consequently, as wildfires have increased, native plant species have been displaced by more weeds that thrive in the early-seral, disturbed conditions brought about by frequent fires (West 1999).

The current vegetation condition in the Snake River Birds of Prey National Conservation Area (NCA) reflects these past and ongoing influences. Much of the original sagebrush steppe habitat was reduced to stands of exotic annual species devoid of shrubs. Many of the remaining sagebrush stands have understories dominated by early-seral native and exotic grasses, generally with an absence of any significant native forb layer (Quinney 1999). A comprehensive vegetation study of the NCA conducted by the United States Geological Survey (USGS) showed that, in the relatively short period between 1979 and 1994, shrub steppe coverage in the NCA decreased from 51% to 30%, with a corresponding increase in grassland coverage (BLM 1979, USGS 1996). Since 1994, much of this remaining shrub steppe habitat has burned in various wildfires and currently contains primarily exotic grasses (Quinney 1999).

---

[1] Nomenclature follows the U.S. Department of Agriculture, Natural Resources Conservation Service database (NRCS 2007).

E.3.3.1.1.1. General Vegetation Resources

A cover-type map was developed for the study area, and each of the cover types and vegetation assemblages that composed these cover types were described (Technical Report E.3.3-A). The study area was defined as all lands below the Snake River Canyon rim within 0.5 miles of the reservoir/river centerline, from river mile (RM) 471.0 downstream to Guffey Bridge at RM 447.2 (a total area of 12,045 acres) (Figure 1 in Technical Report E.3.3-A).

In August 2004, stereo color infrared imagery was flown at a scale of 1:7,200 (1 inch = 600 feet) for the study area. Primary control points were established in the study area using Topcon global positioning system (GPS) receivers to support the airborne GPS photography. Accurate ground data were used to post-process the airborne GPS data to yield *XYZ* coordinates. Full, analytical digital aerotriangulation techniques were used to extend the control as required to complete the mapping. Boeing SoftPlotter® software was used to generate color infrared ortho-rectified imagery. All aerial mapping data met or exceeded National Map Accuracy Standards. Well-defined planimetry shown in the ortho imagery is accurate to within ± 2.5 feet horizontally.

A geographic information system (GIS) was used to map vegetation polygons and all related spatial information. ArcInfo® software was used to digitize vegetation boundaries onscreen from ortho-rectified color infrared photography. Classification was based on 26 vegetation, natural feature, and land-use cover types (Table 1 in Technical Report E.3.3-A). Minimum mapping units were established and followed for riparian (15 m^2) and upland vegetations (30 m^2), and most of the digitizing was done at scales of 1:1,400 for riparian and 1:3,000 for upland vegetation. Field verification of the vegetation map was done between 2005 and 2006. The vegetation map was then corrected and a final topology check completed.

Vegetation was mapped for 20,612.9 acres, using 23 land-use cover types. In the study area (12,045.5 acres), upland cover types dominated, not including water (78.0% of total acreage) Dominant upland cover types included *Grassland* (3,066.4 acres), *Shrubland* (2,649.1 acres), *Shrub Savanna* (2,225.0 acres), and *Forbland* (270.3 acres) (Table E.3.3-1). Other upland cover types (*Tree Savanna*, *Desertic Shrubland*, and *Desertic Herbland*) each comprised <1% of total acreage cover typed. Riparian cover types comprised 458.9 acres or 3.8% of the total study area. Of the riparian cover types, *Emergent Herbaceous Wetland* showed the highest acreage

(211.9 acres), followed by *Scrub-Shrub Wetland* (184.9 acres), *Forested Wetland* (35.9 acres), and *Shore and Bottomland Wetland* (26.3 acres) (Table E.3.3-1). All other land-use cover types covered relatively small percentages of the study area, with the exception of *Cliff/Talus/Slope* (1,175.1 acres) and *Agriculture* (595.0 acres).

The Swan Falls Federal Energy Regulatory Commission (FERC) project boundary is entirely enclosed by the Swan Falls study area (Figure 1 in Technical Report E.3.3-A) and encompasses approximately 2,191.8 acres (Tables 5 and 6 in Technical Report E.3.3-A). The project boundary extends upstream approximately 12 miles from the dam along Swan Falls Reservoir and only several hundred meters below the dam (Figure 1 in Technical Report E.3.3-A). Approximately 2,093.5 acres are within the project boundary upstream, and 98.3 acres are downstream of the dam (Table 6 in Technical Report E.3.3-A). Most of the land, not including water, within the project boundary is in upland cover types (936.3 out of 1,264.7 acres, or 74.0%). The main upland cover types that are within the project boundary are *Shrubland* (510.3 acres), *Shrub Savanna* (254.5 acres), *Grassland* (138.0 acres), and *Forbland* (26.8 acres) (Table 6 in Technical Report E.3.3-A). Riparian cover types cover approximately 208.6 acres, or 16.4% of lands, not including water, within the project boundary. *Emergent Herbaceous Wetland* (109.6 acres), *Scrub-Shrub Wetland* (63.6 acres), *Forested Wetland* (29.1 acres), and *Shore and Bottomland Wetland* (6.3 acres) were delineated (Table 6 and Figures 2.1–2.6 in Technical Report E.3.3-A). Although the project boundary extends only several hundred meters below Swan Falls Dam, the relative proportion of cover types is similar upstream and downstream of the dam (Table 6 in Technical Report E.3.3-A). Land ownership within the project boundary is almost equally distributed between private (668 acres) and federal or state ownership (590 acres) (Table 5 in Technical Report E.3.3-A). Most of the private lands are owned in fee title by the Applicant (584 acres) and the remaining acreage by The Nature Conservancy (84 acres). The Applicant owns additional acreage downstream of Swan Falls Dam, but these lands are not within the FERC project boundary (Table 3 in Technical Report E.3.3-A).

Using the cover-type map developed by the Applicant for the Swan Falls Project, vegetation polygons were selected for sampling using a stratified, random selection method. In general, one polygon from each mapped cover type was selected for sampling for each half river mile, resulting in 125 upland and 180 riparian polygons to be sampled. All transects in a cover type were then grouped into plant assemblages using Two-Way Indicator Species Analysis. The vast majority of transects (*n* = 118) were classified into one of the four, primary upland cover types occurring in the study area: *Shrub Savanna* (*n* = 49 transects), *Grassland* (*n* = 33 transects), *Shrubland* (*n* = 24 transects), and *Forbland* (*n* = 12 transects). Six of the remaining seven transects were classed into the *Tree Savanna* (*n* = 2 transects), *Desertic Herbland* (*n* = 2 transects), *Desertic Shrubland* (*n* = 1 transect), and *Cliff/Talus/Slope* (*n* = 1 transect) cover types.

Five plant assemblages were identified in the *Shrub Savanna* cover type (Appendix 2 in Technical Report E.3.3-A). The *Shrub Savanna* cover type was dominated by a moderately dense shrub layer over a consistent grass layer, with various forb species contributing significant cover. The shrub layer typically consisted of *Artemisia tridentata* (big sagebrush), *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Sarcobatus vermiculatus* (greasewood), and various *Atriplex* (saltbush) species. The grass layer was dominated by *Bromus tectorum*, but native species such as *Poa secunda* (Sandberg bluegrass) also occurred at significant cover levels in some assemblages. Polygons falling into the *Shrub Savanna* cover type were scattered along the length of the study area, showing no apparent correlation with any particular river mile segment. Noxious weeds (*Cardaria draba* [whitetop] and *Lepidium latifolium* [broadleaved pepperweed]) were present, but at relatively low average covers and constancies.

Three plant assemblages were identified within the *Grassland* cover type (Appendix 2 in Technical Report E.3.3-A). Most transects classed into this cover type (31 of 33) were dominated by *Bromus tectorum* in the grass layer, with much smaller average covers for the other grass species. The other two transects were classified into one assemblage dominated by *Agropyron triticeum* (annual wheatgrass) in the grass layer (with no *Bromus tectorum*). Transects classified as assemblages in the *Grassland* cover type were scattered throughout the study area. The noxious weeds *Acroptilon repens* (hardheads or Russian knapweed), *Cardaria draba,* and *Lepidium latifolium* were found at neither high average covers nor constancies.

Four plant assemblages were identified in the *Shrubland* cover type (Appendix 2 in Technical Report E.3.3-A). The *Shrubland* cover type is dominated by a moderate to dense layer of various shrub species (typically, *Artemisia tridentata, Chrysothamnus viscidiflorus,* *Sarcobatus vermiculatus*, and several *Atriplex* species). The grass layer is primarily dominated by *Bromus tectorum*, with several native species providing lower, but still significant, cover (primarily *Poa secunda* and *Distichlis spicata* [desert saltgrass]). *Shrubland* polygons were distributed throughout the study area. Noxious weeds (*Cardaria draba* and *Lepidium perfoliatum* [clasping pepperweed]) were found at low average covers.

Three plant assemblages were identified within the *Forbland* cover type (Appendix 2 in Technical Report E.3.3-A). The *Forbland* cover type was dominated by introduced forbs (*Descurainia sophia* [herb sophia], *Erodium cicutarium* [redstem stork's bill], and *Salsola kali*). *Bromus tectorum* dominated the grass layer. *Forbland* was primarily located toward the upstream end of the study area. Noxious weeds (*Lepidium perfoliatum* and *Cardaria draba*) were present, but other non-native species dominated most transects in this cover type.

Plant assemblages were not identified for the *Tree Savanna* cover type due to the small number of sites sampled (*n* = 2). The *Tree Savanna* cover type was dominated by *Elaeagnus angustifolia* (Russian olive) at moderate cover levels. Graminoid cover was also relatively high (*Festuca* sp. [fescue] and *Distichlis spicata*). No noxious weeds were present, although *Elaeagnus angustifolia* was considered to be an invasive riparian species (Technical Report E.3.3-B).

Plant assemblages were not identified for the *Desertic Herbland* cover type due to the small number of sites sampled (*n* = 2). The *Desertic Herbland* cover type was sparsely vegetated and had low plant diversity (5 species recorded). Rock cover averaged 83% for the two transects, with only *Leymus cinereus* (basin wildrye) grass occurring at greater than 2% average cover (5.6% for *Leymus cinereus*). This cover type was found in steep rocky areas.

One *Desertic Shrubland* polygon was sampled. Total vegetative cover was low (29.0%). The shrub layer was composed of *Sarcobatus vermiculatus* and *Atriplex canescens* (fourwing saltbush). Forb and grass species comprised less than 10% cover. No noxious weeds were present.

Four riparian cover types were identified and mapped: *Shore and Bottomland Wetland*, *Emergent Herbaceous Wetland*, *Scrub-Shrub Wetland*, and *Forested Wetland* (Figures 2.2–2.6 in

Technical Report E.3.3-A). The term *Wetland* refers only to the designations developed specifically for the cover type mapping effort, and are not based on formal definitions for jurisdictional wetlands developed by the U.S. Army Corps of Engineers for purposes of applying Section 404 of the Clean Water Act (ACOE 1987). The actual extent of legally recognized wetland boundaries was not indicated on the cover-type map. In the summer of 2005, 176 riparian sample sites were sampled and classified into four riparian cover types: *Emergent Herbaceous Wetland* (60 transects), *Scrub-Shrub Wetland* (56 transects), *Forested Wetland* (39 transects), and *Shore and Bottomland Wetland* (21 transects). Table 3 in Technical Report E.3.3-A presents a summary of the plant assemblages identified in these cover types. Each of the four cover types are described below.

Five plant assemblages were identified within the *Emergent Herbaceous Wetland* cover type (Appendix 2 in Technical Report E.3.3-A). The *Emergent Herbaceous Wetland* cover type was dominated by monocot species (primarily, *Phalaris arundinacea* [reed canarygrass], *Paspalum distichum* [knotgrass], *Schoenoplectus acutus* [hardstem bulrush], *Typha latifolia* [broadleaf cattail], and *Distichlis spicata*). In general, trees and shrubs were present at low cover levels (with the exception of *Salix exigua* [narrowleaf willow] in shrub form that occurred in the assemblages at up to 5.4% average cover). This cover type was comparatively species rich, although most species occurred at low average covers, constancies, or both. Assemblages in the *Emergent Herbaceous Wetland* cover type were found throughout the study area. *Lythrum salicaria* (purple loosestrife), *Cirsium arvense* (Canada thistle), *Cardaria draba,* and *Lepidium latifolium* were found in this cover type but at a low average cover and constancy.

Four plant assemblages were identified within the *Scrub-Shrub Wetland* cover type (Appendix 2 in Technical Report E.3.3-A). Most of the sample sites were dominated by *Salix exigua* with *Elaeagnus angustifolia* as a co-dominant species. Other shrub species present were *Rhus trilobata* (skunkbrush sumac), *Salix lucida* (Pacific willow), *Rosa woodsii* (Woods' rose), *Celtis laevigata* (netleaf hackberry), and *Tamarix parviflora* (smallflower tamarisk). Dominant grass species were *Distichlis spicata, Bromus tectorum,* and *Paspalum distichum*. The forb layer was species rich, dominated by *Cardaria draba, Bassia scoparia* (burningbush), *Lepidium latifolium,* and *Chenopodium* sp. (goosefoot). The *Scrub-Shrub* cover type was found along the length of the study area. However, the *Rhus trilobata/Bromus tectorum* assemblage was only found well below the dam on the downstream reach, and the *Elaeagnus angustifolia/Distichlis spicata* assemblage was primarily limited to the reservoir reach. Noxious weeds present were *Cardaria draba, Lepidium latifolium*, *Acroptilon repens*, *Lythrum salicaria*, and *Tribulus terrestris* (puncturevine). The noxious weed community was dominated by *Lepidium latifolium*.

Six plant assemblages were identified within the *Forested Wetland* cover type (Appendix 2 in Technical Report E.3.3-A). This cover type was dominated by several introduced and native woody tree species: *Acer saccharinum* (silver maple), *Acer negundo* (boxelder), *Robinia pseudoacacia* (black locust), *Elaeagnus angustifolia*, *Salix lucida,* and *Celtis laevigata*. The shrub layer was typically dominated by shorter individuals of the dominant tree species for the assemblage, but *Ribes aureum* (golden currant), *Sarcobatus vermiculatus, Toxicodendron rydbergii* (western poison ivy), *Clematis ligusticifolia* (western white clematis), and *Salix exigua* were also present at significant cover levels. The grass layer was typically sparse (less than 25% average cover). The *Forested Wetland* cover type occurred throughout the length of the study area; several of the individual assemblages were geographically restricted. The *Celtis laevigata* assemblage was only found at the lower end of the downstream reach, while the *Salix lucida/Cardaria draba* assemblage was encountered only on the reservoir reach. The *Elaeagnus angustifolia/Cardaria draba* assemblage was recorded throughout the reservoir reach, and then clustered at the bottom of the downstream reach. The noxious weed *Cardaria draba* was often found in the forb layer, in addition to *Lepidium latifolium, Cirsium arvense,* and *Tribulus terrestris.* The invasive riparian species *Elaeagnus angustifolia* and *Tamarix parviflora* were also present.

In the *Shore and Bottomland Wetland* cover type, trees were absent, and the shrub layer was composed of *Salix exigua*, *Elaeagnus angustifolia, Rosa woodsii,* and *Salix* spp. Appendix 2 in Technical Report E.3.3-A). The forb layer was poorly developed (less than 1% average cover). *Schoenoplectus acutus* and *Paspalum distichum* were present in the grass layer, which was poorly developed (less than 1% average cover). The *Shore and Bottomland Wetland* cover type was scattered throughout the study area, except for the lowest portion of the downstream reach. The noxious weed *Lythrum salicaria* was present, as well as the invasive riparian tree *Elaeagnus angustifolia*.

E.3.3.1.1.2. Noxious Weeds

For purposes of the noxious weed investigation, the study area was defined as all lands below the canyon rim within 0.5 miles of the reservoir/river centerline, between river mile (RM) 471.0 downstream to Guffey Bridge at RM 447.2 (a total area of 12,045 acres) (Figure 1 in Technical Report E.3.3-B). The objectives of the noxious study included the following: 1) identify those noxious weeds species known or suspected to occur in the study area; 2) inventory the occurrence, distribution, and abundance of noxious weeds in the study area; 3) record the types of disturbance activities and the intensity of each type of disturbance in the study area; and 4) assess how current hydroelectric operations and other land-based disturbance activities in the study area likely affect noxious weeds on a local scale.

Due to the large size of the study area, three types of sampling units were defined: Shoreline Units ($n = 95$), Island Units ($n = 7$), and Disturbance Units ($n = 38$) (Figure 2 in Technical Report E.3.3-B). Shoreline Units were delineated based on a stratified, random sampling scheme designed to inventory 50% of all shoreline habitat within the study area. Island Units were located on islands in the reservoir or river. Disturbance Units were delineated to encompass specific on-the-ground anthropogenic disturbance features (such as roads, campsites, and trails). Thirty-six Idaho noxious weeds were targeted. In addition, four invasive riparian plant species that were not on the Idaho noxious weed list were included (*Amorpha fruticosa* [desert false indigo], *Elaeagnus angustifolia*, *Phalaris arundinacea*, and *Tamarix parviflora*). During 2005, one survey occurred between May 8 and June 13 and a second from July 5 to September 11.

Fourteen different species were recorded in 983 separate weed populations (Shoreline Units, $n = 707$; Disturbance Units, $n = 213$; and Island Units, $n = 63$) (Table 2 in Technical Report E.3.3-B). The upstream reach showed an average of 8.3 weed populations per Shoreline Unit (range 3–15, standard deviation [SD] = 2.7), while the downstream reach had an average of 8.4 populations per Shoreline Unit (range 4–13, SD = 2.2). Shoreline Units in both the upstream and downstream reaches showed a range of 3 to 9 different weed species per unit. Maps of all recorded noxious weed locations are found in Technical Report E.3.3-B (Figures 5–15). In the following, all 14 reported noxious and invasive species are discussed in more detail.

Elaeagnus angustifolia was the most abundant target weed species found (*n* = 185 populations out of 983 reported) and the fourth most abundant based on Shoreline Units occupied (90 out of 95 total) (Tables 2 and 3 and Figures 5 and 16 in Technical Report E.3.3-B). Most often, the species was growing in riparian habitats on moist (mesic) soils. The presence of *Elaeagnus angustifolia* was not significantly associated with either the upstream or downstream reach, but the size of the populations was significantly larger on the upstream reach.

Cardaria draba was the second most common target weed species recorded, based on total number of populations (*n* = 166), and the third most abundant based on number of Shoreline Units occupied (91 out of 95 units) (Tables 2 and 3 and Figures 6 and 17 in Technical Report E.3.3-B). Also, populations were larger closer to the shoreline.

Lepidium latifolium was the third most abundant target weed species found, based on total populations (*n* = 142), and ranked fifth in terms of species presence within the Shoreline Units (70 out of 95 units) (Tables 2 and 3 and Figures 7 and 18 in Technical Report E.3.3-B). However, the species showed preponderance in the downstream, compared to the upstream, Shoreline Units (present in 91% of the downstream units versus 60% of the upstream units). *Lepidium latifolium* was typically found in the riparian zone, although large populations occasionally extended into upland habitats. The presence of *Lepidium latifolium* populations was significantly and positively associated with livestock disturbance.

Lythrum salicaria was documented in 138 populations (Table 2 and Figures 8 and 19 in Technical Report E.3.3-B). The species was found in almost all (92 out of 95 total) of the Shoreline Units (Table 3 in Technical Report E.3.3-B), typically growing close to the shoreline in soils usually either saturated or moist (mesic).

Phalaris arundinacea was found in 117 populations. The species showed a similar frequency of occurrence as *Lythrum salicaria* and was found in 92 (97%) of the Shoreline Units (Tables 2 and 3, Figures 9 and 20 in Technical Report E.3.3-B). Soils in which the species grew were mostly categorized as moist to saturated.

Eighty-four populations of *Tamarix parviflora* were reported (Table 2 and Figures 10 and 21 in Technical Report E.3.3-B). The species was found in just under half of the Shoreline Units (46 out of 95 total units) (Table 3 in Technical Report E.3.3-B), typically growing in the riparian zone near the shoreline. The species usually grew in moist to mesic soils, but also occasionally in dry-to-mesic soils. The presence of *Tamarix parviflora* was significantly and positively associated with recreation disturbance. The presence of *Tamarix parviflora* was also significantly associated with the upstream reach.

Cirsium arvense was documented in 71 populations and in 36 (38%) of the Shoreline Units (Tables 2 and 3 and Figures 11 and 22 in Technical Report E.3.3-B). More populations were recorded in the downstream reach ($n = 43$) than in the upstream reach ($n = 28$). The species was found in the riparian zones, typically near the shoreline, but often extending upslope when soils were moist.

Tribulus terrestris was recorded in 46 populations, although the species occurred only in 7 of the 95 Shoreline Units (Tables 2 and 3 and Figures 12 and 23 in Technical Report E.3.3-B). The species was frequently found in upland habitats, primarily along roads and in other areas disturbed by vehicles. Occasionally, *Tribulus terrestris* was found near the shoreline, but was typically reported in xeric soils. The size of *Tribulus terrestris* populations was also positively associated with off-road vehicle (ORV) disturbance.

Only nine populations of *Chondrilla juncea* (rush skeletonweed) were reported; only three populations were located in Shoreline Units (Table 2 and Figures 13 and 24 in Technical Report E.3.3-B). In general, the species occurred in xeric soils, well outside the riparian zone. Overall, 361 individuals were found in nine populations, but 300 plants were contained in one population. Recreation disturbance was present at moderate to high levels in all nine populations. Likewise, road disturbance occurred at moderate to high levels in five of nine populations.

Eight populations of *Convolvulus arvensis* (field bindweed) were observed, primarily in Disturbance Units (Table 2 and Figures 14 and 25 in Technical Report E.3.3-B). Three of the populations grew in mesic soils and the remaining five in xeric soils. The majority of the populations were located well away from the shoreline. Recreation and road disturbances were listed as moderate to extreme in six of eight populations.

Onopordum acanthium (Scotch cottonthistle) was found in seven populations, five of which were in Shoreline Units (Table 2 and Figures 13 and 26 in Technical Report E.3.3-B). Populations were found in highly disturbed riparian and upland habitats, with soils ranging from moist to xeric. Livestock and agricultural disturbances were rated particularly high as potential drivers for several of the populations.

Seven populations of *Acroptilon repens* were reported: two on the upstream reach and five on the downstream reach (Table 2 and Figures 15 and 27 in Technical Report E.3.3-B). The plants were found growing in both upland and riparian habitats on moist to xeric soils. In total, approximately 2,500 plants were found in the seven populations, but 2,000 of those were from one population at the mouth of Sinker Creek.

Only two populations of *Aegilops cylindrica* (jointed goat grass) were found, both on the downstream reach (Table 2 and Figures 14 and 28 in Technical Report E.3.3-B) and adjacent to each other. The plants were growing in road tracks and adjacent shrub habitat in xeric soils.

One individual speciman of *Centaurea stoebe* (spotted knapweed) was located in upland habitat, approximately 15 feet from the shoreline in dry to mesic soils, just above a shrubby riparian zone on an island in the upstream reach.

In summary, noxious weed species and other invasive plants are common to abundant throughout the entire study area. At least three target weed species were found in every sampled unit. Several factors contribute to weed concentrations along shorelines of rivers and reservoirs. First, habitats are more varied and dynamic along shorelines of the Snake River and reservoir, compared to the general surrounding landscape, providing opportunities for the occurrence of a wide variety of plant species, including noxious and invasive weeds. Second, river corridors are typically exposed to higher levels of both natural and man-made disturbance activities, such as recreation, flooding, animal use, sediment deposition, and road building, compared to upland habitats outside the river corridors, favoring noxious and invasive species. Third, effective transport and dispersal of plant seeds and plant parts along the river corridor could increase weed populations and concentrations, compared to upland areas away from the river or reservoir corridor.

E.3.3.1.1.3. Threatened, Endangered, and Special Status Species

The study area was defined as all lands below the canyon rim within 0.5 miles of the reservoir/ river centerline, between RM 471.0 downstream to Guffey Bridge at RM 447.2 (a total area of 12,045 acres) (Figure 1 in Technical Report E.3.3-C). The objectives of this study included the following: 1) identify those rare plant species known or suspected to occur in the study area; 2) inventory the occurrence, distribution, and abundance of rare plants in the study area; 3) record the types of disturbance activities and the intensity of each type of disturbance in the study area; and 4) assess how current hydroelectric operations and other (land-based) disturbance activities in the study area likely affect rare plant species on a local scale.

The same sampling design was employed as used for the survey of noxious and invasive species (see section E.3.3.1.1.2.). A list of rare plant species potentially occurring in the study area was compiled based on consultation with the Bureau of Land Management (BLM) and field data collected prior to sampling (Table 1 in Technical Report E.3.3-C). Using habitat preferences, identification periods for each target species, and topographic and vegetation maps of the study area, a field-survey plan was developed to guide the timing and intensity of the field surveys. Known sites were visited to confirm assumptions regarding habitat requirements, phenology, and morphology of the target species. The first survey occurred between May 8 and June 13, 2005, primarily targeting upland species. A second complete survey was conducted from July 5 to September 11, 2005, primarily targeting the riparian-associated species.

In 2000 and 2001, surveys were conducted for BLM sensitive plants in the NCA (Mancuso et al. 2003, Mancuso and Murphy 2001). These studies documented 162 extant rare plant Element Occurrences (EO; the standard term used by the Idaho Conservation Data Center [IDCDC] to describe a local grouping of same-species individuals) in the NCA (Mancuso et al. 2003). Fourteen of the EOs documented in the IDCDC database were situated either in, or partially in, the study area. Since 2000, nine of these have been visited and verified extant, four were last observed between 1975 and 1994, and one EO was listed as a Historical

Occurrence. These 14 EOs represent five different species: *Astragalus purshii* var. *ophiogenes* (Snake River milkvetch, 7 EOs); *Teucrium canadense* var. *occidentale* (western germander, 3 EOs); *Chaenactis stevioides* (Steve's dustymaiden, 2 EOs); *Astragalus mulfordiae* (Mulford's milkvetch, 1 EO); and *Glyptopleura marginata* (carveseed) (1 EO).

Surveys in the study area documented 90 populations of nine, different, target rare plant species (Table 2 in Technical Report E.3.3-C). The following species and populations were reported: *Teucrium canadense* var. *occidentale* (*n* = 36); *Astragalus purshii* var. *ophiogenes* (*n* = 26); *Chaenactis stevioides* (*n* = 13); *Astragalus mulfordiae* (*n* = 4); *Glyptopleura marginata* (*n* = 4); *Eatonella nivea* (white false tickhead, *n* = 2); *Epipactis gigantea* (stream orchid, *n* = 2); *Psathyrotes annua* (annual psathyrotes, *n* = 2); and *Nemacladus rigidus* (stoutstem threadplant, *n* = 1). The IDCDC database contained 14 plant EOs located within, or partially within, the study area. These 14 EOs represent five different species: *Astragalus mulfordiae* (1 EO), *Astragalus purshii* var. *ophiogenes* (7 EOs), *Chaenactis stevioides* (2 EOs), *Glyptopleura marginata* (1 EO), and *Teucrium canadense* var. *occidentale* (3 EOs). However, 11 of the 14 populations were located either partially or entirely within the study area. Table 2 in Technical Report E.3.3-C provides a summary of all populations reported, including those previously recorded by the IDCDC.

A total of 36 populations of *Teucrium canadense* var. *occidentale* were found in both the upstream reach (*n* = 30) and the downstream reach (*n* = 6) (Table 2, Figures 18 and 19 in Technical Report E.3.3-C). Twenty-three populations are located within the five-mile-long stretch of reservoir immediately above Swan Falls Dam. Two populations are located either entirely or partially in EOs for the species reported by the IDCDC. The *Teucrium canadense* var. *occidentale* plants always grew in riparian habitats, usually close to the shoreline, in moist or saturated soils. The lower five miles of the reservoir, where most of the populations occur, has high recreational use (mainly boating). Interestingly, some of the most vigorous plants were present in high-use areas, such as around a boat dock and in associated camping areas.

Twenty-six populations of *Astragalus purshii* var. *ophiogenes* were documented: 15 in the downstream and 11 in the upstream reach of the Swan Falls study area (Table 2 and Figures 6 and 7 in Technical Report E.3.3-C). The populations were scattered along the length of the study area, although most of the populations ($n = 19$) were located along a stretch of canyon running from approximately three miles above to two miles below Swan Falls Dam. Only 7 of 26 populations were within mapped boundaries of EOs reported by the IDCDC. The *Astragalus purshii* var. *ophiogenes* populations were primarily found in upland shrub habitats on xeric soils. In general, populations of *Astragalus purshii* var. *ophiogenes* were extensive. Half of the *Astragalus purshii* var. *ophiogenes* populations were associated with trails. Disturbances due to roads, livestock, and off-road vehicle (ORV) use were also noted.

All 13 populations of *Chaenactis stevioides* were observed upstream of Swan Falls Dam (Table 2 and Figures 8 and 9 in Technical Report E.3.3-C). Most were located in a four-mile stretch of reservoir running upstream from Sinker Butte, but two populations were found several miles further upstream near Wildhorse Butte. Only one of the populations is likely located near or in EOs recorded by the IDCDC. The populations were on upland sites on steep to moderately steep slopes and xeric soils above the reservoir. Many of the *Chaenactis stevioides* populations were extensive, at times extending up the talus slopes for hundreds of feet. *Chaenactis stevioides* populations may be impacted by fire and, to a lesser extent, livestock, roads, recreation, and trails.

The four *Astragalus mulfordiae* populations were all located within 1,500 feet of each other near a known EO, near the downstream end of the study area (Table 2 and Figures 4 and 5 in Technical Report E.3.3-C). All four populations were likely previously reported by the IDCDC. Two of the populations were comprised of a single individual, one contained five individuals, and the fourth population was estimated at 50 individuals. All were located in dry, upland habitat. The *Astragalus mulfordiae* plants were mostly growing on loose, sandy soils on slopes near or in small, dry draws. The plants both flowered and bore fruit when recorded (June 9, 2005). ORV use, trails, livestock, fire, and recreation were all recorded as disturbances associated with the reported populations.

All four populations of *Glyptopleura marginata* were on the upstream reach (Table 2 and Figures 13 and 14 in Technical Report E.3.3-C). None of the populations was located within the mapped boundaries of previously known EOs for the species. *Glyptopleura marginata* plants were located in xeric-soiled, shrub steppe habitats on benches above the reservoir. Livestock, road, and ORV disturbances were documented at the *Glyptopleura marginata* populations.

Two new populations (i.e., not previously recorded by the IDCDC) of *Eatonella nivea* were found in the study area, located just below the rim on either side of the canyon above Swan Falls Dam (Table 2 and Figure 10 in Technical Report E.3.3-C). Both populations of *Eatonella nivea* were found on dry, sparsely vegetated basalt scree. Disturbance factors were rated moderate (roads) to slight (fire, recreation, and trails).

Two populations of *Epipactis gigantea* were found along Swan Falls Reservoir (Table 2 and Figures 11 and 12 in Technical Report E.3.3-C). The two populations of *Epipactis gigantea* found are over 47 miles from the nearest known EOs in the IDCDC database. One documented *Epipactis gigantea* population grew in riparian habitat along the reservoir. The other population was in a seep that was upslope from the shoreline. Soils were rated as mesic for both populations, and vegetative cover was high. Livestock trampled the seep population, and most of the plants were grazed to stubble height. The shoreline population was moderately impacted by recreation.

Two populations of *Psathyrotes annua* were found in the study area, both on the upstream reach (Table 2 and Figures 16 and 17 in Technical Report E.3.3-C). Neither population was considered part of any previously known EO for the species. The *Psathyrotes annua* individuals in both populations grew on xeric-soiled, sparsely vegetated slopes (32–35°). Only soil erosion was considered a moderate threat at both populations. Threats to both populations from recreation, road, ORV, and trail-related disturbances are probably limited.

One individual specimen of *Nemacladus rigidus* grew with a population of *Eatonella nivea* near the western rim of the canyon (Table 2 and Figure 15 in Technical Report E.3.3-C). The population is not part of any previously known EO as mapped by the IDCDC. The plant grew in dry, loose basalt/sandstone scree near a dirt road that provides access down from the rim. Road-related impacts are the most obvious threat to this plant, as well as fire and noxious weed invasion.

Four populations of *Astragalus mulfordiae* were documented. These populations likely were reported by the IDCDC as the Con Shea Basin EO. *Astragalus purshii* var. *ophiogenes* is relatively common within its limited range, especially within the NCA, which contains approximately half of the occurrences in Idaho (Mancuso et al. 2003). Within the study area, numerous populations were documented during this investigation, and it is likely that additional populations exist in the areas that were not surveyed. While *Astragalus purshii* var. *ophiogenes* may decline in areas of ground or vegetation disturbance, the species can tolerate at least a moderate level of disturbance at some sites.

E.3.3.1.2. Botanical Resources along Transmission Lines and Associated Service Roads

E.3.3.1.2.1. General Vegetation Resources

The general vicinity of the Swan Falls Tap (Line 954) has at least ten Shrub Map land cover classes (USGS 2006). Shrub Map is a new, regional land-cover dataset produced using decision tree classifier and other techniques to model land cover. Multi-season satellite imagery (Landsat ETM+, 1999–2003) and digital elevation model derived datasets (e.g., elevation, landform, aspect, etc.) were utilized to derive rule sets for the various land-cover classes. Field verification was conducted at many points over the landscape. On the benchland in the Swan Falls Tap right-of-way (ROW), sagebrush, semi-desert shrub steppe, and invasive annual grassland are equally dominant. Below the cliff, canyon grassland, sagebrush, and salt desert scrub occur. Nearby types include greasewood flat and sagebrush steppe (Figure 3 in Technical Report E.3.3-D). No riparian or wetland habitat are present in the Swan Falls Tap ROW.

Predominant species observed on the benchland include *Artemisia tridentata*, *Krascheninnikovia lanata* (winterfat), *Bromus tectorum*, and *Sisymbrium altissimum* (tall tumblemustard). Below the cliff, the habitat is rocky with mostly invasive annual species such as *Bromus tectorum* and *Salsola tragus* (prickly Russian thistle), with some scattered shrubs (*Atriplex confertifolia* [shadscale saltbush] and *Atriplex canescens*). Adjacent to the service road by Tower 3 is a wet, mossy slope with native bunchgrass.

E.3.3.1.2.2. Noxious Weeds

Two noxious weed species, *Cardaria draba* and *Tribulus terrestris*, occur in the road corridor, and one noxious weed species, *Convolvulus arvensis*, occurs in the Swan Falls Tap ROW. *Cardaria draba* is locally abundant in the road corridor, close to Applicant housing in the canyon. *Tribulus terrestris* is occasionally located in the road corridor and occurs in the same disturbed site as *Cardaria draba. Convolvulus arvensis* was reported close to where the Swan Falls Tap crosses the road.

E.3.3.1.2.3. Threatened, Endangered, and Special Status Species

Six vascular species, *Astragalus purshii* var. *ophiogenes*, *Chaenactis stevioides*, *Eriogonum shockleyi* var. *packardiae (*Shockley's buckwheat), *Glyptopleura marginata*, *Ipomopsis polycladon* (many-branched ipomopsis), and *Lepidium papilliferum* (Idaho pepperweed or slickspot peppergrass), and one nonvascular species, *Catapyrenium congestum* (earth lichen) were identified as priority search species (Table 1 in Technical Report E.3.3-D).

Two known occurrences of sensitive plant species are located within 1 kilometer (km) of the study area. *Astragalus purshii* var. *ophiogenes* occurs on flat terrain above the canyon wall, approximately 0.5 km northeast of Tower 3, and *Eriogonum shockleyi* var. *packardiae*, occurs on the canyon rim approximately 150 meters (m) northwest of Tower 4.

No special status plants were detected in the Swan Falls Tap ROW or road corridors during field surveys.

E.3.3.1.2.4. Anticipated Incremental Impacts of New Developments

The Applicant performs a number of activities to keep its transmission lines operational and in good repair. These activities are either planned, such as those for routine patrols, inspections, scheduled maintenance, and scheduled emergency maintenance, or unplanned in case of emergency maintenance when public safety and/or property are threatened. New construction or developments associated with the Swan Falls Tap are not proposed.

Maintenance activities for this line include the following: annual inspection/line patrol, pole inspection and groundline treatment, and general maintenance. Currently, no plans have been proposed to change any of these maintenance activities.

E.3.3.2. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section E.3.3.3.3. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.3.3.3. Applicant's Existing and Proposed Measures or Facilities

E.3.3.3.1. Existing Measures or Facilities to Be Continued or Maintained

FERC issued the following article regarding the Swan Falls Project (FERC No. 503) on December 22, 1982.

> Article 41. The Licensee shall consult and cooperate with the Bureau of Land Management (BLM) to ensure that redevelopment of the Swan Falls Project is consistent with existing land management objectives for the area. The Commission reserves the right to resolve any dispute that may occur between the Licensee and BLM regarding land management practices.

In late December 1986 and spring 1987, two disturbed sites were reclaimed by the Applicant in consultation with the BLM: the lower part of the island, located about 200 m downstream of the Swan Falls Project, and the Owyhee County bank on the south side of the spillway gates (Idaho Power Company, *Amendment to Swan Falls License*, submitted to FERC on April 24, 1989). The BLM completed a site visit in November 1997. In its letter of November 19, 1997, the BLM stated: “We believe that the rehabilitation effort that has been completed to date has been adequate to give the established vegetation a good chance of being successful. It is our opinion that the site is clean and well kept.” Thus, the Applicant believes that Article 41, as it relates to the rebuilding of the spillway and associated ground disturbance, was successfully completed.

In January 1985, the Applicant requested FERC’s permission to postpone work on the Swan Falls Power Plant until the additional capacity was needed. An order amending the license, issued on April 30, 1987, granted this request. Subsequently, on April 24, 1989, the Applicant requested that FERC amend the license and allow the Applicant to replace the existing powerhouse and generating units. FERC issued an order amending the license on December 8, 1989. In this amended order, FERC issued additional articles, including Article 403, pertaining to the restoration of vegetative cover and wildlife habitat disturbed during reconstruction of the powerhouse.

> Article 403. The Licensee shall implement the reclamation plan providing for the restoration of vegetative cover and wildlife habitat, consisting of pages E-6 through E-10 in the exhibit E of the application for amendment of license, filed on April 24, 1989. The measures shall be implemented according to the schedule outlined in the plan.

The reclamation plan, as outlined in the Applicant's *Amendment to Swan Falls License* (submitted to FERC on April 24, 1989) and ordered by FERC to be implemented in Article 403, was implemented in October and November 1994, following completion of the new powerhouse. Approximately 18 acres of disturbed sites were reclaimed. The main focus for revegetation work was at three separate areas downstream of Swan Falls Dam: the laydown yard, island, and spoils area. The Applicant, fulfilling the requirements set forth in Article 403, successfully completed this rehabilitation effort.

E.3.3.3.2. New Measures or Facilities Proposed by the Applicant

The following existing botanical measures would be maintained over the life of the new license. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.3.3.3.2.1. Protect, Enhance, and Restore Riparian Habitat

Reference is made to section E.3.2.3.2.1 for this measure.

E.3.3.3.2.2. Protect, Enhance, and Restore Upland Habitat

Reference is made to section E.3.2.3.2.2 for this measure.

E.3.3.3.2.3. Noxious Weed Control, Monitoring, and Reseeding

Justification

Noxious weeds and other invasive species are common in the Swan Falls study area (Technical Reports E.3.3-A and E.3.3-B). The expansion of the impromptu road system, both upstream and downstream of Swan Falls Dam, on Applicant-owned lands has impacted both upland and riparian vegetation, which has provided ample opportunity for weeds to establish, propagate, and expand. These species impact wildlife habitat and wildlife species that depend on upland and riparian habitats for their life cycles. For some weed species, hydroelectric operations appear to influence the presence and abundance. Other noxious weed species appear to be promoted by the generally high, land-based disturbance levels mainly associated with human activities along both the reservoir and the unimpounded river reach (Tables 5 and 6 in Technical Report E.3.3-B).

Goal

The general goal of the Applicant is to control noxious and undesirable species on Applicant-owned lands within the study area by conducting weed control efforts on 689 acres of Applicant-owned lands. The Applicant also proposes to cooperatively manage for noxious and undesirable species on other lands not owned by the Applicant within the FERC project boundary, including 572 acres of federal lands within the FERC project boundary.

Description

The Applicant conducted surveys for noxious and undesirable weed species in the Swan Falls study area (Technical Report E.3.3-B). Thus, the current composition and distribution of the weed community is well understood. Based on this information, the Applicant proposes to implement targeted control of noxious and undesirable weed species. This program will apply to all Applicant-owned lands associated with the Swan Falls Hydroelectric Project. The Applicant proposes to work cooperatively with other land management agencies that control lands within the FERC project boundary. The Applicant proposes to conduct weed-control efforts on 689 acres of Applicant-owned lands and 572 acres of federal lands within the FERC project boundary (Table 5 in Technical Report E.3.3-A). Standard control measures will be applied to noxious weeds and undesirable species, including biological, chemical, mechanical, and cultural measures.

Associated Benefits

Control of noxious weeds and undesirable species will benefit riparian and upland botanical resources. Likewise, wildlife species, including special status species are impacted by habitat degradation caused by the presence and spread of noxious and undesirable species (Technical Reports E.3.2-B, E.3.2-C, E.3.3-A, E.3.3-B, and E.3.3-C,). Lack of native vegetation cover, due to the presence of weeds, may cause soil erosion. Noxious and invasive species may impact the visual quality of an area. Control of noxious weeds and undesirable species, coupled with enhancement of both upland and riparian habitat, will improve botanical, wildlife, soil, and visual resources in the area.

Implementation or Construction Schedule

Time Frame	Action
Within 1 year after license is issued	*Planning Phase*
	Develop site-specific plans, including the following: • Goals and objectives • Implementation schedule • Monitoring schedule
Within 2 years after license is issued	*Implementation Phase*
	Develop project plans
	Implement projects
Beginning 5 years after license is issued and continuing for the life of the license	*Adaptive Monitoring Phase*
	Implement monitoring
	Adapt control measures as needed
	Produce monitoring reports

Cost Estimate

Project	Time Frame (yrs)	Annual Cost ($)		Total Cost ($)	
		O&M[a]	Capital	O&M	Capital
Noxious weed control, monitoring, and reseeding					
Develop weed control plan	Year 1	6,000		6,000	

Project	**Time Frame (yrs)**	**Annual Cost ($)**		**Total Cost ($)**	
		O&M[a]	**Capital**	**O&M**	**Capital**
Implement plan	Annually from years 2–30	11,069		321,000	
Monitor	Year 1 and at 5-year increments through year 30	4,286		30,000	
Report	Year 1 and at 5-year increments through year 30	2,857		20,000	
Total				**377,000**	

a. O&M = Operations and maintenance.

Location Map

Reference is made to Figures 5 through 15 in Technical Report E.3.3-B for locations to target noxious weeds and undesirable species.

E.3.3.3.2.4. Protect and Monitor Special Status Plant Species

Justification

In southwest Idaho, degradation of the sagebrush steppe plant community has been well documented due to increased frequency of wildfires, overgrazing, non-native weed invasion, widespread development, and recreational use. Much of the sagebrush steppe has been reduced to early-seral stands of *Bromus tectorum* and other invasive species. The degradation and conversion of these communities has placed significant pressure on native plants, leading to declines in the numbers of many plant species across the taxonomic spectrum. The Applicant reported nine, target special status plant species in the study area, totaling 90 populations (Technical Report E.3.3-C). Recreational activities, roads, trails, and livestock impact special status plant populations in the study area (Table 3 in Technical Report E.3.3-C). The Applicant proposes to avoid impacts to special status plant populations. Therefore, special status plant populations need to be regularly monitored to determine whether impacts are taking place and to remedy the situation if impacts are reported.

Goal

The Applicant proposes to protect and monitor special status species on Applicant-owned lands and other lands that are within the FERC project boundary.

Description

Applicant proposes the following specific measures:

(i) *Conduct Clearance Surveys*—Prior to any ground-disturbance activities on Applicant-owned lands and other lands within the FERC project boundary, the Applicant will conduct a special status plant clearance survey. Projects will move forward only when no special status plant species are found within the area of impact.

(ii) *Weed Control Avoidance*—The Applicant will avoid identified EOs and special status plant populations during weed-control efforts. Any new populations identified during the term of the new license will be added to the exclusion zones that will not be sprayed for weeds.

(iii)*Monitor Special Status Plant Populations*—The Applicant proposes to monitor targeted special status plant populations at five-year intervals over the term of the new license. Status information will indicate whether these populations are impacted by external disturbance factors. If such factors are found to exist, the Applicant will take appropriate measures to protect the impacted special status plant populations.

Associated Benefits

Protection of special status plant populations has inherent value, but such protection efforts will also benefit upland and riparian habitats where the special status species are found. Protection measures will enrich and enhance the overall biodiversity of plant communities within both the study area and the NCA in general.

Implementation or Construction Schedule

Time Frame	Action
Within 1 year after license is issued	*Planning Phase*
	Develop site-specifc plans, including the following: • Goals and objectives • Implementation schedule • Monitoring schedule
Within 2 years after license is issued	*Implementation Phase*
	Develop project plans
	Conduct clearance surveys
Beginning 5 years after license is issued and continuing for the life of the license	*Adaptive Monitoring Phase*
	Implement monitoring
	Adapt control measures as needed
	Produce monitoring reports

Cost Estimate

Project	Time Frame (yrs)	Annual Cost ($)		Total Cost ($)	
		O&M	Capital	O&M	Capital
Protect and monitor special plant species					
Conduct clearance surveys					
Develop clearance plans	Annually from year 1–30	133		4,000	
Implement plan	Annually from years 2–30	845		24,500	
Report	Year 5 and at 5-year increments through year 30	667		4,000	
Subtotal				*32,500*	
Special status species avoidance					
Develop plans	Year 1	133		4,000	
Implement plan	Annually from years 2–30	963		27,914	
Report	Year 5 and at 5-year increments through year 30	600		3,600	

Project	**Time Frame (yrs)**	**Annual Cost ($)**		**Total Cost ($)**	
		O&M	**Capital**	**O&M**	**Capital**
Subtotal				*35,514*	
Monitor special status plant populations					
Develop monitoring plan	Year 1	4,000		4,000	
Monitor special status plants	Year 5 and at 5-year increments through year 30	2,000		12,000	
Implement adaptive management	Year 5 and at 5-year increments through year 30	1,667		10,000	
Report	Year 5 and at 5-year increments through year 30	1,250		7,500	
Subtotal				*33,500*	
Total				**101,514**	

Location Map

Table 3 in Technical Report E.3.3-C describes the special status plant populations found in the study area. The Applicant has location information available for each reported special status plant population for management and monitoring purposes.

E.3.3.3.2.5. Develop and Implement Transmission Line Operation and Maintenance Plan

Justification

The Swan Falls Tap extends approximately 1.2 miles from the Swan Falls Power Plant to the Strike Junction–Caldwell 138-kV transmission line. Maintenance activities include annual inspections, pole treatments on a 10-year cycle, and repair and replacement of structures and associated hardware (Technical Report E.3.2-D). In 2006, surveys for sensitive plant species were conducted but no sensitive plants were found in the study area (Technical Report E.3.2-D). Two species of noxious weeds and potentially 20 sensitive wildlife species are present within the ROW. O&M activities are infrequent and are focused on a small number of poles. Potential impacts in the ROW are minimal due to the limited time spent at each structure and are unlikely to impact existing plant communities or sensitive plant or animal species. However, there is a possibility for impacts to botanical and wildlife resources caused by the Applicant’s O&M activities (section 3 in Technical Report E.3.3-D).

Goal

The Applicant proposes measures to eliminate or minimize potential impacts to botanical and wildlife resources as a result of major ground-disturbance activities along the Swan Falls Tap in compliance with BLM ROW grant stipulations.

Description

The Applicant's O&M activities have minimal potential to disturb botanical and wildlife resources within the vicinity of the Swan Falls Tap. The Applicant proposes to implement the following protection, mitigation, and enhancement (PM&E) measures to protect botanical and wildlife resources when major ground-disturbance activities would occur as a result of a catastrophic event at the Swan Falls Tap:

(i) *Develop O&M Plan*—The Applicant proposes to develop an O&M plan for the Swan Falls Tap that will include specific PM&E measures. Measures will address both annual ongoing O&M activities, as well as measures to be implemented as a result of a catastrophic event at the Swan Falls Tap promulgated by fire, vandalism, or a weather-related phenomenon.

(ii) *Mitigate for Ground-Disturbing Activities*—Ground-disturbing activities, due to annual O&M inspections, will be minimized by continuing to drive overland and use existing roads. When major ground-disturbance activities occur as a result of a catastrophic event at the Swan Falls Tap, the Applicant proposes to revegetate affected areas using native plant materials.

(iii) *Monitor and Control Noxious Weeds*—The Applicant will monitor for noxious weeds following major ground-disturbing activities. If noxious weeds occur as a result of the Applicant's activities, the Applicant will consult with the BLM authorized officer and treat the noxious weeds as agreed.

(iv) *Comply with BLM ROW Grant (No. IDI-29012) Stipulation*—The Applicant will comply with the ROW grant stipulations for the Swan Falls Tap regarding pesticide use.

Associated Benefits

Proposed PM&E measures are specific to the ROW for the Swan Falls Tap. Potential impacts of O&M activities are considered to be minimal (section 7 in Technical Report E.3.3-D) and contained to a small area. Associated benefits of the proposed measures extend to minimize any soil erosion as a result of major O&M activities with significant ground disturbance or avoidance of the spread of noxious weeds, while maintaining and possibly improving visual qualities of the area.

Implementation or Construction Schedule

Time Frame	Action
Within 1 year after license is issued	*Planning Phase*
	Develop site-specific O&M plan, including the following: • Goals and objectives • Implementation schedule
Within 2 years after license is issued	*Implementation Phase*
	Develop project plans
Beginning 2 years after license is issued and continuing for the life of the license	*Monitoring Phase*
	Monitoring will take place only during major ground-disturbance activities
	Implement PM&E measures as needed

Cost Estimate

The Swan Falls Tap was recently built, and O&M activities associated with this line are expected to be minimal, as are resource impacts. Only in the case of catastrophic failure of the Swan Falls Tap due to fire, vandalism, or weather-related phenomenon, would major construction and ground disturbance take place. Under these circumstances, the Applicant would implement proposed PM&E measures related to the Swan Falls Tap.

Location Map

Reference is made to Figure 2 in Technical Report E.3.3-D for the location of the Swan Falls Tap and the associated ROW.

E.3.3.3.3. Measures or Facilities Recommended by the Agencies

Measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. The comment letters often did not clearly indicate specific recommended measures. However, the Applicant made a good faith effort to extract as many recommended measures as possible. In section E.3.2.3.3, the Applicant includes agency-recommended measures for botanical resources where those measures were clearly stated and contained specific elements. Full responses to these comments are in Attachment F of the Consultation Appendix.

E.3.3.3.3.1. Accepted or Conditionally Accepted Measures or Facilities

No measures or facilities were recommended by the agencies.

E.3.3.3.3.2. Rejected Measures or Facilities and Explanations for Rejection

No measures or facilities were recommended by the agencies.

E.3.3.4. Anticipated Impacts on Botanical Resources

E.3.3.4.1. Swan Falls Reservoir and Vicinity

E.3.3.4.1.1. General Vegetation

Twenty-three land-use cover types were identified in the reach upstream of Swan Falls Dam (6,865.7 acres), adjoining the reservoir (Table E.3.3-1). Upland land-use cover types were most prominent and included *Grassland* (1,498.7 acres), *Shrubland* (1,359.5 acres), *Shrub Savanna* (1,295.6 acres), and *Agriculture* (575.5 acres). Other upland cover types (*Tree Savanna*, *Desertic Shrubland*, *Desertic Herbland*, and *Forbland*) were much smaller in acreage, and each occupied less than 1% to 2% of the area that was cover-typed upstream (Table E.3.3-1).

Four wetland cover types were identified in the upstream reach: *Emergent Herbaceous Wetland* (118.2 acres), *Scrub-Shrub Wetland* (73.6 acres), *Forested Wetland* (32.3 acres), and *Shore and Bottomland Wetland* (4.2 acres). Wetland cover types are concentrated in the upper part of Swan Falls Reservoir, which is relatively shallow. Relatively stable water levels and a shallow topography favors the development of wetland cover types; specifically, *Emergent Herbaceous Wetland* and *Forested Wetland* (Table E.3.3-1).

A description of each of the cover types is found in section E.3.3.1, to which further reference is made.

E.3.3.4.1.2. Noxious Weeds

Several metrics were used to evaluate noxious and undesirable species in the Swan Falls study area, including the number of populations, presence, and average total net area occupied by a target species (Tables 2–4 in Technical Report E.3.3-B). The upstream reach showed an average of 8.3 weed populations per Shoreline Unit (range 3–15 species), similar to the downstream reach (8.4 populations per Shoreline Unit, range 4–13 species) (section 3.1 in Technical Report E.3.3-B). Weed species were widely distributed in both the upstream and downstream reaches (5 and 6 weed species present per Shoreline Unit, respectively) (section 3.1 and Figures 5–15 in Technical Report E.3.3-B).

In the upstream reach a total of 463 weed populations were reported (Table 2 in Technical Report E.3.3-B). *Cardaria draba*, *Lythrum salicaria*, and *Tamarix parviflora* showed larger numbers of weed populations in the upstream, compared to the downstream, reach (Table 2 in Technical Report E.3.3-B). However, reported total net area covered by a target species per sample unit (Shoreline Unit) provides a much more distinct difference between the upstream and the downstream reach (Table 4 in Technical Report E.3.3-B). *Elaeagnus angustifolia* populations occupied, on average, 10 times the area per sample unit in the upstream reach ascompared to the downstream reach. Average area occupied, per sample unit, by *Cardaria draba*, *Lythrum salicaria*, *Phalaris arundinacea*, and *Tamarix parviflora* were all larger in the upstream reach compared to the downstream reach (Table 4 in Technical Report E.3.3-B). The presence of these species showed an affinity to the wetted zone associated with the reservoir (i.e., the Flow Zone, Table 5 in Technical Report E.3.3-B). *Lythrum salicaria* and *Phalaris arundinacea* showed a close affinity to the shoreline. The area of a sample unit dominated by *Elaeagnus angustifolia* increased with the presence of livestock disturbance, and the presence of agricultural activities increased the area dominated by *Cardaria draba* in a sample unit (Table 6 in Technical Report E.3.3-B).

Relatively stable water levels and a shallow topography in the lower part of the reservoir reach, resulting in a relatively large wetted zone, generally encourages the proliferation of several noxious or undesirable species, specifically *Elaeagnus angustifolia*, *Lythrum salicaria*, *Phalaris arundinacea*, and a relatively recent invader, *Tamarix parviflora*.

E.3.3.4.1.3. Threatened and Endangered Plant Species

Nine rare plant species were reported in the study area (Table 2 in Technical Report E.3.3-C). Three species were found in both the upstream and downstream reaches (*Astragalus purshii* var. *ophiogenes*, *Eatonella nivea*, and *Teucrium canadense* var. *occidentale*); four species were observed only in the upstream reach (*Chaenactis stevioides*, *Epipactis gigantea*, *Glyptopleura marginata*, and *Psathyrotes annua*); and the remaining two species (*Astragalus mulfordiae* and *Nemacladus rigidus*) were observed only in the downstream reach.

Eleven populations of *Astragalus purshii* var. *ophiogenes* were documented in the upstream reach (Table 2 and Figures 6 and 7 in Technical Report E.3.3-C). These populations were scattered along the length of the study area, although most of the populations (n = 19) were located along a stretch of canyon running from approximately three miles above to two miles below Swan Falls Dam. *Astragalus purshii* var. *ophiogenes* populations were associated with trails. Populations of these species were considered to be affected by roads, livestock, and ORV use.

Two populations of *Eatonella nivea* were reported in the study area (Table 2 and Figure 10 in Technical Report E.3.3-C). Both populations of *Eatonella nivea* were found on dry, sparsely vegetated basalt scree. Disturbance factors that may affect *Eatonella nivea* populations were rated moderate (roads) to slight (fire, recreation, and trails).

Thirty of 36 populations of *Teucrium canadense* var. *occidentale* were in the upstream reach (Table 2 and Figures 18 and 19 in Technical Report E.3.3-C). Twenty-three populations were located within the five-mile-long stretch of reservoir immediately above Swan Falls Dam. *Teucrium canadense* var. *occidentale* plants always grew in riparian habitats, usually close to the shoreline, in moist or saturated soils. The lower five miles of the reservoir, where most of the populations occur, has high recreational use (mainly boating). Some of the most vigorous plants were present in high-use areas, such as around a boat dock and in associated camping areas.

Thirteen populations of *Chaenactis stevioides* were observed upstream of Swan Falls Dam (Table 2 and Figures 8 and 9 in Technical Report E.3.3-C). Most were located in a four-mile stretch of reservoir running upstream from Sinker Butte, but two populations were found several miles further upstream near Wildhorse Butte. The populations were on upland sites on steep to moderately steep slopes and xeric soils above the reservoir. Many of the *Chaenactis stevioides* populations were extensive, at times extending up the talus slopes for hundreds of feet. *Chaenactis stevioides* populations may be impacted by fire and, to a lesser extent, by livestock, roads, recreation, and trails.

Two populations of *Epipactis gigantea* were recorded along Swan Falls Reservoir (Table 2 and Figures 11 and 12 in Technical Report E.3.3-C). One *Epipactis gigantea* population grew in riparian habitat along the reservoir, and the other population grew in a seep upslope from the shoreline. Livestock trampled the seep population, and most of the plants were grazed to stubble height. The shoreline population was moderately impacted by recreation.

Four populations of *Glyptopleura marginata* were found in the upstream reach (Table 2 and Figures 13 and 14 in Technical Report E.3.3-C). *Glyptopleura marginata* plants were located in xeric-soiled, shrub steppe habitats on benches above the reservoir. Livestock, road, and ORV disturbances were documented at the *Glyptopleura marginata* populations.

Two populations of *Psathyrotes annua* were documented in the upstream reach (Table 2 and Figures 16 and 17 in Technical Report E.3.3-C). The *Psathyrotes annua* individuals in both populations grew on sparsely vegetated slopes (32–35°) in xeric soils. Only soil erosion was considered a moderate threat to both populations. Threats to the populations from recreation, road, ORV, and trail-related disturbances are probably limited.

Five of seven rare plant species found in the upstream reach are upland plants. Direct effects on these species from operation and maintenance of the Swan Falls Project are likely limited. Populations of these species were considered to be affected by noxious weed invasion, livestock grazing, recreation, and wildfire. Only *Teucrium canadense* var. *occidentale* appears to be strictly associated with the shoreline and mean high-water mark. Changes in reservoir operations may effect these populations. The other riparian associate found, *Epipactis gigantea*, was found in two populations—one being located at an upland seep, well above the reservoir level. As such, this population would likely be subject to similar disturbance factors as the upland species, with the additional threat of changing hydrologic conditions at the seep. The other *Epipactis gigantea* population, while located near the shoreline, was likely not directly affected by fluctuating water levels in the reservoir.

E.3.3.4.1.4. Shoreline Erosion of Terrestrial Habitat

Approximately 40.90 miles of shoreline were inventoried in the upstream reach. This included all shorelines, including islands. Thirty-two erosion sites were reported for a total length of 4.78 miles (11.68% of the shoreline inventoried), or 7.45 acres (Table E.3.3-2). Half the sites were between 26 to 500 m^2. Also, many sites (11) were reported between 1,001 to 5,000 m^2. The metrics of each site were variable: average length was 239.1 m (±311.7 m), average height was 3.3 m (±1.4 m), and average surface area was 942.7 m^2 (±1,250 m^2). Slumping was the most common (93.8%) type of erosion reported. Only one site was classified as an upland sheet wash, and one site was associated with scouring (Table E.3.3-2).

The most common wetland cover types associated with all erosion sites (n = 32 sites) were *Emergent Herbaceous Wetland* (96.9% of sites) and *Scrub-Shrub Wetland* (68.8% of sites). Upland cover types associated with erosion sites were *Shrubland* (81.3%) and *Shrub Savanna* (n = 13 sites, 12.5%). The two most common factors identified to potentially cause erosion were erosive soils and wind-caused waves along Swan Falls Reservoir (Table E.3.3-2). Wind-caused waves are thought to play a significant role in shoreline erosion. High wind speeds can generate waves ranging from 0.2 m to 1.8 m in height and move sediment particles greater than

1.0 millimeter in size from 0.2 to 5.0 m below the water surface (the Applicant's unpublished data). *Parks/Recreatio*n (3.1%) was the only land-use cover type associated with erosion sites.

Cut banks provided habitat for nesting birds. Burrows were most likely used by bank swallows (*Riparia riparia*), northern rough-winged swallows (*Stelgidopteryx serripennis*), and belted kingfisher (*Ceryle alcyon*). Wetland vegetation was associated with all of the shoreline erosion sites. Wetlands are part of the ecological continuum or gradient between aquatic and terrestrial ecosystems and have a disproportionately high use by wildlife and humans compared to the abundance of wetlands across the landscape.

The Applicant evaluated operational impacts of the C.J. Strike Project downstream of C.J. Strike Dam to Swan Falls Dam for the C.J. Strike final license application (IPC 1998). Mitigation was proposed in that license application to offset project-related impacts. FERC directed the Applicant to conduct additional evaluations of project operations downstream of the C.J. Strike Project (Wulforst et al. 2000). In C.J. Strike Article 412 (Riparian Habitat Acquisition), FERC ordered the Applicant to acquire at least 170 acres of riparian habitat to mitigate for downstream operational impacts of the project. Therefore, no impact studies are conducted for the reservoir reach of the Swan Falls study area.

E.3.3.4.1.5. Human Activities and Botanical Resources

Reference is made to Technical Report E.3.2-B.

E.3.3.4.2. Downstream of the Swan Falls Project

E.3.3.4.2.1. Downstream Operations and General Vegetation

The Applicant's proposed operation of the Swan Falls Project may affect the persistence and establishment of perennial riparian vegetation along shorelines of the Snake River. Therefore, one issue for relicensing is the potential impact of future operations on riparian habitat. Specifically, the Applicant assessed the extent (acreage) of riparian habitat (i.e., cover types) impacted by proposed operations and provided information for the development of proposed PM&E of riparian habitat in the study area (Technical Report E.3.2-A). The evaluation area for this study is the shoreline fluctuation zone in the river reach downstream of Swan Falls Dam to the Guffey Bridge (RM 470 to 447.2).

The shoreline fluctuation zone is a polygon that follows the contours formed by the characteristic maximum and minimum daily flows (section 4.2.2 in Technical Report E.3.2-A), extending from Swan Falls Dam to Guffey Bridge (Figure 1 in Technical Report E.3.2-A). Shoreline geometry and stage-discharge relationships (section 4.2.3 in Technical Report E.3.2-A) defined the lateral (or upslope) boundaries of the evaluation area. The evaluation period, June 1 to August 31, was the growing season for riparian vegetation.

CHEOPS®, a simulation package for hydropower systems, was used to model flow data to simulate proposed operations. Average daily minimum and maximum flows for the three runoff years from 15-minute CHEOPS outputs were calculated and then averaged to determine characteristic flows. The modeled characteristic minimum and maximum flows for proposed operations of the Swan Falls Project were 6,885 cubic feet per second (cfs) and 7,458 cfs, respectively (Table 1 in Technical Report E.3.2-A). Subsequently, stage-discharge relationships were determined for each of the 45 cross sections in the downstream reach below Swan Falls Dam using the characteristic flows as input to MIKE 11-GIS®. The cross-sectional elevation data was used to determine the vertical width of the fluctuation zone, which averaged 0.26 feet. This vertical distance resulted in an average width of 1.3 feet, given the slope of the land. Given the length of the downstream reach, 2.89 acres of land were calculated to be in the fluctuation zone (Table 2 in Technical Report E.3.2-A). The fluctuation zone was intersected with the cover-type map to calculate the acres of each cover type impacted by the fluctuation zone. Of the 2.89 acres in the fluctuation zone, 2.00 acres were riparian cover types (i.e., 0.76 acres of *Emergent Herbaceous Wetland*, 0.60 acres of *Shore and Bottomland Wetland*, and 0.69 acres of *Scrub-Shrub Wetland*) (Table 2 in Technical Report E.3.2-A). It was estimated that 0.87% of riparian vegetation in the downstream reach of the Swan Falls study area would be impacted by proposed operations (Table 2 in Technical Report E.3.2-A).

E.3.3.4.2.2. Downstream Operations and Noxious Weeds

Inferences on the downstream effects of operations on noxious and undesirable weed species were based on analyses of distribution and abundance of these species (section 2 in Technical

Report E.3.3-B). Upstream and downstream sampling efforts were similar, which allows comparison between these reaches (Figure 2 in Technical Report E.3.3-B).

Several metrics were used to evaluate noxious and undesirable weed species in the Swan Falls study area, including the number of populations, presence, and average total net area a target species occupied (Tables 2–4 in Technical Report E.3.3-B). An average of 8.4 populations per Shoreline Unit (range 4–13 populations) were reported for the downstream reach, and an average of 5.4 different weed species were present per Shoreline Unit (range 3–9 species) for the upstream reach (section 3.1 in Technical Report E.3.3-B). The number of weed populations and presence in sample units (Shoreline Units) was significantly higher for *Lepidium latifolium* downstream than upstream, but not for any of the other species (Table 2 in Technical Report E.3.3-B). Only *Lythrum salicaria* showed numerically larger populations downstream than upstream (Table 6 in Technical Report E.3.3-B). *Lepidium latifolium* was the only species showing higher average coverage per sampled unit downstream than upstream (Table 4 in Technical Report E.3.3-B).

Eight of 14 target weed species were reported in sufficiently large numbers to allow statistical analysis of various disturbance factors (Tables 5 and 6 in Technical Report E.3.3-B). One of these disturbance factors relates to fluctuating water levels ("Flow Zone," defined as the zone between low and high water levels) and provides insight into the effects of (downstream) flow fluctuations on the presence of noxious weed species. *Lythrum salicaria* was the only species whose presence was positively associated with fluctuating water levels (Table 5 in Technical Report E.3.3-B). In contrast, the presence of *Elaeagnus angustifolia, Cardaria draba, Lepidium latifolium,* and *Tamarix parviflora* was negatively associated with fluctuating water levels (section 3.4 in Technical Report E.3.3-B). Interestingly, *Lythrum salicaria* showed a higher number of populations and average coverage per sample unit upstream than downstream, but a lower presence upstream than downstream. Thus, although *Lythrum salicaria* was less abundant downstream than upstream, the species was present at every sampled unit in the downstream reach. In conclusion, *Lythrum salicaria* may be the only target species positively influenced by downstream flow fluctuations.

E.3.3.4.2.3. Downstream Operations and Threatened and Endangered Plant Species

Five of nine target rare plant species were found in the downstream reach: *Astragalus purshii* var. *ophiogenes* (15 populations); *Astragalus mulfordiae* (4 populations); *Teucrium canadense* var. *occidentale* (6 populations); *Eatonella nivea* (1 population); and *Nemacladus rigidus* (1 population) (Table 2 in Technical Report E.3.3-C). Of the nine species, only *Teucrium canadense* var. *occidentale* and *Epipactis gigantea* (not reported downstream) were found in riparian habitats. The remaining species occur solely in the drier upland habitats above the riparian zone and are not affected by downstream operations of the Swan Falls Hydroelectric Project.

Teucrium canadense is found on streambanks and moist bottom-lands throughout the United States, except for the southeastern states, and extends north into Canada and south into Mexico. The variety *occidentale* is irregularly distributed in the Rocky Mountains and to the west. In Idaho, *Teucrium canadense* var. *occidentale* sites occur on the Snake, Boise, Owyhee, and Bruneau river systems, along the western edge of the state (Atwood and DeBolt 2000, Cronquist et al. 1977–1997, Mancuso et al. 2003). *Teucrium canadense* var. *occidentale* was the only target species found during this investigation that showed a marked association with the mean high-water mark and flow fluctuations. The species is likely the only one of the nine rare species found that would be directly affected by long-term changes in river flows. Mancuso et al. (2003) noted that *Teucrium canadense* var. *occidentale* is probably sensitive to changes in the hydrologic regime. Most (30 of 36) of the *Teucrium canadense* var. *occidentale* populations are located in the upstream reach, concentrated on the lower five miles of the reservoir. Similar observations were made by Cole (1997) at C.J. Strike Reservoir. More stable hydrologic conditions at the reservoir, compared to the unimpounded reach below the dam, may be a factor in the distribution of *Teucrium canadense* var. *occidentale*. These observations suggest that the hydrologic regime of the river may effect *Teucrium canadense* var. *occidentale* populations in the downstream reach.

E.3.3.4.2.4. Downstream Operations and Shoreline Erosion of Terrestrial Habitat

The Applicant surveyed 31.4 miles of shoreline below Swan Falls Dam (to RM 442). This included all shorelines, including islands. A total of 29 sites were reported in the downstream reach. Total length of shoreline erosion was 2.14 miles below Swan Falls Dam (6.81% of the shoreline inventoried). The total area of erosion was estimated at 2.90 acres below Swan Falls Dam. The surface area of most sites (24 of 29) below the dam was between 26 to 500 m^2. The size of each site was highly variable below Swan Falls Dam: average length, height, and surface area were 118.8 m (±125.5 m), 3.4 m (±1.3 m), and 404.5 m^2 (±472.5 m^2), respectively.

The majority of sites (86.2%) were associated with slopes in the low category (0–5 °). Scouring was the most common type of erosion (93.1%) observed below Swan Falls Dam (Table E.3.3-3). The most common factors potentially influencing bank erosion were erosive soil and channel flow. Disturbance from erosive soil and channel flow was observed at all sites below the dam (Table E.3.3-3). Evidence of livestock grazing was found at 5 sites below Swan Falls Dam. Other disturbance factors included recreation (5 sites below), industrial, and roads (1 site each) (Table E.3.3-3).

Wetland cover types were associated with all erosion sites. The most commonly associated wetland cover types were *Emergent Herbaceous Wetland* (96.6%) and *Scrub-Shrub Wetland* (89.7%). Upland cover types associated with erosion sites were *Shrubland* (48.3%) and *Shrub Savanna* (31.0%).

Not all shoreline erosion sites should be viewed as detrimental to environmental resources. At many sites, shoreline erosion appeared conducive to wetland vegetation establishment. Wetland vegetation was associated with all of the shoreline erosion sites. Wetlands are part of the ecological continuum or gradient between aquatic and terrestrial ecosystems and have a disproportionately high use by wildlife and humans, compared to the abundance of wetlands across the landscape.

E.3.3.4.2.5. Human Activities and Botanical Resources

Reference is made to technical report E.3.2-B.

E.3.3.5. Materials and Information on Measures and Facilities

All materials and information regarding existing measures and facilities to be continued by the Applicant are included in section E.3.3.3.1. All materials and information regarding measures and facilities proposed by the Applicant are included in section E.3.3.3.2.

E.3.3.6. Consultation

For a summary of consultation efforts to date for the Swan Falls Project, see the Consultation Appendix.

LITERATURE CITED

Atwood, D., and A. DeBolt. 2000. Field guide to the special status plants of the Bureau of Land Management Lower Snake River District. Bureau of Land Management, Lower Snake River District, Boise, ID.

Bureau of Land Management (BLM). 1979. Snake River Birds of Prey special research report. U.S. Department of the Interior. BLM, Boise, ID. 142 p.

Cole, N. K. 1997. Inventory of sensitive plants and special plant communities of the C.J. Strike study area. In: Technical appendices for new license application: C.J. Strike (FERC Project No. 2055). Idaho Power Company, Boise, ID. Technical Report E.3.3-B. 76 p.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal, P. K. Holmgren, and R. C. Barneby. 1977–1997. Intermountain flora: vascular plants of the intermountain west. Volumes 3a, 3b, 4, 5, 6. The New York Botanical Garden, New York, NY.

Idaho Power Company (IPC). 1998. New license application for C.J. Strike Hydroelectric Project. Eight volumes. IPC, Boise, ID.

Mancuso, M., and C. Murphy. 2001. Field investigation for BLM sensitive rare plant species within the Snake River Birds of Prey National Conservation Area, Southwestern Idaho. Idaho Conservation Data Center, Boise, ID. Agreement No. DAA000203. 16 p.

Mancuso, M., C. Murphy, and S. Cooke. 2003. Field investigation for Idaho BLM special status plant species within the Snake River Birds of Prey National Conservation Area. Idaho Conservation Data Center, Boise, ID. 55 p., plus appendices.

Natural Resources Conservation Service (NRCS). 2007. Plants database. U.S. Department of Agriculture, NRCS, National Plant Data Center. Baton Rouge, LA. <http://plants.usda.gov/>. Accessed on: July 17, 2007.

Quinney, D. 1999. Then and now: changes in vegetation and land use practices in Southwestern Idaho sagebrush lands, with emphasis on sagebrush and former sagebrush lands of the Snake River Birds of Prey National Conservation Area north of the Snake River. In: P. G. Entwistle, A. M. DeBolt, J. H. Kaltenecker, and K. Steenhof, compilers. Proceedings—Sagebrush steppe ecosystems symposium. 2000. Bureau of Land Management, Boise, ID. Publication No. BLM/ID/PT-001001+1150. p. 91–97.

U.S. Army Corps of Engineers (ACOE). 1987. Wetland delineation manual. ACOE Environmental Laboratory, Vicksburg, MS. 99 p., plus appendices.

U.S. Geological Survey (USGS). 1996. Effects of military training and fire in the Snake River Birds of Prey National Conservation Area. Bureau of Land Management/Idaho Army National Guard research project final report. U.S. Department of the Interior, Geological Survey, Biological Research Division, Snake River Field Station, Boise, ID. 130 p.

U.S. Geological Survey (USGS). 2006. Shrub Map. U.S. Department of the Interior, USGS, Snake River Field Station, Boise, ID. <http://sagemap.wr.usgs.gov/shrubmap_home.htm>.

West, N. E. 1999. Synecology and disturbance regimes of sagebrush steppe ecosystems. In: P. G. Entwistle, A. M. DeBolt, J. H. Kaltenecker, and K. Steenhof, compilers. Proceedings—Sagebrush steppe ecosystems symposium. 2000. Bureau of Land Management, Boise, ID. Publication No. BLM/ID/PT-001001+1150. p. 15–26.

Wulforst, J., G. Annandale, and A. M. A. Holthuijzen. 2000. Terrestrial effects of load following. Response to the Federal Energy Regulatory Commission Additional Information Request No. 13. Idaho Power Company, Boise, ID.

Yensen, D. 1982. A grazing history of southwestern Idaho with emphasis on the Birds of Prey Study Area. U.S. Department of the Interior, Bureau of Land Management, Snake River Birds of Prey Research Project Report, Boise, ID. 82 p.

Table E.3.3-1 Vegetation cover types and associated acreages within the Swan Falls study area.

Land-Use Cover Type	Downstream	Upstream	Total
Emergent Herbaceous Wetland	93.7	118.2	211.9
Shore and Bottomland Wetland	22.1	4.2	26.3
Scrub-Shrub Wetland	111.3	73.6	184.9
Forested Wetland	3.6	32.3	35.9
Lentic (Standing Water)	20.1	0.5	20.6
Lotic (Moving Water)	473.3	984.7	1,458.0
Shrubland	1,289.6	1,359.5	2,649.1
Tree Savanna		3.1	3.1
Shrub Savanna	929.4	1,295.6	2,225.0
Desertic Shrubland	5.1	18.7	23.8
Desertic Herbland	1.4	9.4	10.8
Grassland	1,567.7	1,498.7	3,066.4
Forbland	84.5	185.8	270.3
Barrenland	2.0	1.5	3.5
Cliff/Talus/Slope	516.4	658.7	1,175.1
Disturbed	11.4	17.5	28.9
Agriculture	19.5	575.5	595.0
Grazing Land/Pasture	9.3	9.1	18.4
Residential	3.2	4.9	8.1
Industrial	2.6	3.5	6.1
Parks/Recreation	7.9	6.2	14.0
Roads	4.8	2.4	7.2
Forested/Orchard	0.9	2.1	3.0
Total	5,179.8	6,865.7	12,045.5

Table E.3.3-2 Characteristics of shoreline erosion sites mapped in the upstream reach of the Swan Falls study area, 2004.

Characteristic	Category	Number of Sites	Percent
Slope	Low (0–5°)	22	68.8
	Mod. (6–30°)	5	15.6
	Steep (>30°)	5	15.6
Erosion Type	Slump	30	93.8
	Scour	1	3.1
	Upland Sheet Wash	1	3.1
Disturbance Factors	Erosive Soils	31	96.9
	Wind Waves	32	100.0
	Channel Flow	1	3.1
	Livestock Grazing	6	18.8
	Recreation	1	3.1
	Tributary Flow	4	12.5
	Industrial	0	0.0
	Roads	0	0.0
Bird Nesting Burrows	Present	8	25.0
	Absent	24	75.0

Table E.3.3-3 Characteristics of shoreline erosion sites mapped in the downstream reach of the Swan Falls study area, 2004.

Characteristic	Category	Number of Sites	Percent
Slope	Low (0–5°)	25	86.2
	Moderate (6–30°)	3	10.3
	Steep (>30°)	1	3.5
Erosion Type	Slump	2	6.9
	Scour	27	93.1
Disturbance Factors	Erosive Soils	29	100.0
	Wind Waves	0	0.0
	Channel Flow	29	100.0
	Livestock Grazing	5	17.2
	Recreation	5	17.2
	Tributary Flow	0	0.0
	Industrial	1	3.4
	Roads	1	3.4
Bird Nesting Burrows	Present	23	79.3
	Absent	6	20.7

This page left blank intentionally.

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(4)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f)(4) Report on historical and archaeological resources. The report must discuss the historical and archaeological resources in the project area and the impact of the project on those resources. The report must be prepared in consultation with the State Historic Preservation Officer and the National Park Service. Consultation must be documented by appending to the report a letter from each agency consulted that indicates the nature, extent, and results of the consultation. The report must contain:
>
> (i) Identification of any sites either listed or determined to be eligible for inclusion in the National Register of Historic Places that are located in the project area, or that would be affected by operation of the project or by new development of project facilities (including facilities proposed in this exhibit);
>
> (ii) A description of any measures recommended by the agencies consulted for the purpose of locating, identifying, and salvaging historical or archaeological resources that would be affected by operation of the project, or by new development of project facilities (including facilities proposed in this exhibit), together with a statement of what measures the applicant proposes to implement and an explanation of why the applicant rejects any measures recommended by an agency.
>
> (iii) The following materials and information regarding the survey and salvage activities described under paragraph (f)(4)(ii) of this section:
>
> (A) A schedule for the activities, showing the intervals following issuance of a license when the activities would be commenced and completed; and
>
> (B) An estimate of the costs of the activities, including a statement of the sources and extent of financing.

E.4. REPORT ON HISTORICAL AND ARCHAEOLOGICAL RESOURCES

E.4.1. Identification of Historical and Archaeological Sites

As part of the relicensing studies for the Swan Falls Hydroelectric Project, the Applicant has identified historical and archaeological sites within the area of potential effect (APE). Pursuant to 36 CFR 800.16(d), the Applicant identified an APE that may be directly or indirectly altered in character or use of historic properties. The Applicant then implemented studies to identify historic properties within the APE, including an intensive-level archaeological inventory of the entire APE.

The APE for the project covers a 23.8-mile long stretch of the Snake River corridor between Guffey Bridge in Canyon County, Idaho, and the vicinity of Castle Butte in Elmore County, Idaho. The APE includes the Swan Falls Dam and Powerhouse and all of the Swan Falls Reservoir. The APE to be surveyed was defined as a linear zone on both sides of the river extending 0.10 miles (160.9 meters [m]) inland from the high-water line of the river and reservoir. The upstream boundary of the APE begins on both sides of the river at river mile (RM) 471 near Big Foot Bar. In the vicinity of the Swan Falls Dam, the APE is expanded to include the entire area currently encompassed within the Federal Energy Regulatory Commission (FERC) project boundary for the Swan Falls Hydroelectric Project, which means that the APE in the area of the dam and powerhouse extends as much as 0.31 miles (500 m) inland on either side of the river. Below the dam, the APE continues downstream at a width of 0.10 miles (160.9 m) from the high-water line on both sides of the river to RM 453.4. Below RM 453.4, the APE narrows to 100 feet (30.5 m) from the high water line on either side of the river. The APE narrows here because the only potential operational effect of the Swan Falls Project past the end of the public access road on the north side of the river is erosion related to water fluctuations caused by dam operations. On the north side of the river, the APE extends downstream to the Ada–Canyon county line (approximately RM 448.8) just upstream from Celebration Park. On the south side of the river, the APE extends slightly further downstream, ending at RM 447.2, just below Guffey Bridge at the point where the boundary for the Snake River Birds of Prey National Conservation Area (NCA) crosses the river. The single, very short, power line (Swan Falls Tap [Line 954]) associated with the FERC license for the project was previously surveyed and found to contain no historic properties (Druss 1992). Therefore, it was not reexamined as part of the relicensing study.

A considerable amount of previous research has been conducted in the general vicinity of the project area, resulting in the identification of a large number of historical and archaeological sites. To account for the results of this previous research, the Applicant identified a regional study area (RSA) covering an area considerably larger than the APE. The RSA was defined as a geographic buffer zone that extended from RM 439.3 to RM 482.3 and extended inland 2 miles (3,219 m) from the county line on both sides of the river. A data request was made to the Idaho State Historical Society (ISHS) for all information and site records for the area within the RSA. The information from the area covered by the RSA included site data for more than 310 archaeological sites. The site data received from ISHS records was provided to the consultant who conducted the intensive-level archaeological survey. Many of the sites in the RSA lie outside the APE and therefore were excluded from further consideration in the formal study. The information derived from examining the archaeological site data for the entire RSA allowed the consultant to develop a more accurate and complete context for the APE archaeological survey and to provide the information needed to allow discrimination between sites inside and outside the APE located near the boundary of the survey area.

The intensive-level survey of the APE examined a total area of approximately 3,472 acres. The fieldwork for the survey was completed during summer 2006 by a consultant working under contract to the Applicant. A comprehensive list of all archaeological sites, historic sites, and historic structures identified with the APE is listed in Table E.4-1.

E.4.1.1. Sites Listed on the National Register of Historic Places

One site that is individually listed on the National Register of Historic Places (NRHP) is located within the APE. This individually listed site is the Swan Falls Dam and Power Plant (10AA211). The entire APE lies within the exterior boundaries of the Guffey Butte–Black Butte Archaeological District, a previously listed multiproperty district covering a 35-mile-long stretch of the Snake River Canyon overlapping with, and surrounding, the Swan Falls hydroelectric project. Seventy-four archaeological sites that were originally included as part of the archaeological district lie within the APE.

E.4.1.1.1. Swan Falls Dam and Power Plant

The original dam and power plant at Swan Falls (10AA211) were constructed beginning in 1900 (Stacy 1991:4). The power plant was designed by one of Idaho’s first hydraulic engineers, Andrew J. Wiley, and was initially developed to provide power for the Silver City Mining District located in the Owyhee Mountains, approximately 28 miles southwest of the dam. The Swan Falls Project, the first hydroelectric power plant built on the Snake River, was producing power by 1901 (Stacy 1991:12). The dam and powerhouse were expanded or extensively remodeled four times between 1901 and 1913 (Baker 2005). New sections were added to the east and west ends of the original power plant to accommodate additional new generators in 1907 and 1910, respectively (Stacy 1991). The superstructure of the original powerhouse was torn down and completely rebuilt in 1911 (Hibbard 1976). The complex consisting of the dam and three connected powerhouses was listed on the NRHP in 1978 (Davis and Swanson 1997, Hibbard 1976). In addition to the dam and power plant, a three-story boardinghouse was built in 1900–1901 at a spot adjacent to the dam to house workers who handled operations at the remote location of the facility. Between 1910 and 1953, the complex was expanded with the construction of additional housing and support structures, including a blacksmith’s shop, three garages, a boat house, and 14 operator cottages. None of these additional structures were included in the NRHP listing for the dam and power plant, and most have been removed subsequent to the time the dam and power plant were listed.

E.4.1.1.2. Guffey Butte–Black Butte Archaeological District

Previous archaeological research conducted in the Swan Falls area prior to the studies conducted in conjunction with relicensing identified a relatively large number of archaeological sites covering a wide spectrum of cultural periods and site types. These previously identified sites include historic and precontact[1] Native American archaeological sites and Euroamerican historic archaeological properties. The area immediately around the dam and extending several miles, both upstream and downstream, is characterized by localities of precontact site density that are some of the highest in the mid-Snake Region. Recognition of the exceptional character of this concentration of archaeological sites led to the area being nominated to the NRHP in 1977 as the Guffey Butte–Black Butte Archaeological District (Green and Torgeson 1977). The archaeological district incorporates an area of approximately 21,370 acres, extending from near Grand View, Idaho, to a point about 30 miles downstream near Walter’s Ferry, Idaho (below the Swan Falls Dam) (Green and Torgeson 1977). The archaeological district was formally listed in 1978 and contains 117 individual historic properties, the majority of which are archaeological sites. The Swan Falls Dam and Power Plant lie within the archaeological district, but were already listed on the NRHP at the time the district was created, so the facility was excluded from inclusion in the nomination. Three other historic Euroamerican properties were identified as contributing resources within the district at the time of the nomination and listing.

The focus of the Guffey Butte–Black Butte Archaeological District, as defined in the significance statement contained in the nomination form, was the abundant precontact sites located within the area. Accordingly, the nomination form specifically addresses the individual precontact sites

---

[1] For the purposes of this document, the author has elected to use the term “precontact” as the preferred label to designate archaeological sites and materials associated with Native American occupations that predate the arrival of Euroamericans in the project area (circa. A.D. 1810). This term is preferred by many Native Americans, who find that the term “prehistoric” does not adequately acknowledge the extensive oral history associated with their occupation and use of various areas of North America prior to the arrival of Euroamericans. However, the term “prehistoric” has a long period of wide use and acceptance in the professional anthropological literature, and the two terms may be used synonymously in this document and other sections of the draft license application, including the *Archaeological Survey of the Swan Falls, Idaho, Project Area* (Technical Report E.4.1-A) and *Historic Property Management Plan* (Technical Report E.4.1-B).

included in the district, but gives less attention to the historic sites, although three historical sites are included by specific reference. In addition, the section of the form providing descriptions of individual sites suggests the presence of historic components on some of the sites described as being primarily precontact resources, but these historic materials do not appear to have been considered significant in terms of these sites' status as contributing elements within the district. The nomination form states that the district includes 77 open campsites and villages, and 33 rock shelters that are associated with precontact or early-historic Native American use. Three historic Euroamerican properties were also explicitly included in the district at the time of listing. Information for the identification and description of the district was based primarily on archaeological inventories reported by Touhy (1959) and Keeler and Koko (1971). At the time the Guffey Butte–Black Butte Archaeological District was created, other archaeological sites were known to be present in the area of the district, but were not included within the district. The criteria used to distinguish between those sites that were included and those that were not are not entirely clear from the nomination form. The results of the relicensing survey suggest that many of these other previously recorded sites probably should have been considered contributing elements at the time the district was created.

Seventy-four of the historic properties originally listed in the Guffey Butte–Black Butte Archaeological District are located within the APE for the Swan Falls relicensing study. The remainder of the sites listed in the district lie in areas that are outside the current project APE and will not be considered in this document. All but one of the historic properties that were listed within the district which lie within the APE are archaeological sites. The single non-archaeological resource is a historic bridge. Most of the archaeological sites consist primarily of cultural materials related to the Native American occupation and use of the canyon, although several also include tailings from placer mining and other features and artifacts related to historic Euroamerican mining, homesteading, and other uses of the area. As already noted, the original NRHP nomination form gave little attention to the historic components that were associated with sites that were primarily precontact/prehistoric. The majority of the Native American archaeological sites are characterized by light-to-moderately dense artifact scatters and occasional features. Relatively few of the sites include any chronologically diagnostic artifacts that allow confident conclusions regarding precise cultural affiliation or dating. All of the sites that are located within the APE that are currently listed as part of the Guffey Butte–Black Butte

Archaeological District on the National Register of Historic Places are summarized in Table E.4-2.

The 2006 survey of the APE lead to a redefinition of many of the sites previously listed in the district. In some instances, cultural materials previously recorded under multiple site numbers have been combined by the Idaho State Historic Preservation Office (SHPO) during the intervening years under a single site number. A large number of sites that the original NRHP nomination document treated as exclusively precontact/prehistoric were actually found to be more complex multicomponent sites that contained cultural material from more than one time period. The summary which follows categorizes information on the known sites that are currently on the NRHP as they are currently represented in the site records of the ISHS and as documented by the most recent survey. Due to this process of combining and redefining sites, the numbers of sites discussed in various parts of this document will vary depending on how the redefined sites are counted.

E.4.1.1.2.1. Precontact/Prehistoric Sites

Precontact or prehistoric cultural resources consist of those archaeological sites and remains determined to predate written records in the Swan Falls Project area (circa. 1810). These sites and remains were clearly produced by Native Americans. The term precontact/prehistoric does not imply that Native Americans have no history or presence in the area, but rather that evidence for their use of the area during this period comes from archaeology and oral history, rather than written records. Many of the sites assigned to this general category are quite generic in nature and frequently lack any clear diagnostic artifacts or characteristics that allow them to be dated with any degree of precision. It is important to note that the term "precontact" or "prehistoric" actually represents a rather lengthy chronological period that may extend from 15,000 +/– years before the present (B.P.) into the early historic period of Euroamerican settlement. The category "precontact/ prehistoric" may include sites that date from the very Early Holocene into the Protohistoric Period, or even the Early Historic Period when Euroamericans were present in the area, but their presence is not reflected in any way in the Native American sites dating to the period. A number of different chronologies have been suggested for the Snake River Plain (see discussion in Technical Report E.4.1-A[2]), but all recognize a Native American occupation dating from as early

---

[2] Due to the confidential nature of this report, it has been removed and provided to the appropriate entities.

as 12,000 to 15,000 years B.P. through the period of Euroamerican contact and into the present (Plew 2000). Named periods or traditions subsumed within the general precontact designation include Paleo-Indian, Archaic, and Protohistoric. Sites lacking chronometric diagnostics that are identified only to the general precontact period could potentially date to any of these periods, or even the Early Historic or Early Postcontact periods.

A total of 54 sites have been identified within the APE that are exclusively Native American in content, and which are already listed as part of the Guffey Butte–Black Butte Archaeological District (Table E.4-3). All of these are assumed to date to the precontact period due to the lack of any historic materials; however, as already noted, some may actually date to the Postcontact period, but lack evidence of that chronological context. The majority of these sites consist of open sites containing nondiagnostic scatters of cultural debris, including lithic debitage, fire cracked rock (FCR), and mussel shell debris. These sites probably represent a range of functional site types, including temporary seasonal habitation sites, fishing or harvesting sites, resource processing sites, and other types of temporary logistical loci. No conclusive evidence for extensive, permanent, year-round precontact residential sites exists in the study area. Fourteen of the sites include some sort of sheltered component, either a shallow rockshelter or boulder overhang. These appear to be primarily seasonal or short-term occupations. It should be noted that previous research in the region has found the potential for sheltered sites to contain extensive cultural deposits resulting from repetitive occupation over an extended time period (Plew 2000). Three of the sites include rock art. Each of these precontact/prehistoric sites that is located within the APE is discussed in detail in Technical Report E.4.1-A.

E.4.1.1.2.2. Historic Sites

The NRHP listing for the Guffey Butte–Black Butte Archaeological District specified three historic period properties that were considered contributing elements within the district. These included two archaeological sites and a single historic structure. Only two of these are located within the APE for the relicensing survey. One of the archaeological sites, the historic Guffey Town Site (10OE244), is located outside the APE, was not included in this study, and is not considered here (Table E.4-4). The two sites classified by the NRHP nomination form as being historic period properties include the Guffey Railroad Bridge and a Euroamerican archaeological site representing the remains of a small historic settlement (10AA51) near

Halverson Bar. The Halverson Bar site actually includes both prehistoric and historic materials, but the primary component at the site is the remnants of a large placer mining operation that includes a ditch, extensive tailings, the ruins of seven stone buildings, and a stone wall. Since the site is actually multicomponent in nature, it is considered in section E.4.1.1.2.3 as part of the total of multicomponent sites, although it was characterized on the nomination form as a historic period site (Table E.4-4).

In addition to the historic archaeological site at Halverson Bar, a single historic-period structure—the Guffey Railroad Bridge (10OE1994/10CN44)—is included in the Guffey Butte–Black Butte Archaeological District. The Guffey Railroad Bridge is a 500-foot long, two-span, Parker steel truss (a variety of Pratt truss) bridge built in 1896–1897 in connection with mining operations at Silver City (Green and Torgeson 1977). The two, truss-work spans are supported on concrete abutments and a single, midchannel pier. The bridge was built as the primary engineered feature of the Boise, Nampa, and Owyhee Railroad (BN&O), which ran from Nampa to a terminal in Murphy. The bridge was the first to be built across the Snake River in that area and is a contributing property to the Guffey Butte–Black Butte Archaeological District (Green and Torgeson 1977). The railroad ceased operations in September 1947. The bridge has been renovated as a pedestrian bridge to allow access to the south side of the river. It is the only major surviving railroad example of this type of structure in Idaho (ISHS 1993).

E.4.1.1.2.3. Multicomponent Sites

There are 14 multicomponent sites located within the APE that were listed in the Guffey Butte–Black Butte Archaeological District (Table E.4-5). Although treated as precontact sites in the original listing, these sites actually contain cultural material from more than one time period. They were listed as contributing properties within the district primarily on the basis of their precontact components, but the recent survey demonstrated that many have potential to also contribute information on historic use of the area. Many of the multicomponent sites are characterized by nondiagnostic scatters of Native American cultural debris in inadvertent association with historic placer tailings or other modest historic remains. In many cases, the historic placer mining has interrupted and impacted, to various degrees, the precontact cultural deposits. Some of the historic components include rather substantial remnants of historic ferries, dugout structures, and buildings, and the sites may be equally or even more significant for their potential to yield data relative to the historic Euroamerican occupation in the canyon, although this was not previously acknowledged in the NRHP listing. Each of these sites is discussed in detail in Technical Report E.4.1-A.

E.4.1.2. Sites Eligible for Inclusion in the National Register of Historic Places

An intensive-level archaeological survey was conducted of the entire APE during summer 2006. The survey was conducted by independent consultants working under contract to the Applicant. The primary contract for the research was held by SWCA Environmental Consultants, Inc. (SWCA) of Salt Lake City, Utah; but all aspects of the field work and reporting were completed by a joint team of scientists from SWCA and Rain Shadow Research, Inc. (RSR) of Pullman, Washington. SWCA and RSR submitted a joint proposal for the project, and the contract was awarded to SWCA, with RSR participating through a subcontract with SWCA.

E.4.1.2.1. Overview of Survey Strategy and Results

The objective of the survey was to relocate all previously recorded cultural resources (archaeological sites, historic structures, historic buildings, etc.) located within the APE, and any new resources not previously identified. The APE for the project was defined to encompass the likely extent of the Applicant’s activities associated with the new license, and included the FERC project boundary and a 0.10-mile wide (160.9 m) zone on either side of the river/reservoir high-water line, both above and below the dam. The 0.10-mile wide (160.9 m) APE on both sides of the watercourse was defined as a buffer following the shoreline, which was intended to accommodate near-shoreline developments, such as boat ramps and parks, and potential project impacts related to reservoir and river fluctuations tied to hydroelectric operations of the dam and powerhouse complex.

Much of the previous research in the area and many of the site forms were between 30 and almost 50 years old, so a primary objective of the current survey was to relocate and redocument the numerous sites identified by earlier studies, and to assess their current condition and significance. All sites identified during the survey were assigned temporary site numbers (prefaced with the acronym IPC-SF-, indicating the sites were documented as part of the Idaho Power Company

Swan Falls relicensing survey), regardless of whether they were newly identified or previously recorded sites. This method of assigning temporary numbers to all sites identified in the field allowed researchers to objectively manage data on a wide range of very similar sites located in close proximity to one another while attempting to sort out and distinguish individual sites identified, but poorly documented, in some of the early surveys. All previously recorded sites, and newly identified sites were documented using the Archaeological Survey of Idaho Site (ASI) Inventory Form and standard recording protocols prescribed by the ISHS to ensure uniform, consistent, and current data for all sites in the APE.

A total of 204 sites were identified during the 2006 survey to which temporary numbers were assigned. Two of the sites (IPC-SF-004 and 10AA213) were later found to be located outside the APE, and one site (IPC-SF-130) was determined to be a modern road that is not an archaeological site. Those three sites were accordingly dropped from further consideration. One additional site was documented during the survey to which a temporary number was not assigned. Three sites exist within the project area that were not specifically addressed in the field by the 2006 survey because the existing data were adequate (Idaho Historic Sites Inventory IHSI 01-15199, IHSI 01-17866), or there was a disagreement on how to designate a previously recorded site (10OE25). A total of 205 sites are identified as having been identified at one time or another within the APE for the project. Of these, 148 sites were previously recorded (including the 74 previously listed in the district), and 57 sites were newly identified and recorded. One hundred twenty-three of the sites are located along the right bank of the Snake River, and 81 sites are located along the left bank. A single site was identified on Sign Island in the middle of the river near the Ada–Canyon county line. One-hundred forty sites are located entirely on Bureau of Land Management (BLM) land, 45 sites are located entirely on private land (including lands owned by the Applicant), and 15 sites are located entirely on state of Idaho land. The site on Sign Island is on land administered by the U.S. Fish and Wildlife Service (USFWS). The Guffey Railroad Bridge (10OE1994) is owned by Canyon County. Three sites are divided by property lines and have multiple ownership, including one that is split between BLM and a private landowner, one that is split between BLM and the state of Idaho, and one that is split between the State of Idaho and a private landowner.

The consultants recorded 145 sites that contain only Native American components, 30 sites that contain only Euroamerican (or Chinese) components, and 29 sites that contain both Native American and Euroamerican (or Chinese) components. Historic mining in the area during the last half of the nineteenth century and the first half of the twentieth century involved both Euroamericans and smaller numbers of ethnic Chinese who came to the area specifically for the economic opportunities provided by the mining operations. Sites with historic components dating to this period can be attributed to the appropriate time period based on the artifact and feature assemblages, but they often lack surface diagnostics that allow clear identification of the ethnic or cultural group responsible for the creation of the site. Four sites contain modern components or components of unknown age.

E.4.1.2.2. Precontact/Prehistoric Archaeological Sites

The 2006 relicensing survey recorded 72 newly identified precontact Native American archaeological sites in the APE that are recommended as eligible for the NRHP. Most qualify as possible contributing resources within the Guffey Butte–Black Butte Archaeological District, but some may be individually significant. No attempt was made to distinguish between those two categories of properties since all of the APE lies within the boundaries of the district, and all 72 newly identified sites in consideration were considered to qualify, at the minimum, as contributing elements. Thirty-five of these sites were identified prior to the 2006 relicensing survey, but are not included in the district, either because they were found after the district was formally listed or because they were known of in 1978 when the district was created but, for unknown reasons, were not included. They are now being recommended as eligible. The precontact/prehistoric Native American sites that are located within the APE and are recommended as eligible for the NRHP are summarized in Table E.4-6 and are discussed in detail in Technical Report E.4.1-A.

E.4.1.2.3. Historic Archaeological Sites

The relicensing survey recorded 20 newly identified archaeological sites that appear to contain exclusively historic materials. No clear determination could be made regarding the cultural affiliation, but the sites are assumed to be associated with Euroamerican or possibly Chinese use of the area. The sites appear to date from the early 1800s into the late 1950s. The sites include dugout structures possibly used for habitations, stone fences, wagon roads, foundations, and other remnants of habitation, and ranching buildings, placer mined areas and tailings, and a range of historic artifacts. The historic period Euroamerican (and possibly Chinese) sites and structures that are located within the APE and are recommended as eligible for the NRHP, are summarized in Table E.4-7 and discussed in detail in Technical Report E.4.1-A. Some of these sites were known, but were largely ignored, at the time the Guffey Butte–Black Butte Archaeological District was developed for listing. All 20 sites are recommended as eligible for the NRHP and appear to have good potential to yield additional information about historic mining, ranching, and transportation in the project area.

E.4.1.2.4. Multicomponent Archaeological Sites

There are 15 newly recorded multicomponent sites located within the APE that were recommended by the consultant as eligible for the NRHP (Table E.4-8). The majority have been recommended as eligible as possible contributing elements within the Guffey Butte–Black Butte Archaeological District. Most of the multicomponent sites are characterized by nondiagnostic scatters of Native American cultural debris in inadvertent association with historic placer tailings or other modest historic remains. In many cases, the historic placer mining has interrupted and impacted, to various degrees, the precontact cultural deposits. Some of the historic components include more substantial remnants of historic ferries, dugout structures, stone fences, and building foundations, and many of these sites appear to have good potential to yield data relative to the historic Euroamerican occupation in the canyon. Each of these sites is discussed in detail in Technical Report E.4.1-A.

E.4.1.2.5. Historic Buildings

The archaeological survey conducted by SWCA did not identify any previously unknown, standing historic buildings or structures in the APE. The inventory of historic structures located within the APE was well known and documented prior to the initiation of identification efforts associated with relicensing. Several of the historic archaeological sites identified during the survey have remnants of buildings, but those resources are considered above in the sections dealing with archaeological sites that are listed on, or eligible for listing on, the NRHP. Considered here is the question of historic buildings located within the APE that may be eligible for the NRHP but are not currently listed. Two previously known historic buildings are located in the area of the dam, one of which is considered eligible for the NRHP. In addition to the historic dam and powerhouse, there are two existing buildings located in the immediate vicinity of the dam that are remnants of the former operator’s village (IHSI No. 01-17866).

Between 1901 and 1953, the Applicant and its predecessors, The Trade Dollar Consolidated Mining Company and the Swan Falls Power Company, constructed a relatively large complex of residential buildings and support structures that became known as the “Swan Falls Village.” The complex reached a maximum size when the final structures were added in 1953. In its final configuration, the village included a blacksmith’s shop, three garages, a boat house, 14 operator cottages, and several other structures, such as a water tower and small hose houses for fire hoses. As conditions and needs changed through time, some of the structures became obsolete, and were torn down at irregular intervals between 1953 and 1992. None of these ancillary structures comprising the operators village were included in the NRHP listing for the dam and power plant, and none were included in the Guffey Butte–Black Butte Archaeological District. In 1990, the Applicant proposed to construct new employee housing at a location upstream from the historic operators village, and to demolish the historic housing complex once the new buildings were completed. Prior to the demolition, the Applicant entered into consultation with FERC and the SHPO to consider the effects of the proposed removal of the complex. During consultation, the SHPO confirmed that the village complex was eligible for the NRHP (Watts 1990).

On September 16, 1991, the Applicant filed with FERC a cultural resource disposition plan for the Swan Falls Operator’s Village. In an order dated April 30, 1992, FERC approved the plan, authorizing the Applicant to complete Historic American Building Survey (HABS) documentation on the components of the village as appropriate mitigation for their eventual demolition. In conjunction with the HABS documentation, a reconnaissance inventory was conducted of all the structures in the area of the village. The village complex was documented and assigned site number 01-17866 in the IHSI. The HABS documentation was completed on the village in 1992 and was accepted by the National Park Service (NPS) on October 15, 1992 (HABS No. ID-105). However, not all of the buildings extant in 1992 were included in the HABS documentation, with some of the smaller structures being omitted.

Following completion of the documentation, all but two of the major buildings/structures were removed. The only structures left from the original complex are the boardinghouse (Applicant Building No. 011) and a small garage (IPC Building No. 532). The garage is a small, wood-frame structure located towards the upstream end of the original Swan Falls Village. The original structure was constructed in 1953, and had a small, rectangular footprint, and a simple front-gabled roof. The exterior was clad in simple, drop-style, horizontal wood siding over most of the exterior, with board and batten siding in the area under both gables. Two garage-style doors opened on the north side, and the south side was furnished with two symmetrically placed 4-over-4 light, double-hung windows. The structure was substantially modified in the summer of 2005 with an extensive addition and the application of new, medium-density fiberboard siding and a metal roof. It is currently used for equipment storage. The structure was not included in the HABS documentation and no record can be found regarding a determination of whether the building was considered a contributing element in the village complex or not. The additions made in 2005 are substantial enough that the structure has lost all integrity and is not eligible for the NRHP.

E.4.1.2.5.1. Building No. 011–Boardinghouse ("Clubhouse")(IHSI Site No. 01-17866)

The boardinghouse (referred to in company documents and by employees as the clubhouse) is located just upstream from the dam and powerhouse. Company records and early photographs confirm that the structure was built in 1901 at the same time as the dam and first powerhouse. The building was occupied by the single men who worked at the power plant, while married men with families occupied the cottages. The building is a simple, two-story vernacular design with a third floor attic that was partitioned into two bedrooms. The wood frame building has horizontal, drop-style wood siding and a hipped roof with wood shingles. The upstream and downstream ends of the building each have a single, projecting gabled dormer. Each dormer has a large, 1-over-1 double-hung sash window. The area of the gable above each dormer window is clad with wood shingle siding arranged in a decorative pattern of an inverted crescent curve.

The front façade of the building facing the road is furnished with a one-story porch, screened on the upstream end and covered with siding on the downstream end. The porch houses two entry doors, one of which accesses the kitchen, and the other a pantry. On the rear of the structure is a one-story porch originally used as sleeping porch, which was enclosed in 1938 to provide additional living space. The building shows clear evidence of numerous improvements and changes as the local maintenance crews and inhabitants repainted, modernized, and changed the building to meet changing needs (Stacy 1992). Most of the major changes were made during the historic period and reflect the evolving use of the building and changing technology. The building retains good integrity and is eligible for the NRHP, both individually and as a contributing component of a potential multiple-property listing of buildings and structures associated with the theme of hydroelectric operations in the Swan Falls area. Such a possible listing would represent an expansion of the original listing which included only the dam and powerhouse. The building was documented together with the other buildings in the operator's village following HABS protocols in 1992 (HABS No. ID-105).

E.4.1.2.6. Traditional Cultural Properties

SWCA conducted a review of the general anthropological and archaeological literature related to the region in the process of developing the ethnographic and prehistoric context for Technical Report E.4.1-A. The sources reviewed for this study revealed that, at the time of contact with Euroamericans, the Northern Shoshone and Bannock people used various locations within the study area for a variety of purposes, including subsistence, settlement, and trade. No specific locations within the APE were identified in the literature that could be conclusively tied to any of these activities. Other Native American tribal groups from the region likely used portions of the area in the past, and there was a considerable amount of contact and long distance trade and exchange between groups living and moving about in the region. Distinguishing sites in the study area that are culturally significant to local Native American groups is hampered somewhat by a lack of good, primary documentary sources. The consultants did not find any indication of previously known sites that have been identified as traditional cultural properties (TCPs), as defined by guidelines developed by the NPS under the provisions of the National Historic Preservation Act (NHPA)(Parker and King 1998). The Applicant invited both the Shoshone–Bannock Tribes of the Fort Hall Reservation and the Shoshone–Paiute Tribes of the Duck Valley Reservation to participate in the process of identifying TCPs in the APE (Baker 2006a,b; 2007a,b), but neither of the tribes has responded by furnishing any data indicating that TCPs are present in the APE. Therefore, no historic properties that are TCPs have been identified in the APE. Following the release of the Draft License Application, the Applicant broadened consultation efforts to include the Burns Paiute Tribe of the Burns Paiute Indian Colony and the Fort McDermitt Paiute and Shoshone Tribe of the Fort McDermitt Reservation, and invited them to participate in the relicensing consultation process. So far, neither tribe has provided any information indicating the presence of TCPs related to their group within the project area.

E.4.1.3. Sites Affected by Swan Falls Operations or New Development

The 2006 survey identified 201 archaeological sites within the APE. In addition, two historic buildings (Swan Falls boardinghouse and garage) were previously documented and were not included within the results of the survey as reported by the consultant, but lie within the APE and are included here. The total number of historic and/or archaeological sites within the APE is 203. Field assessments made at the time of the survey found evidence of some sort of impact to all but 12 of these sites. Disturbances were caused by humans and natural agents. The overwhelming majority of the impacts appear to be related to natural agents and other causes not under control of the Applicant. Only 65 sites exhibited impacts that might be related to the Applicant's operations or actions.

E.4.1.3.1. Operational Impacts to Sites in the Swan Falls Project and Vicinity

During the archaeological survey, the field scientists collected data on observed impacts to cultural resources. Some form of impact was noted at all but 12 of the sites identified within the APE. Disturbances to sites include agricultural use, deflation, development, erosion, grazing, recreation vehicle use, road use, vandalism, and others. Table E.4-9 summarizes impacts to all listed and eligible sites. The table summarizes both natural impacts and impacts due to human activity, including impacts potentially related to project operations. The consultants were asked to identify, whenever possible, cases where impacts to sites appeared to have been directly related to project operations.

Table E.4-9 presents an ordinal score for the severity of each impact category at each site. A "0" indicates that there were no impacts of that category observed. A score of "1" indicates that the impact is relatively minor, and that the site is not in danger of losing integrity due to that specific impact category (many sites exhibit impacts from more than one agent, and the impact from any given agent might be minor, while that from another agent is more severe). A score of "2" indicates that a moderate impact is beginning to compromise site integrity. For example, if a feature (such as a housepit) is being destroyed, but much of the feature remains intact, this would have been assigned a score of "2." A score of "3" indicates a severe impact and that features or substantial areas of intact cultural deposits are being directly impacted or lost, or are in eminent danger of being lost. A score of "4" indicates that component or site integrity has been totally lost; the site no longer retains any potential for data recovery, or the integrity necessary to convey historic significance under the NRHP criterion for which the site may have once been eligible has been lost. No, or few, cultural deposits remain intact. Table E.4-9 summarizes data on several types of erosion, including river and reservoir shoreline erosion and slope erosion, as well as wind deflation, recreation, vandalism, and several other agents. More detailed descriptions of site impacts are included for each individual site in the survey report (Technical Report E.4.1-A).

The first components of the Swan Falls Project were constructed in 1900–1901 and have an operational history reaching back more than 100 years. No new operational changes or construction of new facilities is planned, so future project-related impacts should continue to be characterized by the type of impacts observed during the cultural resources survey. Many of the impacts potentially related to the project have changed very little during the 100-year operational history of the project, and accordingly, no significantly new project-related impacts are expected in conjunction with the relicensing of the facility. The impacts that appear to be potentially related to project operations are restricted primarily to river and reservoir shoreline erosion related to manipulation of river flows for hydroelectric generation purposes. Some additional, project-related impacts are associated with service roads in the project area, but these are minimal, and no new roads are anticipated. Some archaeological sites appear to have been impacted by construction of the new powerhouse in 1994, but those were addressed through the Section 106 process at the time the project was undertaken in accordance with an amendment to the FERC license.

The consultants did not identify any impacts conclusively linked to project operations. Table E.4-10 summarizes impacts that are believed to be potentially associated, directly or indirectly, to project operations. These impacts include river and reservoir erosion, and road construction and maintenance.

E.4.1.3.1.1. Erosion

The consultant identified four types of erosion: 1) river shoreline erosion, 2) reservoir shoreline erosion, 3) wind erosion, and 4) general slope erosion related to water run off that is not associated with the Applicant's operations. Clearly, wind erosion and general run-off slope erosion are not associated with project operations, and are not under the control of the Applicant. However, these natural erosional forces are significant and are responsible for continuing degradation of site integrity.

The consultant observed river shoreline erosion at 67 sites. The erosion is minor at 37 sites, moderate at 19 sites, and severe at 11 sites. Eight sites with severe river shoreline erosion (10AA176, 10AA177, 10AA189, 10AA306, 10AA448, 10AA457, 10OE583, and IPC-SF-071) are located downstream of Swan Falls Dam, whereas three sites (10AA54, 10OE24, and IPC-SF-069) exhibiting severe reservoir shoreline erosion are located along the banks of the reservoir upstream from the dam. Three of the sites with severe river shoreline location located downstream of the dam (10AA189, 10AA448, and 10AA457) are situated along flood channels that carry water only during times of high river flows and, thus, erosion occurs only intermittently. At site IPC-SF-071, the terrace is being severely impacted by river erosion, but it is not clear how much the cultural deposits on the terrace are being affected. Most of this site may remain buried in the terrace, or most may already have eroded away.

The precise relationship of project operations and these shoreline erosion impacts is not clear, but it is assumed that they may be at least partially related to project operations. It is important to note, however, that the Swan Falls Project is considered a run-of-river project. That is, the reservoir is not used to store water on a seasonal basis. The reservoir storage that is available is used to reregulate inflows resulting from operations of the upstream C.J. Strike Project so that the existing ramping rate restriction below the Swan Falls Dam is maintained (IPC 2005). Currently, FERC requires the Applicant to maintain instantaneous minimum flows below Swan Falls Dam at no less than 5,000 cubic feet per second (cfs) during the irrigation season (April 1 to September 30) and no less than 4,000 cfs outside the irrigation season (October 1 to March 31). If the average daily inflow is less than the specified required outflow, FERC stipulates that the plant discharge must be equal to the average inflow. To demonstrate that inflows are being passed during these periods, the Applicant restricts headwater elevation changes to less than 0.4 feet within a 24-hour period. Although headwater elevation can normally be held fairly stable, wind conditions can greatly affect reservoir headwater elevation levels, and wind-related waves are known to change the headwater elevation by as much as 0.3 feet. The normal maximum operating headwater is 2,314 feet above mean sea level (msl) and the minimum operating headwater is 2,310 feet above msl. The normal downstream ramping rate restriction for the project is 1 foot per hour and a maximum of 3 feet per day, measured below the dam (IPC 2005). These operational conditions and restrictions ensure that the elevation changes, both above and below the dam, are relatively gradual and of comparatively low magnitude. These gradual elevation changes, in turn, limit the degree to which project operations are responsible for erosional impacts to cultural sites in river and shoreline locations. It is clear that naturally occurring river-related erosion will always be present in an entrenched canyon setting, such as that found within the project area, and it can be difficult to separate this natural effect from project-related conditions. However, it appears possible that some shoreline erosion is directly or indirectly related to project operations, and that the presence of the project has created some erosional conditions that otherwise would not exist. The monitoring program proposed by the Applicant will collect additional data to clarify the nature of the erosion impacts and recommend mitigation if necessary. A severity assessment, recommendations of adverse effects, and preliminary mitigation recommendations from the consulting archaeologists are presented in Table E.4-10.

E.4.1.3.1.2. Road Damage

The consulting archaeologists observed 73 cases of road damage to archaeological sites eligible for the NRHP. Road damage ranged from very minor impacts to the edges of ephemeral artifact scatters to possible obliteration of an entire site, as in the case of site 10OE3083. The primary road giving access to public lands on the north side of the river downstream from the dam is located mostly on lands managed by the BLM. The BLM constructed and maintains the road, along with primitive recreation areas downstream from the dam. The Applicant is not responsible for impacts to sites created by this federal undertaking on federally managed land. Only three instances were noted of road damage to sites on the Applicant’s land or directly related to the Applicant’s activities. These include sites 10AA41, 10AA43, and 10OE3083. Mitigation recommendations are summarized in Table E.4-10.

E.4.1.3.1.3. Recreational Use

The consulting archaeologists observed 104 cases of recreational-use damage to archaeological sites eligible for the NRHP. Recreational-use damage varied in severity from slight disturbances from foot traffic to more substantial impacts from impromptu campsites and fire rings. Much of the heaviest recreational use is taking place on BLM- and Applicant-owned land in the river reach below the dam. Access to this area is provided via the road constructed and maintained by the BLM. The Applicant does not have jurisdiction over the sites on BLM land, but will take measures to protect sites located on Applicant-owned property that are being impacted by recreational use. A human-use study was conducted for the project, and a model was developed to predict sites that may be at risk of human-use related impacts (Technical Report E.3.2-B). The Applicant has proposed to implement a monitoring measure to collect data on the condition of these sites and implement mitigation and protection measures if necessary on sites that are being impacted by recreational use on Applicant-owned land. The Applicant will also collaborate with federal and state land managing agencies to address recreational impacts to sites within on public lands within the project area. The severity of recreational impacts to sites is summarized in Table E.4-9.

E.4.1.3.1.4. Vandalism

The consulting archaeologists documented 34 instances of sites that appeared to have been damaged by vandalism/looting. The damage ranges from extensive, illegal digging at some sites, which has resulted in substantial impact to cultural deposits and site integrity, to less extensive digging, bullet hole damage to rock art panels (site 10AA43), and the apparent collection of surface artifacts. An example of one of the most serious cases of vandalism is site 10AA41, where extensive, illegal digging in both of the shallow rockshelters comprising the site may have destroyed most of the original cultural deposits constituting the archaeological record for which the site is significant. Although field observations indicate that most of the vandalism is old and little evidence was found for current looting activities, the Applicant has proposed to specifically include vandalism in the monitoring program and will cooperate with federal and state officials to prevent and prosecute any identified cases of vandalism activities. Some data recovery or other mitigation measures may be necessary if data from the proposed monitoring program yields evidence of continuing vandalism damage to sites on Applicant-owned land. The severity of vandalism impacts to sites is summarized in Table E.4-9.

E.4.1.3.2. Sites That Would Be Affected By Development

No additional hydroelectric facility development is planned in the project area. Although some recreation facility developments have been proposed under the new license, no archaeological sites or TCPs have been identified within the specific footprint of these planned developments. No known archaeological or historic sites will be affected by the proposed recreational development. Section 106 procedures will be followed for any future activities that have the potential to disturb or impact archaeological or historic sites, and the SHPO and the appropriate agencies will be consulted on a case-by-case basis prior to the construction of any new recreational facilities under the new license.

E.4.1.3.3. Operational Impacts to Sites along Transmission Lines and Associated Service Roads

The single, very short transmission line associated with the project (Swan Falls Tap [Line 954]) was surveyed by Applicant's archaeologist in 1992, and no historic or archaeological sites were found in association with the line. There is no potential for historic properties to be impacted in conjunction with project use of the transmission line. No service roads are associated specifically with this line.

E.4.2. Measures or Facilities Recommended by the Agencies and Tribes

The Applicant distributed the draft *New License Application: Swan Falls Hydroelectric Project* in September 2007. In response, agencies and tribes submitted recommendations for measures or facilities that they believed were necessary to protect or enhance cultural resources. Those measures are discussed in section E.4.2.7.

Before any studies were conducted or the draft license application developed, the Applicant consulted with Native American tribes and federal and state agencies prior to initiating and during the cultural resource studies, providing them opportunities to recommend measures for locating, identifying, and evaluating cultural resources. Native American tribes and state agencies recommended measures are described below and in sections E.4.2.2, E.4.2.4, and E.4.2.5.

Informal consultation was initiated with a preconsultation meeting on May 26, 2004, to which federal and state agencies, and Native American tribal groups, were invited. No tribal representatives attended the meeting, but the Shoshone–Bannock Tribes furnished a short list of concerns through their attorney (Donald Clary, personal communication). Representatives of the SHPO and the BLM were also present.

Consultation was formally initiated by the Applicant when the Formal Consultation Package for Relicensing: Swan Falls Project (FCP) was mailed and distributed on CD in March 2005. The Applicant's staff also met with the SHPO on several occasions throughout the period preceding, during, and following the cultural resources study to ensure that the SHPO was kept informed of the progress of the study, and to invite their participation in developing the historic properties management plan (HPMP), and specific mitigation, protection, and enhancement measures. The Applicant's staff also contacted representatives of the Shoshone–Paiute Tribes and the Shoshone–Bannock Tribes by both letter and telephone before, during, and following the completion of the cultural resources study to invite their participation in completing the study and in developing the HPMP and management measures. The primary contact for the Shoshone–Paiute Tribes was Mr. Ted Howard, Cultural Resources Program Director. The primary contact for the Shoshone–Bannock Tribes was Ms. Carolyn B. Smith, Tribal Department of Energy/Heritage Tribal Office (DOE/HeTO) Cultural Resources Coordinator. A follow-up visit to the Fort Hall Reservation to meet with the Tribal DOE/HeTO staff and other resources specialists was made on November 9, 2005. A site tour of the project area was conducted on May 3, 2005. Invitations were made to the Shoshone–Paiute Tribes and the Shoshone–Bannock Tribes to participate, but no tribal representatives attended. The only federal agency that participated in the tour was the BLM, which was represented by Mr. John Sullivan, manager of the Snake River Birds of Prey NCA.

The Applicant furnished the NPS Pacific West Region Office copies of all the consultation materials for the project, including an invitation to participate in the preconsultation meeting, project tour, public meetings, and a copy of the FCP. The NPS has not responded with any requests for specific measures to identify historic properties, or with any measures for salvage, protection, or mitigation.

E.4.2.1. Measures or Facilities Recommended in Response to the Draft License Application

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies and tribes in section E.4.2.7. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.4.2.2. Recommended Measures for Locating and Assessing Resources

E.4.2.2.1. Archaeological Inventory for Locating Sites

In response to the preconsultation meeting, the SHPO requested that the Applicant "complete a survey of the area of potential effects for the Swan Falls Project" (Neitzel 2004). The SHPO further requested that, "Areas that will be used for off-site mitigation for other resources including fish and wildlife (e.g., Deer Flat Wildlife Refuge) should be included in the survey. The objective of the survey should be to rerecord and reevaluate previously recorded sites; record and evaluate newly discovered sites; assess effects from project operations and recreation on eligible or listed sites; and formulate mitigation measures if necessary. The sites should be recorded using the *Archaeological Survey of Idaho* site record" (Neitzel 2004). The SHPO also noted that, in addition to the Shoshone–Paiute Tribes and the Shoshone–Bannock Tribes, there might be Native American tribal members at the Burns Paiute and Fort McDermitt reservations with family ties to the area.

In response to the preconsultation meeting, the BLM expressed concerns that the Applicant possibly did not have current geographic information system (GIS) data on land ownership boundaries, but otherwise did not request any specific measures in regards to identifying archaeological resources (Sullivan 2004).

None of the federal or state agencies or tribal groups responded to the FCP with any additional requests regarding specific measures for identifying archaeological sites in the APE.

E.4.2.2.2. Inventory of Historic Buildings and Structures

None of the government agencies or tribal organizations made any recommendations about identifying historic structures in the APE. The number and location of historic structures was already well established prior to the cultural resource survey, and it appears that, due largely to this fact, none of the consulted parties requested any specific measures regarding this class of historic resource.

E.4.2.2.3. Inventory and Identification of Traditional Cultural Properties

None of the federal or state agencies requested any specific measures aimed at the identification of TCPs in the project area. The Applicant invited both the Shoshone–Bannock Tribes and the Shoshone–Paiute Tribes to participate in the process of identifying TCPs in the APE through phone contacts and registered letters (Baker 2006a,b; 2007a,b), but neither of the tribes responded with any information. The lack of response from these two tribes means that there was no request for any special measures aimed at identifying TCPs within the project area.

E.4.2.3. Measures Implemented by Applicant for Locating and Assessing Cultural Resources

The Applicant conducted studies aimed at identifying cultural resources in the APE as outlined in the FCP and in response to the recommendations received from the agencies. The identification efforts were conducted during 2006 and in consultation with the SHPO, BLM, and tribes.

E.4.2.3.1. Implemented Measures for Identifying Resources

The Applicant implemented measures to identify all historic properties located within the APE as required by Section 106 of the NHPA as per the regulations at 36 CFR 800.4 and the guidance provided in National Register Bulletin 15. This included efforts to identify resources of all types, including sites, buildings, structures, objects, and TCPs. The standard requirements of Section 106 were followed, including the steps of identification, evaluation of significance through the application of the NRHP criteria, and the assessment of effects.

E.4.2.3.1.1. Identification and Assessment of Archaeological Sites

A Class III intensive-level pedestrian survey of the entire APE was proposed by the Applicant in the FCP and was consistent with the survey recommended by the SHPO. The inventory covered all FERC project lands and a buffered zone extending inland 0.10 mile (160.9 m) above the high-water line on the reservoir and within an area extending approximately 5 miles (8,04 m) downstream from the dam. The survey included Applicant, federal, state and private land within the proposed APE. The objective was to relocate previously identified archaeological sites and update the documentation for those sites, and examine all areas within the APE for any other previously unidentified archaeological sites.

Archaeologists conducting the survey followed the guidelines established by the SHPO and the ASI for identifying and assessing sites. Protocols for the survey followed applicable professional standards and procedures, and the recommended methods prescribed by the ASI. All previously identified and new sites were documented using ASI standard forms and the site documentation procedures stipulated by ASI and recommended by the Idaho Advisory Council of Professional Archaeologists (now the Idaho Professional Archaeological Council). The ASI forms provide a uniform standard used throughout the State of Idaho for documenting sites and recording professional recommendations on site condition and significance. All identified sites were assessed for their integrity and “significance” under the eligibility criteria established for the NRHP as stipulated in 36 CFR 60 and NRHP Bulletin 15. This study was responsive to the request from the SHPO for a complete survey of the entire APE for the project as requested in their letter of June 1, 2004. No off-site mitigation areas were surveyed as requested, because no off-site mitigation is being proposed in conjunction with the new license.

E.4.2.3.1.2. Inventory of Historic Buildings and Structures

In previous relicensing projects (such as the application for the C.J. Strike Project and the Shoshone Falls Project), the SHPO recommended that historic structures and buildings on the Applicant’s lands be located through a reconnaissance survey. The reconnaissance methods for inventorying and recording historic buildings recommended by Attebery and Egleston (1990) have been used by the Applicant on past projects. These methods include on-the-ground surveys to photograph properties and record buildings and structures on a reconnaissance inventory form. No reconnaissance building survey was conducted for the Swan Falls Project as the inventory of historic buildings and structures is well known, and most of these facilities have already been documented at a level exceeding the standards of reconnaissance documentation. The Swan Falls Dam and Powerhouse (01-759/10AA211) have been documented according to the protocols for the Historic American Engineering Record (HAER) (HAER No. ID-20) and the Swan Falls Operator's Village (01-17866) was previously documented following HABS protocols (HABS No. ID-105). The Guffey Bridge (10OE1994/10CN44/73-1706/73-4908) was documented in 1982 by the NPS's Pacific Northwest Region Office (see 73-4908).

E.4.2.3.1.3. Traditional Cultural Properties and Archival and Oral History Studies

The Applicant conducted archival studies to assess the potential for TCPs to be located in the project area and to capture any previously developed data relevant to such properties if they were known to exist. An effort was made to identify specific TCPs through both the literature review conducted in conjunction with the archaeological survey and through attempts to solicit input from tribal governments.

A TCP is a "district, site, building, structure, or object that is valued by a human community for the role it plays in sustaining the community's cultural integrity. Generally [TCPs are] a place that figures in important community traditions or in culturally important activities" (King 1998:267). In addition, a TCP may be eligible for inclusion in the NRHP "because of its association with cultural practices or beliefs in a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998:1).

Methods for identifying TCPs include ethnographic studies and reports, oral history interviews or data, consulting with knowledgeable individuals and groups in a culturally sensitive manner, and taking knowledgeable individuals into the field to visit important TCPs (Parker and King 1998:7). The literature review did not uncover any data on known TCPs, and the tribes did not respond to solicitations to assist in the identification of TCPs, so no additional ethnographic studies or oral history interviews were conducted.

E.4.2.4. Recommended Measures for Protecting, Mitigating, or Enhancing Cultural Resources

None of the federal agencies recommended any specific measures regarding the protection or mitigation of cultural resources in the project area.

In response to the FCP, the Idaho Department of Parks and Recreation (IDPR) recommended that the historic interpretive facilities in the historic Swan Falls Powerhouse be made available to the public on a more regular basis. If this was not possible for security reasons, the IDPR suggested that the historic boardinghouse could be used as a "walk through museum" (Lucachick 2005).

No recommendations were received from tribal organizations regarding any management measures.

E.4.2.5. Recommended Measures for Salvaging Resources

No changes in operations are proposed, and no new development of hydroelectric facilities is proposed. Accordingly, no salvage measures were proposed by the Applicant in the preconsultation meeting or in the FCP.

E.4.2.5.1. Measures for Salvaging Resources That Would Be Affected by Operations

No changes in operations are proposed. No salvage measures appear to be needed and none were recommended by the agencies or the tribes.

E.4.2.5.2. Measures for Salvaging Resources That Would Be Affected by New Development

No new development of the hydroelectric facilities is planned. No salvage measures are needed and none were recommended by the agencies or the tribes.

E.4.2.6. *Measures Proposed by the Applicant*

The Applicant proposes to develop an HPMP to protect and manage cultural resources in the Swan Falls Project area. The HPMP is included here as Technical Report E.4.1-B. The HPMP will be implemented through a Programmatic Agreement (PA) between FERC, the Idaho SHPO, the BLM, and the Advisory Council on Historic Preservation (ACHP), if they chose to participate. The Applicant will participate in the PA as a concurring party. FERC will likely invite the tribal governments of the Shoshone–Bannock Tribes of Fort Hall, Shoshone–Paiute Tribes of Duck Valley, Burns Paiute Tribe of the Burns Paiute Indian Colony, and the Fort McDermitt Paiute and Shoshone Tribe of the Fort McDermitt Indian Reservation to be concurring parties in the PA and participate in consultation during the process of implementing measures to protect and interpret cultural resources.

In addition to the general management and protection measures stipulated in the HPMP, the Applicant proposes the following specific mitigation, protection, and management measures. The applicant proposes the following measures or facilities for cultural resources at the Swan Falls Project area. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.4.2.6.1. Management and Mitigation Measures

As part of the License Application and in accordance with the Federal Power Act of 1920 (FPA), IPC was required to develop measures for the purpose of "locating, identifying, and salvaging historical or archaeological resources that would be affected by the operation of the project" (18 CFR 4.51 (f)(4)(ii)). Although the language of the act is slightly inconsistent with the current vernacular of historic preservation, the section cited is interpreted as being functionally equivalent to, and consistent with, the goals of Section 106 of the NHPA. Specifically, the FPA requires IPC (acting with delegated authority through the PA), to resolve matters of adverse effects to historic properties resulting from project operations. In response to this requirement IPC has developed, through consultation with the SHPO and other interested parties, a variety of management measures. These measures are meant to satisfy the requirements of the FPA and the FERC licensing regulations in 18 CFR 4.51. As the same measures also satisfy the requirements of Section 106, they are also included in the HPMP.

To satisfy the requirement of "identify[ing]…archaeological resources that would be affected by the operation of the project", IPC implemented the archaeological survey proposed in the FCP dated March 2005, and has proposed a program to identify TCPs within the APE, and a site monitoring program to monitor the condition of all historic properties within the APE. As "salvaging" is taken to mean mitigation, IPC has also developed a specific mitigation measure to address and resolve matters of adverse effect to historic properties potentially resulting from project operations. This mitigation measure is currently based on the impacts to historic properties within the APE as observed by the survey conducted for relicensing. This measure is separate from the general protocol proposed in the HPMP for the mitigation of unavoidable adverse effects on historic properties and dispute resolution, which addresses impacts that have not yet been identified.

Additionally, IPC has developed other management measures that are not specifically required by the license application or as specific mitigation under Section 106. These measures include protection and stewardship measures, and measures to provide for the interpretation of the cultural resources of the project area.

The Applicant proposes the following measures for mitigation of project-related effects, and the protection and management of historic properties identified in the APE.

E.4.2.6.1.1. Mitigation of Adverse Impacts to Historic Properties

Goal: Mitigate adverse impacts to historic properties located within the Swan Falls Project APE.

Description: This measure will implement or recommend protection or mitigation measures for historic properties. Recommending or implementing a particular protection or mitigation measure depends on several factors that will be observed by the various site monitoring protocols. The monitoring protocols will then make evaluations regarding the severity and extent of adverse impacts. According to the evaluations and landownership, the historic properties will be attributed to one of two possible categories. The categories and resulting actions are as follows:

- For historic properties located on non-Applicant lands that are determined to be experiencing adverse effects not related to project operations, the Applicant will document the effects and recommend possible protection and/or mitigation measures to the appropriate landowner or agency. As such impacts are not related to project operations, the Applicant will not be responsible, financially or otherwise, for implementing the mitigation measures.

- For historic properties located on the Applicant's lands or determined to be experiencing adverse effects related to the Applicant's project operations, the Applicant will design a site-specific protection/mitigation program in consultation with the SHPO and implement the program.

Although all monitoring protocols begin with an initial data gathering period of 3–4 years, a historic property may be recommended for protection and/or mitigation measures prior to the end of the data-gathering period. All historic properties within the Swan Falls Project APE, including those that may be subject to protection and/or mitigation, will be monitored throughout the life of the license according to the monitoring protocol to which they are assigned. The results of the monitoring protocols will be documented in an annual report, which will be reviewed by the SHPO and appropriate landowners, agencies, and tribes.

Possible protection and mitigations measures include limiting site access (fencing off sites, road closures), posting cautionary signs, establishing security patrols, excavating for data recovery, and protecting the shoreline. Additionally, numerous methods of shoreline protection can be used alone or in combination, including soil capping, riprap, gabion baskets, revegetation, and log revetments (Biedenharn et al. 1998). Revegetation with native plants will be the Applicant's preferred method of protection. The Applicant will design shoreline protection methods in consultation with the SHPO, and other appropriate parties, in consideration of cultural and noncultural resources and appropriate legislation. Additional or alternative protective measures may be developed through consultation with the SHPO or agencies.

In all cases, the Applicant will strive to leave the existing historic properties in place. Protective structures will be placed against the shoreline rather than into the bank. Bank sloping or other invasive methods will not disturb the shoreline unless there is no other reasonable alternative. In the event that no reasonable alternative is available, excavation of the shoreline, in connection with protection measures, will be preceded by an archaeological excavation to recover any data that would be lost due to excavation or surface-disturbing activities associated with the stabilization actions. If bank sloping is necessary for shoreline protection, the bank will be excavated using appropriate archaeological methods, possibly including dry and/or water screening methods to recover excavated cultural material.

In accordance with the ACHP (1999) guidance on data recovery excavations, shoreline protection of archaeological sites is preferable to archaeological data recovery excavations. However, when surface evidence is inadequate to conclusively determine the eligibility of a site, some limited testing may be required to confirm qualities that are required to make a site eligible for the NRHP. If data recovery is deemed appropriate, the Applicant will ensure that archaeologists who conduct the work meet the Secretary of the Interior’s Standards for Professional Archaeologists and hold all necessary state and federal permits, including curation agreements. Prior to commencing data recovery, the Applicant will submit a detailed plan to guide the data recovery to the SHPO and/or the BLM, as appropriate, for the lands involved. The SHPO and/or the BLM will have 30 days to review and comment on the plan. Failure to respond within 30 days will be considered to constitute acceptance of the plan. On acceptance of the plan, data recovery efforts can proceed. If precontact resources are involved, the affected tribes will be provided with a copy of the data recovery plan for review and comment and will be invited to participate in implementing the plan as appropriate.

Associated Benefits: Additionally, botanical, wildlife, recreational, and aesthetic resources will be enhanced by this measure, as revegetation will reestablish original flora, provide habitat, and enhance shoreline appearance.

Functional Design Drawings: Functional design drawings are not available at this time. Site specific design will be developed, as necessary, in consultation with the SHPO and other interested parties.

Implementation Schedule and Cost Estimate: Eleven sites have currently been identified by the relicensing survey as experiencing severe impacts potentially related to the Applicant's project operations. Of these, six historic properties are estimated to be experiencing adverse effects serious enough to require some level of protection and/or mitigation. The implementation cost is estimated at $50,000 per site. Protection and mitigation measures would be implemented as needed, according to the evaluations of the site monitoring protocols. The estimated operations and maintenance (O&M) cost associated with each line item follows:

Year	Action	O&M Cost ($)
1–30	Recommend protection and/or mitigation measures to appropriate landowner or agency	No additional cost
1–30	Design and implement protection and/or mitigation measures to adversely affected historic properties either owned by the Applicant or impacted by the Applicant's operations	50,000 per site

Total Cost: Total O&M cost is $300,000. The Applicant will fund mitigation measures on the Applicant's land and those on public lands necessitated by impacts directly related to project operations. The Applicant will encourage federal, state, and private landowners to fund mitigation efforts on their lands for sites that are experiencing nonproject-related impacts.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.2. General Site Monitoring: Historic Properties within the Area of Potential Effect

Goal: Protect historic properties within the Swan Falls Project APE, determine the cause of any impacts, and make recommendations for the mitigation of impacts to the appropriate party(s), should impacts exist.

Description: This measure describes one of three monitoring programs presented in the management measures to assess the potential impacts to historic properties over time. This particular measure will examine the condition of all historic properties that are being impacted by activities or processes not related to project operations. Data created by this measure will be used to determine which sites may require protection or mitigation.

Currently, 155 historic properties occur within the APE that were not specifically identified as experiencing severe impacts related to the Applicant's project operations or as being at risk of human-use impacts (Technical Report E.3.2-B). These sites will be monitored by the general monitoring protocol. Table 2 in the HPMP (Technical Report E.4.1-B[3]) lists all historic properties within the APE and their corresponding monitoring measure.

Monitors, working under the supervision of a professional archaeologist qualified according to the Secretary of the Interior's standards, will visually evaluate the condition of sites while looking for causes of site impacts. Examples of potential impact agents include, but are not limited to, erosion, vandalism, looting, recreation, and grazing.

Each site will be photographically documented with a minimum of two, site-overview images each time the site is monitored. To replicate the photo documentation of each site from year-to-year, the photo points will be taken with a global positioning system (GPS) unit capable of submeter accuracy when differentially corrected. Additionally, observed impacts and photo points will be mapped on the most recent site map, which was updated during the 2006 survey. Additional images may be taken of particular areas that exemplify the impacts present, which will create the template for future work at respective sites and will document changing conditions. If a monitoring visit does not observe a change in the extent or severity of impacts, as evidenced by previous photos and monitoring data, the additional photos will not be taken.

The direction of each photograph will be taken using a compass adjusted to the correct declination. Digital images will be taken with a camera capable of at least a four megapixel resolution, which should allow images to be cropped as necessary to replicate the same field of view from visit to visit. The mapping may use the existing site datum or a newly established datum (outside the active impact area) where necessary.

---

[3] Due to the confidential nature of this report, it has been removed and provided to the appropriate entities.

Data will be collected from each site in a manner consistent with the previous year, allowing for the data to be more easily quantified and potentially graphed for tracking impacts. Prior to initiating the monitoring, the Applicant, or its designated contractor, will develop forms for consistently collecting data. Although the goal of this particular monitoring protocol differs from the other monitoring programs, the methods are essentially the same as those used by the human-use study site monitoring measure.

Implementing this monitoring measure will begin with an initial data collection period that will require a monitoring visit to half of the sites, every other year, until all sites are visited twice over the course of 4 years. After the initial data collection period, all the sites belonging to this monitoring protocol will be evaluated to determine the necessary interval of future monitoring. The evaluations may also make recommendations regarding protection of the sites or mitigation of the impacts to the appropriate agency or landowner. The Applicant will cooperate with the appropriate agency or landowner to reduce adverse impacts to historic properties, but does not assume responsibility for the impacts or costs related to the mitigation of such impacts. Following a review of the baseline data generated during the first 4 years of monitoring, sites may be dropped completely from the monitoring process, may be monitored on a less frequent basis, or may continue to be monitored once every 2 years.

Associated Benefits: The information produced through this monitoring measure will help the Applicant better understand impacts to historic properties and how to best manage those impacts. Additionally, historic properties will be preserved through this measure, securing the potential data they have to offer and possibly adding to the general understanding of archaeology along the middle Snake River. Although the focus of this monitoring measure is to document impacts to historic properties within the Swan Falls Project APE, it will also enable the Applicant to make protection and mitigation recommendations regarding such impacts and to provide those recommendations to the appropriate agency. The results of the monitoring will be reported in an annual monitoring report and will be subject to SHPO and agency review. Recommended mitigation actions stemming from monitoring, and any proposed changes to the monitoring schedule, will be made only after consulting with the SHPO and, if necessary, the federal agency.

Implementation Schedule and Cost Estimate: This measure would be implemented throughout the life of the license. Annual costs could decrease significantly as sites are reassigned to a less frequent monitoring interval or reassigned to a different monitoring measure. Additionally, should a site be mitigated for adverse impacts, it may not require the same intensity or frequency of monitoring. The implementation schedule and the estimated O&M cost associated with each line item are as follows:

Year	Action	O&M Cost ($)
1	Monitor one-half of the sites to establish baseline data	38,000
2	Monitor one-half of the sites to establish baseline data	38,000
3	Monitor one-half of the sites a second time to establish baseline data	38,000
4	Monitor one-half of the sites a second time to establish baseline data	38,000
4–30	Evaluate and (re)assign sites to a particular monitoring interval or monitoring measure as appropriate	No additional cost
1–30	Determine which sites require mitigation of adverse effects; make recommendations to the appropriate landowner or agency	2,000
5–30	Monitor sites according to appropriate monitoring interval as initially established by the 4-year evaluation, and subsequent evaluations	20,000/year
1–30	Monitor effectiveness of any mitigation and provide feedback to mitigation measure	No additional cost

Total Cost: Total O&M cost over 30 years is $674,000. The Applicant will be responsible for funding this measure.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.3. Site Monitoring: Assessing Project Impacts to Historic Properties

Goal: Protect historic properties within the APE that have been identified as being directly or indirectly impacted by project operations.

Description: This is one of the three monitoring programs presented in the management measures to assess the potential impacts to historic properties through time. This particular measure will monitor the condition of all historic properties that appear to possibly be directly or indirectly impacted by project operations. The measure will confirm or deny that project operations are causing the observed impacts. This measure will create data that will be used to determine which sites may require protection or mitigation of adverse effects and to identify the cause of the impacts.

Currently, 10 historic properties have been identified as experiencing severe impacts that are potentially directly or indirectly related to project operations. All 10 properties are included in this monitoring measure. An additional 20 sites have been identified as experiencing moderate impacts that are potentially related to project operations. Of the 20, 18 sites will be monitored through the general site monitoring protocol, and the remaining two sites are assigned to the human-use monitoring protocol. There is a possibility that any of the 20 sites could be reassigned to this protocol pending on further evaluation. Table 2 of the HPMP (Technical Report E.4.1-B) lists all historic properties within the APE and their corresponding monitoring measure.

Associated Benefits: The information produced through this monitoring measure will help the Applicant better understand project-related impacts and how to best manage sites impacted by project operations. Additionally, historic properties will be preserved through this measure, securing the potential data they have to offer and possibly adding to the general understanding of archaeology along the middle Snake River. And, although the focus of this monitoring measure is to document project-related impacts to historic properties within the APE, it also will document observed impacts not related to project operations and make protection and mitigation recommendations regarding such impacts.

Functional Design Drawings: Functional design drawings are not applicable for this proposed measure.

Operation and Maintenance Procedures: The sites selected for this protocol were identified by the most recent survey (Technical Report E.4.1-A) as experiencing severe impacts directly or indirectly attributable to project operations. Sites experiencing low or moderate impacts potentially related to project operations will be assigned to the general site monitoring protocol with the potential of being reassigned to this protocol if impacts become severe and/or are definitively linked to project operations. Observed impacts will include, but will not be limited to, shoreline erosion, road damage, and vandalism. The monitoring process will precisely map the impacts to sites to establish a baseline against which future monitoring may evaluate an increase or decrease in effects or the static nature and severity of the impacts. The monitoring will evaluate if the reported impacts are related to the Applicant’s project operations. The mapping of impacts will be achieved through the use of a total station (Topcon) that will be based at an established datum. As a total station requires line of sight to take measurements, it will use the existing site datum or newly established datum (outside the active impact area) where necessary. A total station is capable of accurate measurements (± 2 mm) through three dimensions and will provide reliable data for the evaluation of impacts. The measured impacts may involve the dimensions of a road cut or the position of a retreating shoreline. Measurements may be taken along an established transect through the impact area or the observed limit of the impact area. Any given site may require measuring numerous impact areas. If practical, measurements may also be taken manually with measuring tapes. From year to year and using previous records, data will be collected from each site in a manner consistent with the previous year using a similar or identical number of measured points. Using similar measured points will allow for the data to be mapped, quantified, and potentially graphed for conveniently tracking impacts. Prior to initiating the monitoring, the Applicant, or its designated contractor, will develop forms for the consistent collection of data. The methods of this site monitoring protocol are far more intensive than the methods used by the other two site monitoring programs.

Additionally, photographs (digital images) will be taken at each site as appropriate. Photographs will, at a minimum, include views of each distinct impact area and may also include general site overviews. The photographs will be taken from set photography points that will be established virtually and mapped with the total station. The direction of each photograph will be measured using a compass adjusted to the correct declination. If a monitoring visit does not observe a discernable change in the extent or severity of impacts as evidenced by previous photographs and monitoring data, photographs will not be taken. Digital images will be taken with a camera capable of at least a four-megapixel resolution. This level of resolution should allow images to be cropped, as needed, to replicate the same field of view from year to year.

Implementing this monitoring measure will begin with an initial data collection period that will require a monitoring visit to each site, each year, for the first 3 years of the monitoring program. After the initial data collection period, all sites belonging to this monitoring protocol will be evaluated to determine the needed interval of future monitoring or the possibility of reassigning the site to the general site monitoring protocol. The possible outcomes of such evaluations and the associated required actions may include monitoring on an annual basis, mitigation of adverse effects and continued monitoring, or reassignment to the general monitoring protocol. The results of the monitoring will be reported in an annual monitoring report and will be subject to SHPO and agency review. Recommended mitigation actions stemming from monitoring, and any proposed changes to the monitoring schedule, will be made only after consultation with the SHPO and, if necessary, the federal agency.

Implementation Schedule and Cost Estimate: This measure would be implemented throughout the life of the license. Annual costs could decrease as sites are monitored less frequently within this protocol or reassigned to the general monitoring protocol. Additionally, if a site is mitigated for adverse impacts, it may not require the same monitoring frequency. The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
1	Monitor sites to establish baseline data	14,500
2	Monitor sites to establish baseline data	14,500
3	Monitor sites to establish baseline data	14,500
3	Evaluate monitoring interval need and/or monitoring measure for sites and reassign as appropriate	2,000
1–30	Determine which sites require mitigation of adverse effects, implement under mitigation measure	2,000

Year	Action	O&M Cost ($)
4–30	Monitor sites according to appropriate monitoring interval as established by 3–year evaluation process	16,000/year
5–30	Reevaluate and reassign sites to particular monitoring interval or monitoring measure as appropriate	No additional cost
1–30	Monitor effectiveness of adverse effects mitigation; provide feedback to mitigation measure	No additional cost

Total Cost: Total O&M cost over 30 years is $479,500 (partly based on estimated cost of $1,450 per site per monitoring visit). The Applicant will be responsible for funding this measure.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.4. Site Monitoring: Assessing Impacts from Human-use to Historic Properties

Goal: Protect historic properties within the Swan Falls Project APE that have been identified by the human-use study GIS model as being at risk for impacts related to human-use (primarily recreational) activities. The measure will also determine the accuracy of the GIS predictive model.

Description: This measure is one of three monitoring programs presented in the management measures to assess the potential impacts to historic properties within the APE through time. This particular measure will examine the condition of historic properties that have been identified in the “Influences of Human Activities on Terrestrial Resources Associated with the Swan Falls Hydroelectric Project” (Technical Report E.3.2-B) (a GIS model) as being at risk for impacts related to human-use (recreational) activities. Historic properties and human-use areas were assessed weighted values based on various attributes. These values, along with an evaluation of proximity, generated an index value for each site that predicted a Very Low, Low, Moderate, High, or Very High probability of human-use impacts to historic properties. Examples of human-use areas included roads, trails, and popular fishing and camping locations. This measure will determine the predictive functionality of the human-use study GIS model by comparing the actual and predicted presence and severity of human-use impacts. Additionally, this measure will create data that will be used to determine which sites may require protection or mitigation. The potential human-use impacts identified by the study are not related to the Applicant’s project operations (Technical Report E.3.2-B).

Thirteen historic properties within the Swan Falls Project APE have currently been identified by the human-use study GIS model as being at Very High, High, or Moderate risk for human-use impacts. Table 2 of the HPMP (Technical Report E.4.1-B) lists all historic properties within the APE and their corresponding monitoring measure.

Most of these impacted sites are located along the north bank of the river, downstream of the dam, and on BLM land. The majority of the historic properties identified by the human-use study as having elevated risk values did so because of an interaction with a primary road and user-defined secondary roads. Management measures driven by other resource concerns propose closing many of the user-defined secondary roads that interact with several of the historic properties of this monitoring protocol. If the roads are effectively closed, such sites would be reassigned to the general site monitoring protocol.

Associated Benefits: The information produced through this monitoring measure will help the Applicant better understand impacts to historic properties and how to best manage such impacts. Additionally, historic properties will be preserved through this measure, securing the potential data they have to offer and possibly adding to the general understanding of archaeology along the middle Snake River. And, although the focus of this monitoring measure is to document human-use impacts to historic properties within the Swan Fall Project APE, it will also help the Applicant make protection and mitigation recommendations regarding such impacts and provide those recommendations to the appropriate agency.

Functional Design Drawings: Functional design drawings are not applicable for this proposed measure.

Operation and Maintenance Procedures: The sites selected for this protocol were identified by the human-use study GIS model that sought to identify historic properties at risk of being impacted by identified human-use (recreational) areas. The study identified 13 sites as having a

Moderate, High, or Very High level of potential risk due to adjacent or overlapping human-use areas. Sites identified as having a Low or Very Low risk of impact due to human use were eliminated from the dataset and not further examined by the study. However, such sites are within the Swan Falls Project APE and will be monitored by the general site monitoring protocol.

Monitors, working under the supervision of a professional archaeologist qualified under the Secretary of the Interior's Standards, will visually evaluate the condition of sites while looking for the cause(s) of impact. Examples of impact agents may include, but are not limited to, erosion, vandalism, looting, recreation, and grazing.

Each site will be photographically (digital) documented with a minimum of two, site-overview images each time the site is monitored. To replicate the photo documentation of each site from year to year, the photo points will be taken with a GPS unit capable of submeter accuracy when differentially corrected. Additionally, observed impacts and photo points will be mapped on the most recent site map, which was updated during the 2006 survey. Additional images may be taken of particular areas that exemplify impacts present, which will create the template for future work at respective sites and will document changing conditions. If a monitoring visit does not observe a change in the extent or severity of impacts as evidenced by previous photos and monitoring data, the additional photos will not be taken.

The direction of each photograph will be taken using a compass adjusted to the correct declination. Digital images will be taken with a camera capable of at least a four megapixel resolution. This level of resolution should allow images to be cropped, as necessary, to replicate the same field of view from visit to visit. The mapping may use the existing site datum or a newly established datum (outside the active impact area) where necessary and allowed.

From year to year and using previous records, data will be collected from each site in a manner consistent with the previous year. This consistency will allow for the data to be more easily quantified, and potentially graphed for conveniently tracking impacts. Prior to initiating the monitoring, the Applicant, or its designated contractor, will develop forms for consistently collecting data. Although the goal of this particular monitoring protocol differs from the other monitoring programs, the methods are essentially the same as those used by the general site monitoring measure.

Implementing this monitoring measure will begin with an initial data collection period that will require a monitoring visit to each site, each year, for the first 3 years of the monitoring program. After the initial data collection period, all the sites belonging to this monitoring protocol will be evaluated to determine the needed interval of future monitoring or the possibility of reassigning the site to the general site monitoring protocol. The evaluations may also allow the Applicant to make recommendations to the appropriate landowner regarding protection or mitigation measures. The Applicant will cooperate with the appropriate landowner or agency to reduce human-use impacts to sites, but does not assume responsibility for the impacts or costs related to the mitigation of such impacts. After conclusions have been made regarding the effectiveness of the human-use study as a tool for identifying recreational-related impacts, the sites of this monitoring protocol may be reassigned to the general site monitoring protocol. The possible outcomes of such evaluations and the associated required actions may include monitoring on an annual basis, mitigation of adverse effects and continued monitoring, or reassignment to the general monitoring protocol. The results of the monitoring will be reported in an annual monitoring report and will be subject to SHPO and agency review. Recommended mitigation actions stemming from monitoring, and any proposed changes to the monitoring schedule, will be made only after consultation with the SHPO and, if necessary, the federal agency.

Implementation Schedule and Cost Estimate: This measure would be implemented throughout the life of the license. Annual costs could decrease if there is a reduction in the number of sites requiring the intensive monitoring protocol or sites are reassigned to a different monitoring measure. Additionally, if a site is mitigated for adverse impacts, it may not require the same intensity or frequency of monitoring. The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
1	Monitor sites to establish baseline data	6,000
2	Monitor sites to establish baseline data	6,000
3	Monitor sites to establish baseline data	6,000
3	Evaluate monitoring interval need and/or monitoring measure for sites and reassign as appropriate	1,000
1–30	Determine which sites require mitigation of adverse effects, implement under mitigation measure	1,000
4–30	Monitor sites according to appropriate monitoring interval as established by 3–year evaluation process	6,000/year
5–30	Reevaluate and reassign sites to particular monitoring interval or monitoring measure as appropriate	No additional cost
1–30	Monitor effectiveness of adverse effects mitigation; provide feedback to mitigation measure	No additional cost

Total Cost: Total O&M cost over 30 years is $182,000. The Applicant will be responsible for funding this measure.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.5. Identify and Protect Traditional Cultural Properties

Goal: Identify and protect TCPs located on project lands through consultation with the Shoshone–Bannock Tribes, Shoshone–Paiute Tribes, Burns Paiute Tribe, and Fort McDermitt Paiute and Shoshone Tribe, and if necessary, through implementation of an ethnographic or oral history study.

Description: Although no TCPs are currently identified within the Swan Falls Project APE, such resources may potentially exist within the APE. The process of identifying the presence and significance of TCPs may be achieved through continued consultation with the tribes, but may also require a specific ethnographic study. As discussed in section E.4.1.2.6, the Applicant has provided the tribes several opportunities to participate in the Section 106 process in regards to assisting with the identification of TCPs. To this point in time, the Applicant’s efforts to solicit input from the tribes regarding the possible presence of TCPs in the APE have not yielded any information confirming the existence of any such properties. If further consultation with the tribes fails to identify TCPs within the APE, and if such a study is requested by the tribes, the Applicant will contract with a qualified ethnographer to conduct an ethnographic study with the explicit objective of identifying any TCPs located within the Swan Falls Project APE. The ethnographer will be selected in consultation with the tribes. If any TCPs are identified on Applicant-owned lands and evaluated as eligible to the NRHP, the Applicant will protect such resources according to applicable laws and regulations. Additionally, consultation protocols will be developed to address concerns that tribes or agencies may raise about confidentiality and access. The Applicant will also collaborate with private, federal, and state landowners to encourage protection of any TCPs located in the APE on lands managed by those entities.

Associated Benefits: The affected tribes may benefit from the protection and preservation of traditional knowledge and the identification and protection of cultural sites of significance to their members.

Functional Design Drawings: Functional design drawings are not applicable for this proposed measure.

Operation and Maintenance Procedures: If requested by the Shoshone–Bannock and/or the Shoshone–Paiute Tribes, Burns Paiute Tribe, Fort McDermitt Paiute and Shoshone Tribe, the Applicant will contract with a qualified ethnographer to conduct a systematic study with the explicit objective of identifying any TCPs within the Swan Falls Project APE. The Applicant will consult with the respective tribes regarding the selection of the ethnographer in an effort to identify a researcher that is acceptable to all the interested parties. The study would be conducted according to NPS guidelines as outlined in National Register Bulletin No. 38, *Guidelines for Evaluation and Documenting Traditional Cultural Properties* (Parker and King 1998). The study will likely include a literature review of pertinent historic and ethnographic documentation, interviews with knowledgeable tribal members, and field inspection and recordation while in the company of knowledgeable tribal members. Any identified TCPs must be appropriately documented on NRHP forms or their equivalent. All identified TCPs would be evaluated for eligibility according to the standards for inclusion on the NRHP and the results of the study would be made available to the Applicant to facilitate the effective management and protection of cultural resources within the project APE. The Applicant will work with the ethnographer and the tribes to ensure appropriate safeguards are implemented as recommended in Bulletin No. 38 and to safeguard information about TCPs that may be considered sacred, sensitive, or confidential. TCPs identified on Applicant-owned lands will be managed according to applicable laws and regulations. The Applicant will work with the tribes to address any concerns about protection and access. If this measure identifies TCPs on non-Applicant lands within the project APE, the Applicant will coordinate with the appropriate tribes and landowners to facilitate proper treatment of the TCPs; however, the Applicant has no authority over or responsibility for TCPs located on lands it does not own.

Implementation Schedule and Cost Estimates: The Applicant will continue to consult with the tribes in an effort to identify any TCPs that may be located in the APE. If consultation fails to identify any TCPs, and if requested by the tribes, the Applicant will initiate ethnographic or oral history studies aimed at identifying TCPs within the Swan Falls Project APE. The Applicant will fund and contract the studies during the first 3 years following issuance of the license.

Year	Action	O&M Cost ($)
1	Consult with tribes to identify the most appropriate process for identifying TCPs	2,000
2–3	Contract with independent researchers or tribal governments to conduct ethnographic/oral history research necessary to identify TCPs located within the APE	40,000

Total Cost: Total O&M cost is $42,000. The Applicant will be responsible for funding this measure.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.6. Historic Boardinghouse Maintenance

Goal: Preserve the three-story boardinghouse, through a program of regular maintenance, for the life of the license. This measure is one of five related measures, all of which seek to improve the quality and quantity of interpretive and educational opportunities for the general public.

Description: The boardinghouse (also known as the clubhouse) is one of the few remaining structures of the Swan Falls Operator's Village related to the early construction and operation of Swan Falls Dam. It is located within the project area and is eligible for the NRHP. As abandonment of the structure would constitute an adverse effect to the historic property, the company will maintain the facility. Maintenance may include activities such as exterior cleaning and painting, treating (oiling) of roof shingles, and re-roofing as needed.

Associated Benefits: The maintenance of the boardinghouse would preserve the historic property for possible integration into informational and educational displays for the public visiting the historic Swan Falls facilities.

Functional Design Drawings: Provided maintenance is "in kind;" functional design drawings are not necessary for this proposed measure.

Operation and Maintenance Procedures: The maintenance procedures outlined by this measure would be implemented on an as-needed basis. Given the record of previously required maintenance, the Applicant projects that the roof shingles would need to be treated (oiled) every other year, the exterior would need to be repainted every 15 years (both for the life of the license), and the roof would need replacement at some point toward the end of the license period.

Implementation Schedule and Cost Estimate: The various maintenance items of this measure would be implemented on an as-needed basis. The implementation schedule and the estimated O&M cost associated with each line item are projected as follows:

Year	Action	O&M Cost ($)
2–30	Treat (oil) wooden shingles every other year beginning in year 2 (15 times)	30,000 (2,000 per treatment)
2 & 17	Repaint exterior (2 times)	5,000 (2,500 per application)
1	Replace roof (1 time)	18,500
1–30	General maintenance	1,800/year

Total Cost: Total O&M cost over 30 years is $107,500. The Applicant will be responsible for funding this measure.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.7. Photo Documentation and Site Relocation

Goal: Locate photographic documentation completed as part of the original site recordings. Incorporate any of the missing data from the original site documentation efforts, particularly the original photographs, with new site forms completed in conjunction with the current survey. This more complete site documentation would then be used to try to find sites that were not or could not be relocated during the most recent survey conducted for relicensing.

Description: The site forms for many of the historic properties located within the Swan Falls Project APE have not been updated since the original surveys of the area. Most of the original site forms are brief, incomplete, and do not include artifact or site area photographs. As a result, definitively relocating and recording previously recorded sites is challenging. Using the original, incomplete site forms, 16 sites originally documented as being within the APE were not relocated by the survey preformed for relicensing. However, the associated early survey reports document that photos were taken for most of these sites. Further investigation has revealed that at least some of the original photographs are currently curated at the SHPO or the BLM’s Four Rivers Field Office. Initially, this measure would procure the disassociated site photographs and attempt to connect them with the correct sites. This measure would then use the artifact and site photos in conjunction with the original site forms in an attempt to relocate and rerecord the sites that were not relocated by the relicensing survey.

The 14 sites that were not relocated by the survey conducted for relicensing that are included in this measure are: 10AA19, 10AA22, 10AA50, 10AA193, 10AA194, 10AA195, 10AA199, 10AA200, 10AA201, 10AA208, 10AA445, 10OE31, 10OE247, and 10OE250. The surveyors were denied access to the remaining two sites that were not relocated (10OE2014 and 10OE2015); these two sites are not included in this measure.

Associated Benefits: This measure has the potential to increase the understanding of Idaho archaeology in general.

Implementation Schedule and Cost Estimates: The schedule to implement this measure depends somewhat on the SHPO, although it ideally would be completed within 5 years of the new license issuance. The O&M cost for relocating and rerecording sites is based on an estimate of approximately $550.00 per site. The implementation schedule and the estimated cost associated with each line item are as follows:

Year	Action	O&M Cost ($)
1–2	Procure site photos and associate with site forms	7,500/year
3–4	Relocate/rerecord sites	3,850/year
5	Assign any relocated sites to appropriate monitoring or mitigation measure	500

Total Cost: Total O&M cost is $23,200. The Applicant will be responsible for funding this project.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.8. Comprehensive Recording of Site 10AA684

Goal: Research and record a little-understood historic waterwheel complex downstream of Swan Falls Dam.

Description: The survey for relicensing located and recorded an extensive historic waterwheel complex on the north shore of the river, just downstream of the Swan Falls Dam. While the completed recording is adequate for current reporting standards and an evaluation of NRHP eligibility, it did not conclusively determine the function or origin of the complex. The site is enigmatic in that the most likely functions for such a water-driven wheel (saw mill, grist mill) are not necessarily congruent with the location of the complex. Historical research and a more intensive site recording could potentially add to understanding the site.

Associated Benefits: This measure would increase the general knowledge of historic archaeology in Idaho. Additionally, the potential exists for volunteer opportunities and teaming with other interested parties/agencies.

Implementation Schedule and Cost Estimates: The implementation of this measure would ideally be completed within 5 years of the issuance of a new license. The implementation schedule and the estimated O&M cost associated with each line item are as follows:

Year	Action	O&M Cost ($)
1–2	Site recording	1,250/year
1–2	Historical research	2,500/year
3–5	Report results—updated site recording	5,000

Total Cost: Total O&M cost is $12,500. The Applicant will be responsible for funding this project.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.9. Analysis and Publication of Previously Collected Materials

Goal: Temporarily procure and analyze artifacts collected at archaeological sites within the Swan Falls Project APE during previous surveys and publish the results.

Description: During the course of reviewing the original site forms for all of the sites within the APE, researchers observed that many forms detail artifacts that were collected during the early surveys. Unfortunately, little in the way of additional documentation regarding such collections exists. Communications with the SHPO confirmed that they possess at least some of the artifacts. This measure would seek to locate and temporarily borrow such collections for a program of analysis. After lithic, faunal, floral, or ceramic analysis, the artifact collections would be returned to the SHPO. The results of the analysis would be assembled into a report and published though the Applicant’s report series or, possibly, through the Boise State University report series. This measure would contribute toward several other management measures proposed in this section.

Associated Benefits: This measure would have the associated benefit of contributing to the understanding of Idaho archeology in general, making such information available to future research. As this measure is ideally suited to an undergraduate or graduate project, its implementation offers partnering opportunities with academic institutions. Implementing this measure also has the potential to contribute to the success of several other management measures proposed in this section.

Implementation Schedule and Cost Estimate: Implementing this measure would ideally be completed within 5 years of the issuance of a new license. The implementation schedule and the estimated O&M cost associated with each line item are as follows:

Year	Action	O&M Cost ($)
1–3	Procure collections from the SHPO	2,000/year
1–3	Analyze collections	3,333/year
4–5	Publish report	2,500/year

Total Cost: Total O&M cost is $21,000. The Applicant will be responsible for funding this project.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.10. Native American Interpretive and Educational Panel

Goal: Provide the public with interpretive and educational opportunities to enhance area recreation and visitation. This measure is one of five related measures, all of which seek to improve the quality and quantity of interpretive and educational opportunities for the general public.

During consultation for various relicensing efforts, tribal representatives expressed strong interest in letting the general public know about the Native American presence and historical land use in the general area. Interpretive and educational panels are a cost-effective means of accomplishing this goal.

Description: This measure consists of the design and placement of an interpretive panel. The panel will focus on the culture (subsistence, settlement patterns, etc.) of Native Americans of the Swan Falls area. Ethnographic accounts and data from archaeological investigations of the area will be used to compose the text and graphics. Exact panel placement has not been determined, but the panel will be installed in a location that will optimize exposure, perhaps near the general parking area.

Associated Benefits: Associated benefits from this measure are anticipated for recreational and botanical/wildlife resources. For recreational resources, providing project area history is considered a means of enhancing visitor experience. For botanical and wildlife resources, educating visitors about Native American use of local plant and animal resources is also expected to enhance visitor experience and encourage protection of those resources.

Functional Design Drawings: Functional design drawings are not available at this time. Designs will be developed as part of the implementation of the proposed measure.

Implementation Schedule and Cost Estimate: The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
1–3	Develop, produce, and install panels	2,667/year
1–30	Repair and/or replace (annually)	350/year

Total Cost: Total O&M cost is $18,500. The Applicant will be responsible for funding this measure.

Location Map: A location map is not available at this time. The signage placement will be determined during the implementation.

E.4.2.6.1.11. Swan Falls Dam and Boardinghouse Interpretive and Educational Panels

Goal: Produce panels to provide the public with interpretive and educational opportunities for the dam, powerhouse, and boardinghouse that will enhance recreation and visitation. This measure is one of five related measures, all of which seek to improve the quality and quantity of interpretive and educational opportunities for the general public.

Description: As a result of this measure, the Applicant would develop and install two interpretive and educational panels regarding the history of the Swan Falls Hydroelectric Project. One panel would focus on the dam and the powerhouse, while the other would be specific to the boardinghouse and Swan Falls Operators Village. The panels would include historic images and interpretive text derived from historic records and “Swan Falls, A History of the First Hydroelectric Power Plant on the Snake River 1899–1901” by James L. Huntley (Huntley 1982). Exact panel placement has not been determined, but the panel will be installed in a location that will optimize exposure, perhaps near the general parking area.

Associated Benefits: The proposed panels will benefit aesthetic resources and recreational resources by providing information to the public about the immediate Swan Falls area.

Functional Design Drawings: Functional design drawings are not available at this time. Designs will be developed as part of the implementation of the proposed measure.

Implementation Schedule and Cost Estimate: The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
1–3	Develop, produce, and install panels	5,333/year
1–30	Repair and/or replacement	700/year

Total Cost: Total O&M cost is $37,000. The Applicant will be responsible for funding this measure.

Location Map: A location map is not available at this time. The placement of the panels will be determined during the implementation.

E.4.2.6.1.12. Improve Powerhouse Interpretive Displays

Goal: Improve the interpretive displays of the powerhouse. This measure is one of five related measures, all of which seek to improve the quality and quantity of interpretive and educational opportunities for the general public.

Description: This measure would improve the quality and quantity of displays in the powerhouse and update the existing displays to facilitate self-guided visits.

This measure would also include developing and producing a tri-fold brochure to complement the displays, further aiding visitors in their tour of the facility.

Associated Benefits: This measure allows the Applicant to demonstrate its commitment to providing informational and educational opportunities to the public and its dedication to the protection and preservation of historic properties.

Functional Design Drawings: Functional design drawings are not available at this time. Designs will be developed as part of the implementation of the proposed measure.

Implementation Schedule and Cost Estimate: The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
2–3	Develop and install additional exhibit items	5,000/year
4–5	Create historic brochure/exhibit guide	2,500/year
6–30	Update and print brochure	100/year

Total Costs: Total O&M cost is $17,500. The Applicant will be responsible for funding this project.

Location Map: A location map is not needed for this measure.

E.4.2.6.1.13. Open Powerhouse to Seasonal Public Visitation

Goal: Provide increased opportunities for the public to tour the Applicant's historic Swan Falls Powerhouse and its interpretive displays by increasing the hours the facility is open to the public.

Description: This measure would open the historic powerhouse on an annual basis every Saturday between April 15 and Labor Day, from 10:00 A.M. to 4:00 P.M. The measure would also provide for a uniformed security guard to be present to ensure the safety of visitors and the security of company property. This measure would also address the need for additional cleaning services to keep the powerhouse in a condition appropriate for public visits.

Associated Benefits: This measure allows the Applicant to demonstrate its commitment to providing informational and educational opportunities to the public and its dedication to the protection and preservation of historic properties.

Functional Design Drawings: Functional design drawings are not applicable for this proposed measure.

Implementation Schedule and Cost Estimate: The implementation schedule and the estimated O&M cost associated with each line item follows:

Year	Action	O&M Cost ($)
1–30	Coordination with HPMP coordinator	No additional cost
1–30	Annual labor cost for a security guard	5,000/year
1–30	Additional cleaning	3,000/year

Total Cost: Total O&M cost is $240,000. The Applicant will be responsible for funding this project.

E.4.2.7. Measures or Facilities Recommended by the Agencies or Tribes

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. Often the comment letters did not clearly indicate specific recommended measures. However, the Applicant made a good-faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant’s proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.4.2.7.1. Accepted or Conditionally Accepted Measures or Facilties

Bureau of Land Management comment letter, dated December 20, 2007

BLM-3

> To better serve the interested public, and to the degree security issues are resolved, the BLM suggests the Swan Falls Dam historic museum be open to the general public, at minimum, during the Spring and Summer months on Fridays, Saturday, and Sundays.

Response

The Applicant has proposed a measure that largely meets the intent of this request from the BLM. The suggested measure would provide for the historic Swan Falls Powerhouse and historical exhibits to be open every Saturday between April 15 and Labor Day each year. The measure has been proposed to include funding for a uniformed security guard to be present during all hours the facility is open. This measure will help ensure both the safety of the visitors and the security of the facility, and should meet both corporate and federal security guidelines regarding hydroelectric facilities. The Applicant does not believe that the current level of visitor interest and use merits the cost of having the facility open three days a week. The Applicant will monitor and assess visitor use and interest in the historic powerhouse and will consider expanding visitation hours in the future if demand and use support the need to do so.

Shoshone–Bannock Tribes comment letter, dated December 21, 2007

SBT-10

> Shoshone-Bannock Tribes recommend that the Idaho Power Company continue and expand the monitoring of all archeological effects within the APE to identify project effect. The Shoshone-Bannock Tribes also request that the Idaho Power Company develop measures that are most protective for those sits that have eligibility under the National Historic Preservation Act, and those sites that have the potential to be eligible, within the APE.

Response

The Applicant agrees with the need to monitor and protect cultural resources that meet the significance criteria established by federal regulations. The Applicant has included in the HPMP (Technical Report E.4.1-B) a comprehensive site monitoring plan. The plan currently calls for regular monitoring of all sites that are eligible or potentially eligible for inclusion in the NRHP, and is therefore essentially in agreement with the measure requested by the Tribes. Due to the fact that the entire APE lies within the exterior boundaries of the previously existing Guffey Butte–Black Butte National Register District, very few of the cultural resources identified during the survey were evaluated as being “not eligible” or non-significant. At a minimum, almost all of the archaeological sites identified appear to have the potential to be contributing elements within the District. The monitoring program is directed explicitly towards assessing changes in site conditions through time, as well as identifying potential impacts related to project operations. The purpose of the monitoring program is to provide an effective means whereby project-related impacts to historic properties within the APE can be quickly identified and appropriate mitigation or protection measures implemented. Given the exhaustive nature of the identification efforts and the comprehensive nature of the proposed monitoring plan, the Applicant sees no room or need to “expand” the monitoring program as recommended by the Tribes.

E.4.2.7.2. Rejected Measures or Facilities and Explanations for Rejection

Bureau of Land Management comment letter, dated December 20, 2007

BLM-3

> The “clubhouse” [historic boardinghouse] should be restored and open to the public as a visitor information and contact station.

Response

The Applicant has studied the possibility of adaptive reuse of the historic boardinghouse (clubhouse) either as a visitor contact station or for some other purpose, including the possibility of a long-term lease of the building to a historic or preservation group interested in acting as a partner in operating the facility for the public benefit. So far, the Applicant has not been able to identify any willing cooperators. Currently, the structure does not meet current building code, safety, or Americans with Disabilities Act (ADA) access requirements. It would be cost prohibitive to attempt to bring the entire structure into compliance with these requirements. The Applicant has proposed two specific measures aimed at preserving this building and enhancing public interpretation. The Applicant has proposed to develop a new interpretive panel to be installed outside the building providing year-round access to additional historic information regarding the history and use of the building. The Applicant has also proposed specific funding under one of the contemplated measures that would provide for routine maintenance of the building consistent with The Secretary of the Interior’s Standards for the Treatment of Historic Properties (36 CFR 68).

The isolated location of the structure does not allow it to be opened to the public without providing on-site security personnel to protect the facility from vandalism and damage and to ensure visitor safety. Due to the relatively high cost involved in restoring the building, providing security, and fulfilling the other roles inherent in providing a visitor contact and information station, the Applicant does not believe it is feasible at the present time to open the building as recommended by the BLM. The Applicant will continue to look for cooperative opportunities to preserve the building and make it available for appropriate adaptive reuse.

Shoshone–Bannock Tribes comment letter, dated December 21, 2007

SBT-9

> The Tribes recommend that the Idaho Power develop a measure that provides for the protection, preservation and enhancement of the Tribes culture and language.

Response

The Applicant believes that it is not appropriate for the Tribes to request support from the Applicant for a general measure with the stated purpose of "the protection, preservation and enhancement of the Tribes culture and language." This request obviously exceeds the legal requirements associated with the FERC relicensing process. The Federal Power Act and other applicable laws require only that a licensee address impacts demonstrably resulting from the licensee's project. The Applicant is not required to fund measures for enhancing Tribal culture when there is no nexus to the project and its impacts.

SBT-9

> The Shoshone-Bannock Tribes commented that "petroglyphs and pictographs are endangered due to anthropologic [sic] activity related to dam construction, operation and increased human presence in the riverine area where the petroglyphs and pictographs are located. The Idaho Power Company's Draft License Application fails to adequately address protection, preservation, and enhancement of petroglyphs and pictographs." The Applicant interprets this as a general recommendation for additional protection of rock art sites. The Tribes also requested "that the Idaho Power Company develop additional measures to fund a Tribal ethnographic study of the Swan Falls Project area to gather and assess information to develop appropriate mitigation and identify Traditional Cultural Properties. The Shoshone-Bannock Tribes will need $150,000 per year throughout the term of the new license to secure a contractor to produce the tribal cultural geography for the Swan Falls Project."

Response

The archaeological survey of the APE did not find any evidence that project operations are linked to impacts to any of the rock art sites identified in the project APE. Therefore, the Applicant does not agree with the assertion made in the Tribes' recommendation that "petroglyphs and pictographs are endangered due to anthropologic [sic] activity related to dam construction, operation and increased human presence in the riverine area where the petroglyphs and pictographs are located." The majority of the sites identified within the APE that have rock art components are located downstream from the Swan Falls Dam. Recreational use of this area is occurring primarily on public land managed by the BLM, and is not related to the presence or continued operation of the Swan Falls Dam.

All of the archaeological sites with rock art components have been included in the comprehensive monitoring program outlined in the HPMP (Technical Report E.4.1-B). The Applicant believes that the monitoring program represents an effective avenue to protect and preserve petroglyphs and pictographs in the project area, and rejects the recommendation that special measures for the protection or enhancement of rock art are necessary or appropriate.

The Applicant acknowledges that Tribal groups are an important source of information regarding cultural resources, particularly TCPs, located within the APE for the project. The Applicant has frequently solicited the cooperation of the Shoshone–Bannock Tribes (and other tribes)—in writing, in meetings with Tribal staff, and through telephone calls—in participating in identifying TCPs, sacred sites, or other sites of special concern to the Tribes. The Tribes have not provided any input throughout the relicensing process that would assist in identifying TCPs or other resources of special concern to the Tribes. The Applicant has proposed a measure in the HPMP (Technical Report E.4.1-B) that will provide an opportunity for continued consultation with the Tribes, and, if appropriate, additional ethnographic research to ensure the identification and protection of cultural resources of importance to the Tribes.

The review of previous research and the ethnographic literature for the project area does not suggest that there is a complex tribal geography present in the APE, and there is no demonstrable evidence that there are substantial or numerous TCPs present within the APE that have not been identified. The Applicant believes that the measure proposed in the HPMP will be more than adequate to allow any TCPs that may be present to be identified and protected. The Applicant does not believe it is reasonable to assume that there is any need for the Tribes to receive funding from the Applicant in the amount of $150,000 per year throughout the life of the license to identify TCPs and "produce the tribal geography for the Swan Falls Project." This request is clearly well beyond the scope of measures required for compliance with the NHPA and normally included in the relicensing process under FERC policy and guidelines. The Applicant believes that the scope of the work already completed meets the requirements of a "reasonable and good faith effort" to identify historic properties as required by the Section 106 regulations (36 CFR 800.4[b][1]).

SBT-10

> The Shoshone-Bannock Tribes commented that "the Idaho Power Company needs to resolve all discrepancy [in the draft HPMP] by requiring resurvey of areas where inaccurate or inconsistent site information exists in the APE." The Tribes recommended "that Idaho Power Company develop measures to correct discrepancies and to provide funding throughout the term of the new license (2 – Tribal FTE's) so that the Tribes can be an active participant in additional archaeological investigations." The Applicant interprets this as a recommendation to address some sort of inaccuracy in the data relative to the identification of historic properties in the APE. The tribal comments were not specific enough to allow the Applicant to clearly identify the basis of the assertion that there are inconsistencies in any of the data on historic properties.

Response

The Applicant is not aware of any "inconsistency identified in the current HPMP working draft" as indicated by the Tribes. Sites have been consistently and appropriately identified and assessed following the criteria established for the NRHP. The Applicant is unclear what possible inconsistencies the Tribes might be referring to in their recommendation. Although no archaeological survey can be considered absolutely perfect, the protocols employed during the relicensing survey were consistent with industry standards that are intended to result in a thorough and complete identification of observable cultural resources in the APE. The survey examined all accessible areas of the APE and recorded all cultural resources identified. All of the sites identified were then assessed according to consistent criteria established by the NRHP. The Applicant believes the data reported in Technical Report E.4.1-A is accurate, consistent, and meets or exceeds all FERC and federal guidelines. There are no inconsistencies in the study that would necessitate a resurvey of any portion of the APE. The Applicant does not believe that there are any data gaps or inconsistencies in the completed study, and therefore rejects the recommendation that there is a need to conduct any additional archaeological surveys or to fund tribal positions for the life of the license to participate in such studies.

SBT-11

> The Tribes recommend that Idaho Power develop a measure to assist with the funding of a Cultural Center, which would provide a central location for professional staff to be located for the continued management of cultural and natural resources.

Response

The Applicant is not required to fund mitigation measures unrelated to project impacts. The Applicant has proposed measures in the Final License Application that are, first and foremost, intended to offset ongoing project impacts identified through the Applicant's extensive environmental review. In addition, some measures have been proposed that constitute protection and stewardship measures which have a reasonable tie to the cultural resources within the project area and their protection and interpretation for the general public as implied in FERC's directive to balance power and non-power values as critical elements in making decisions that are in the public interest. There is no evidence indicating a need to establish a "Cultural Center, which could provide a central location for professional staff to be located for the continued management and protection of cultural and natural resources" as requested by the Tribes. The development and continued operation of such a center would be extremely costly, and there is no evidence to suggest that such a facility would fill any necessary role in protecting historic properties in the APE. The Applicant has proposed measures that provide for an efficient and cost-effective program to address on-going management of cultural resources. These measures are focused on the resources themselves, and provide appropriate procedures that will protect the historic properties in a manner consistent with accepted management practices for sites on public lands. The estimated funding levels suggested in the HPMP will be adequate to support the proposed measures, including the monitoring and protection of cultural resources. The funding of a Cultural Center is clearly beyond the scope of appropriate mitigation of any project-related impacts.

SBT-11

> The Tribes recommend that the Idaho Power Company develop a measure to provide for Native American Programs, which would include a scholarship fund and education programs administered by the Tribes as appropriate mitigation.

Response

The Applicant is not required to fund mitigation measures unrelated to project impacts. The Applicant has proposed measures that are, first and foremost, intended to offset ongoing project impacts identified through the Applicant’s extensive environmental review. While additional education would be helpful as a general matter for tribal members and would ultimately enable them to participate more fully in future cultural resource forums, such as those related to Swan Falls, these propositions by themselves provide no basis to require such education as a part of the relicensing of the Swan Falls Project. There is no connection between the helpfulness of or need for tribal education and impacts related to the project. The Applicant is not required to fund measures unrelated to the project and therefore rejects this request by the Shoshone–Bannock Tribes for funding of a Native American program, including a scholarship fund. The request is clearly beyond the limits of the relicensing process.

E.4.3. Survey and Salvage Activities

E.4.3.1. Schedule of Activities

E.4.3.1.1. Archaeological Inventory

Field work completed—September 2006.

Draft Report completed—January 2007.

LITERATURE CITED

Advisory Council on Historic Preservation (ACHP). 1999. Draft guidance of archaeological data recovery: recommended approach for consultation on recovery of significant information from archeological sites. ACHP, Washington, D.C.

Attebery, J., and E. Egleston. 1990. Completing a reconnaissance survey of historic properties. Idaho State Historic Preservation Office, Boise, ID.

Baker, S. A. 2005. Cultural resource impact assessment for re-roofing the historic Swan Falls Powerhouse. Available from: Idaho Power Company, Boise, ID, and Idaho State Historical Society, State Historic Preservation Office, Boise, ID. Idaho Power Company Cultural Resources Project Report 05-11.

Baker, S. A. 2006a. Idaho Power Company letter to C. B. Smith, dated July 20, 2006. Available from: Idaho Power Company, Boise, ID.

Baker, S. A. 2006b. Idaho Power Company letter to T. Howard, dated July 20, 2006. Available from: Idaho Power Company, Boise, ID.

Baker, S. A. 2007a. Idaho Power Company letter to C. B. Smith, dated March 28, 2007. Available from: Idaho Power Company, Boise, ID.

Baker, S. A. 2007b. Idaho Power Company letter to T. Howard, dated March 28, 2007. Available from: Idaho Power Company, Boise, ID.

Biedenharn, D. S., C. M. Elliot, C. C. Watson, S. T. Maynord, J. Leech, and H. H. Allen. 1998. Streambank stabilization handbook. Version 1.0. Veri-Tech, Inc., Vicksburg, MS.

Davis, B., and A. Swanson, compilers. 1997. The national register of historic places in Idaho. Idaho State Historical Society, State Historic Preservation Office, Boise, ID. 59 p.

Druss, M. 1992. Cultural resources inspection for Swan Fall Tap 138-kV line. Available from: Idaho Power Company, Boise, ID, and Idaho State Historical Society, State Historic Preservation Office, Boise, ID. Project Report 92-8.

Green, T., and G. Torgeson [King]. 1977. National register of historic places inventory—nomination form: Guffey Butte–Black Butte archaeological district. On file with the Idaho State Historical Society, State Historic Preservation Office, Boise, ID.

Hibbard, D. 1976. National register of historic places inventory—nomination form: Swan Falls Dam and Power Plant. On file with the Idaho State Historical Society, State Historic Preservation Office, Boise, ID.

Huntley, J. L. 1982. A history for the first hydro-electric power plant on Snake River, 1899–1901. Owyhee Outpost 13:13–50.

Idaho Power Company (IPC). 2005. Formal consultation package for relicensing: Swan Falls Project. IPC, Boise, ID. 438 p.

Idaho State Historical Society (ISHS). 1993. Boise, Nampa, and Owyhee railroad. ISHS, Boise, ID. ISHS Reference Series No. 218.

Keeler, R. W., and D. G. Koko. 1971. An archaeological survey of the proposed Guffey–Swan Falls reservoirs, southwestern Idaho. Unpublished manuscript, Idaho State University Museum pof Natural History, Pocatello, ID.

King, T. 1998. Cultural resource laws and practice: an introductory guide. Altimira Press, Walnut Grove, CA. 301 p.

Lucachick, M. 2005. Idaho Department of Parks and Recreation letter to C. Jones, Idaho Power Company, dated July 1, 2005. Available from: Idaho Power Company, Boise, ID.

Neitzel, S. P. 2004. Idaho State Historical Preservation Office letter to C. Jones, Idaho Power Company, dated June 1, 2004. Available from: Idaho Power Company, Boise, ID.

Parker, P. L., and T. F. King. 1998. National Register Bulletin: guidelines for evaluating and documenting traditional cultural properties. Revised edition. U.S. Department of the Interior, National Park Service, National Register, History and Education, Washington, D.C. National Register Bulletin 38. Available at: <www.cr.npr.gov/nr/publications/buletins/nrb38/>

Plew, M. G. 2000. The archaeology of the Snake River Plain. Boise State University, Boise, ID.

Stacy, S. M. 1991. Legacy of light: a history of Idaho Power Company. Idaho Power Company, Boise, ID. 256 p.

Stacy, S. M. 1992. Historic American buildings survey Swan Falls Village (HABS No. ID-105): descriptive report and index to photographs. On file with the Federal Energy Regulatory Commission, Washington, D.C. and the Idaho State Historical Society, State Historic Preservation Office, Boise, ID. Idaho Power Company Cultural Resources Project Report 91-9.

Sullivan, J. 2004. Bureau of Land Management letter to C. Jones, Idaho Power Company, dated June 29, 2004. Available from: Idaho Power Company, Boise ID.

Touhy, Donald 1959. An appraisal of the archaeological resources of the Guffey Reservoir in Southwestern Idaho. Report on file, Idaho State University Museum, Pocatello, ID.

Watts, D. W. 1990. Idaho State Historical Society letter to Idaho Power Company, dated November, 29, 1990. Available from Idaho Power Company, Boise, ID.

This page left blank intentionally.

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects.

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
01-759		Swan Falls Dam Documented under 10AA211							
01-15198		Documented under 10AA5							
01-15199		Stone foundation (not relocated—may be out of APE)	Historic	Not relocated	BLM	Unevaluated			None
01-17866		Historic boardinghouse	1900 to Present	God	IPC	Eligible		None	General
10AA5	IPC-SF-201	Native American artifact scatter; Historic placer mine, dugout, and artifact scatter (this form also documents what is recorded under IHSI number 01-15198)	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM	Listed	RE,W,R, RC,G	Minor	General
10AA6	IPC-SF-200	Native American artifact scatter; Historic placer prospects, foundation, artifacts	Unknown Precontact, Late 1800s to early 1900s	Good	BLM	Eligible	RE,W,R,RC, M,G	Minor	General
10AA9		Documented under 10AA188							
10AA10	IPC-SF-055	Native American boulder overhang, artifacts	Unknown Precontact	Poor	BLM	Listed	RC	None	General
10AA11	IPC-SF-058	Native American artifact scatter	Unknown Precontact	Poor	BLM	Eligible	RE,GE,W,R, OC,	Moderate	Human Use (H)
10AA13	IPC-SF-052	Native American artifact scatter	Archaic	Fair	BLM	Listed	RE,GE,RC	Moderate	General
10AA14	IPC-SF-128	Native American artifact scatter	Middle Archaic, Late Prehistoric to Early Postcontact	Poor	BLM	Listed	GE,W,R,RC, OC,V,D	None	Human Use (VH)

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA15	IPC-SF-127	Native American rockshelter, artifacts	Late Prehistoric to Early Postcontact	Poor	BLM	Listed		None	General
10AA17	IPC-SF-115	Native American Swan Falls Site, house features, artifacts	Early Archaic, Middle to Late Archaic, Late Prehistoric	Part of site is preserved	Private	Listed	RC	None	General
10AA18	IPC-SF-111	Native American artifact scatter	Unknown Precontact	Fair	Private	Eligible	RE,GE,W,R, RC	Minor	Human Use (H)
10AA19	IPC-SF-109	Native American artifact scatter	Unknown Precontact	Not relocated	Private	Listed			None
10AA20	IPC-SF-107	Native American artifact scatter	Unknown Precontact	Good	Private	Eligible	GE,W,R	None	General
10AA21	IPC-SF-106	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed	GE,W,R,RE	None	General
10AA22	IPC-SF-108	Native American shell concentration	Unknown Precontact	Not relocated	Private	Insufficient information			None
10AA23	IPC-SF-047	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	State & Private	Listed	RE,GE,W,R, RC,V,G	Moderate	General
10AA24	IPC-SF-163	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed	GE,W	None	General
10AA25	IPC-SF-166	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Listed	RE,GE,W,R, V,B	Moderate	General
10AA26	IPC-SF-165	Native American artifact scatter, hearth	Late Prehistoric to Early Postcontact	Poor	BLM	Listed	GE,R,RC	None	General
10AA27	IPC-SF-164	Native American artifact scatter, hearth	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM	Listed	R,RC,V,G	None	General

Table E.4-1 **Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)**

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA28	IPC-SF-181	Native American artifact scatter (this form also documents what was once recorded as 10AA29 and 10AA30)	Unknown Precontact	Fair	BLM	Listed	GE,W,R,RC, V,G,B	None	General
10AA29		Documented under 10AA28							
10AA30		Documented under 10AA28							
10AA31	IPC-SF-160	Native American artifact scatter, FCR feature (this form also documents what was once recorded as 10AA32)	Middle Archaic	Good	BLM	Listed	RE,G	Minor	General
10AA32		Documented under 10AA31							
10AA33	IPC-SF-156	Native American artifact scatter; Historic Clark's Ferry, canal, artifacts	Unknown Precontact, Late 1800s	Poor, Good	BLM	Listed	GE,W,R,RC, OC	None	General
10AA34	IPC-SF-067	Native American artifact scatter	Archaic	Poor	BLM	Listed	RE,GE,W,R, RC	Moderate	General
10AA35	IPC-SF-066	Native American artifact scatter	Middle to Late Archaic	Fair	BLM	Listed	RE,GE,W,R, RC	Moderate	General
10AA36	IPC-SF-065	Native American artifact scatter, cairn	Unknown Precontact	Fair	BLM & State	Listed	RE,W,R,RC, V	Moderate	General
10AA41	IPC-SF-021	Native American rockshelters (2), artifacts	Middle Archaic	Poor	Private	Listed	V	Severe	Project impacts
10AA43	IPC-SF-022	Native American petroglyphs, artifact scatter	Unknown Precontact	Fair	Private	Listed	R,RC,V	Moderate-severe	General
10AA44	IPC-SF-105	Native American artifact scatter	Unknown Precontact	Fair	Private	Listed	GE,W,R,RC	None	General
10AA45	IPC-SF-104	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed	GE,W,R,RC, V	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA46	IPC-SF-122	Native American boulder overhang, FCR	Unknown Precontact	Poor	BLM	Listed	GE,W,R	None	General
10AA49		Documented under 10AA188							
10AA50	IPC-SF-177	Native American artifact scatter; Historic Artifact scatter	Unknown Precontact, Late 1800s to early 1900s	Not relocated	BLM	Listed	R,RC	None	None
10AA51	IPC-SF-213	Native American artifact scatter; Historic Placer mine, stone buildings, artifacts	Unknown Precontact, Late 1800s to early 1900s	Poor, Good	BLM	Listed	RE,GE,R, RC,V,M,G	Minor	General
10AA52	IPC-SF-015	Native American boulder overhangs (this site also documents what was once recorded as 10AA53)	Undetermined	Good	Private	Listed	R	None	General
10AA53		Documented under 10AA52							
10AA54	IPC-SF-018	Native American, possible house floor, artifact scatter	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private	Listed	RE,W	Severe	Project impacts
10AA55	IPC-SF-017	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	Private	Listed	RE,W,B	Moderate	General
10AA56		Documented under 10AA57							
10AA57	IPC-SF-041	Native American rockshelters, artifacts (this form also documents what was once recorded as 10AA56)	Unknown Precontact	Poor	BLM	Listed	GE,WD,V	None	General
10AA58	IPC-SF-043	Native American artifact scatter	Unknown Precontact	Good	BLM	Listed	GE,G	None	General
10AA59	IPC-SF-048	Native American artifact scatter	Unknown Precontact	Good	BLM	Listed	RE,GE,W,R, RC,G	Moderate	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA60	IPC-SF-169	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed	W,R,RC	None	General
10AA66	iPC-SF-201	Native American rock art boulder (site is completely within boundary of 10AA5)	Unknown precontact	Poor	BLM	Listed	V	None	General
10AA163	IPC-SF-036	Historic rock alignments, pit, artifacts	Historic	Good	BLM	Eligible	G	None	General
10AA166	IPC-SF-155	Native American artifact scatter, house floor	Late Prehistoric to Early Postcontact	Fair	BLM	Eligible	GE,R,RC,V, G	None	General
10AA169	IPC-SF-203	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Listed	RE,GE,W,R, RC,G	Moderate	General
10AA176	IPC-SF-202	Native American artifact scatter	Late Archaic to Early Postcontact	Fair	BLM	Eligible	RE,W,RC,G	Severe	Project impacts
10AA177	IPC-SF-097	Native American artifact scatter; Historic dugout	Unknown Precontact, Historic	Fair, Good	BLM	Eligible	RE,R,RC	Severe	Project impacts
10AA181	IPC-SF-176	Native American boulder overhang, artifacts; Historic dugout	Late Prehistoric to Early Postcontact, Historic	Fair	BLM	Eligible	GE,W,R,RC, G	None	General
10AA186	IPC-SF-174	Historic Dugout	Historic	Fair	BLM	Eligible	R,RC,G	None	General
10AA187	IPC-SF-057	Native American boulder overhang, artifacts	Unknown Precontact	Poor	BLM	Eligible	GE,R,RC,V, B	None	General
10AA188	IPC-SF-056	Native American boulder overhang, artifacts (this number also documents 10AA9 and 10AA49)	Early to Late Archaic, Late Prehistoric to Early Postcontact, also found under 10AA9 and 10AA49	Fair	BLM	Listed	R,RC,V	None	General
10AA189	IPC-SF-059	Native American artifact scatter	Middle to Late Archaic	Fair	BLM	Eligible	RE,GE,W,R, RC,OC	Severe	Project impacts

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA192	IPC-SF-061	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	RE,GE,R, RC	Minor	Human Use (VH)
10AA193	IPC-SF-126	Native American rockshelter, artifacts	Unknown Precontact	Not relocated-Destroyed (?)	BLM	Insufficient information	R,RC	None	None
10AA194	IPC-SF-125	Native American artifact scatter	Unknown Precontact	Not relocated-Destroyed (?)	BLM	Insufficient information	GE,R,RC	None	None
10AA195	IPC-SF-124	Native American artifact scatter	Unknown Precontact	Not relocated-Destroyed (?)	BLM	Insufficient information	GE,R,RC	None	None
10AA197	IPC-SF-103	Native American artifact scatter	Unknown Precontact	Fair	Private	Eligible	GE,W,R,RC	None	General
10AA198	IPC-SF-112	Historic homestead complex, artifacts	1890–1960	Poor	Private	Eligible	R,OC,D,A	None	General
10AA199	IPC-SF-114	Native American artifact scatter	Unknown Precontact	Not relocated	Private	Insufficient information	RC,OC,D	None	None
10AA200	IPC-SF-116	Native American rock features, artifact scatter	Unknown Precontact	Not relocated	Private	Insufficient information	RC,OC	None	None
10AA201	IPC-SF-113	Native American artifact scatter	Unknown Precontact	Not relocated	Private	Insufficient information	RC	None	None
10AA202	IPC-SF-016	Native American boulder overhang, artifacts	Unknown Precontact	Fair	Private	Eligible	RE,GE,R	Minor	General
10AA203	IPC-SF-037	Native American talus pits	Unknown Precontact	Poor	BLM	Eligible	V	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA204	IPC-SF-118	Historic Artifact scatter, building foundation	1901–1916	Poor	Private	Determined Not Eligible by SHPO	G	None	None
10AA205	IPC-SF-117	Native American artifact scatter; Historic Swan Falls Ferry	Middle to Late Archaic, 1901–1939	Poor, Good	Private	Eligible	RE,GE,R	Moderate	Human Use (M)
10AA207	IPC-SF-014	Native American artifact scatter	Unknown Precontact	Good	Private	Eligible	RE,W,RC,V	Minor	Human Use (M)
10AA208	IPC-SF-170	Native American artifact scatter	Late Prehistoric to Early Postcontact	Not relocated	BLM	Insufficient information	GE	None	None
10AA210	IPC-SF-102	Native American boulder overhang, artifacts	Unknown Precontact	Poor	Private	Insufficient information	R,V	None	General
10AA211	IPC-SF-119	Swan Falls Dam (this form also documents what is recorded under IHSI numbers 01-01-759 and 73-759)	1900–1924	Good	Private	Listed		None	General
10AA216	IPC-SF-214	Native American isolated biface	Unknown Precontact	Poor	BLM	Not Eligible		None	None
10AA306	IPC-SF-218	Native American artifact scatter, shell midden	Late Archaic to Early Postcontact	Poor	BLM	Eligible	R,RC	None	General
10AA445	IPC-SF-219	Historic cable anchor	Historic	Not relocated	BLM	Not Eligible			None
10AA446	IPC-SF-033	Native American artifact scatter	Unknown Precontact	Good	BLM	Eligible	R	None	General
10AA447	IPC-SF-029	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	GE	None	Human Use (VH)
10AA448	IPC-SF-032	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	RE,R,RC	Severe	Project impacts

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA451	IPC-SF-054	Native American artifact scatter	Unknown Precontact	Good	BLM	Eligible	W	None	General
10AA452	IPC-SF-060	Native American isolated tool and flake; Historic Priest Ranch Ferry	Unknown Precontact, 1957–1959	Fair, Poor	BLM	Eligible	R,RC	None	General
10AA454	IPC-SF-034	Native American artifact scatter	Late Prehistoric	Good	BLM	Eligible	W,RC	None	General
10AA456	IPC-SF-053	Depression, no artifacts	Modern	Good	BLM	Not Eligible		None	None
10AA457	IPC-SF-031	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	RE,GE,R, RC	Severe	Project impacts
10AA458	IPC-SF-030	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	GE,RC	None	General
10AA654	IPC-SF-011	Native American artifact scatter	Unknown Precontact	Fair	Private	Eligible	GE,W	None	General
10AA655	IPC-SF-012	Native American stacked-rock feature	Unknown Precontact	Good	Private	Eligible		None	General
10AA656	IPC-SF-013	Native American talus pit	Unknown Precontact	Good	Private	Eligible		None	General
10AA657	IPC-SF-019	Historic Stone fence	Late 1800s to early 1900s	Good	Private	Eligible	SC	None	General
10AA658	IPC-SF-020	Native American artifact scatter	Unknown Precontact	Fair	Private	Eligible	GE,RC	None	General
10AA659	IPC-SF-028	Historic artifact scatter	1915-1930	Fair	BLM	Not Eligible		None	None
10AA691	IPC-SF-035	Native American talus pits	Unknown Precontact	Good	BLM	Eligible	SC	None	General
10AA660	IPC-SF-038	Native American alcove with grinding stone	Unknown Precontact	Good	BLM	Eligible	GE,W	None	General
10AA661	IPC-SF-039	Native American talus pits	Unknown Precontact	Good	BLM	Eligible		None	General
10AA662	IPC-SF-040	Native American talus pits	Unknown Precontact	Good	BLM	Eligible	SC	None	General
10AA663	IPC-SF-042	Native American two artifacts	Middle to Late Archaic	Good	BLM	Eligible	GE	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA664	IPC-SF-045	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Eligible	GE	None	General
10AA665	IPC-SF-046	Native American three artifacts	Unknown Precontact	Good	State	Eligible	W	None	General
10AA666	IPC-SF-049	Native American Artifact scatter	Unknown Precontact	Good	State	Eligible	GE	None	General
10AA667	IPC-SF-050	Historic dugout	Historic	Good	State	Eligible	GE	None	General
10AA668	IPC-SF-051	Historic stone fence and enclosure	Late 1800s to early 1900s	Good	State	Eligible		None	General
10AA669	IPC-SF-062	Native American talus pit, stacked-rock features	Unknown Precontact	Good	BLM	Eligible		None	General
10AA670	IPC-SF-063	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	State	Eligible	W	None	General
10AA671	IPC-SF-064	Native American FCR feature, artifacts	Unknown Precontact	Poor	State	Eligible	W,R	None	General
10AA672	IPC-SF-068	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	RE,GE,W, RC,V,G	Minor	General
10AA673	IPC-SF-096	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	RE,R,RC,G	Minor	General
10AA674	IPC-SF-098	Native American artifact scatter; Historic placer prospect	Late Prehistoric to Early Postcontact, Historic	Good	BLM	Eligible	W,R,RC,G	None	General
10AA675	IPC-SF-099	Native American artifact scatter	Late Prehistoric	Good	BLM	Eligible	W,R,RC,G	None	General
10AA676	IPC-SF-110	Native American isolated projectile point	Unknown Precontact	Fair	Private	Eligible	GE,R	None	General
10AA677	IPC-SF-123	Native American boulder overhang, artifact	Unknown Precontact	Good	BLM	Eligible	R	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10AA678	IPC-SF-152	Native American FCR features, biface fragment	Unknown Precontact	Poor	Private	Eligible	RE,GE,W,R, RC,V,G	Minor	General
10AA679	IPC-SF-153	Native American artifact scatter	Unknown Precontact	Poor	BLM	Eligible	GE,R,RC,G	None	General
10AA680	IPC-SF-154	Historic placer mine, artifacts	Early to Mid-1900s	Good	BLM	Eligible	RE,GE,R,G	Minor	General
10AA681	IPC-SF-162	Native American isolated projectile point	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	GE,W	None	General
10AA682	IPC-SF-167	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	GE,WD,R,G	None	General
10AA683	IPC-SF-168	Native American isolated projectile point	Paleoindian?	Good	BLM	Eligible	GE,W	None	General
10AA684	IPC-SF-171	Historic water wheel complex	Pre-1945	Fair	BLM	Eligible	RE,R	Moderate	General
10AA685	IPC-SF-172	Historic stone buildings, depression, artifacts	Late 1800s to early 1900s	Fair	BLM	Eligible	RE,GE,W,R, G	Moderate	General
10AA686	IPC-SF-173	Native American artifact scatter; Historic stone building, depressions, artifacts	Unknown Precontact, Late 1800s to early 1900s	Poor, Good	BLM	Eligible	GE,R,SC	None	General
10AA687	IPC-SF-175	Native American isolated projectile point	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	RC	None	General
10AA688	IPC-SF-179	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	GE,R,G	None	General
10AA689	IPC-SF-182	Native American artifact scatter	Unknown Precontact	Good	BLM	Eligible	GE,W,G	None	General
10AA690	IPC-SF-174	Historic dugout	Historic	Fair	BLM	Eligibe	R,RC,G	None	General
10AA691	IPC-SF-035	Native American talus pit	Unknown Precontact	Good	BLM	Eligible	SC	None	General
10AA692	IPC-SF-161	Native American isolated projectile point	Middle Archaic	Good	BLM	Eligible	RC	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10CN11	IPC-SF-001	Native American artifact scatter, FCR features; Historic dugout-like feature, pits, artifacts	Late Prehistoric to Early Postcontact, Early 1900s	Good, Fair	USF&W	Listed	RE,W	Moderate	General
10CN44		Documented under 10OE1994							
10EL2036	IPC-SF-069	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	RE,GE,W,R, G,B	Severe	Project impacts
10EL2037	IPC-SF-070	Native American artifact scatter	Middle to Late Archaic	Good	BLM	Eligible	GE,W,G,B	None	General
10OE9		Documented under 10OE15							
10OE13		Documented under 10OE238							
10OE15	IPC-SF-100	Native American rockshelter, boulder overhang, possible house pit, petroglyph, artifacts (this form also documents what was once recorded as 10OE16)	Unknown Precontact	Good	State	Listed	RE,GE,W,R	Minor	General
10OE16		Documented under 10OE15							
10OE17	IPC-SF-216	Native American artifact scatter	Unknown Precontact	Poor	BLM	Not Eligible	GE,D	None	None
10OE18	IPC-SF-205	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed	GE,M	None	General
10OE23	IPC-SF-025	Native American artifact scatter	Unknown Precontact	Fair	State	Listed	GE,W	None	General
10OE24	IPC-SF-023	Native American artifact scatter (this form also documents what was once recorded as 10OE25)	Early Archaic	Fair	State	Listed	RE,W	Severe	Project impacts
10OE25		Documented under 10OE24							

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE26	IPC-SF-137	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed	RE,GE,R, RC,V	Minor	General
10OE27	IPC-SF-140	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed	GE,R,RC	None	General
10OE29	IPC-SF-150	Native American artifact scatter	Early Archaic	Good	BLM	Listed	RE,GE,R,G	Minor	General
10OE30	IPC-SF-147	Native American artifact scatter; Historic artifact scatter, hearth	Unknown Precontact, Early 1900s	Fair	BLM & Private	Listed	RE,GE,W,R, G,B	Minor	General
10OE31	IPC-SF-010	Native American boulder overhang, artifacts	Unknown Precontact	Not relocated	Private	Insufficient information			None
10OE32	IPC-SF-003	Native American artifact scatter	Unknown Precontact	Good	Private	Listed	W,B	None	General
10OE33		Documented under 10OE252							
10OE34		Documented under 10OE252							
10OE35		Documented under 10OE252							
10OE39	IPC-SF-143	Native American artifact scatter, FCR feature	Early to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private	Listed	GE,W,R,G	None	General
10OE235	IPC-SF-088	Native American rockshelter, artifacts	Unknown Precontact	Good	BLM	Listed	G	None	General
10OE236	IPC-SF-089	Native American depression, artifact scatter	Unknown Precontact	Good	BLM	Listed	GE,W,R, OC,G	None	General
10OE237	IPC-SF-094	Native American rockshelter	Unknown Precontact	Good	BLM	Listed	W	None	General
10OE238	IPC-SF-204	Native American artifact scatter; Historic placer mine, artifacts (this form also documents what was once recorded as 10OE0013)	Unknown Precontact, 1880–1939	Poor, Good	BLM	Listed	GE,R,M	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE239	IPC-SF-215	Historic placer mine	Unknown Precontact, 1880–1939	Good	BLM	Listed	RE,GE	Minor	General
10OE241	IPC-SF-158	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed	RE,GE,R	Moderate	General
10OE242	IPC-SF-100	Native American artifact scatter (this site boundary completely encompasses two other sites, 10OE15 and 10OE16)	Unknown Precontact	Good	State	Listed	RE,GE,W, R	Minor	General
10OE243	IPC-SF-101	Native American artifact scatter	Unknown Precontact	Good	State	Listed	GE,R	None	General
10OE246	IPC-SF-026	Native American boulder overhangs (2), artifacts	Unknown Precontact	Fair	BLM	Listed	R	None	General
10OE247	IPC-SF-120	Native American artifact scatter	Unknown Precontact	Not relocated	BLM	Listed	GE	None	None
10OE249	IPC-SF-121	Native American boulder overhang, artifacts; Historic dugout, ditch, sluice	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM	Listed	RE,GE,R,B	Moderate	General
10OE250	IPC-SF-183	Native American rockshelter, artifacts	Unknown Precontact	Not relocated	BLM	Listed			None
10OE251	IPC-SF-132	Native American artifact scatter; Historic dugout	Middle Archaic, Historic	Fair	BLM	Listed	GE,W,R,RC	None	General
10OE252	IPC-SF-129	Native American rockshelters (multiple), artifacts (this form also documents what was once recorded as 10OE33, 10OE34, 10OE35, 10OE253, 10OE254, and 10OE255)	Unknown Precontact	Fair	BLM	Listed	GE,V,G	None	General
10OE253		Documented under 10OE252							

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE254		Documented under 10OE252							
10OE255		Documented under 10OE252							
10OE257	IPC-SF-133	Native American rockshelter	Unknown Precontact	Fair	BLM	Listed	GE	None	General
10OE258	IPC-SF-135	Native American boulder overhang; Historic stone building	Unknown Precontact, Historic	Poor, Good	BLM	Listed	GE,R,V	None	General
10OE262	IPC-SF-144	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed	GE,R,V,A	None	General
10OE263	IPC-SF-141	Native American artifact scatter	Late Prehistoric	Poor	Private	Listed	OC,D,A,G	None	General
10OE270	IPC-SF-073	Native American petroglyphs, artifact scatter	Unknown	Good	BLM	Eligible	R,RC	None	General
10OE271	IPC-SF-081	Native American boulder overhang, artifacts	Unknown Precontact	Fair	BLM	Listed	W,R	None	General
10OE272	IPC-SF-080	Native American petroglyphs	Unknown Precontact	Good	BLM	Eligible		None	General
10OE273	IPC-SF-082	Native American isolated flake tool	Unknown Precontact	Poor	BLM	Not Eligible		None	None
10OE274	IPC-SF-083	Native American boulder overhang, artifacts	Unknown Precontact	Good	BLM	Eligible	W,B	None	General
10OE275	IPC-SF-087	Native American artifact scatter	Middle to Late Archaic	Fair	BLM	Eligible	GE,WD,RC	None	General
10OE276	IPC-SF-095	Native American artifact scatter; Historic Priest Ranch Ferry	Unknown Precontact, 1957–1959	Good, Poor	BLM	Listed	R,RC,A	None	Human Use (M)
10OE277	IPC-SF-086	Native American artifact scatter	Early Archaic, Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM	Listed	RE,R,RC,A	Minor	Human Use (M)

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE278	IPC-SF-090	Native American artifact scatter	Middle to Late Archaic	Poor	BLM	Eligible	GE,R,RC	None	General
10OE279	IPC-SF-079	Native American boulder overhang, artifacts	Late Prehistoric to Early Postcontact	Poor	BLM	Eligible	W	None	General
10OE527	IPC-SF-076	Native American artifact scatter	Unknown Precontact	Good	BLM	Eligible	RE,W,R,RC, G	Minor	Human Use (M)
10OE529	IPC-SF-075	Native American artifact scatter	Unknown Precontact	Good	BLM	Eligible	RE,W,RC,A, G,B	Moderate	General
10OE559		Documented under 10OE15							
10OE567	IPC-SF-085	Native American artifact scatter; Historic irrigation ditch	Unknown Precontact, 1890–1959	Good	BLM	Listed	RE,W,RC,M	Moderate	General
10OE583	IPC-SF-091	Native American Artifact scatter	Middle Archaic	Poor	BLM	Listed	RE,GE,W, RC,OC,G	Severe	Project impacts
10OE584	IPC-SF-208	Native American petroglyphs, depressions, cairn, artifact scatter	Middle to Late Archaic, Historic(?)	Good	BLM	Listed	RE,GE,R,G	Minor	General
10OE1983	IPC-SF-092	Native American flaked cobble; Historic placer Mine, artifacts	Unknown Precontact, Historic	Poor, Good	BLM	Eligible	RE,GE,R	Minor	Human Use (M)
10OE1989	IPC-SF-206	Historic ferry crossing or ford location	Undetermined	poor	BLM	Not Eligible		None	None
10OE1994	IPC-SF-220	Historic Guffey Railroad Bridge (this form also documents what is or was once recorded as 10CN44, and under IHSI numbers 73-1706 and 73-4908)	Built in 1897, rail service across bridge began in 1898	Good	State	Listed		None	General
10OE1995	IPC-SF-002	Native American artifact scatter	Unknown Precontact	Good	State	Eligible	GE,W,RC,V, G,B	None	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE1996	IPC-SF-157	Native American boulder overhangs (multiple), artifacts	Unknown Precontact	Fair	BLM	Eligible	GE,R,RC,V	None	General
10OE1997	IPC-SF-159	Native American artifact scatter; Historic stone building, stone fence, depression	Unknown Precontact, Historic	Poor, Fair	BLM	Eligible	R,RC,V	None	General
10OE1998	IPC-SF-211	Native American artifact scatter; Historic dugout, artifacts	Unknown Precontact, Early 1900s	Fair	BLM	Eligible	R,RC,G	None	General
10OE1999	IPC-SF-210	Native American petroglyphs, artifact scatter	Unknown Precontact	Good	BLM	Eligible	R	None	General
10OE2008	IPC-SF-077	Possible talus feature	Undetermined	Good	BLM	Not Eligible	SC	None	None
10OE2009	IPC-SF-074	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM	Eligible	W,R,RC	None	General
10OE2011	IPC-SF-008	Native American boulder overhang, artifacts	Unknown Precontact	Poor	Private	Eligible	D	None	General
10OE2013	IPC-SF-151	Historic placer mine, two dugouts, artifact scatter	Late 1800s to early 1900s	Good	BLM	Eligible	RE,GE,WD, V	Minor	General
10OE2014	IPC-SF-145	Native American artifact scatter; Historic Clark's Ferry	Late Prehistoric to Early Postcontact, Late 1800s	Not relocated-denied access	Private	Insufficient information			None
10OE2015	IPC-SF-146	Native American artifact scatter	Unknown Precontact	Not relocated-denied access	Private	Insufficient information			None

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE2034	IPC-SF-044	Native American artifact scatter; Historic stone fence and corral, artifacts	Unknown Precontact, Late 1800s to early 1900s	Fair, Good	Private	Eligible	GE,RC,SC, G	None	General
10OE2298	IPC-SF-139	Native American artifact scatter	Unknown Precontact	Fair	BLM	Eligible	GE	None	General
10OE2840	IPC-SF-009	Historic wagon road	1901–Present	Fair	Private	Eligible	RC	None	General
10OE3083	IPC-SF-007	Native American artifact scatter	Unknown Precontact	Destroyed	Private	Not Eligible	OC	Integrity lost	None
10OE3607	IPC-SF-084	Historic Priest Ranch, artifacts	1890–1959	Poor	BLM	Eligible	RE,R,D	Minor	Human Use (M)
10OE9859	IPC-SF-005	Native American cairn	Unknown Precontact	Good	Private	Eligible		None	General
10OE9860	IPC-SF-006	Native American artifact scatter	Archaic	Good	Private	Eligible	GE	None	General
10OE9861	IPC-SF-024	Native American depression, artifact scatter	Early Archaic, Middle to Late Archaic	Fair	State	Eligible	RE,W,G	Minor	General
10OE9862	IPC-SF-027	Native American isolated projectile point	Early Archaic	Poor	BLM	Not Eligible	GE,	None	None
10OE9863	IPC-SF-071	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Eligible	RE,W,R	Severe	Project impacts
10OE9864	IPC-SF-078	Native American artifact scatter	Middle Archaic	Good	BLM	Eligible	GE,W,R,RC	None	General
10OE9865	IPC-SF-093	Historic Dugout	Historic	Good	BLM	Eligible	RE	Minor	Human Use (M)
10OE9866	IPC-SF-131	Historic placer mine, artifacts	Early 1900s	Good	BLM	Eligible	GE,R	None	General
10OE9867	IPC-SF-134	Historic stone fence, marker	Historic	Good	BLM	Eligible	RE,GE,R	Minor	General

Table E.4-1 Comprehensive list of all archaeological and historic sites and structures in the Swan Falls Project Area of Potential Effects. (Continued)

Trinomial/ IHSI No.	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommend-ation	Non-Project Impact Agents	Potential Project Impact	Monitoring Protocol
10OE9868	IPC-SF-136	Native American possible game drive, talus pits; Historic stone fences, pits	Unknown Precontact, Late 1800s to early 1900s	Good	BLM	Eligible	RE,GE	Minor	General
10OE9869	IPC-SF-138	Native American projectile points, one core; Historic placer mine, artifacts	Early to Late Archaic, Historic	Poor, Good	BLM	Eligible	RE,GE,R,M	Moderate	General
10OE9870	IPC-SF-148	Native American artifact scatter; Historic artifact scatter	Unknown Precontact, Early 1900s	Good	BLM	Eligible	GE,W,G	None	General
10OE9871	IPC-SF-149	Native American artifact scatter, hearths; Historic dugout, artifact scatter	Late Prehistoric to Early Postcontact, Late 1800s to early 1900s	Good	BLM	Eligible	RE,GE,W,G	Minor	General
10OE9872	IPC-SF-207	Historic placer mine	Historic	Good	BLM	Eligible	RE,GE	Minor	General
10OE9873	IPC-SF-209	Historic dugout, pit	Mid-1900s	Fair	BLM	Eligible	RE,GE,SC	Minor	General
10OE9874	IPC-SF-212	Historic placer mine, artifacts	Historic	Fair	BLM	Eligible	RE,GE,R	Minor	General
73-759		Swan Falls Dam Documented under 10AA211							
73-1706		Documented under 10OE1994							
73-4908		Documented under 10OE1994							

Table E.4-2 Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10AA5	IPC-SF-201	Native American artifact scatter; Historic placer mine, dugout, and artifact scatter (this form also documents what is recorded under IHSI number 01-15198)	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM	Listed
10AA10	IPC-SF-055	Native American boulder overhang, artifacts	Unknown Precontact	Poor	BLM	Listed
10AA13	IPC-SF-052	Native American artifact scatter	Archaic	Fair	BLM	Listed
10AA14	IPC-SF-128	Native American artifact scatter	Middle Archaic, Late Prehistoric to Early Postcontact	Poor	BLM	Listed
10AA15	IPC-SF-127	Native American rockshelter, artifacts	Late Prehistoric to Early Postcontact	Poor	BLM	Listed
10AA17	IPC-SF-115	Native American Swan Falls Site, house features, artifacts	Early Archaic, Middle to Late Archaic, Late Prehistoric	Part of site is preserved	Private	Listed
10AA19	IPC-SF-109	Native American artifact scatter	Unknown Precontact	Not relocated	Private	Listed
10AA21	IPC-SF-106	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed
10AA23	IPC-SF-047	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	State & Private	Listed
10AA24	IPC-SF-163	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed
10AA25	IPC-SF-166	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Listed
10AA26	IPC-SF-165	Native American artifact scatter, hearth	Late Prehistoric to Early Postcontact	Poor	BLM	Listed
10AA27	IPC-SF-164	Native American artifact scatter, hearth	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM	Listed

Table E.4-2 **Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places. (Continued)**

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10AA28	IPC-SF-181	Native American artifact scatter (this form also documents what was once recorded as 10AA29 and 10AA30)	Unknown Precontact	Fair	BLM	Listed
10AA31	IPC-SF-160	Native American artifact scatter, FCR feature (this form also documents what was once recorded as 10AA32)	Middle Archaic	Good	BLM	Listed
10AA33	IPC-SF-156	Native American artifact scatter; Historic Clark's Ferry, canal, artifacts	Unknown Precontact, Late 1800s	Poor, Good	BLM	Listed
10AA34	IPC-SF-067	Native American artifact scatter	Archaic	Poor	BLM	Listed
10AA35	IPC-SF-066	Native American artifact scatter	Middle to Late Archaic	Fair	BLM	Listed
10AA36	IPC-SF-065	Native American artifact scatter, cairn	Unknown Precontact	Fair	BLM & State	Listed
10AA41	IPC-SF-021	Native American rockshelters, artifacts	Middle Archaic	Poor	Private	Listed
10AA43	IPC-SF-022	Native American petroglyphs, artifact scatter	Unknown Precontact	Fair	Private	Listed
10AA44	IPC-SF-105	Native American artifact scatter	Unknown Precontact	Fair	Private	Listed
10AA45	IPC-SF-104	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed
10AA46	IPC-SF-122	Native American boulder overhang, FCR	Unknown Precontact	Poor	BLM	Listed
10AA50	IPC-SF-177	Native American artifact scatter; Historic Artifact scatter	Unknown Precontact, Late 1800s to early 1900s	Not relocated	BLM	Listed
10AA51	IPC-SF-213	Native American artifact scatter; Historic Placer mine, stone buildings, artifacts	Unknown Precontact, Late 1800s to early 1900s	Poor, Good	BLM	Listed
10AA52	IPC-SF-015	Native American boulder overhangs (this site also documents what was once recorded as 10AA53)	Undetermined	Good	Private	Listed
10AA54	IPC-SF-018	Native American, possible house floor, artifact scatter	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private	Listed

Table E.4-2 Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10AA55	IPC-SF-017	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	Private	Listed
10AA57	IPC-SF-041	Native American rockshelters, artifacts (this form also documents what was once recorded as 10AA56)	Unknown Precontact	Poor	BLM	Listed
10AA58	IPC-SF-043	Native American artifact scatter	Unknown Precontact	Good	BLM	Listed
10AA59	IPC-SF-048	Native American artifact scatter	Unknown Precontact	Good	BLM	Listed
10AA60	IPC-SF-169	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed
10AA66	IPC-SF-201	Native American rock art boulder (site is completely within boundary of 10AA5)	Unknown Precontact	Poor	BLM	Listed
10AA169	IPC-SF-203	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM	Listed
10AA188	IPC-SF-056	Native American boulder overhang, artifacts (this number also documents 10AA9 and 10AA49)	Early to Late Archaic, Late Prehistoric to Early Postcontact, also found under 10AA9 and 10AA49	Fair	BLM	Listed
10AA211	IPC-SF-119	Swan Falls Dam (this form also documents what is recorded under IHSI numbers 01-01-759 and 73-759)	1900–1924	Good	Private	Listed
10CN11	IPC-SF-001	Native American artifact scatter, FCR features; Historic dugout-like feature, pits, artifacts	Late Prehistoric to Early Postcontact, Early 1900s	Good, Fair	USF&W	Listed
10OE15	IPC-SF-100	Native American rockshelter, boulder overhang, possible housepit, petroglyph, artifacts (this form also documents what was once recorded as 10OE16)	Unknown Precontact	Good	State	Listed
10OE18	IPC-SF-205	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed
10OE23	IPC-SF-025	Native American artifact scatter	Unknown Precontact	Fair	State	Listed

Table E.4-2 Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10OE24	IPC-SF-023	Native American artifact scatter (this form also documents what was once recorded as 10OE25)	Early Archaic	Fair	State	Listed
10OE26	IPC-SF-137	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed
10OE27	IPC-SF-140	Native American artifact scatter	Unknown Precontact	Poor	BLM	Listed
10OE29	IPC-SF-150	Native American artifact scatter	Early Archaic	Good	BLM	Listed
10OE30	IPC-SF-147	Native American artifact scatter; Historic artifact scatter, hearth	Unknown Precontact, Early 1900s	Fair	BLM & Private	Listed
10OE32	IPC-SF-003	Native American artifact scatter	Unknown Precontact	Good	Private	Listed
10OE39	IPC-SF-143	Native American artifact scatter, FCR feature	Early to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private	Listed
10OE235	IPC-SF-088	Native American rockshelter, artifacts	Unknown Precontact	Good	BLM	Listed
10OE236	IPC-SF-089	Native American depression, artifact scatter	Unknown Precontact	Good	BLM	Listed
10OE237	IPC-SF-094	Native American rockshelter	Unknown Precontact	Good	BLM	Listed
10OE238	IPC-SF-204	Native American artifact scatter; Historic placer mine, artifacts (this form also documents what was once recorded as 10OE13)	Unknown Precontact, 1880–1939	Poor, Good	BLM	Listed
10OE239	IPC-SF-215	Historic placer mine	Unknown Precontact, 1880–1939	Good	BLM	Listed
10OE241	IPC-SF-158	Native American artifact scatter	Unknown Precontact	Fair	BLM	Listed
10OE0242	IPC-SF-100	Native American artifact scatter (this site boundary completely encompasses two other sites, 10OE15 and 10OE16)	Unknown Precontact	Good	State	Listed
10OE243	IPC-SF-101	Native American artifact scatter	Unknown Precontact	Good	State	Listed
10OE246	IPC-SF-026	Native American boulder overhangs, artifacts	Unknown Precontact	Fair	BLM	Listed

Table E.4-2 Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10OE247	IPC-SF-120	Native American artifact scatter	Unknown Precontact	Not relocated	BLM	Listed
10OE249	IPC-SF-121	Native American boulder overhang, artifacts; Historic dugout, ditch, sluice	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM	Listed
10OE250	IPC-SF-183	Native American rockshelter, artifacts	Unknown Precontact	Not relocated	BLM	Listed
10OE251	IPC-SF-132	Native American artifact scatter; Historic dugout	Middle Archaic, Historic	Fair	BLM	Listed
10OE252	IPC-SF-129	Native American rockshelters, artifacts (this form also documents what was once recorded as 10OE33, 10OE34, 10OE35, 10OE253, 10OE254, and 10OE255)	Unknown Precontact	Fair	BLM	Listed
10OE257	IPC-SF-133	Native American rockshelter	Unknown Precontact	Fair	BLM	Listed
10OE258	IPC-SF-135	Native American boulder overhang; Historic stone building	Unknown Precontact, Historic	Poor, Good	BLM	Listed
10OE262	IPC-SF-144	Native American artifact scatter	Unknown Precontact	Poor	Private	Listed
10OE263	IPC-SF-141	Native American artifact scatter	Late Prehistoric	Poor	Private	Listed
10OE271	IPC-SF-081	Native American boulder overhang, artifacts	Unknown Precontact	Fair	BLM	Listed
10OE276	IPC-SF-095	Native American artifact scatter; Historic Priest Ranch Ferry	Unknown Precontact, 1957–1959	Good, Poor	BLM	Listed
10OE277	IPC-SF-086	Native American artifact scatter	Early Archaic, Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM	Listed
10OE567	IPC-SF-085	Native American artifact scatter; Historic irrigation ditch	Unknown Precontact, 1890–1959	Good	BLM	Listed

Table E.4-2 Archaeological and historic sites within the Swan Falls Project Area of Potential Effect that are listed in the Guffey Butte—Black Butte Archaeological District on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner	NR Status or Recommendation
10OE583	IPC-SF-091	Native American Artifact scatter	Middle Archaic	Poor	BLM	Listed
10OE584	IPC-SF-208	Native American petroglyphs, depressions, cairn, artifact scatter	Middle to Late Archaic, Historic(?)	Good	BLM	Listed
10OE1994	IPC-SF-220	Historic Guffey Railroad Bridge (this form also documents what is or was once recorded as 10CN44, and under IHSI numbers 73-1706 and 73-4908)	Built in 1897, rail service across bridge began in 1898	Good	State	Listed

Table E.4-3 Precontact/prehistoric Native American archaeological sites in the Swan Falls Area of Potential Effect that are listed on the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA10	IPC-SF-055	Native American boulder overhang, artifacts	Unknown Precontact	Poor	BLM
10AA13	IPC-SF-052	Native American artifact scatter	Archaic	Fair	BLM
10AA14	IPC-SF-128	Native American artifact scatter	Middle Archaic, Late Prehistoric to Early Postcontact	Poor	BLM
10AA15	IPC-SF-127	Native American rockshelter, artifacts	Late Prehistoric to Early Postcontact	Poor	BLM
10AA17	IPC-SF-115	Native American Swan Falls Site, house features, artifacts	Early Archaic, Middle to Late Archaic, Late Prehistoric	Part of site is preserved	Private
10AA19	IPC-SF-109	Native American artifact scatter	Unknown Precontact	Not relocated	Private
10AA21	IPC-SF-106	Native American artifact scatter	Unknown Precontact	Poor	Private
10AA23	IPC-SF-047	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	State & Private
10AA24	IPC-SF-163	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA25	IPC-SF-166	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM
10AA26	IPC-SF-165	Native American artifact scatter, hearth	Late Prehistoric to Early Postcontact	Poor	BLM
10AA27	IPC-SF-164	Native American artifact scatter, hearth	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM
10AA28	IPC-SF-181	Native American artifact scatter (this form also documents what was once recorded as 10AA29 and 10AA30)	Unknown Precontact	Fair	BLM
10AA31	IPC-SF-160	Native American artifact scatter, FCR feature (this form also documents what was once recorded as 10AA32)	Middle Archaic	Good	BLM
10AA34	IPC-SF-067	Native American artifact scatter	Archaic	Poor	BLM
10AA35	IPC-SF-066	Native American artifact scatter	Middle to Late Archaic	Fair	BLM

Table E.4-3 Precontact/prehistoric Native American archaeological sites in the Swan Falls Area of Potential Effect that are listed on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA36	IPC-SF-065	Native American artifact scatter, cairn	Unknown Precontact	Fair	BLM & State
10AA41	IPC-SF-021	Native American rockshelters, artifacts	Middle Archaic	Poor	Private
10AA43	IPC-SF-022	Native American petroglyphs, artifact scatter	Unknown Precontact	Fair	Private
10AA44	IPC-SF-105	Native American artifact scatter	Unknown Precontact	Fair	Private
10AA45	IPC-SF-104	Native American artifact scatter	Unknown Precontact	Poor	Private
10AA46	IPC-SF-122	Native American boulder overhang, FCR	Unknown Precontact	Poor	BLM
10AA52	IPC-SF-015	Native American boulder overhangs (this site also documents what was once recorded as 10AA0053)	Undetermined	Good	Private
10AA54	IPC-SF-018	Native American, possible house floor, artifact scatter	Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private
10AA55	IPC-SF-017	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	Private
10AA57	IPC-SF-041	Native American rockshelters, artifacts (this form also documents what was once recorded as 10AA0056)	Unknown Precontact	Poor	BLM
10AA58	IPC-SF-043	Native American artifact scatter	Unknown Precontact	Good	BLM
10AA59	IPC-SF-048	Native American artifact scatter	Unknown Precontact	Good	BLM
10AA60	IPC-SF-169	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA169	IPC-SF-203	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM
10OE15	IPC-SF-100	Native American rockshelter, boulder overhang, possible house pit, petroglyph, artifacts (this form also documents what was once recorded as 10OE0016)	Unknown Precontact	Good	State
10OE23	IPC-SF-025	Native American artifact scatter	Unknown Precontact	Fair	State

Table E.4-3 Precontact/prehistoric Native American archaeological sites in the Swan Falls Area of Potential Effect that are listed on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE24	IPC-SF-023	Native American artifact scatter (this form also documents what was once recorded as 10OE25)	Early Archaic	Fair	State
10OE26	IPC-SF-137	Native American artifact scatter	Unknown Precontact	Poor	BLM
10OE27	IPC-SF-140	Native American artifact scatter	Unknown Precontact	Poor	BLM
10OE29	IPC-SF-150	Native American artifact scatter	Early Archaic	Good	BLM
10OE32	IPC-SF-003	Native American artifact scatter	Unknown Precontact	Good	Private
10OE39	IPC-SF-143	Native American artifact scatter, FCR feature	Early to Late Archaic, Late Prehistoric to Early Postcontact	Fair	Private
10OE235	IPC-SF-088	Native American rockshelter, artifacts	Unknown Precontact	Good	BLM
10OE236	IPC-SF-089	Native American depression, artifact scatter	Unknown Precontact	Good	BLM
10OE237	IPC-SF-094	Native American rockshelter	Unknown Precontact	Good	BLM
10OE241	IPC-SF-158	Native American artifact scatter	Unknown Precontact	Fair	BLM
10OE243	IPC-SF-101	Native American artifact scatter	Unknown Precontact	Good	State
10OE246	IPC-SF-026	Native American boulder overhangs, artifacts	Unknown Precontact	Fair	BLM
10OE247	IPC-SF-120	Native American artifact scatter	Unknown Precontact	Not relocated	BLM
10OE250	IPC-SF-183	Native American rockshelter, artifacts	Unknown Precontact	Not relocated	BLM
10OE252	IPC-SF-129	Native American rockshelters, artifacts (this form also documents what was once recorded as 10OE33, 10OE34, 10OE35, 10OE253, 10OE254, and 10OE255)	Unknown Precontact	Fair	BLM
10OE257	IPC-SF-133	Native American rockshelter	Unknown Precontact	Fair	BLM

Table E.4-3 Precontact/prehistoric Native American archaeological sites in the Swan Falls Area of Potential Effect that are listed on the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE262	IPC-SF-144	Native American artifact scatter	Unknown Precontact	Poor	Private
10OE263	IPC-SF-141	Native American artifact scatter	Late Prehistoric	Poor	Private
10OE270	IPC-SF-072	Native American petroglyphs, artifact scatter	Middle to Late Archaic	Good	BLM
10OE271	IPC-SF-081	Native American boulder overhang, artifacts	Unknown Precontact	Fair	BLM
10OE277	IPC-SF-086	Native American artifact scatter	Early Archaic, Middle to Late Archaic, Late Prehistoric to Early Postcontact	Fair	BLM
10OE583	IPC-SF-091	Native American Artifact scatter	Middle Archaic	Poor	BLM

Table E.4-4 Historic archaeological sites and structures in the Swan Falls Project Area of Potential Effect that are listed on the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA211	IPC-SF-119	Historic Swan Falls Dam	1900–1924	Good	Private
10OE1994	IPC-SF-220	Historic Guffey Railroad Bridge (this form also documents what is or was once recorded as 10CN44, and under IHSI numbers 73-1706 and 73-4908)	Built in 1897, rail service across bridge began in 1898	Good	State

Table E.4-5 Multicomponent archaeological sites in the Swan Falls Project Area of Potential Effect that are listed on the National Register of Historic Places in the Guffey Butte–Black Butte Archaeological District.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA5	IPC-SF-201	Native American artifact scatter; Historic placer mine, dugout, and artifact scatter (this form also documents what is recorded under ISHS number 01-15198)	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM
10AA33	IPC-SF-156	Native American artifact scatter; Historic Clark's Ferry, canal, artifacts	Unknown Precontact, Late 1800s	Poor, Good	BLM
10AA50	IPC-SF-177	Native American artifact scatter; Historic Artifact scatter	Unknown Precontact, Late 1800s to early 1900s	Not relocated	BLM
10AA51	IPC-SF-213	Native American artifact scatter; Historic Placer mine, stone buildings, artifacts	Unknown Precontact, Late 1800s to early 1900s	Poor, Good	BLM
10CN11	IPC-SF-001	Native American artifact scatter, FCR features; Historic dugout-like feature, pits, artifacts	Late Prehistoric to Early Postcontact, Early 1900s	Good, Fair	USF&W
10OE30	IPC-SF-147	Native American artifact scatter; Historic artifact scatter, hearth	Unknown Precontact, Early 1900s	Fair	BLM & Private
10OE238	IPC-SF-204	Native American artifact scatter; Historic placer mine, artifacts (this form also documents what was once recorded as 10OE13)	Unknown Precontact, 1880–1939	Poor, Good	BLM
10OE239	IPC-SF-215	Historic placer mine	Unknown Precontact, 1880–1939	Good	BLM
10OE249	IPC-SF-121	Native American boulder overhang, artifacts; Historic dugout, ditch, sluice	Unknown Precontact, Late 1800s to early 1900s	Fair	BLM
10OE251	IPC-SF-132	Native American artifact scatter; Historic dugout	Middle Archaic, Historic	Fair	BLM
10OE258	IPC-SF-135	Native American boulder overhang; Historic stone building	Unknown Precontact, Historic	Poor, Good	BLM
10OE276	IPC-SF-095	Native American artifact scatter; Historic Priest Ranch Ferry	Unknown Precontact, 1957–1959	Good, Poor	BLM

Table E.4-5 Multicomponent archaeological sites in the Swan Falls Project Area of Potential Effect that are listed on the National Register of Historic Places in the Guffey Butte–Black Butte Archaeological District. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE567	IPC-SF-085	Native American artifact scatter; Historic irrigation ditch	Unknown Precontact, 1890–1959	Good	BLM
10OE584	IPC-SF-208	Native American petroglyphs, depressions, cairn, artifact scatter	Middle to Late Archaic, Historic(?)	Good	BLM

Table E.4-6 Precontact/prehistoric archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA11	IPC-SF-058	Native American artifact scatter	Unknown Precontact	Poor	BLM
10AA18	IPC-SF-111	Native American artifact scatter	Unknown Precontact	Fair	Private
10AA20	IPC-SF-107	Native American artifact scatter	Unknown Precontact	Good	Private
10AA166	IPC-SF-155	Native American artifact scatter, house floor	Late Prehistoric to Early Postcontact	Fair	BLM
10AA176	IPC-SF-202	Native American artifact scatter	Late Archaic to Early Postcontact	Fair	BLM
10AA187	IPC-SF-057	Native American boulder overhang, artifacts	Unknown Precontact	Poor	BLM
10AA189	IPC-SF-059	Native American artifact scatter	Middle to Late Archaic	Fair	BLM
10AA192	IPC-SF-061	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA197	IPC-SF-103	Native American artifact scatter	Unknown Precontact	Fair	Private
10AA202	IPC-SF-016	Native American boulder overhang, artifacts	Unknown Precontact	Fair	Private
10AA203	IPC-SF-037	Native American talus pits	Unknown Precontact	Poor	BLM
10AA207	IPC-SF-014	Native American artifact scatter	Unknown Precontact	Good	Private
10AA306	IPC-SF-218	Native American artifact scatter, shell midden	Late Archaic to Early Postcontact	Poor	BLM
10AA446	IPC-SF-033	Native American artifact scatter	Unknown Precontact	Good	BLM
10AA447	IPC-SF-029	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM
10AA448	IPC-SF-032	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA451	IPC-SF-054	Native American artifact scatter	Unknown Precontact	Good	BLM
10AA454	IPC-SF-034	Native American artifact scatter	Late Prehistoric	Good	BLM
10AA457	IPC-SF-031	Native American artifact scatter	Unknown Precontact	Fair	BLM

Table E.4-6 Precontact/prehistoric archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA458	IPC-SF-030	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA654	IPC-SF-011	Native American artifact scatter	Unknown Precontact	Fair	Private
10AA655	IPC-SF-012	Native American stacked-rock feature	Unknown Precontact	Good	Private
10AA656	IPC-SF-013	Native American talus pit	Unknown Precontact	Good	Private
10AA658	IPC-SF-020	Native American artifact scatter	Unknown Precontact	Fair	Private
10AA660	IPC-SF-038	Native American alcove with grinding stone	Unknown Precontact	Good	BLM
10AA661	IPC-SF-039	Native American talus pits	Unknown Precontact	Good	BLM
10AA662	IPC-SF-040	Native American talus pits	Unknown Precontact	Good	BLM
10AA663	IPC-SF-042	Native American two artifacts	Middle to Late Archaic	Good	BLM
10AA664	IPC-SF-045	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM
10AA665	IPC-SF-046	Native American three artifacts	Unknown Precontact	Good	State
10AA666	IPC-SF-049	Native American Artifact scatter	Unknown Precontact	Good	State
10AA669	IPC-SF-062	Native American talus pit, stacked-rock features	Unknown Precontact	Good	BLM
10AA670	IPC-SF-063	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	State
10AA671	IPC-SF-064	Native American FCR feature, artifacts	Unknown Precontact	Poor	State
10AA672	IPC-SF-068	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA673	IPC-SF-096	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM
10AA675	IPC-SF-099	Native American artifact scatter	Late Prehistoric	Good	BLM
10AA676	IPC-SF-110	Native American isolated projectile point	Unknown Precontact	Fair	Private

Table E.4-6 Precontact/prehistoric archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA677	IPC-SF-123	Native American boulder overhang, artifact	Unknown Precontact	Good	BLM
10AA678	IPC-SF-152	Native American FCR features, biface fragment	Unknown Precontact	Poor	Private
10AA679	IPC-SF-153	Native American artifact scatter	Unknown Precontact	Poor	BLM
10AA681	IPC-SF-162	Native American isolated projectile point	Late Prehistoric to Early Postcontact	Good	BLM
10AA682	IPC-SF-167	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA683	IPC-SF-168	Native American isolated projectile point	Paleoindian?	Good	BLM
10AA687	IPC-SF-175	Native American isolated projectile point	Late Prehistoric to Early Postcontact	Good	BLM
10AA688	IPC-SF-179	Native American artifact scatter	Unknown Precontact	Fair	BLM
10AA689	IPC-SF-182	Native American artifact scatter	Unknown Precontact	Good	BLM
10A0691	IPC-SF-035	Native American talus pits	Unknown Precontact	Good	BLM
10AA692	IPC-SF-161	Native American isolated projectile point	Middle Archaic	Good	BLM
10EL2036	IPC-SF-069	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM
10EL2037	IPC-SF-070	Native American artifact scatter	Middle to Late Archaic	Good	BLM
10OE15	IPC-SF-100	Native American rockshelter, boulder overhang, possible house pit, petroglyph, artifacts (this form also documents what was once recorded as 10OE16)	Unknown Precontact	Good	State
10OE18	IPC-SF-205	Native American artifact scatter	Unknown Precontact	Poor	BLM
10OE270	IPC-SF-073	Native American petroglyphs, artifact scatter	Unknown	Good	BLM
10OE272	IPC-SF-080	Native American petroglyphs	Unknown Precontact	Good	BLM
10OE274	IPC-SF-083	Native American boulder overhang, artifacts	Unknown Precontact	Good	BLM

Table E.4-6 Precontact/prehistoric archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE275	IPC-SF-087	Native American artifact scatter	Middle to Late Archaic	Fair	BLM
10OE278	IPC-SF-090	Native American artifact scatter	Middle to Late Archaic	Poor	BLM
10OE279	IPC-SF-079	Native American boulder overhang, artifacts	Late Prehistoric to Early Postcontact	Poor	BLM
10OE527	IPC-SF-076	Native American artifact scatter	Unknown Precontact	Good	BLM
10OE529	IPC-SF-075	Native American artifact scatter	Unknown Precontact	Good	BLM
10OE1995	IPC-SF-002	Native American artifact scatter	Unknown Precontact	Good	State
10OE1996	IPC-SF-157	Native American boulder overhangs (multiple), artifacts	Unknown Precontact	Fair	BLM
10OE1999	IPC-SF-210	Native American petroglyphs, artifact scatter	Unknown Precontact	Good	BLM
10OE2009	IPC-SF-074	Native American artifact scatter	Late Prehistoric to Early Postcontact	Good	BLM
10OE2011	IPC-SF-008	Native American boulder overhang, artifacts	Unknown Precontact	Poor	Private
10OE2298	IPC-SF-139	Native American artifact scatter	Unknown Precontact	Fair	BLM
10OE9859	IPC-SF-005	Native American cairn	Unknown Precontact	Good	Private
10OE9860	IPC-SF-006	Native American artifact scatter	Archaic	Good	Private
10OE9861	IPC-SF-024	Native American depression, artifact scatter	Early Archaic, Middle to Late Archaic	Fair	State
10OE9863	IPC-SF-071	Native American artifact scatter	Late Prehistoric to Early Postcontact	Fair	BLM
10OE1996	IPC-SF-157	Native American boulder overhangs (multiple), artifacts	Unknown Precontact	Fair	BLM

Table E.4-7 Historic period Euroamerican archaeological sites and structures in the Swan Falls Project Area of Potential Effect that are recommended as eligible for the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
01-17866		Historic boardinghouse	1900–Present	Good	IPC
10AA163	IPC-SF-036	Historic rock alignments, pit, artifacts	Historic	Good	BLM
10AA186	IPC-SF-174	Historic dugout	Historic	Fair	BLM
10AA198	IPC-SF-112	Historic homestead complex, artifacts	1890–1960	Poor	Private
10AA657	IPC-SF-019	Historic Stone fence	Late 1800s to early 1900s	Good	Private
10AA667	IPC-SF-050	Historic dugout	Historic	Good	State
10AA668	IPC-SF-051	Historic stone fence and enclosure	Late 1800s to early 1900s	Good	State
10AA680	IPC-SF-154	Historic placer mine, artifacts	Early to mid-1900s	Good	BLM
10AA684	IPC-SF-171	Historic water wheel complex	Pre-1945	Fair	BLM
10AA685	IPC-SF-172	Historic stone buildings, depression, artifacts	Late 1800s to early 1900s	Fair	BLM
10AA690	IPC-SF-690	Historic dugout	Historic	Fair	BLM
10OE2013	IPC-SF-151	Historic placer mine, two dugouts, artifact scatter	Late 1800s to early 1900s	Good	BLM
10OE2840	IPC-SF-009	Historic wagon road	1901–Present	Fair	Private
10OE3607	IPC-SF-084	Historic Priest Ranch, artifacts	1890–1959	Poor	BLM
10OE9865	IPC-SF-093	Historic dugout	Historic	Good	BLM
10OE9866	IPC-SF-131	Historic placer mine, artifacts	Early 1900s	Good	BLM
10OE9867	IPC-SF-134	Historic stone fence, marker	Historic	Good	BLM

Table E.4-7 Historic period Euroamerican archaeological sites and structures in the Swan Falls Project Area of Potential Effect that are recommended as eligible for the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE9872	IPC-SF-207	Historic placer mine	Historic	Good	BLM
10OE9873	IPC-SF-209	Historic dugout, pit	Mid-1900s	Fair	BLM
10OE9874	IPC-SF-212	Historic placer mine, artifacts	Historic	Fair	BLM

Table E.4-8 Multicomponent archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places.

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10AA06	IPC-SF-200	Native American artifact scatter; Historic placer prospects, foundation, artifacts	Unknown Precontact, Late 1800s to early 1900s	Good	BLM
10AA177	IPC-SF-097	Native American artifact scatter; Historic dugout	Unknown Precontact, Historic	Fair, Good	BLM
10AA181	IPC-SF-176	Native American boulder overhang, artifacts; Historic dugout	Late Prehistoric to Early Postcontact, Historic	Fair	BLM
10AA205	IPC-SF-117	Native American artifact scatter; Historic Swan Falls Ferry	Middle to Late Archaic, 1901–1939	Poor, Good	Private
10AA452	IPC-SF-060	Native American isolated tool and flake; Historic Priest Ranch Ferry	Unknown Precontact, 1957–1959	Fair, Poor	BLM
10AA674	IPC-SF-098	Native American artifact scatter; Historic placer prospect	Late Prehistoric to Early Postcontact, Historic	Good	BLM
10AA686	IPC-SF-173	Native American artifact scatter; Historic stone building, depressions, artifacts	Unknown Precontact, Late 1800s to early 1900s	Poor, Good	BLM
10OE1983	IPC-SF-092	Native American flaked cobble; Historic placer mine, artifacts	Unknown Precontact, Historic	Poor, Good	BLM
10OE1997	IPC-SF-159	Native American artifact scatter; Historic stone building, stone fence, depression	Unknown Precontact, Historic	Poor, Fair	BLM
10OE1998	IPC-SF-211	Native American artifact scatter; Historic dugout, artifacts	Unknown Precontact, Early 1900s	Fair	BLM
10OE2034	IPC-SF-044	Native American artifact scatter; Historic stone fence and corral, artifacts	Unknown Precontact, Late 1800s to early 1900s	Fair, Good	Private
10OE9868	IPC-SF-136	Native American possible game drive, talus pits; Historic stone fences, pits	Unknown Precontact, Late 1800s to early 1900s	Good	BLM

Table E.4-8 Multicomponent archaeological sites in the Swan Falls Project Area of Potential Effect that are eligible for the National Register of Historic Places. (Continued)

Trinomial	Temp No.	Site Type	Period	Site Condition	Land Owner
10OE9869	IPC-SF-138	Native American projectile points one core; Historic placer mine, artifacts	Early to Late Archaic, Historic	Poor, Good	BLM
10OE9870	IPC-SF-148	Native American artifact scatter; Historic artifact scatter	Unknown Precontact, Early 1900s	Good	BLM
10OE9871	IPC-SF-149	Native American artifact scatter, hearths; Historic dugout, artifact scatter	Late Prehistoric to Early Postcontact, Late 1800s to early 1900s	Good	BLM

Table E.4-9 **Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect.**

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA5	IPC-SF-201	1	0	1	3	3	0	0	0	0	0	0	1	0	0
10AA6	IPC-SF-200	1	0	1	1	1	0	0	0	0	1	0	1	0	0
10AA10	IPC-SF-055	0	0	0	0	3	0	0	0	0	0	0	0	0	0
10AA11	IPC-SF-058	2	2	2	3	0	3	0	0	0	0	0	0	0	0
10AA13	IPC-SF-052	2	2	0	0	2	0	0	0	0	0	0	0	0	0
10AA14	IPC-SF-128	0	1	1	3	3	1	2	3	0	0	0	0	0	0
10AA15	IPC-SF-127	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10AA17	IPC-SF-115	0	0	0	0	4	0	0	0	0	0	0	0	0	0
10AA18	IPC-SF-111	1	1	2	2	2	0	0	0	0	0	0	0	0	0
10AA20	IPC-SF-107	0	1	1	1	0	0	0	0	0	0	0	0	0	0
10AA21	IPC-SF-106	0	2	2	3	3	0	0	0	0	0	0	0	0	0
10AA23	IPC-SF-047	2	2	1	1	1	0	1	0	0	0	0	1	0	0
10AA24	IPC-SF-163	0	2	2	0	0	0	0	0	0	0	0	0	0	0
10AA25	IPC-SF-166	2	1	1	1	0	0	1	0	0	0	0	0	1	0
10AA26	IPC-SF-165	0	2	0	2	1	0	0	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA27	IPC-SF-164	0	0	0	2	1	0	1	0	0	0	0	1	0	0
10AA28	IPC-SF-181	0	1	1	1	1	0	1	0	0	0	0	1	1	0
10AA31	IPC-SF-160	1	0	0	1	0	0	0	0	0	0	0	1	0	0
10AA33	IPC-SF-156	0	1	1	3	2	1	0	0	0	0	0	0	0	0
10AA34	IPC-SF-067	2	3	2	2	2	0	0	0	0	0	0	0	0	0
10AA35	IPC-SF-066	2	2	2	1	1	0	0	0	0	0	0	0	0	0
10AA36	IPC-SF-065	2	0	2	2	1	0	2	0	0	0	0	0	0	0
10AA41	IPC-SF-021	0	0	0	0	0	0	3	0	0	0	0	0	0	0
10AA43	IPC-SF-022	0	0	0	3	2	0	1	0	0	0	0	0	0	0
10AA44	IPC-SF-105	0	1	2	3	2	0	0	0	0	0	0	0	0	0
10AA45	IPC-SF-104	0	2	2	3	3	0	1	0	0	0	0	0	0	0
10AA46	IPC-SF-122	0	2	2	1	0	0	0	0	0	0	0	0	0	0
10AA50	IPC-SF-177	0	0	0	4	2	0	0	0	0	0	0	0	0	0
10AA51	IPC-SF-213	1	1	0	1	1	0	3	0	0	3	0	1	0	0
10AA52	IPC-SF-015	0	0	0	2	0	0	0	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA54	IPC-SF-018	3	0	1	0	0	0	0	0	0	0	0	0	0	0
10AA55	IPC-SF-017	2	0	1	0	0	0	0	0	0	0	0	0	1	0
10AA57	IPC-SF-041	0	2	2	0	0	0	3	0	0	0	0	2	0	0
10AA58	IPC-SF-043	0	1	0	0	0	0	0	0	0	0	0	1	0	0
10AA59	IPC-SF-048	2	2	1	1	1	0	0	0	0	0	0	1	0	0
10AA60	IPC-SF-169	0	0	1	2	2	0	0	0	0	0	0	0	0	0
10AA163	IPC-SF-036	0	0	0	0	0	0	0	0	0	0	0	1	0	0
10AA166	IPC-SF-155	0	1	0	1	1	0	2	0	0	0	0	1	0	0
10AA169	IPC-SF-203	2	2	1	2	3	0	0	0	0	0	0	1	0	0
10AA176	IPC-SF-202	3	0	1	0	3	0	0	0	0	0	0	1	0	0
10AA177	IPC-SF-097	3	0	0	1	2	0	0	0	0	0	0	0	0	0
10AA181	IPC-SF-176	0	1	1	1	1	0	0	0	0	0	0	1	0	0
10AA186	IPC-SF-174	0	0	0	1	1	0	0	0	0	0	0	1	0	0
10AA187	IPC-SF-057	0	2	0	2	3	0	3	0	0	0	0	0	2	0
10AA188	IPC-SF-056	0	0	0	2	2	0	2	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA189	IPC-SF-059	3	3	2	1	1	3	0	0	0	0	0	0	0	0
10AA192	IPC-SF-061	1	1	0	2	3	0	0	0	0	0	0	0	0	0
10AA193	IPC-SF-126	0	0	0	1	4	0	0	0	0	0	0	0	0	0
10AA194	IPC-SF-125	0	4	0	1	4	0	0	0	0	0	0	0	0	0
10AA195	IPC-SF-124	0	4	0	1	4	0	0	0	0	0	0	0	0	0
10AA197	IPC-SF-103	0	1	2	3	3	0	0	0	0	0	0	0	0	0
10AA198	IPC-SF-112	0	0	0	1	0	3	0	3	0	0	1	0	0	0
10AA199	IPC-SF-114	0	0	0	0	4	4	0	3	0	0	0	0	0	0
10AA200	IPC-SF-116	0	0	0	0	4	4	0	0	0	0	0	0	0	0
10AA201	IPC-SF-113	0	0	0	0	4	0	0	0	0	0	0	0	0	0
10AA202	IPC-SF-016	1	3	0	3	0	0	0	0	0	0	0	0	0	0
10AA203	IPC-SF-037	0	0	0	0	0	0	3	0	0	0	0	0	0	0
10AA205	IPC-SF-117	2	1	0	2	0	0	0	0	0	0	0	0	0	0
10AA207	IPC-SF-014	1	0	1	0	1	0	1	0	0	0	0	0	0	0
10AA208	IPC-SF-170	0	4	0	0	0	0	0	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA210	IPC-SF-102	0	0	0	3	0	0	3	0	0	0	0	0	0	0
10AA211	IPC-SF-119	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA446	IPC-SF-033	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10AA447	IPC-SF-029	0	1	0	0	1	0	0	0	0	0	0	0	0	0
10AA448	IPC-SF-032	3	0	0	2	2	0	0	0	0	0	0	0	0	0
10AA451	IPC-SF-054	0	0	1	0	0	0	0	0	0	0	0	0	0	0
10AA452	IPC-SF-060	0	0	0	1	1	0	0	0	0	0	0	0	0	0
10AA454	IPC-SF-034	0	0	1	0	1	0	0	0	0	0	0	0	0	0
10AA457	IPC-SF-031	3	3	0	1	1	0	0	0	0	0	0	0	0	0
10AA458	IPC-SF-030	0	3	0	0	3	0	0	0	0	0	0	0	0	0
10AA654	IPC-SF-011	0	3	3	0	0	0	0	0	0	0	0	0	0	0
10AA655	IPC-SF-012	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA656	IPC-SF-013	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA657	IPC-SF-019	0	0	0	0	0	0	0	0	2	0	0	0	0	0
10AA658	IPC-SF-020	0	2	0	0	2	0	0	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA660	IPC-SF-038	0	1	1	0	0	0	0	0	0	0	0	0	0	0
10AA661	IPC-SF-039	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA662	IPC-SF-040	0	0	0	0	0	0	0	0	1	0	0	0	0	0
10AA663	IPC-SF-042	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10AA664	IPC-SF-045	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10AA665	IPC-SF-046	0	0	1	0	0	0	0	0	0	0	0	0	0	0
10AA666	IPC-SF-049	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10AA667	IPC-SF-050	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10AA668	IPC-SF-051	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA669	IPC-SF-062	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10AA670	IPC-SF-063	0	0	2	0	0	0	0	0	0	0	0	0	0	0
10AA671	IPC-SF-064	0	0	3	1	0	0	0	0	0	0	0	0	0	0
10AA672	IPC-SF-068	1	2	2	0	1	0	1	0	0	0	0	1	0	0
10AA673	IPC-SF-096	1	0	0	1	1	0	0	0	0	0	0	1	0	0
10AA674	IPC-SF-098	0	0	1	1	1	0	0	0	0	0	0	1	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA675	IPC-SF-099	0	0	1	1	1	0	0	0	0	0	0	1	0	0
10AA676	IPC-SF-110	0	2	0	2	0	0	0	0	0	0	0	0	0	0
10AA677	IPC-SF-123	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10AA678	IPC-SF-152	1	1	1	2	2	0	1	0	0	0	0	2	0	0
10AA679	IPC-SF-153	0	1	0	2	2	0	0	0	0	0	0	2	0	0
10AA680	IPC-SF-154	1	1	0	1	0	0	0	0	0	0	0	1	0	0
10AA681	IPC-SF-162	0	1	1	0	0	0	0	0	0	0	0	0	0	0
10AA682	IPC-SF-167	0	1	1	1	0	0	0	0	0	0	0	1	0	0
10AA683	IPC-SF-168	0	1	1	0	0	0	0	0	0	0	0	0	0	0
10AA684	IPC-SF-171	2	0	0	1	0	0	0	0	0	0	0	0	0	0
10AA685	IPC-SF-172	2	1	1	1	0	0	0	0	0	0	0	1	0	0
10AA686	IPC-SF-173	0	2	0	2	0	0	0	0	2	0	0	0	0	0
10AA687	IPC-SF-175	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10AA688	IPC-SF-179	0	1	0	2	0	0	0	0	0	0	0	2	0	0
10AA689	IPC-SF-182	0	1	1	0	0	0	0	0	0	0	0	1	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10AA690	IPC-SF-174	0	0	0	1	1	0	0	0	0	0	0	1	0	0
10AA691	IPC-SF-035	0	0	0	0	0	0	0	0	1	0	0	0	0	0
10AA692	IPC-SF-161	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10CN11	IPC-SF-001	2	0	1	0	0	0	0	0	0	0	0	0	0	0
10EL2036	IPC-SF-069	3	3	2	1	0	0	0	0	0	0	0	3	1	0
10EL2037	IPC-SF-070	0	2	2	0	0	0	0	0	0	0	0	1	1	0
10OE15/ 10OE16/ 10OE242	IPC-SF-100	1	1	1	1	0	0	0	0	0	0	0	0	0	0
10OE23	IPC-SF-025	0	3	2	0	0	0	0	0	0	0	0	0	0	0
10OE24	IPC-SF-023	3	0	1	0	0	0	0	0	0	0	0	0	0	0
10OE26	IPC-SF-137	1	1	0	3	3	0	2	0	0	0	0	0	0	0
10OE27	IPC-SF-140	0	1	0	3	3	0	0	0	0	0	0	0	0	0
10OE29	IPC-SF-150	1	1	0	1	0	0	0	0	0	0	0	1	0	0
10OE30	IPC-SF-147	1	1	1	2	0	0	0	0	0	0	0	1	1	0
10OE32	IPC-SF-003	0	0	1	0	0	0	0	0	0	0	0	0	2	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10OE39	IPC-SF-143	0	2	1	1	0	0	0	0	0	0	0	1	0	0
10OE235	IPC-SF-088	0	0	0	0	0	0	0	0	0	0	0	1	0	0
10OE236	IPC-SF-089	0	1	1	1	0	1	0	0	0	0	0	1	0	0
10OE237	IPC-SF-094	0	0	1	0	0	0	0	0	0	0	0	0	0	0
10OE238	IPC-SF-204	0	1	0	1	0	0	0	0	0	4	0	0	0	0
10OE239	IPC-SF-205	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10OE241	IPC-SF-158	2	1	0	2	0	0	0	0	0	0	0	0	0	0
10OE243	IPC-SF-101	0	1	0	3	0	0	0	0	0	0	0	0	0	0
10OE246	IPC-SF-026	0	0	0	3	0	0	0	0	0	0	0	0	0	0
10OE247	IPC-SF-120	0	4	0	0	0	0	0	0	0	0	0	0	0	0
10OE249	IPC-SF-121	2	1	0	2	0	0	0	0	0	0	0	0	1	0
10OE251	IPC-SF-132	0	1	1	1	1	0	0	0	0	0	0	0	0	0
10OE252	IPC-SF-129	0	1	0	0	0	0	2	0	0	0	0	1	0	0
10OE257	IPC-SF-133	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10OE258	IPC-SF-135	0	2	0	2	0	0	3	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10OE262	IPC-SF-144	0	1	0	1	0	0	1	0	0	0	1	0	0	0
10OE263	IPC-SF-141	0	0	0	0	0	3	0	3	0	0	1	1	0	0
10OE270	IPC-SF-073	0	0	0	2	1	0	0	0	0	0	0	0	0	0
10OE271	IPC-SF-081	0	0	1	1	0	0	0	0	0	0	0	0	0	0
10OE272	IPC-SF-080	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10OE274	IPC-SF-083	0	0	1	0	0	0	0	0	0	0	0	0	1	0
10OE275	IPC-SF-087	0	1	1	0	1	0	0	0	0	0	0	0	0	0
10OE276	IPC-SF-095	0	0	0	1	1	0	0	0	0	0	2	0	0	0
10OE277	IPC-SF-086	1	0	0	1	2	0	0	0	0	0	1	0	0	0
10OE278	IPC-SF-090	0	3	0	2	2	0	0	0	0	0	0	0	0	0
10OE279	IPC-SF-079	0	0	1	0	0	0	0	0	0	0	0	0	0	0
10OE527	IPC-SF-076	1	0	1	1	1	0	0	0	0	0	0	1	0	0
10OE529	IPC-SF-075	2	0	1	0	2	0	0	0	0	0	1	2	1	0
10OE567	IPC-SF-085	2	0	1	0	2	0	0	0	0	0	1	0	0	0
10OE583	IPC-SF-091	3	3	1	0	1	3	0	0	0	0	0	1	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10OE584	IPC-SF-208	1	1	0	1	0	0	0	0	0	0	0	1	0	0
10OE1983	IPC-SF-092	1	2	0	1	0	0	0	0	0	0	0	0	0	0
10OE1995	IPC-SF-002	0	1	1	0	1	0	2	0	0	0	0	1	2	0
10OE1996	IPC-SF-157	0	1	0	2	1	0	1	0	0	0	0	0	0	0
10OE1997	IPC-SF-159	0	0	0	3	1	0	1	0	0	0	0	0	0	0
10OE1998	IPC-SF-211	0	0	0	3	3	0	0	0	0	0	0	1	0	0
10OE1999	IPC-SF-210	0	0	0	1	0	0	0	0	0	0	0	0	0	0
10OE2009	IPC-SF-074	0	0	2	2	2	0	0	0	0	0	0	0	0	0
10OE2011	IPC-SF-008	0	0	0	0	0	0	0	3	0	0	0	0	0	0
10OE2013	IPC-SF-151	1	1	1	0	0	0	1	0	0	0	0	0	0	0
10OE2034	IPC-SF-044	0	3	0	0	1	0	0	0	1	0	0	1	0	0
10OE2298	IPC-SF-139	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10OE2840	IPC-SF-009	0	0	0	0	3	0	0	0	0	0	0	0	0	0
10OE3607	IPC-SF-084	1	0	0	1	0	0	0	3	0	0	0	0	0	3
10OE9859	IPC-SF-005	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E.4-9 Summary of impacts to all listed and eligible Archaeological and Historic Sites in the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	River Erosion (RE)	General Erosion (GE)	Wind Deflation (WD)	Recreation Use (R)	Road Construction (RC)	Other Construction (OC)	Vandalism-Looting (V)	Demolition (D)	Gravity-Structure Collapse (SC)	Placer Mining (M)	Agriculture (A)	Cattle Grazing (G)	Animal Burrowing (B)	Fire (F)
10OE9860	IPC-SF-006	0	1	0	0	0	0	0	0	0	0	0	0	0	0
10OE9861	IPC-SF-024	1	0	2	0	0	0	0	0	0	0	0	3	0	0
11OE9863	IPC-SF-071	3	0	1	1	0	0	0	0	0	0	0	0	0	0
10PE9864	IPC-SF-078	0	1	1	2	2	0	0	0	0	0	0	0	0	0
10OE9865	IPC-SF-093	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10OE9866	IPC-SF-131	0	1	0	1	0	0	0	0	0	0	0	0	0	0
10OE9867	IPC-SF-134	1	1	0	1	0	0	0	0	0	0	0	0	0	0
10OE9868	IPC-SF-136	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10OE9869	IPC-SF-138	2	1	0	1	0	0	0	0	0	1	0	0	0	0
10OE9870	IPC-SF-148	0	1	1	0	0	0	0	0	0	0	0	1	0	0
10OE9871	IPC-SF-149	1	1	1	0	0	0	0	0	0	0	0	1	0	0
10OE9872	IPC-SF-207	1	1	0	0	0	0	0	0	0	0	0	0	0	0
10IE9873	IPC-SF-209	1	1	0	0	0	0	0	0	2	0	0	0	0	0
10OE9874	IPC-SF-212	1	3	0	1	0	0	0	0	0	0	0	0	0	0

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect.

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10AA5	IPC-SF-201	Minor	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA6	IPC-SF-200	Minor	The historic foundation is periodically submerged by the river.	Limited shovel probing to determine presence of intact subsurface deposits near cutbank.
10AA11	IPC-SF-058	Moderate	Some FCR and shell are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA13	IPC-SF-052	Moderate	Artifacts are eroding from a cutbank along an intermittent flood channel.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA18	IPC-SF-111	Minor	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA23	IPC-SF-047	Moderate	Shell, FCR, and a few stone artifacts are eroding from the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA25	IPC-SF-166	Moderate	Numerous artifact concentrations are eroding from the shoreline cutbank.	Test excavations of artifact concentrations eroding from cutbank and limited testing to determine presence of intact subsurface deposits near cutbank.
10AA31	IPC-SF-160	Minor	Artifacts are present near the eroding shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA34	IPC-SF-067	Moderate	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA35	IPC-SF-066	Moderate	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA36	IPC-SF-065	Moderate	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA41	IPC-SF-021	Severe	Rockshelters have been severely looted. Access to site is provided by IPC maintained road.	Limited testing to determine if intact deposits remain.
10AA43	IPC-SF-022	Moderate -Severe	Road construction and recreational use stemming from IPC operations are impacting artifacts and petroglyphs.	Limited testing to assess damage from recreational use and road construction.

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10AA51	IPC-SF-213	Minor	A small portion of the placer mine is periodically submerged by the river.	The placer mine is documented. No further action required.
10AA54	IPC-SF-018	Severe	There is a possible house floor eroding in the cutbank. Numerous artifacts are eroding in the cutbank.	Immediate excavation of feature exposed in cutbank and limited testing along other areas of the cutbank to determine presence of intact subsurface deposits near cutbank.
10AA55	IPC-SF-017	Moderate	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA59	IPC-SF-048	Moderate	Shell, FCR, and a few stone artifacts are eroding from the shoreline cutbank at the south end of the site.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA169	IPC-SF-203	Moderate	Artifacts are eroding in the shoreline cutbank.	Site previously excavated. No further action required.
10AA176	IPC-SF-202	Severe	Stone artifacts, shell, and bone are eroding out of the cutbank along the shoreline.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA177	IPC-SF-097	Severe	Artifacts and lenses of shell and FCR are eroding from the shoreline cutbank up to 0.6 m below the surface.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA189	IPC-SF-059	Severe	A large number of artifacts and a FCR/shell feature are eroding in the shoreline cutbank.	Excavation of eroding feature and limited testing to determine presence of intact subsurface deposits near cutbank
10AA192	IPC-SF-061	Minor	A few artifacts are eroding in the shoreline cutbank.	Periodic monitoring of cutbank to see if more artifacts become exposed
10AA202	IPC-SF-016	Minor	Shell and a few artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA205	IPC-SF-117	Moderate	The shoreline at the ferry location is eroding. Features related to the ferry landing are in the river.	Limited testing to determine presence of intact subsurface deposits near shoreline.
10AA207	IPC-SF-014	Minor	Artifacts are eroding in the road through the site. The road is related to IPC operations.	Road is closed. Monitor for future cutbank erosion.

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10AA306	IPC-SF-218	Severe	Most of the site has eroded into the river.	Mitigative measures previously taken. No further action required.
10AA448	IPC-SF-032	Severe	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near shoreline.
10AA457	IPC-SF-031	Severe	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near shoreline.
10AA458	IPC-SF-030	Minor	The cutbank of the seasonal channel is reached by the river only during flood periods.	Limited testing to determine presence of intact subsurface deposits near shoreline.
10AA672	IPC-SF-068	Minor	Two artifacts were found near the shoreline, but none are actively eroding into the river.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA673	IPC-SF-096	Minor	A small number of artifacts are eroding along the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA678	IPC-SF-152	Minor	The shoreline is eroding adjacent to where artifacts were observed on the surface.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10AA682	IPC-SF-154	Minor	There is minor shoreline erosion within the site boundary.	The placer mine is documented. No further action required.
10AA684	IPC-SF-171	Moderate	The water wheel has collapsed and the majority of the structure is located underwater in the channel.	The site is unusual, additional documentation and background research recommended.
10AA685	IPC-SF-172	Moderate	There is moderate shoreline erosion within the site boundary.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10CN11	IPC-SF-001	Moderate	Artifacts are eroding in the shoreline cutbank.	Test excavations to determine presence of intact subsurface deposits near cutbank on southwest side of island.
10EL2036	IPC-SF-069	Severe	Stone artifacts and FCR are eroding from the shoreline cutbank at the downstream end of the site.	Test excavations to determine presence of intact subsurface deposits near cutbank.
10OE15	IPC-SF-100	Minor	The shoreline cutbank is actively eroding within the site boundary, but is not affecting the main part of the site.	Limited testing to determine presence of intact subsurface deposits near cutbank.

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10OE18	IPC-SF-205	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.
10OE24	IPC-SF-023	Severe	Artifacts are eroding in the shoreline cutbank. The distribution of surface artifacts suggests that most of the remaining portion of the site is located within 15 m of the cutbank and that much of the site may already be gone.	Limited testing to determine presence of intact subsurface deposits near shoreline.
10OE26	IPC-SF-137	Minor	Artifacts are eroding in the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE29	IPC-SF-150	Minor	The shoreline is eroding adjacent to where artifacts were observed on the surface.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE30	IPC-SF-147	Minor	The shoreline is eroding but this is not affecting the main part of the site.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE238	IPC-SF-204	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.
10OE239	IPC-SF-215	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.
10OE241	IPC-SF-158	Moderate	There is moderate shoreline erosion within the site boundary.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE249	IPC-SF-121	Moderate	The shoreline is eroding adjacent to where artifacts were observed on the surface.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE277	IPC-SF-086	Minor	A few artifacts are eroding along the shoreline.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE527	IPC-SF-076	Minor	Erosion of the shoreline cutbank is moderate, but only a few pieces of shell are eroding.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE529	IPC-SF-075	Moderate	FCR and shell are eroding from the cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10OE567	IPC-SF-085	Moderate	Stone artifacts, FCR, and shell are eroding from the cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE583	IPC-SF-091	Severe	FCR and shell are eroding from the cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE584	IPC-SF-208	Minor	A small amount of shell is eroding from the shoreline cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE1983	IPC-SF-092	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.
10OE2013	IPC-SF-151	Minor	There is minor shoreline erosion within the site boundary.	The placer mine is documented. No further action required.
10OE3083	IPC-SF-007	Integrity Lost	All original near-surface sediments have been removed or disturbed by the construction of a short road bed down from the dam. The road appears to be related to dam operation.	Site destroyed, no further action required
10OE3607	IPC-SF-084	Minor	Two historic pump docks along the shoreline are periodically inundated.	The pump docks are documented. No further action required.
10OE9861	IPC-SF-024	Minor	Flakes found near edge of eroding cutbank.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE9863	IPC-SF-071	Severe	The terrace has been severely impacted by river erosion; it is not clear how much the cultural deposits on the terrace have been affected.	Very little cultural material appears to be present. Periodic monitoring is recommended.
10OE9865	IPC-SF-093	Minor	The river cutbank is a few meters in front of the historic dugout. Potential artifact-bearing deposits in front of the dugout are eroding.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE9867	IPC-SF-134	Minor	The shoreline is eroding adjacent to the site.	The historic features are documented, no further action required.
10OE9868	IPC-SF-136	Minor	The shoreline is eroding adjacent to the site.	Periodic monitoring

Table E.4-10 Summary of potential Applicant operational impacts severity, recommendations of adverse effect, and preliminary mitigation recommendations from consulting archaeologists for archaeological and historic sites within the Swan Falls Project Area of Potential Effect. (Continued)

Trinomial	Temporary Number	Severity of Potential IPC Operational Impacts	Recommendation of Adverse Effect of IPC Operations	Mitigation Recommendation
10OE9869	IPC-SF-138	Moderate	There is moderate shoreline erosion within the site boundary.	The placer mine is documented and the stone artifacts are in secondary context. No further action required.
10OE9871	IPC-SF-149	Minor	There is minor shoreline erosion within the site boundary.	Limited testing to determine presence of intact subsurface deposits near cutbank.
10OE9872	IPC-SF-207	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.
10OE9873	IPC-SF-209	Minor	The two historic features are periodically inundated.	The features are documented. No further action required.
10OE9874	IPC-SF-212	Minor	A small portion of the placer mine along the shoreline is periodically inundated.	The placer mine is documented. No further action required.

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(5)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f)(5) Report on recreational resources. The report must discuss existing and proposed recreational facilities and opportunities at the project. The report must be prepared in consultation with local, state, and regional recreation agencies and planning commissions, the National Park Service, and any other state or Federal agency with managerial authority over any part of the project lands. Consultation must be documented by appending to the report a letter from each agency consulted indicating the nature, extent, and results of the consultation. The report must contain:
>
> (i) A description of any existing recreational facilities at the project, indicating whether the facilities are available for public use;
>
> (ii) An estimate of existing and potential recreational use of the project area, in daytime and overnight visits;
>
> (iii) A description of any measures or facilities recommended by the agencies consulted for the purpose of creating, preserving, or enhancing recreational opportunities at the project and in its vicinity (including opportunities for the handicapped), and for the purpose of ensuring the safety of the public in its use of project lands and waters;
>
> (iv) A statement of the existing measures or facilities to be continued or maintained and the new measures or facilities proposed by the applicant for the purpose of creating, preserving, or enhancing recreational opportunities at the project and in its vicinity, and for the purpose of ensuring the safety of the public in its use of project lands and waters, including an explanation of why the applicant has rejected any measures or facilities recommended by an agency and described under paragraph (f)(5)(iii) of this section; and
>
> (v) The following materials and information regarding the measures and facilities identified under paragraphs (f)(5)(i) and (iv) of this section:
>
> (A) Identification of the entities responsible for implementing, constructing, operating, or maintaining any existing or proposed measures or facilities;
>
> (B) A schedule showing the intervals following issuance of a license at which implementation of the measures or construction of the facilities would be commenced and completed;
>
> (C) An estimate of the costs of construction, operation, and maintenance of any proposed facilities, including a statement of the sources and extent of financing;
>
> (D) A map or drawing that conforms to the size, scale, and legibility requirements of § 4.39 showing by the use of shading, cross-hatching, or other symbols the identity and location of any facilities, and indicating whether each facility is existing or proposed (the maps or drawings in this exhibit may be consolidated); and
>
> (vi) A description of any areas within or in the vicinity of the proposed project boundary that are included in, or have been designated for study for inclusion in, the National Wild and Scenic Rivers System, or that have been designated as wilderness area, recommended for such designation, or designated as a wilderness study area under the Wilderness Act.

E.5. REPORT ON RECREATIONAL RESOURCES

E.5.1. Description of Recreational Resources for the Swan Falls Project

The Swan Falls Project area, as it pertains to recreational resources, falls within the boundaries outlined by the Federal Energy Regulatory Commission (FERC). The reach extends from the upstream boundary at approximately river mile (RM) 469.4 to the downstream boundary at approximately RM 457.3. The downstream boundary extends just below Swan Falls Dam (RM 457.5) to encompass a short reach of the tailwater section. The remaining reservoir river miles extend from the dam to the upstream boundary where the reservoir transitions to a free-flowing river at RM 469.4 (Figure E.5-1). Recreational use within the corridor is extensive and includes a multitude of opportunities. Fishing, powerboating, and camping are the most common activities in the reservoir area. Float boating is available in the free-flowing reach below

Swan Falls Dam. Public land surrounds much of the Snake River, providing many recreational opportunities for public use throughout the Swan Falls Project area.

E.5.1.1. Recreational Facilities and Opportunities in the Project Vicinity

The Applicant maintains five distinct recreation facilities within the Swan Falls study area. The Bureau of Land Management (BLM) provides recreation amenities along the free-flowing section of the study area and outside the project boundary below Swan Falls Dam.

E.5.1.1.1. Bureau of Land Management Facilities and Opportunities

The BLM offers one developed site near the project area. Located on the canyon rim, Dedication Point offers two vault toilets, a parking area, interpretive displays, graveled trails, benches, garbage cans, and a covered small-group kiosk. The parking area is approximately 0.50 mile from the rim overlook, where visitors can view the canyon corridor and birds of prey (Figure E.5-1). The BLM has also placed fire rings at multiple impromptu campsites and an interpretive information kiosk at a parking area along the reach of the Snake River immediately downstream of Swan Falls Dam.

E.5.1.2. Recreational Facilities and Opportunities at the Project

Recreational facilities within the project boundary are all owned and maintained by the Applicant. Opportunities include boating access, impromptu camping, picnicking, day use, and interpretive signs for natural and historical features. Currently, there are no user fees charged for any of the Applicant's facilities in the Swan Falls Project area. The location of each facility is illustrated in Figure E.5-1. Details of each facility and its respective opportunities are as follows:

Swan Falls Park—The Applicant maintains one day-use park within the study area. Amenities at this site include full restrooms, benches, picnic tables, an interpretive display, and day-use parking. The park grass is manicured, and large trees provide adequate shade cover. The park borders the reservoir, offering barrier-free access at most sites.

Swan Falls Reservoir Boat Ramp—This one-lane boat launch with mooring docks is located 0.25 miles above the dam. The site also includes a portable toilet located in the parking area. In 2003, the Applicant installed a second mooring dock upstream of the boat launch to accommodate increased demand and provide daily moorage of outfitters' boats from April through June.

Swan Falls Downstream Boat Launch—There is a gravel boat launch downstream of Swan Falls Dam that provides access to the free-flowing segment of the Snake River. Amenities include a portable toilet and an air compressor, which was installed to assist rafters at this location.

Canoe Portage Trail—The canoe portage trail is located adjacent to the west side of the dam. A sign upstream of the dam notifies boaters of the trail's location. The effective length of the portage varies with flows. When there is no spill, the persons portaging must walk approximately 1,100 feet to a reasonable launch point. When there is spill, the persons portaging could travel up to about 2,500 feet downstream to launch.

Swan Falls Powerhouse Museum—In 1994, the Applicant finished construction of the new power plant and, in the process, stabilized and converted the old powerhouse into a museum. Located at the Swan Falls Dam, the museum offers interpretive displays on the history of the Applicant and the Swan Falls Project. It also has a turbine/generator display. Because of national security concerns, current visiting days and hours are restricted to Tuesday and Wednesday from 10:00 A.M. to 1:00 P.M. Tour groups must provide a list of the names and addresses of all adults on the tour at least 48 hours in advance.

E.5.2. Estimates of Existing and Potential Recreation Use

FERC regulations require that an applicant seeking to relicense a hydroelectric project provide a report of the amount of recreational use associated with that project. The Applicant, through consultation with concerned agencies and entities, determined that additional information about recreational use at the Swan Falls Project would be required to determine appropriate recreation measures to be proposed for the duration of a new license. Additional information collected by the Applicant included the type, timing, and location of recreational use associated with the project and the demographic profiles and attitudes and opinions of the recreators. Several types of recreational use occur in the area, including angling, camping, picnicking, sightseeing, off-roading, hunting, and paintballing (Brown 2002). The Applicant conducted recreational-use studies at the Swan Falls Project from 1984 to 1987 (Holthuijzen 1989) and in 1996 (IPC 1997), 2001 (Brown 2002), 2003 (IPC 2003), and 2005 (Technical Reports E.5-A, E.5-B, and E.5-C).

Through consultation with concerned agencies and other entities, the Applicant developed recreational-use studies to obtain information needed to guide development of reasonable and adequate recreation measures for the Swan Falls Project (IPC 2005). The results of those studies are presented in four technical reports that are included as technical appendices to the license application. The following provides a brief description of each of the four technical reports:

- *E.5-A. Recreational Use at the Swan Falls Project*—This report contains information about the amount, type, location, and timing of recreational use associated with the Swan Falls Project (Technical Report E.5-A).

- *E.5-B. Demographics, Attitudes, and Opinions of Recreators at the Swan Falls Hydroelectric Project*—This report contains results from on-site interviews conducted with recreators at the Swan Falls Hydroelectric Project (Technical Report E.5-B).

- *E.5-C. Angling Use at the Swan Falls Project*—This report contains the results of comprehensive creel surveys conducted at the Swan Falls Project during 2001, 2003, and 2005 (Technical Report E.5-C).

- *E.5-D. Inventory of Recreational Dispersed Sites and Corresponding Recreational Use in the Swan Falls Project Area*—This report contains the results of an inventory of all recreational-use sites within the project area and estimates of the amount and descriptions of the type of use occurring at each site (Technical Report E.5-D).

E.5.2.1. Existing Recreational Use and Users

The FERC project area extends from the upstream end of Swan Falls Reservoir (RM 469.5) to the small island just downstream of Swan Falls Dam (RM 457.7). The Applicant's recreational-use study area extended from the upstream end of the FERC project area to the end of practical road access at a gate installed by the BLM about 4 miles downstream of Swan Falls Dam (Figure E.5-1).

E.5.2.1.1. Amount, Type, Timing, and Location of Recreational Use

The Applicant conducted recreational-use studies to support the relicensing efforts at the Swan Falls Project during 2003 and 2005. Additionally, the Applicant conducted recreational-use studies during 1996 and 2001 to meet the requirement of filing Form 80, recreational-use report, with FERC. During each of the study periods, the Applicant's survey clerks conducted roving recreational-use surveys at the Swan Falls Project using methodologies suggested by Malvestuto et al. (1978), Malvestuto (1983), and Hoenig et al. (1993). Throughout the study period, survey clerks counted recreators by location during randomly selected survey periods and conducted on-site interviews with recreators to obtain information about their demographics, recreational use, and attitudes. For details of study methodologies, see Technical Reports E.5-A and E.5-B.

During these surveys, the Applicant conducted on-site interviews with 4,830 recreators[1], distributed among the sampling years as follows:

- 1996—470 interviews

- 2001—970 interviews

---

[1] In several of the graphs of results presented in this exhibit, sums of individual categories are not always exactly equal to the same information presented as a total in separate graphs. These differences are small and caused by rounding to whole numbers.

- 2003—1,737 interviews

- 2005—1,653 interviews

E.5.2.1.1.1. Estimated Hours of Recreational Use

Overall—The estimated amount of recreational use within the FERC project area varied somewhat among the study years. In 1996, there was an estimated 48,096 hours of recreational use. This increased to 67,835 in 2001, and increased again in 2003 to 72,391 hours. During 2005, the estimate decreased to 51,971 hours.

Monthly—The monthly amount of recreational use varied considerably among the study years (Figures E.5-2, E.5-3, E.5-4, and E.5-5). The months with the most use included July (1996), September (2001), and May (2003 and 2005). Other months that had high use included June (2003 and 2005), July (2005), and August (2003 and 2005). While January consistently had the lowest amount of use, all of the cold-season months had considerably less use than the warm-season months.

By Activity—During each of the four study years, angling was the most popular activity observed, followed by lounging (Figures E.5-6, E.5-7, E.5-8, and E.5-9). Other activities observed included hiking/walking, hunting, jet skiing, motorcycling/ATVing, float boating, picnicking, swimming, water skiing, rock climbing, and bicycling.

Recreational Use at Dispersed Sites—A large majority of the sites used for recreation purposes are impromptu sites that, over time, have been established and impacted by repeated use. These sites include almost every place where it is practical to drive a vehicle to an area that provides convenient river access. The Applicant identified 26 such sites within the study area (Technical Report E.5-D). Table E.5-1 lists all 26 sites, including their four-letter abbreviations, estimated hours of use, location relative to FERC project boundary, the entity responsible for operation and maintenance (O&M), and acreage of the site. Areas were identified as recreation sites based on a combination of prior observation of use and obvious human-use impacts at the sites. Because of the topography and the distribution of roads, a large majority of the dispersed-use sites are associated with the tailwater area. Dispersed-site use in the reservoir area accounted for only 753 hours of overall dispersed-site use. The most common activity observed at the dispersed sites was bank angling, which accounted for 46% (22,787 hours) of use. Lounging accounted for 40% (19,737 hours) of use. Other activities at dispersed sites, which accounted for more than 1,000 hours, included loading/unloading equipment (3,038 hours) and hiking/walking (1,753 hours) (Figure E.5-10).

The estimated hours of overall use at individual dispersed sites varied from 7,458 hours at site STCM to zero hours at several sites (Table E.5-1). Most of the sites with an estimated use of zero hours were simply parking pullouts from which people disperse to associated activity areas (usually bank fishing, paint balling, rock climbing, etc.). Seven individual dispersed sites each accounted for more than 2,000 hours of use: (STCM, BSBD, STFP, BLM1, POFF, FISH, and BLM2). Estimated hours by activity for these seven sites are presented in individual graphs (Figures E.5-11 through E.5-17). Hours by activity for sites that accounted for less than 2,000 hours are presented in tabular format in Table E.5-2.

STCM—The activity observed most often at the STCM site was bank angling (3,857 hours), followed by lounging (2,828 hours). Other activities that accounted for more than 100 hours included swimming (243 hours), hiking/walking (203 hours), and loading/unloading (196 hours) (Figure E.5-11).

BSBD—Bank angling accounted for 4,183 hours of use at the BSBD site, followed by lounging at 847 hours. Hiking/walking (300 hours) and loading/unloading (117 hours) were the only other two activities observed at this site (Figure E.5-12).

STFP—Bank angling accounted for 88% (4,148 hours) of the use observed at the STFP site. Other activities observed included lounging (312 hours), loading/unloading (214 hours), and hiking/walking (41 hours) (Figure E.5-13).

BLM1—Lounging was the most popular activity observed at this site (2,794 hours), followed by bank angling (1,324 hours). Recreators were also observed swimming (380 hours), loading/unloading (141 hours), and hunting (70 hours) (Figure E.5-14).

POFF—Bank angling was the activity observed most often at this site (2,528 hours), followed by lounging (1,006 hours). Only two other activities were observed at this site: loading/unloading (260 hours) and motorcycling/ATVing (95 hours) (Figure E.5-15).

FISH—Bank angling (1,589 hours) and lounging (1,502 hours) accounted for nearly equal amounts of use at this site. Other activities included loading/unloading (555 hours), motorcycling/ATVing (98 hours), land-based miscellaneous (66 hours), and hiking/walking (59 hours) (Figure E.5-16).

BLM2—Bank angling (1,723 hours) was again the most popular activity at the BLM2 site, followed by lounging (1,317 hours). Loading/unloading (251 hours) and swimming (80 hours) were also observed at this site (Figure E.5-17).

E.5.2.1.1.2. Recreational Use Reported as Recreation Days

A recreation day is defined as any person visiting an area for recreational purposes during any portion of an individual day. During 1996, the FERC project area at the Swan Falls Hydroelectric Project hosted an estimated 17,699 recreation days. During 2001, the project area hosted an estimated 21,534 recreation days; in 2003, it hosted an estimated 24,130 recreation days. During 2005, estimated recreation days dropped slightly to 22,596.

E.5.2.1.2. User Demographics, Attitudes, and Opinions

E.5.2.1.2.1. Place of Residence

In 2001, 2003, and 2005, interviewees were asked to provide their country, state, county, and city of residence. Only five interviewees were from outside the United States (one each from Germany, the Netherlands, and Italy; and two from the United Kingdom).

State of Residence—In 2001, 2003, and 2005, interviews were conducted with visitors from 29 states. When data from all three years were combined, visitors from Idaho accounted for 93.19% of interviewees, and only California accounted for as much as 1% (1.09%) of interviewees (Table E.5-3). Interviewees from Idaho dominated during each individual year as well: 2001 (91.68%), 2003 (93.92%), and 2005 (93.04%). States that accounted for at least 1% of respondents during any individual study year included California (2001, 1.62% and 2003, 1.14%), Minnesota (2001, 3.20%), South Carolina (2005, 2.18%), Tennessee (2001, 1.07%), and Washington (2005, 1.54%) (Table E.5-4).

County of Residence—In 2005, 72.71% of the interviewees from Idaho were from Ada County and 23.69% were from Canyon County. During the same year, Owyhee County (1.54%) was the only other county that accounted for more than 1% of the respondents (Table E.5-5).

City of Residence—Among the Idaho residents interviewed, eight cities accounted for as much as 1% of interviewees: Boise (35.67%), Kuna (19.53%), Nampa (17.97%), Meridian (14.18%), Caldwell (3.10%), Eagle (2.06%), Melba (1.66%), and Oreana (1.09%) (Table E.5-6).

E.5.2.1.2.2. Length of Stay

Respondents stayed as little as an average of 2.74 hours in 1996 and as long as an average of 4.29 hours in 2003 (Table E.5-7). Visitors interviewed in the tailwater area generally stayed longer than those interviewed in the reservoir area (Table E.5-7). When grouped in five length-of-stay categories, stays of between three and six hours were the most common during 1996 (43.30%), 2001 (41.19%), 2003 (33.07%), and 2005 (44.25%) (Table E.5-8).

E.5.2.1.2.3. Group Size

Mean group size reported by interviewees was relatively consistent during all sample years. In the reservoir section, mean group sizes were the smallest in 2001 (2.83 interviewees) and the largest in 2003 (3.23 interviewees). In the tailwater section, mean group sizes were the smallest in 2001 (2.26 interviewees) and the largest in 2005 (2.71 interviewees). Group size reported by interviewees in the tailwater section was consistently smaller than that reported by interviewees in the reservoir section (Table E.5-9). When grouped in six group-size categories, two was the most common group size in 1996 (30.61%), 2001 (42.87%), 2003 (39.02%), and 2005 (40.57%). During each sampling year, less than 2% of visitor groups consisted of more than 10 people (Table E.5-10).

E.5.2.1.2.4. Age

Mean age was higher in 2001 (36.82 years) than in 2003 (30.8 years) and 2005 (30.47 years). The age group between 18 and 35 consistently contained the highest proportion of respondents (2001, 28.87%; 2003, 34.90%; and 2005, 37.52%) (Table E.5-11).

E.5.2.1.2.5. Gender

The percentage of male interviewees at the Swan Falls Project area was consistently more than the percentage of female interviewees in 2001 (77.78%), 2003 (70.42%), and 2005 (70.20%) (Table E.5-12). The percentage of males in the tailwater section was slightly higher than the percentage of males in the reservoir section. (Table E.5-13).

E.5.2.1.2.6. Ethnicity

The majority of respondents were Caucasian in 2001 (93.94%), 2003 (89.56%), and 2005 (91.01%). Interviewees of Hispanic origin were the only other ethnic group that consistently accounted for more than 1% (2001, 4.19%; 2003, 9.31%; and 2005, 6.21%) (Table E.5-14). Native Americans were not included as a distinct group in 2003 or 2005.

E.5.2.1.2.7. Number of Visits to Swan Falls During the Last Year

The mean number of visits to the Swan Falls Project area during the last year was 6.00 in 2003 and 7.24 in 2005. The most visits reported by any interviewee was 200. A large percentage of interviewees reported only one prior visit during the last year (2003, 45.58% and 2005, 37.16%) (Table E.5-15).

E.5.2.1.2.8. Primary Reported Activity

In the Swan Falls Project area, respondents reported angling as their primary activity in 2003 (49.41%) and 2005 (53.35%) and sightseeing as their secondary activity in 2003 (10.43%) and 2005 (14.44%). Other activities reported by more than 5% of interviewees during 2003 or 2005 were hiking/walking (2003, 5.49% and 2005, 7.10%), lounging (2003, 6.66% and 2005, 8.48%), and picnicking (2003, 5.47% and 2005, 5.15%)

(Table E.5-16). In 2003, 11.81% of the respondents had no response for the primary reported activity (Table E.5-16).

E.5.2.1.2.9. General Comments

When asked for general comments, 902 of the 4,848 recreators responded. Each of the 902 comments was placed in one of 94 comment categories. The comment categories were then placed in one of 17 groups. Within some of the groups, the comment categories were classified as either a positive or negative subgroup. Listing of one comment into more than one comment category resulted in 49 additional comments for a total of 951. The number of comments in each group and subgroup is provided in Table E.5-17. The number of comments in each comment category within the groups and subgroups is provided in Table E.5-18.

General comments were given by 291 (31%) of respondents who provided comments. Of these 291 comments, all but 11 were included in the positive subgroup and were of the “I love (like) the area” type. Responses related to angling accounted for 136 comments (14%), of which 55 were positive and 81 were negative. Forty-three of the positive angling comments were in the “fishing is good” category. The remaining 12 positive comments included the following: thanks for letting us fish (4); I’ll come back to fish (3); want fishing to stay free (3); and like to fish here (2).

The most common negative comments related to angling included the following: want more fish (28); need slot limit for bass (20); and the fishing is bad (3). Other negative responses related to angling included tournaments (negative) (7); want more bass (5); get rid of carp (4); want bigger fish (4); fish and game needs more enforcement here (3); less fish now than in the past (3); can’t catch many fish (2); and stock more fish (2). Responses related to litter accounted for 132 (14%) of the total responses and were all negative in nature (Table E.5-18). Almost all were references to too much litter (101). Also mentioned was the need for garbage cans (14); requests that litter laws be enforced (9); and the fact that paintballers make an unsightly mess (8).

Comments about facilities accounted for 106 responses (11%). A total of 26 positive, facility-related comments were given and included the following: like the Applicant’s facilities (14); less trash than in the past (6); restrooms are clean (4); and like the Applicant’s facilities at Hells Canyon (2). Each of the 80 negative facilities-related comments was broken into 16 different categories. The greatest number of responses fell under need garbage cans (17) and more portable toilets (15).

None of the other negative facility-related comments contained more than 10 responses. These responses included the following: enforce litter laws (7); want developed campground (7); want more fishing docks (4); change paved road to gravel (4); remove speed bump (4); want loading ramp for dirt bike (3); want more shade (3); want hiking trails (3); smooth/pave ramp roads (3); improve ramp below dam (2); want more sand on park shore (2); want facilities addressing Native American concerns (2); install rod holders below dam (2); and repair roads (2).

More detail of general comment responses and verbatim comments are available in Technical Report E.5-B.

E.5.2.2. Potential Recreational Use

Estimating the potential for change in recreational use at the Swan Falls Hydroelectric Project, as at any other location, requires the consideration of several, usually interrelated, factors. Population changes within the region contribute to increases or decreases in the amount of recreational use. In addition, the particular activity or combination of activities that recreators engage in can become more or less popular. On-site conditions at the recreational area can also change, making the area more or less attractive to recreators.

E.5.2.2.1. Population Growth

While most recreators using the project area live within 75 miles, some come from elsewhere. The U.S. population grew by 10% between 1980 and 1990, and by 13% between 1990 and 2000. This increase is expected to continue at a slower rate of 9% per decade through 2020. During the 1990s, the population of the Pacific Northwest grew at a much higher rate than the population of the United States as a whole. During the 1990s, Idaho’s population grew by 29%; Washington’s by 21%; and Oregon’s by 20%. Population growth in the Pacific Northwest is expected to outpace national growth in the foreseeable future.

Ada and Canyon counties in Idaho contribute the majority of recreators at the Swan Falls Project. During the 1980s and 1990s, population growth rates in both of these counties considerably exceeded that of both the nation and the Pacific Northwest.

E.5.2.2.2. National Trends in Participation in Selected Activities

National surveys have been conducted to determine numbers of participants in outdoor recreational activities and to identify any trends in such participation (Cordell et al. 1999). Participation in fishing increased between 1995 and 2000.

E.5.2.2.3. Conclusions Related to Future Recreational Use

The populations of the counties and states that supply the majority of the recreators to the Swan Falls Project are expected to increase in the foreseeable future. Nationally, the number of participants for all major activity categories associated with recreational use at the project is increasing and numbers are expected to increase during the foreseeable future. Therefore, unless a totally unpredictable event—such as a collapse of the fisheries—occurs, recreational use at the project can be expected to continue to increase in the foreseeable future.

E.5.3. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section E.5.4.3. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.5.4. Applicant’s Existing and Proposed Measures or Facilities

The Applicant’s proposed recreation plan is based on the FERC policy concerning recreational development at licensed projects (18 CFR § 2.7). The policy provides for the development of recreational resources that are “consistent with the needs of the area to the extent that such development is not inconsistent with the primary purpose of the project” and “reasonable expenditures” for recreational development based on an approved plan. Among others, the policy establishes expectations that licensees develop suitable public recreational facilities with adequate public access, including considering the needs of individuals with physical handicaps; cooperating with appropriate agencies and interested entities in determining public recreation needs and developing site plans; encouraging governmental agencies and private interests to assist in carrying out plans, such as the operation and maintenance of facilities; cooperating with governmental agencies in planning, providing, operating, and maintaining facilities on public lands adjacent to the project area; providing for litter and sanitation control at facilities operated by the Applicant; and informing the public about recreational opportunities, including rules governing accessibility and use of recreational facilities.

Therefore, the Applicant proposes a Recreation Management Plan (RMP) for the Swan Falls Project that considers land- and water-based recreational opportunities. The RMP consists of the Applicant’s existing and proposed recreation measures identified in this section. In developing the plan, the Applicant considered study results and referred to and considered recreational-planning documents from the BLM, Idaho Department of Parks and Recreation, applicable counties, and the Idaho Department of Commerce.

The Applicant’s RMP is designed to accomplish the following objectives:

- Promote public safety and increase public awareness of recreational opportunities by providing interpretive, informative, and educational panels or kiosks at developed recreational sites and by providing information through a Web site

- Promote reasonable health and safety standards by implementing a litter pick-up program and providing additional toilet facilities and dumpsters

- Provide safe and reasonable access to project-related recreational activities

- Reduce congestion and conflict among visitors and valuable resources related to recreational activities

- Provide reasonable and amenable recreation facilities that provide for a range of recreational opportunities

- Provide public access to the Snake River while managing to reduce human impacts to sensitive terrestrial and cultural resources

- Provide opportunities to work cooperatively with agencies and other entities to provide adequate and reasonable recreational developments

Finally, consistent with 18 CFR § 4.51(f)(5) of the FERC regulations, the Applicant's proposed RMP includes measures that create, preserve, and enhance recreational opportunities at Swan Falls. To that end, the Applicant has proposed measures that include developing new recreational sites; continuing to operate and maintain existing recreational facilities and the public safety program; and upgrading the existing park, dispersed-user site designations, vault toilets, dumpsters, interpretive displays, and a litter pick-up program.

E.5.4.1. Existing Measures to Be Continued for Recreation and Safety

The following existing recreational measures would be maintained over the life of the new license. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.5.4.1.1. Operation and Maintenance of Applicant-Managed Parks and Recreational Facilities

Justification

Applicant-managed parks and recreational facilities require ongoing O&M.

Goal

The goal of this measure is to continue the existing O&M of all Applicant-managed parks and recreational facilities, which include the reservoir boat launch and parking, Swan Falls Park, canoe portage trail, and downstream boat launch.

Description

The Applicant currently operates and maintains the following recreation facilities at Swan Falls:

- Swan Falls Park
- Swan Falls Reservoir boat ramp
- Swan Falls downstream boat launch
- Canoe portage trail
- Swan Falls Powerhouse museum

O&M of the existing Applicant-managed parks and recreational facilities would remain the responsibility of the Applicant for the duration of the new license period.

Associated Benefits

Public access and recreational opportunities.

Implementation or Construction Schedule

Ongoing.

Cost Estimate

The Applicant would fund this measure. The estimated average annual cost to continue existing O&M activities for Applicant-owned parks and recreation facilities is $120,000 in years 1 to 30.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-1.

E.5.4.1.2. Continuation of Public Safety Program

Justification

FERC requires a public safety program. The Applicant acknowledges that continuing this measure is in the best interests of the public and public safety.

Goal

The goal of this measure is to continue the existing public safety program.

Description

The Applicant has developed and implemented a public safety program for the project area (Technical Report H.13-A) and intends to continue implementing this plan. O&M of the existing public safety program would be ongoing and would remain the responsibility of the Applicant for the life of the new license.

Associated Benefits

Public safety, public information, and security of project facilities.

Implementation or Construction Schedule

Ongoing.

Cost Estimate

The Applicant would fund this measure. The estimated average annual cost is $5,000 in years 1 to 30.

Functional Design Drawings

Not applicable.

Location Map

Not applicable.

E.5.4.2. Proposed Measures or Facilities for Recreation and Safety at Swan Falls

The Applicant proposes the following measures or facilities for recreation resources at the Swan Falls Project area. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

E.5.4.2.1. Litter and Sanitation Plan

Justification

Litter and sanitation are issues that need to be addressed at dispersed and impromptu recreational sites. Study results reveal that litter is a primary concern for recreational users of the project area.

Goal

The goal of this measure is to provide biannual litter pickups, dumpsters, and additional public toilets at appropriate locations in the vicinity of the project and on lands owned by the Applicant.

Description

The Applicant proposes to provide additional vault toilets and dumpsters and to implement a biannual litter pickup program in the project vicinity. Litter pickups would be within the project boundaries and downstream to RM 453.4. Dumpsters would be placed at three locations: Swan Falls Reservoir boat ramp, Swan Falls Park, and the Swan Falls downstream boat launch. Vault toilets would be placed at appropriate dispersed recreation sites. Within 2 years after a new license is issued, the Applicant will begin implementing the litter and sanitation plan.

Associated Benefits

Recreation users, aesthetics, protection of cultural and other resource values, public health and safety, and user satisfaction.

Implementation or Construction Schedule

The Applicant would implement the proposed enhancements within 2 years after the license is issued and would operate and maintain the enhancements over the life of the new license.

Cost Estimate

The Applicant would fund all elements of this measure. The estimated initial capital costs to plan, permit, and implement enhancements is $100,000 spread over the first 2 years of a new license term. The annual estimated O&M cost to administer the plan for years 3 through 30 of a new license term is $45,000.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-18 for the location of proposed vault toilets and dumpsters.

E.5.4.2.2. Information and Education Plan

Justification

This measure promotes the protection and preservation of valuable or sensitive environmental resources through education. It also provides the public with directional information and locations of project-related recreational facilities.

Goal

The goal of this enhancement measure is to develop and implement an integrated information and education (I&E) plan for the Swan Falls Project area.

Description

The Applicant proposes to develop an I&E plan that includes the following elements:

- Review and select appropriate themes such as watchable wildlife, geologic history, benefits of hydropower, the fishery, historic trails, pioneers, recreational opportunities, and public safety (for example, boating regulations).
- Review and select appropriate interpretive media to be used, such as signs and kiosks, at specific site locations.
- Develop a Web site and toll-free phone number accessing pertinent recreation-related information.

Through these efforts, the Applicant would then implement the plan in consultation with the appropriate agencies and entities. The Applicant would operate and maintain the I&E facilities and amenities resulting from this plan.

Associated Benefits

Interpretation, information, education, and protection of environmental resource values through education.

Implementation or Construction Schedule

In consultation with appropriate agencies and entities, the Applicant would develop the proposed plan within 1 year after a new license is issued. Construction and implementation would occur during years 2 and 3. The applicant would maintain facilities associated with the plan over the life of the new license.

Cost Estimate

The Applicant would fund all reasonable and agreed-upon elements of this measure. The estimated total capital cost to develop and implement this plan is $89,000, spread over the first

3 years of a new license term. The estimated average annual O&M cost to implement this plan for years 4 through 30 of a new license is $2,500.

Functional Design Drawings

Not applicable.

Location Map

Not applicable.

E.5.4.2.3. Dispersed Sites Redefinition and Enhancement

Justification

Several existing impromptu or dispersed sites provide access to the reservoir and river within the project vicinity (Figure E.5-19). Visitor use of the Swan Falls area has impacted some upland and riparian habitats located within the local area of these sites. The Applicant proposes to further define and improve six of these recreation sites, which would enhance visitors’ experiences. Buffers would be established around these sites to minimize and limit motorized traffic from further disturbing vegetation adjacent to those sites. The sites to be enhanced were selected based on two criteria 1) the amount and regularity of recreation use demonstrated in the study results; and 2) the physical layout of the site. Physical layout included proximity to an improved road and topographical considerations such as ease of access and adequate flat land to incorporate meaningful enhancements.

Goal

The Applicant proposes improvements for the following named dispersed sites: ABRP, BLOR, STFP, ST13, STCM, and ST12. The Applicant proposes to decommission, recontour, and revegetate 3.72 acres of roadbed and impacted riparian areas using native riparian species. The Applicant will manage motorized traffic to these delineated sites using appropriate buffer materials, such as strategically placed boulders and/or berms.

Description

Below is a list of proposed improvements by individual dispersed site.

ABRP—Define one universal campsite (would include a pad, table, and fire ring) and restrict additional growth of area by providing buffer materials.

BLOR—Define one road that loops through the site and provide two universal campsites. Restrict additional growth of the area by providing buffer materials.

STFP—Close various braided roads to the site, provide one parking pull-out area, and designate two universal campsites. Restrict additional growth of the area by providing buffer materials.

ST13—Close various braided roads to the site, designate one road that loops through the area, and add three to six universal campsites. Restrict additional growth of the area by providing buffer materials.

STCM—Close various braided roads to the site, designate one road that loops through the area, and designate two to three universal campsites. Build and locate a vault toilet near the primary road that enters the site. Restrict additional growth of the area by providing buffer materials.

ST12—Define one road that loops through the site and provide two universal campsites. Restrict additional growth of the area by providing buffer materials.

Associated Benefits

Recreation, public access, enhanced visitor experience, and protection of upland and riparian habitats.

Implementation or Construction Schedule

In consultation with appropriate agencies and entities, the Applicant would develop individual site concepts within one year after a new license is issued. Construction and implementation would occur during years two and three. The Applicant would maintain facilities associated with the plan over the life of the new license.

Cost Estimate

The Applicant would fund this measure. The estimated total capital cost to develop and implement the dispersed sites enhancements is $400,000, spread over the first 3 years of a new license term. The annual estimated O&M cost to implement this plan for years 4 through 30 of a new license is $30,000.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-19.

E.5.4.2.4. Swan Falls Reservoir Boat Ramp

Justification

The Swan Falls Reservoir boat ramp is the only developed boat ramp on the project’s reservoir. Basic improvements and upgrades are needed to accommodate existing and future use at this site. Also, these improvements will reduce traffic congestion associated with the site and ease launching and retrieval of boats.

Goal

The goal of this measure is to provide enhancements at the Swan Falls Reservoir boat ramp to better accommodate existing and future use at the site.

Description

The Applicant proposes to install a new vault toilet, enlarge and define the parking area for vehicles and trailers, provide parking space designated for one average-sized school bus, and designate a staging area for boats. The Applicant will also widen and steepen the concrete boat ramp. Associated docks will be repaired or replaced as needed. The Applicant will target boat access facility standards outlined in the States Organization for Boating Access (SOBA) Design Handbook for Recreational Boating and Fishing Facilities.

Associated Benefits

Recreation, public access, and enhanced visitor experience.

Implementation or Construction Schedule

Construction and implementation would occur during years 2 and 3 of the new license. The Applicant would maintain facilities associated with the boat ramp area over the life of the new license.

Cost Estimate

The Applicant would fund this measure. The estimated total capital cost to upgrade the Swan Falls Reservoir boat ramp is $120,000, spread over years 2 and 3 of the new license term. The estimated average annual O&M cost to implement this plan for years 4 through 30 of a new license is included in section E.5.4.1.1.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-1.

E.5.4.2.5. Swan Falls Park

Justification

Swan Falls Park is a popular day-use facility available to the public. Certain enhancements would improve public safety, provide other recreational opportunities, and enhance visitor experience in large group settings.

Goal

The goal of this measure is to provide enhancements at the Swan Falls Park to better accommodate existing and future use at the park.

Description

The Applicant proposes to repair the park's shoreline by providing either additional rip rap or a retaining wall, adding a new dock system with gangway (Americans with Disabilites Act [ADA] accessible), building one group picnic shelter (size HEX 36), and providing four additional picnic tables near the waterfront.

Associated Benefits

Recreation, public access, visitor experience, and opportunity.

Implementation or Construction Schedule

Construction and implementation would occur during years 2 and 3 of the new license. The Applicant would maintain facilities associated with the park over the life of the new license.

Cost Estimate

The Applicant would fund this measure. The estimated total capital cost to upgrade the Swan Falls Park is $135,000, spread over years 2 and 3 of the new license period. Estimated O&M for this measure is included in the O&M estimate in section E.5.4.1.1.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-1.

E.5.4.2.6. Swan Falls Downstream Boat Launch

Justification

The Swan Falls downstream boat launch needs basic upgrades to effectively launch and retrieve boats and to provide enhanced parking for vehicles and trailers. The present launch is composed of gravel. Historically, this launch was intended to accommodate canoes, kayaks, and rafts. More recently, larger motorized boat use has occurred, primarily because of the popularity of sturgeon fishing below the dam. The Applicant is aware that numerous vehicles have become stuck because of the slope of the ramp and gravel surface. Providing the proposed improvements will reduce traffic congestion associated with the site and ease the launching and retrieval of boats.

Goal

The goal of this measure is to provide enhancements at the Swan Falls downstream boat launch to better accommodate existing and future use of the site.

Description

The Applicant proposes to install a new vault toilet, enlarge and define the parking area for vehicles and trailers, designate a staging area for boats, and construct a two-lane concrete boat ramp. The Applicant will target boat access facility standards as outlined in the SOBA Design Handbook for Recreational Boating and Fishing Facilities. An outdated air compressor will be removed, as floatboaters are self-sufficient with manual air pumps or vehicle portable air compressors.

Associated Benefits

Recreation, public access, and visitor experience.

Implementation or Construction Schedule

Construction and implementation would occur during years 2 and 3 of the new license. The Applicant would maintain facilities associated with the boat launch over the life of the new license.

Cost Estimate

The Applicant would fund this measure. The estimated total capital cost to upgrade the Swan Falls downstream boat launch is $150,000, spread over years 2 and 3 of a new license term. Estimated O&M for this measure is included in the O&M estimate in section E.5.4.1.1.

Functional Design Drawings

Not applicable.

Location Map

See Figure E.5-1.

E.5.4.3. Measures or Facilities Recommended by the Agencies

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. Often the comment letters did not clearly indicate specific recommended measures. However, the Applicant made a good-faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant's proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.5.4.3.1. Accepted or Conditionally Accepted Measures or Facilities

Bureau of Land Management comment letter, dated December 20, 2007

BLM-5

> "…The BLM suggests that, instead of resurfacing the gravel boat ramp, IPC install a concrete boat ramp similar to that on the reservoir. Also the existing air pump does not have the appropriate nozzle required to inflate rafts or inflatable kayaks. The BLM suggests several possible solutions; 1) remove the air pump completely, 2) replace the nozzle with an

> appropriate fitting for raft valves, or 3) provide standard AC outlet plugs for air pumps or inflators."

Response

The Applicant agrees to install a new concrete boat ramp at the downstream boat launch site. The Applicant will target boat access facility standards as outlined in the SOBA Design Handbook for Recreational Boating and Fishing Facilities. Additionally, the Applicant noted concrete as a preferred ramp surface in the recreation technical report titled *Demographics, Attitudes, and Opinions of Recreators at the Swan Falls Hydroelectric Project* (Technical Report E.5-B). See section E.5.4.2.6 for language specific to these actions.

Regarding the air pump at the downstream launch site, the Applicant agrees with recommendation number one. Removal of the air compressor would be the best solution. The area occupied by the air compressor could be utilized for parking and boat ramp enhancements. Portable 12-volt air compressors and hand pumps are common and the Applicant does not believe providing another on-site air compressor would benefit floaters. See section E.5.4.2.6 for language specific to the Applicant's planned actions for the existing air compressor at the downstream boat launch.

Idaho Department of Fish and Game comment letter, dated December 21, 2007
IDFG-9

> "…IDFG recommends, in addition to the Applicant's proposal, that all facilities should be planned for ADA compliance where conditions allow, including restrooms at dispersed campsites and parking areas. A fish cleaning station near boat ramps would also improve sanitation and is recommended."

Response

The Applicant agrees with the above statement referring to ADA compliance. At the Swan Falls Project Joint Meeting held in Boise on February 19, 2008, the need for a fish cleaning station near boat ramps was discussed. IDFG and the Applicant mutually agreed that a fish cleaning station was not necessary at this time. However, it was also agreed that the adequacy of the Applicant's Recreation Plan would be evaluated during the six-year cycle that coincides with gathering recreational data for the FERC Form 80 Recreation Report filings.

IDFG-11

> "…IDFG recommends improving roads that provide access to valid identifiable fishing sites and locating vehicle parking above the river's shoreline to control erosion of the bank."

Response

The Applicant agrees with this recommendation. As a part of the proposed Dispersed Site Redefinition and Enhancement measure, the Applicant will improve access roads to specific areas and eliminate access to others to minimize impacts to sensitive resources. Where multiple accesses (i.e., braided roads) have been developed to the detriment of other resources, access may be limited to one road. The intent of this plan will be to limit vehicle access to some sites by closing access through some of the multiple, braided roads that now exist and rehabilitating those road areas. At that time, based on resource requirements and the results of agency consultation, closure of some dispersed sites could be included in the plan submitted to FERC.

The Applicant will continue to work with IDFG on identifying "valid identifiable fishing sites" and related parking areas as they relate to the areas outlined in section E.5.4.2.3 of the final license application.

IDFG-12

> "…IDFG recommends that IPC widen and steepen the ramp to facilitate loading and unloading of larger boats."

Response

The Applicant agrees with this recommendation. The goal to enhance the reservoir boat ramp under section E.5.4.2.4 will target boat access facility standards outlined in the SOBA Design Handbook for Recreational Boating and Fishing Facilities.

IDFG-13

> "…IDFG also suggests the Applicant construct a concrete boat ramp for motorized boat use and a separate hardened lane for a non-motorized launch site to reduce user conflict. Additionally we recommend IPC install a fully accessible boat boarding dock and improve parking by providing parking sites for vehicles and vehicles with boat trailers."

Response

The Applicant agrees that a concrete surface on this ramp would be the proper material for enhancement. See section E5.4.2.6 for language specific to these improvements. The Applicant will target boat access facility standards as outlined in the SOBA Design Handbook for Recreational Boating and Fishing Facilities. Additionally, the Applicant identified concrete as a preferred ramp surface in the recreation technical report titled *Demographics, Attitudes, and Opinions of Recreators at the Swan Falls Hydroelectric Project* (Technical Report E.5-B).

Regarding the recommendation for a separate hardened lane for non-motorized watercraft, IDFG commented during the Swan Falls Project Joint Meeting (held on February 19, 2008) that they no longer felt a separate lane was needed in light of the concrete two-lane launch the Applicant is proposing.

Idaho Department of Parks and Recreation comment letter, dated December 20, 2007

IDPR-4

> "We recommend that the applicant consult with IDPR in the design of the comprehensive sign package and the I&E plan outlined in E.5.4.2.2."

Response

The Applicant agrees with this recommendation.

E.5.4.3.2. Rejected Measures or Facilities and Explanations for Rejection

Bureau of Land Management comment letter, dated December 20, 2007

BLM-3

> "…Swan Falls Dam is being increasingly used as a starting point to access areas on the south side of the Snake River. The BLM suggests constructing a non-motorized trail that would lead from the dam downstream connecting with existing roads and trails."

Response

With respect to the referenced trail, the Applicant does not agree, based on study results, that the proposed non-motorized trail is warranted or that it is the Applicant's responsibility to construct such a trail. Of the 951 general comments received from recreators during the surveys, only three were requests for more hiking trails (Technical Report E.5-B). An existing road provides an adequate hiking path for people who may wish to hike downstream of the project. There is little traffic, and most of the road is attractively located within view of the river. The proposed trail also is located on BLM lands, outside of the FERC project boundary. Therefore, based on studies conducted and proposed location of the trail, there does not appear to be a need for the trail and there is not sufficient reason to place the responsibility of constructing the trail with the Applicant.

BLM-4

> "…To provide a non-motorized option for users, the BLM suggests developing a non-motorized trail system leading from the "Falcon Flats" area (near ST12 and ST13) downstream to the end of motorized access at FHTR. The trail system would include trailheads with available day use parking, trailhead kiosk with a trail map and other user information, and trail markers designating the trails as non-motorized. The trail system would be developed in association with the BLM and lead from the ST12 area."

Response

With respect to the referenced trail, the Applicant does not agree, based on study results, that the proposed non-motorized trail is warranted or that it is the Applicant's responsibility to construct such a trail. Of the 951 general comments received from recreators during the surveys, only three were requests for more hiking trails (Technical Report E.5-B). An existing road provides an adequate hiking path for people who may wish to hike downstream of the project. There is little traffic, and most of the road is attractively located within view of the river. The proposed trail also is located on BLM lands, outside of the FERC project boundary. Therefore, based on studies conducted and proposed location of the trail, there does not appear to be a need for the trail and there is not sufficient reason to place the responsibility of constructing the trail with the Applicant.

E.5.5. Materials and Information on Measures and Facilities

All materials and information regarding existing measures and facilities that will be continued by the Applicant are included in section E.5.4.1. All materials and information regarding measures and facilities proposed by the Applicant are included in section E.5.4.2.

E.5.6. Areas Associated with the National Wild and Scenic Rivers System or Wilderness

Section 5(d)(1) of the Wild and Scenic Rivers Act (Act) requires federal agencies to determine the eligibility of rivers running through lands that they manage for addition to the National Wild and Scenic Rivers System. The eligibility of the Snake River through the Snake River Birds of Prey National Conservation Area (NCA) had not been determined prior to the BLM's recent development of the *Snake River Birds of Prey National Conservation Area Draft Resource Management Plan/Environmental Impact Statement* (Draft RMP/EIS) (BLM 2006). For a river to be eligible, the river or segment of a river must be free-flowing and possess one or more outstandingly remarkable values. If it is found to be eligible, the river/segment must be classified as wild, scenic, or recreational, depending on its remarkable values. A determination of suitability must then be made for the river to be included in the National Wild and Scenic Rivers System.

E.5.6.1. National Wild and Scenic Rivers System

In the Draft RMP/EIS, the BLM found the river segment above Swan Falls Reservoir to C.J. Strike Dam and the segment below the Swan Falls Dam to be free-flowing and to have wildlife values unique to the Snake River Canyon. However, in Alternative D, the Preferred Alternative, of the Draft RMP/EIS, the BLM did not recommend that either segment of the river was suitable for designation under the act. A final edition of the Draft RMP/EIS has not yet been issued, so there is no Record of Decision at this time. Therefore, no waterway in or near the project area is included in the National Wild and Scenic Rivers System at this time.

E.5.6.2. Wilderness and Wilderness Study Areas

No Wilderness or Wilderness Study Area exists in or near the project area.

E.5.7. Consultation

For a summary of consultation efforts to date, see the Consultation Appendix.

LITERATURE CITED

Brown, M. E. 2002. Recreation use at the Swan hydroelectric project from February 1, 2001 through January 31, 2002. Idaho Power Company, Boise, ID.

Bureau of Land Management (BLM). 2006. Snake River Birds of Prey National Conservation Area: draft resource management plan and environmental impact statement. Volume 1. U.S. Department of the Interior, BLM, Boise District Office, Boise, ID. ID-111-2006-EIS-1740.

Cordell, K. H., B. L. McDonald, J. R. Teasly, J. C. Bergstrom, J. Martin, J. Bason, and V. R. Leeworthy. 1999. Outdoor recreation participation trends. In: K. H. Cordell, C. Betz, J. M. Bowker, D. B. K. English, S. H. Mou, J. C. Bergstrom, R. J. Teasley, M. A. Tarrant, and J. Loomis, compilers. Outdoor recreation in American life: a national assessment of demand and supply trends. Sagamore Publishing, Champaign, IL. 449 p.

Hoenig, J. M., D. S. Robson, C. M. Jones, and K. H. Pollock. 1993. Scheduling counts in the instantaneous and progressive methods for estimating sportfishing effort. North American Journal of Fisheries Management 13(4):723–736.

Holthuijzen, A. M. A. 1989. Behavior and productivity of nesting prairie falcons in relation to construction activities at Swan Falls Dam. Idaho Power Company, Boise, ID. 77 p.

Idaho Power Company (IPC). 1997. Swan Falls Hydroelectric Project, Form 80 recreation use report. Filed with the Federal Energy Regulatory Commission in April 1997. IPC, Boise, ID. 7 p.

Idaho Power Company (IPC). 2003. Swan Falls Hydroelectric Project, Form 80 recreation use report. Filed with the Federal Energy Regulatory Commission in April 2003. IPC, Boise, ID. 7 p.

Idaho Power Company (IPC). 2005. Formal consultation package for relicensing the Swan Falls Project (FERC No. 503). Filed with the Federal Energy Regulatory Commission in March 2005. IPC, Boise, ID. 438 p.

Malvestuto, S. P., W. D. Davies, and W. L. Shelton. 1978. An evaluation of the roving creel survey with nonuniform probability sampling. Transactions of the American Fisheries Society 107:255–262.

Malvestuto, S. P. 1983. Sampling the recreational fishery. In: L. Nielsen and D. Johnson, editors. Fisheries techniques. Transactions of the American Fisheries Society. Bethesda, MD. p. 397–417.

This page left blank intentionally.

Table E.5-1 **Estimated recreational-use hours, location in relation to FERC project boundary, entity responsible for O&M, and acreage at 26 dispersed areas associated with the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

Site Name	Site Abbreviation	Estimated Hours	Inside FERC Project Boundary	Entity Responsible for O&M	Acreage[a]
Swan Tailwater Camp	STCM	7,458	No	IPC[b c]	1.137
Below Swan Falls Boundary	BSBD	5,446	Yes	IPC	0.295
Swan Tailwater Fishing Pullout	STFP	4,714	No	IPC[b]	0.760
BLM Site #1	BLM1	4,709	No	BLM	0.188
Pull Off	POFF	3,888	Yes	IPC	0.115
Fisherman Point	FISH	3,870	No	BLM	0.262
BLM Site #2	BLM2	3,372	No	BLM	0.065
BLM Site #4	BLM4	1,807	No	BLM	0.048
Fishing Access Trail	FHTR	1,752	No	BLM	Trail only
Swan Tailwater Boundary	SBN1	1,695	No	BLM	0.190
Swan Tailwater Beach	STBH	1,176	No	BLM	0.247
Swan Tailwater Boundary 2	SBN2	1,172	No	BLM	Road only
Swan Tailwater Site #12	ST12	730	No	IPC[b]	0.835
BLM Site #3	BLM3	616	No	BLM	0.031
Above Boat Ramp	ABRP	423	Yes	IPC	0.225
BLM Site #7	BLM7	331	No	BLM	0.172
Below Ramp	BLOR	329	Yes	IPC	0.539
BLM Site #8	BLM8	208	No	BLM	.0187
Swan Tailwater Site #13	ST13	142	No	IPC[b]	0.650
Across From Park	AFPK	0	Yes	IPC	1.168
Big Rock	BGRK	0	Yes	IPC	0.361
Biggie Point	BIGP	0	Yes	IPC	0.202

Table E.5-1 Estimated recreational-use hours, location in relation to FERC project boundary, entity responsible for O&M, and acreage at 26 dispersed areas associated with the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).

Site Name	Site Abbreviation	Estimated Hours	Inside FERC Project Boundary	Entity Responsible for O&M	Acreage[a]
Eleven	LEVN	0	Yes	IPC	0.162
Twelve	TWLV	0	Yes	IPC	0.225
Upper Dispersed Site	UDIS	0	Yes	IPC	0.056
Wetlands Bar	WDBR	0	Yes	IPC	0.100

a. Sum of area of all areas within the site obviously impacted by recreational use.

b. These sites are on IPC property that is not within the FERC project boundary.

c. The majority of this site is IPC property, but a small portion is private property, not IPC.

Table E.5-2 **Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005).**

Site	Activity	Estimated Hours of Use
ABRP	Bank Angling	47
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	0
	Lounging	376
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
BLM3	Bank Angling	170
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	47
	Lounging	153
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	246

Table E.5-2 Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005). (Continued)

Site	Activity	Estimated Hours of Use
BLM4	Bank Angling	1,019
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	186
	Lounging	602
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
BLM7	Bank Angling	0
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	207
	Lounging	124
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0

Table E.5-2 **Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005). (Continued)**

Site	Activity	Estimated Hours of Use
BLM8	Bank Angling	0
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	105
	Lounging	103
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
BLOR	Bank Angling	0
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	0
	Lounging	329
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0

Table E.5-2 Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005). (Continued)

Site	Activity	Estimated Hours of Use
FHTR	Bank Angling	944
	Bicycling	0
	Hiking/Walking	320
	Hunting	0
	Land-Based Misc.	177
	Loading/Unloading	0
	Lounging	311
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
SBN1	Bank Angling	331
	Bicycling	90
	Hiking/Walking	420
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	285
	Lounging	568
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0

Table E.5-2 Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005). (Continued)

Site	Activity	Estimated Hours of Use
SBN2	Bank Angling	0
	Bicycling	0
	Hiking/Walking	410
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	391
	Lounging	372
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
ST12	Bank Angling	0
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	42
	Lounging	688
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0

Table E.5-2 **Estimated hours of recreational use, by activity type and site, for sites at which the estimated total hours of use was less than 2,000 (from the recreational-use study conducted by the Applicant at the Swan Falls Hydroelectric Project during 2005). (Continued)**

Site	Activity	Estimated Hours of Use
ST13	Bank Angling	0
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	0
	Lounging	142
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0
STBH	Bank Angling	923
	Bicycling	0
	Hiking/Walking	0
	Hunting	0
	Land-Based Misc.	0
	Loading/Unloading	42
	Lounging	210
	Motorcycling/ATVing	0
	Photography	0
	Picnicking	0
	Rock Climbing	0
	Swimming	0

Table E.5-3 **State of residence of interviewees at Swan Falls Hydroelectric Project during 2001, 2003, and 2005 study years, combined (from recreational-use studies conducted by the Applicant).**

State	Percent of Interviewees
Alaska	0.01
Arizona	0.04
Arkansas	0.01
California	1.09
Colorado	0.07
Florida	0.15
Idaho	93.19
Illinois	0.07
Indiana	0.23
Iowa	0.31
Maine	0.06
Maryland	0.05
Michigan	0.17
Minnesota	0.62
Montana	0.20
Nevada	0.16
New York	0.18
North Carolina	0.07
Oregon	0.53
Pennsylvania	0.04
South Carolina	0.85
South Dakota	0.19
Tennessee	0.18
Texas	0.09

Table E.5-3 State of residence of interviewees at Swan Falls Hydroelectric Project during 2001, 2003, and 2005 study years, combined (from recreational-use studies conducted by the Applicant). (Continued)

State	Percent of Interviewees
Utah	0.27
Virginia	0.07
Washington	0.99
West Virginia	0.02
Wisconsin	0.09

Table E.5-4 **State of residence of interviewees at Swan Falls Hydroelectric Project by study year (from recreational-use studies conducted by the Applicant in 2001, 2003, and 2005).**

State	2001	2003	2005
Arizona	0.00	0.09	0.00
Arkansas	0.00	0.00	0.04
Alaska	0.05	0.00	0.00
California	1.62	1.14	0.80
Colorado	0.00	0.00	0.17
Florida	0.00	0.30	0.05
Idaho	91.68	93.92	93.04
Illinois	0.42	0.00	0.00
Indiana	0.00	0.51	0.00
Iowa	0.00	0.71	0.00
Maine	0.00	0.00	0.17
Maryland	0.00	0.00	0.12
Michigan	0.00	0.13	0.29
Minnesota	3.20	0.16	0.00
Montana	0.39	0.09	0.23
Nevada	0.22	0.18	0.10
New York	0.47	0.00	0.26
North Carolina	0.19	0.00	0.10
Oregon	0.69	0.62	0.36
Pennsylvania	0.00	0.09	0.00
South Carolina	0.00	0.00	2.18
South Dakota	0.00	0.36	0.08
Tennessee	1.07	0.00	0.00
Texas	0.00	0.21	0.00

Table E.5-4 State of residence of interviewees at Swan Falls Hydroelectric Project by study year (from recreational-use studies conducted by the Applicant in 2001, 2003, and 2005). (Continued)

State	2001	2003	2005
Utah	0.00	0.45	0.18
Virginia	0.00	0.07	0.11
Washington	0.00	0.89	1.54
West Virginia	0.00	0.00	0.05
Wisconsin	0.00	0.07	0.15

Table E.5-5 County of residence of interviewees from Idaho at the Swan Falls Hydroelectric Project during 2005 (from recreational-use study conducted by the Applicant).

County	Percent of Interviewees
Ada	72.71
Bannock	0.02
Bingham	0.02
Blaine	0.08
Boise	0.25
Bonner	0.02
Bonneville	0.14
Canyon	23.69
Cassia	0.01
Elmore	0.28
Gem	0.62
Idaho	0.01
Jefferson	0.06
Latah	0.08
Lemhi	0.01
Lincoln	0.02
Nez Perce	0.06
Owyhee	1.54
Payette	0.03
Teton	0.00
Twin Falls	0.28
Valley	0.03
Washington	0.01

Table E.5-6 **City of residence of interviewees from Idaho at Swan Falls Hydroelectric Project (from recreational-use studies conducted by the Applicant during 2001, 2003, and 2005).**

City	Percent of Interviewees
Boise	35.67
Kuna	19.53
Nampa	17.97
Meridian	14.18
Caldwell	3.10
Eagle	2.06
Melba	1.66
Oreana	1.09

Table E.5-7 **Mean length of stay in hours (overall and by section) reported by interviewees at Swan Falls Hydroelectric Project during 1996, 2001, 2003, and 2005.**

Year	Overall Mean Length of Stay (hours)	Reservoir Mean Length of Stay (hours)	Tailwater Mean Length of Stay (hours)
1996	2.74	N/A	N/A
2001	3.28	3.17	3.39
2003	4.29	3.38	5.03
2005	3.20	2.50	3.76

Table E.5-8 **Percentage of interviewees in each of five length-of-stay categories from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 1996, 2001, 2003, and 2005.**

Length of Stay Category	1996	2001	2003	2005
< 3 hours	29.01	28.06	26.18	29.59
> 3 and < 6 hours	43.30	41.19	33.07	44.25
> 6 and < 12 hours	14.95	24.03	17.47	18.66
> 12 and < 24 hours	1.10	0.90	12.70	0.29
24 hours or more	11.65	5.82	10.58	7.22

Table E.5-9 **Mean group size, by year, of interviewees from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2001, 2003, and 2005.**

Section	2001	2003	2005
Reservoir	2.83	3.23	2.86
Tailwater	2.26	2.53	2.71

Table E.5-10 **Percentage of recreator groups in each of six group-size categories from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 1996, 2001, 2003, and 2005.**

Group Size Category	1996	2001	2003	2005
1	13.08	13.01	15.53	15.28
2	30.61	42.87	39.02	40.57
3	25.31	22.99	17.22	17.01
4	18.99	11.6	14.49	14.68
> 4 and < 11	10.19	9.35	12.8	11.01
> 10	1.83	0.19	0.94	1.46

Table E.5-11 **Percentage of interviewees in each of five age categories from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2001, 2003, and 2005.**

Age Group	2001	2003	2005
< 18	18.13	26.75	25.68
> 18 and < 36	28.87	34.9	37.52
> 35 and < 51	28.27	23.68	23.68
> 50 and < 66	19.97	12.29	10.89
> 65	4.77	2.38	2.23

Table E.5-12 **Percentage of interviewees by male/female and study year from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2001, 2003, and 2005.**

Year	Gender	Percent
2001	Female	22.22
	Male	77.78
2003	Female	29.58
	Male	70.42
2005	Female	29.80
	Male	70.20

Table E.5-13 Percentage of interviewees by male/female, study section, and study year from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2001, 2003, and 2005.

Section	Year	Gender	Percent
Reservoir	2001	Female	28.22
		Male	71.78
	2003	Female	31.75
		Male	68.25
	2005	Female	31.95
		Male	68.05
Tailwater	2001	Female	17.56
		Male	82.44
	2003	Female	27.81
		Male	72.19
	2005	Female	28.06
		Male	71.94

Table E.5-14 Percentage of interviewees in each of six ethnicity categories from recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2001, 2003, and 2005.

Ethnicity	2001	2003	2005
African-American	0.13	0.19	0.92
Asian	1.04	0.69	1.10
Caucasian	93.94	89.56	91.01
Hispanic	4.19	9.31	6.21
Native American	0.65	N/A	N/A
Other	0.06	0.25	0.76

Table E.5-15 Number of visits to the Swan Falls area during the last year reported by interviewees during recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2003 and 2005.

Number of Visits	2005	2003
One	37.16	45.58
Two	16.44	15.13
Three	11.10	8.41
Four	5.71	4.22
Five	4.29	2.96
> 5 and < 11	9.32	9.11
> 10 and < 26	9.84	10.09
> 25 and < 101	5.59	4.39
> 100	0.54	0.11

Table E.5-16 **Percentage of interviewees who reported specific primary activities during recreational-use studies conducted by the Applicant at Swan Falls Hydroelectric Project during 2003 and 2005.**

Primary Activity	2003	2005
Angling	49.41	53.35
Bicycling	0.04	0.13
Bird Watching	0.55	0.30
Camping	1.26	0.03
Drinking	0.30	1.05
Exercise Dogs	1.54	0.91
Hiking/Walking	5.49	7.10
Hunting	0.45	0.42
Lounging	6.66	8.48
Motorcycling/ATVing	1.97	0.62
No Response	11.81	3.53
Non-powered Watercrafting	0.41	0.22
Paintballing	1.07	0.59
Photography	0.12	0.26
Picnicking	5.47	5.15
Pleasure Boating	0.81	1.06
Prospecting	0.00	0.13
Sightseeing	10.43	14.44
Swimming	1.52	0.83
Water Sports	0.70	1.38

Table E.5-17 **Number of responses to requests for general comments, by subgroup and group, from interviews with recreators at Swan Falls Hydroelectric Project during surveys conducted by the Applicant from May 1, 2001, through October 31, 2001.**

Group	Subgroup	Count
Access	Negative	51
Access	Positive	19
Angling	Negative	81
Angling	Positive	55
Birds of Prey area	N/A	11
Crowding	N/A	22
Enforcement	N/A	11
Facilities	Negative	80
Facilities	Positive	26
General	Negative	11
General	Positive	280
Hunting	N/A	3
Interpretive/signage	N/A	21
Limit access	N/A	7
Litter	N/A	132
Not applicable	N/A	80
Not crowded	N/A	11
Operations	N/A	24
Regulations/restrictions	N/A	5
Services	N/A	12
Weather	N/A	9

Table E.5-18 Number of responses to requests for general comments, by comment category, subgroup, and group, from interviews with recreators at Swan Falls Hydroelectric Project during surveys conducted by the Applicant in 2001, 2003, and 2005.

Group	Subgroup	Comment Category	Number
Access	Negative	Access (negative)	4
		Allow access to fenced area below dam	3
		Don't like closed road below dam on north side	8
		Don't like people fishing from docks	4
		Don't like tour boat tied up at docks	5
		Improve ramp below dam	4
		Repair roads	3
		Smooth/pave ramp roads	8
		Want more fishing docks	5
		Want on-water camping access to area below dam	3
		Remove speed bump	4
	Positive	Access is good	5
		Enjoy camping right next to river	3
		It is close to home	3
		Keep access open	4
		Like limits on ATV access	4
Angling	Negative	Can't catch many fish	2
		Fish and game needs more enforcement here	3
		Fishing is bad	3
		Get rid of carp	4
		Less fish now than in the past	3
		Need slot limit on bass	20
		Stock more fish	2

Table E.5-18 Number of responses to requests for general comments, by comment category, subgroup, and group, from interviews with recreators at Swan Falls Hydroelectric Project during surveys conducted by the Applicant in 2001, 2003, and 2005. (Continued)

Group	Subgroup	Comment Category	Number
Angling (Continued)	Negative	Tournaments (negative)	7
		Want bigger fish	4
		Want more bass	5
		Want more fish	28
	Positive	Fishing is good	43
		I'll come back to fish	3
		Like to fish here	2
		Thanks for letting us fish	4
		Want fishing to stay free	3
Snake River Birds of Prey NCA	None	Birds of Prey area—need blinds to observe birds	2
		Birds of Prey area—no birds	4
		Birds of Prey area is beautiful	3
		Like efforts to eradicate cheatgrass and restore habitat	2
Crowding	None	Crowded/too much traffic	19
		Don't like people fishing from docks	2
		Don't like tour boat tied up at docks	1
Enforcement	None	Enforce litter laws	8
		Fish and game needs more enforcement here	3
Facilities	Negative	Change paved road to gravel	4
		Enforce litter laws	7
		Improve ramp below dam	2
		Install rod holders below dam	2
		More portable toilets	15

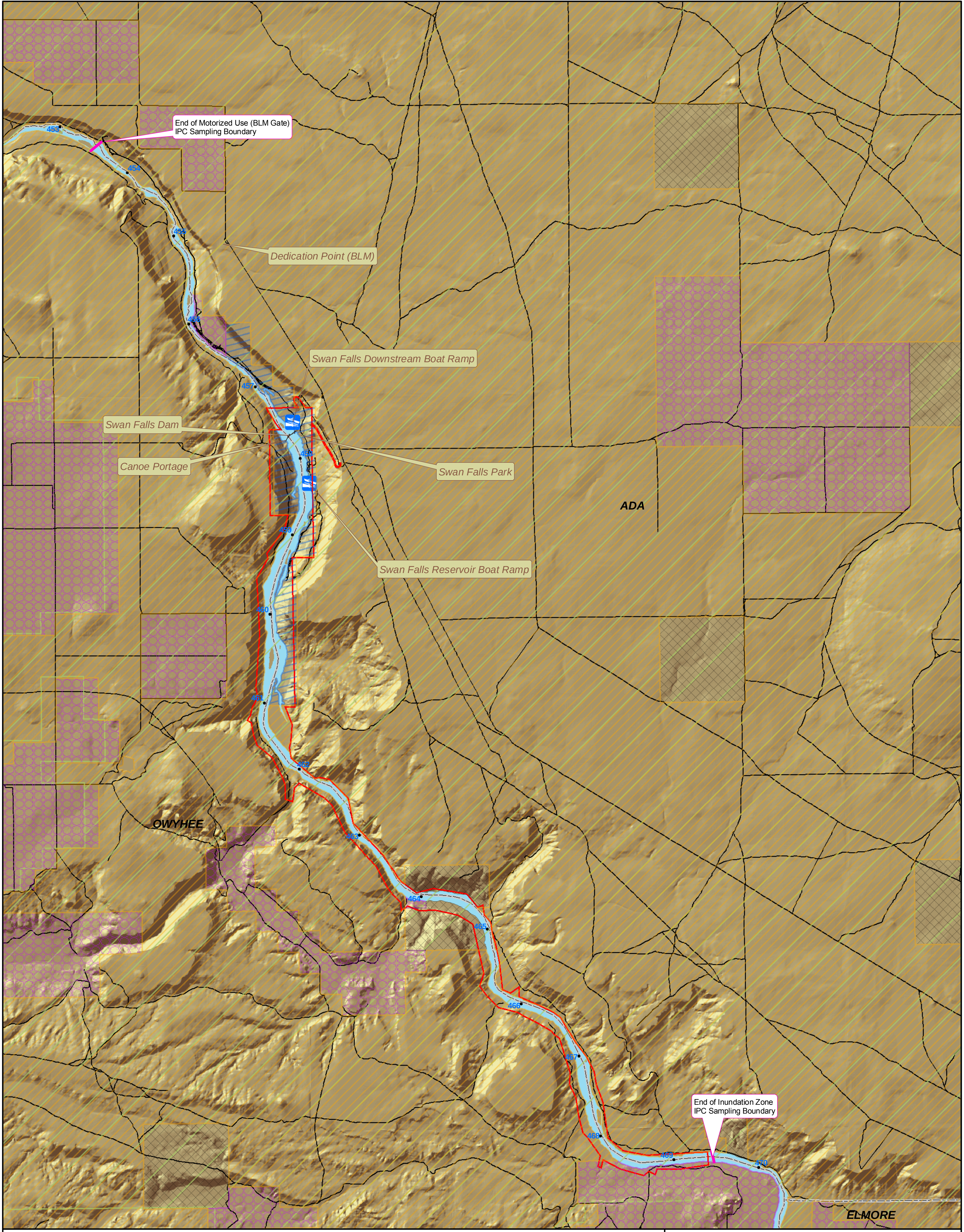
Table E.5-18 Number of responses to requests for general comments, by comment category, subgroup, and group, from interviews with recreators at Swan Falls Hydroelectric Project during surveys conducted by the Applicant in 2001, 2003, and 2005. (Continued)

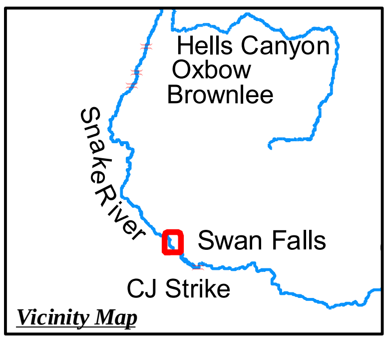
Group	Subgroup	Comment Category	Number
Facilities (Continued)	Negative	Need garbage cans	17
		Repair roads	2
		Smooth/pave ramp roads	3
		Want developed campground	7
		Want facilities addressing Native American concerns	2
		Want hiking trails	3
		Want loading ramp for dirt bike	3
		Want more fishing docks	4
		Want more sand on park shore	2
		Want more shade	3
		Remove speed bump	4
	Positive	Less trash now than in the past	6
		Like the Applicant’s facilities at Hells Canyon	2
		Like the Applicant’s facilities here	14
		Restrooms are clean	4
General	Negative	Too many bugs	11
	Positive	Beautiful area	83
		Birds of Prey area is beautiful	3
		Enjoyed area	9
		Everything was good	9
		Great/good/nice area	131
		It was fun	14
		Keep the same	11

Table E.5-18 Number of responses to requests for general comments, by comment category, subgroup, and group, from interviews with recreators at Swan Falls Hydroelectric Project during surveys conducted by the Applicant in 2001, 2003, and 2005. (Continued)

Group	Subgroup	Comment Category	Number
General (Continued)	Positive	Like the semi-primitive nature of area	12
		Peaceful	8
Hunting	None	Hunting comments	3
Interpretive/signage	None	More interpretive displays/signage	21
Limit Access	None	Change paved road to gravel	4
		Like limits on ATV access	3
Litter	None	Enforce litter laws	9
		Need garbage cans	14
		Paintballers make an unsightly mess	8
		Too much litter	101
Not Applicable	None	Do you stock fish?	4
		Like the Applicant’s work at rapid river	3
		Like conservation part with dirt trail	5
		Lower rates	5
		Not sure how to categorize	61
		Want more wildlife to view	2
Not Crowded	None	Not crowded	3
		Peaceful	8
Operations	None	Want lower flows	7
		Water is too low	17
Regulations/ restrictions	None	No jet skis	3
		No motors on river section	2
Services	None	Want bait shop at dam	1
		Want services (stores, gas, ice, beer, etc.)	11
Weather	None	Weather-related comments	9

Theme: \\dallas\gis_relic\swanfalls\FCP\study_area5_1_1.mxd





Vicinity Map

IDAHO POWER
An IDACORP Company

SWAN FALLS HYDROELECTRIC PROJECT-FERC NO. 503
IDAHO POWER COMPANY, BOISE, ID 2007

Figure E.5-1

Location of the Swan Falls Hydroelectric Project and Proposed Study Area

0 0.5 1 2 Miles

This page left blank intentionally.

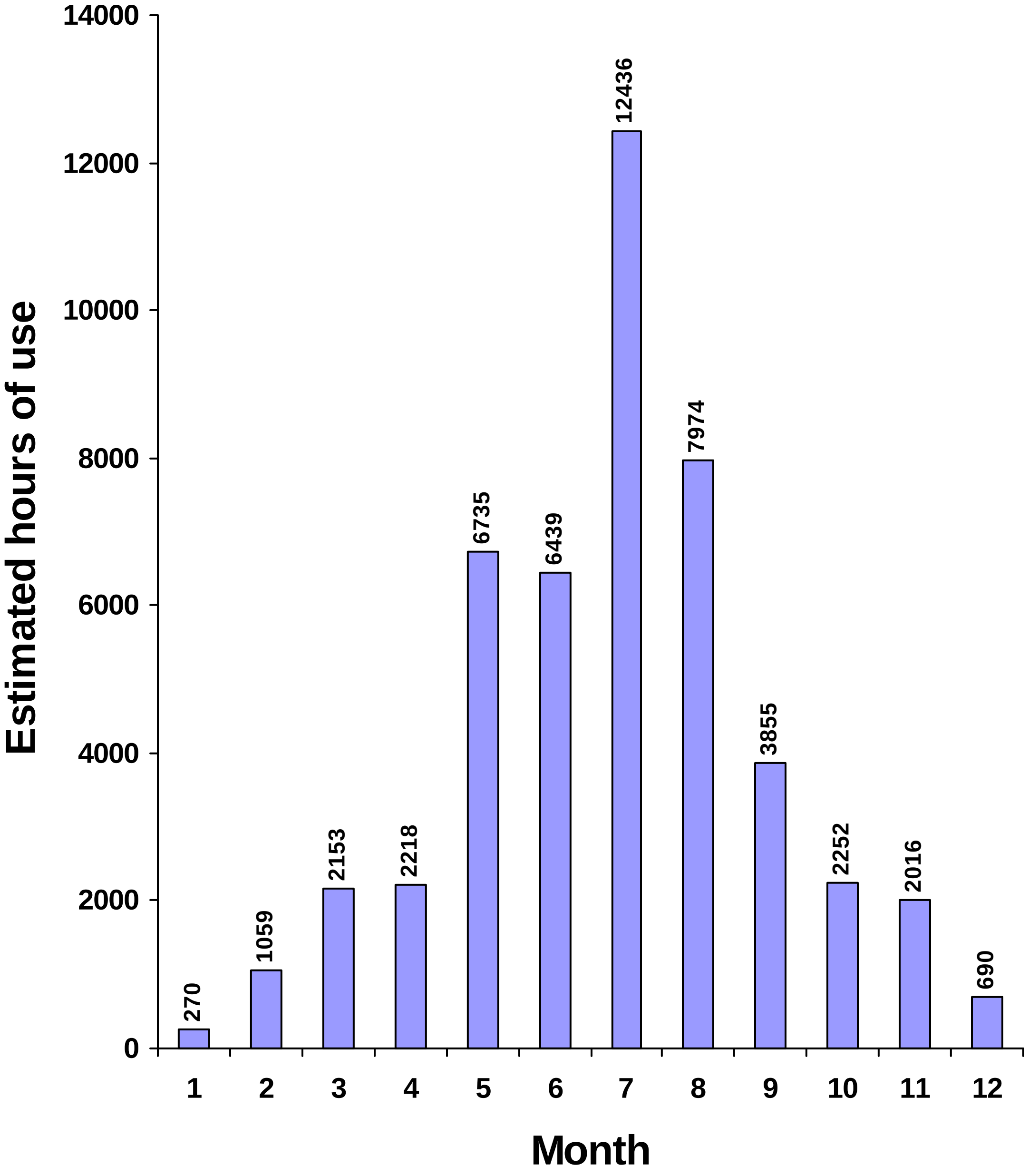


Figure E.5-2 **Estimated monthly hours of recreational use in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 1996).**

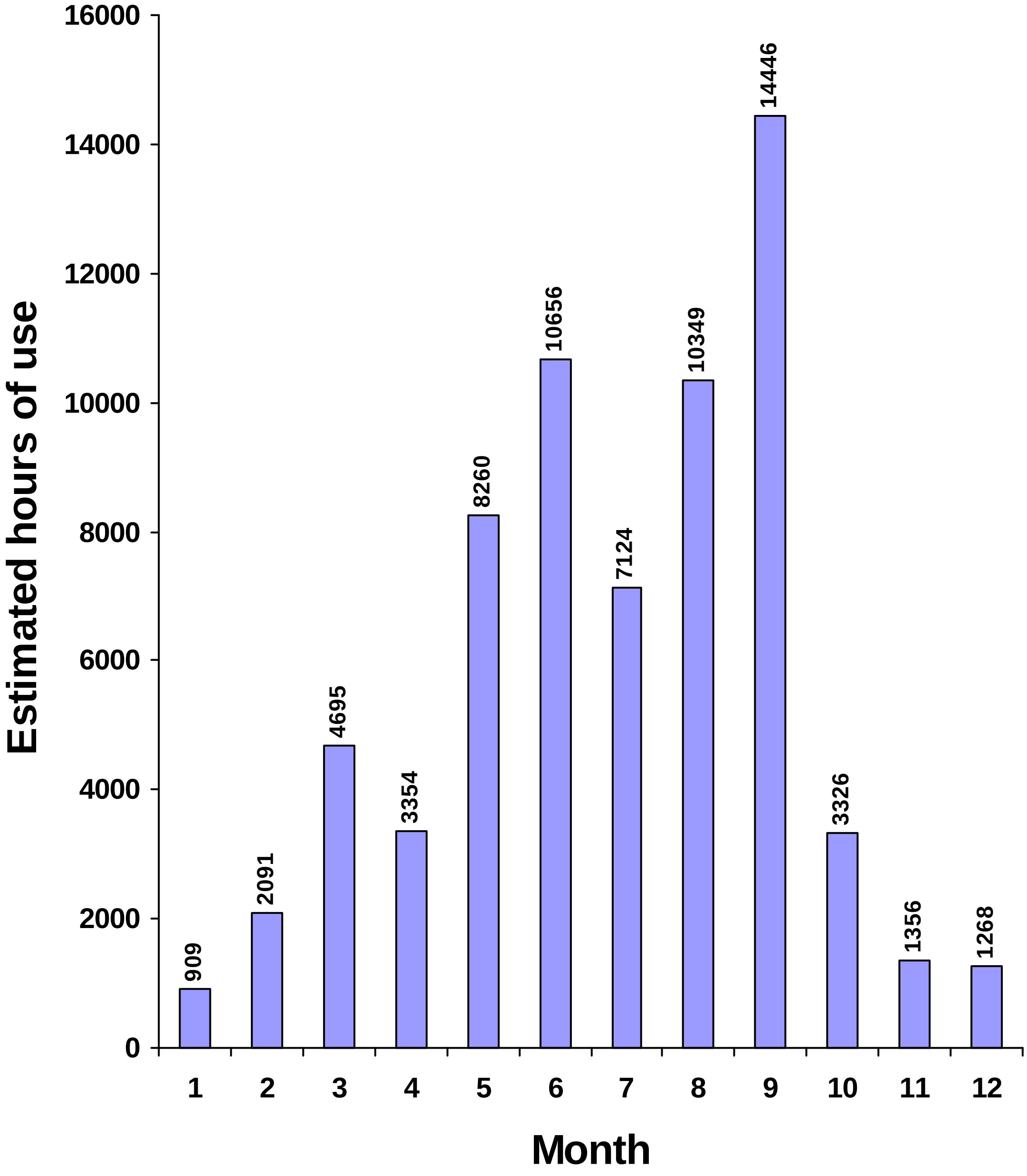


Figure E.5-3 **Estimated monthly hours of recreational use in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2001).**

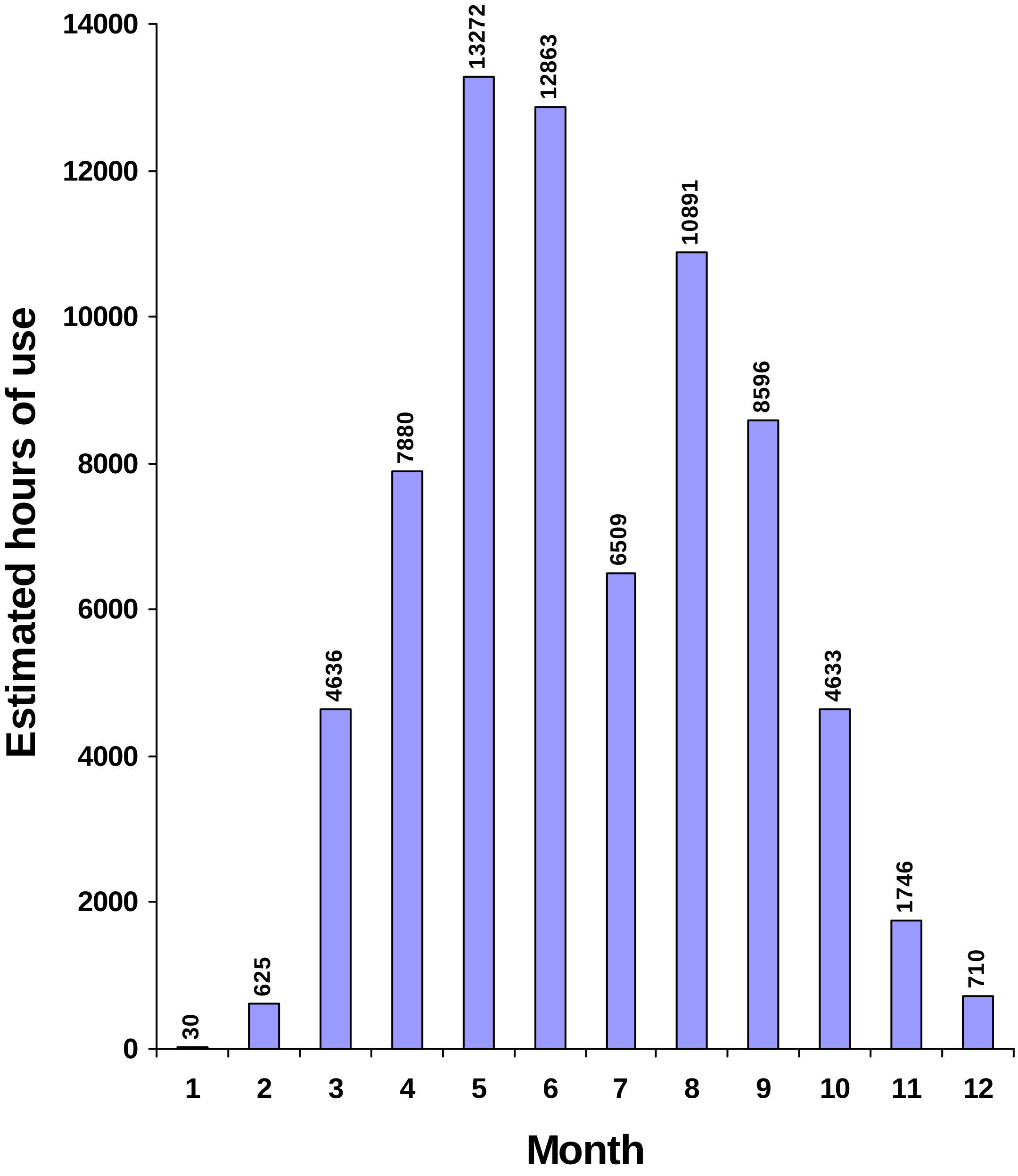


Figure E.5-4 **Estimated monthly hours of recreational use in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2003).**

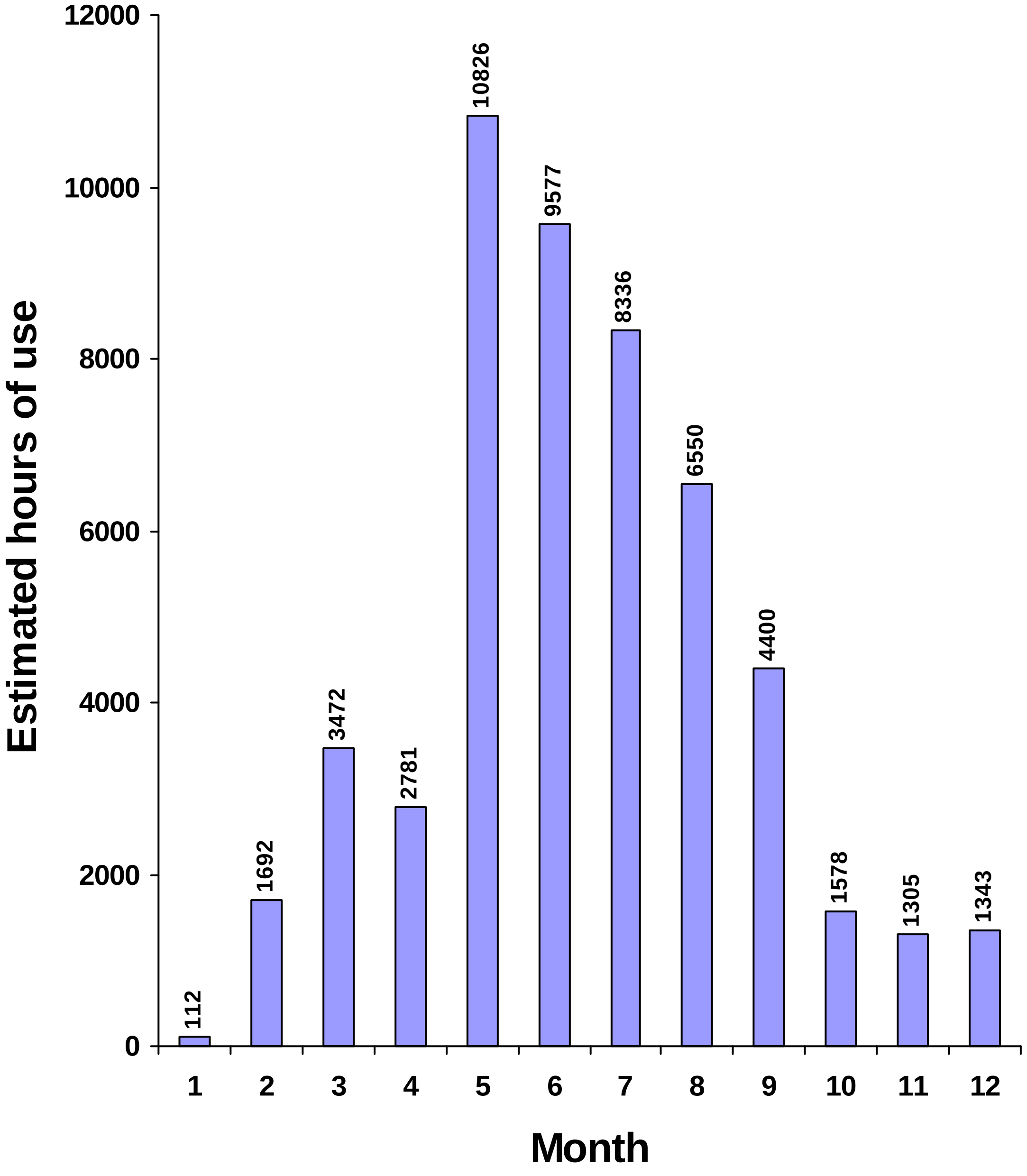


Figure E.5-5 **Estimated monthly hours of recreational use in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2005).**

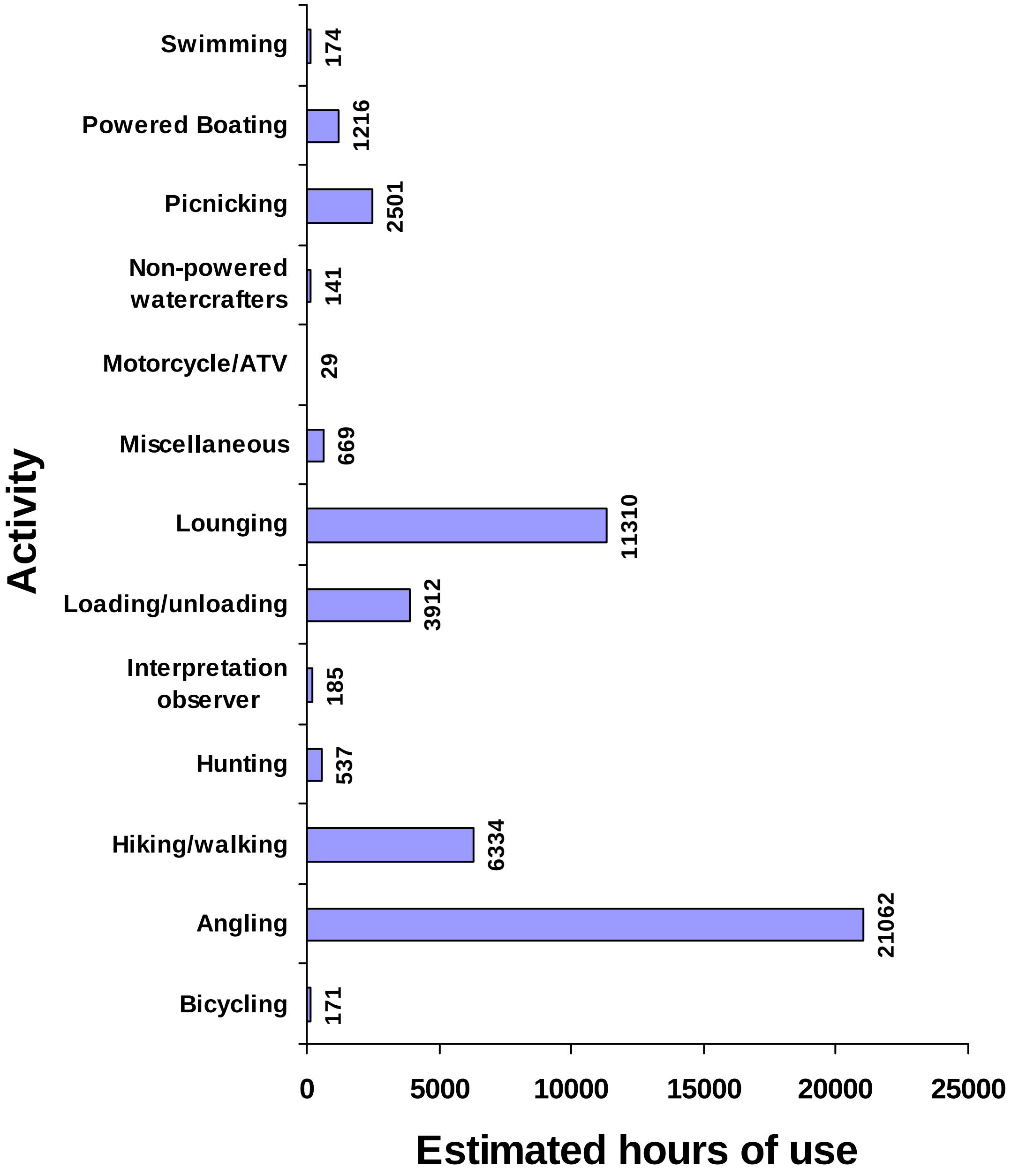


Figure E.5-6 Estimated hours of recreational use, by activity, in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 1996).

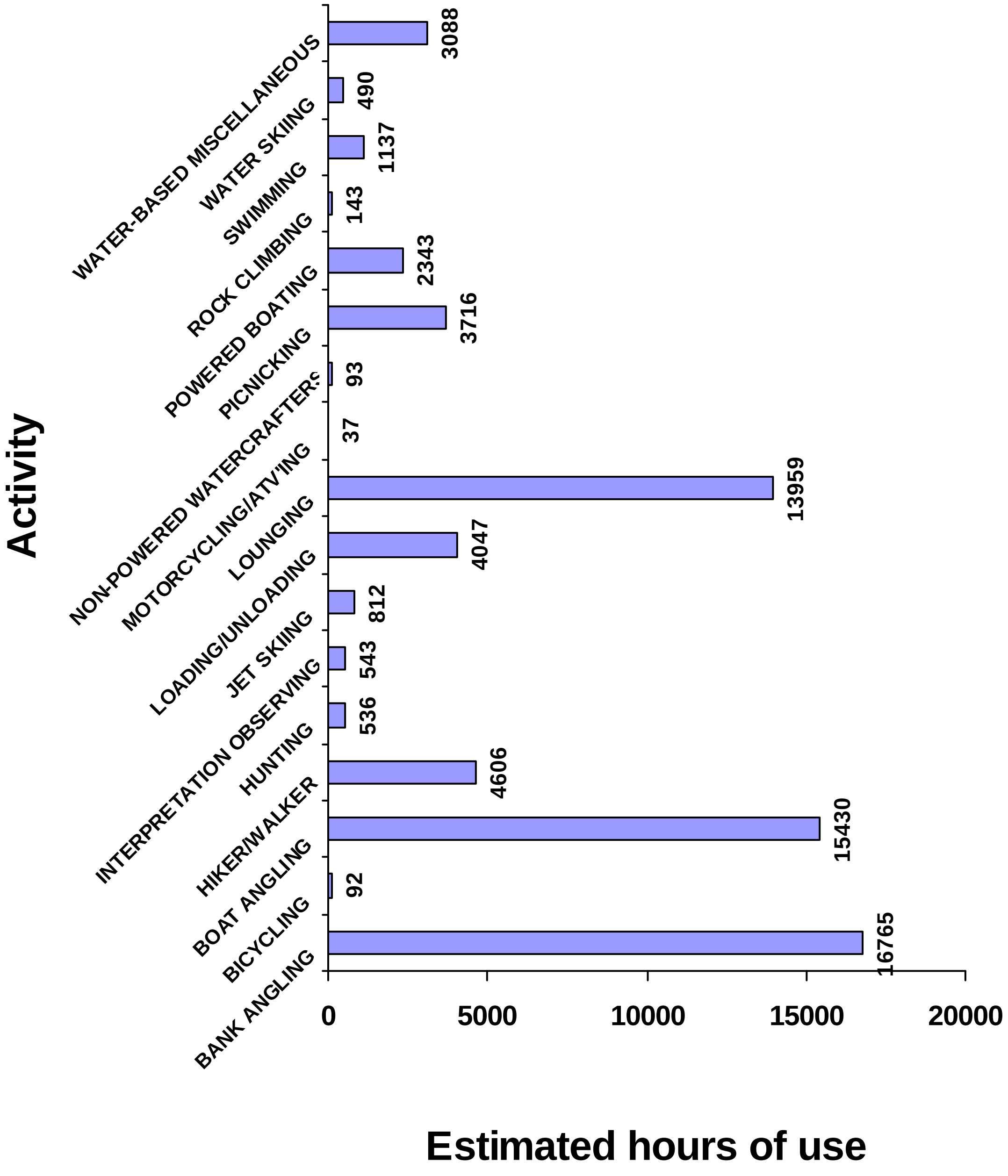


Figure E.5-7 **Estimated hours of recreational use, by activity, in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2001).**

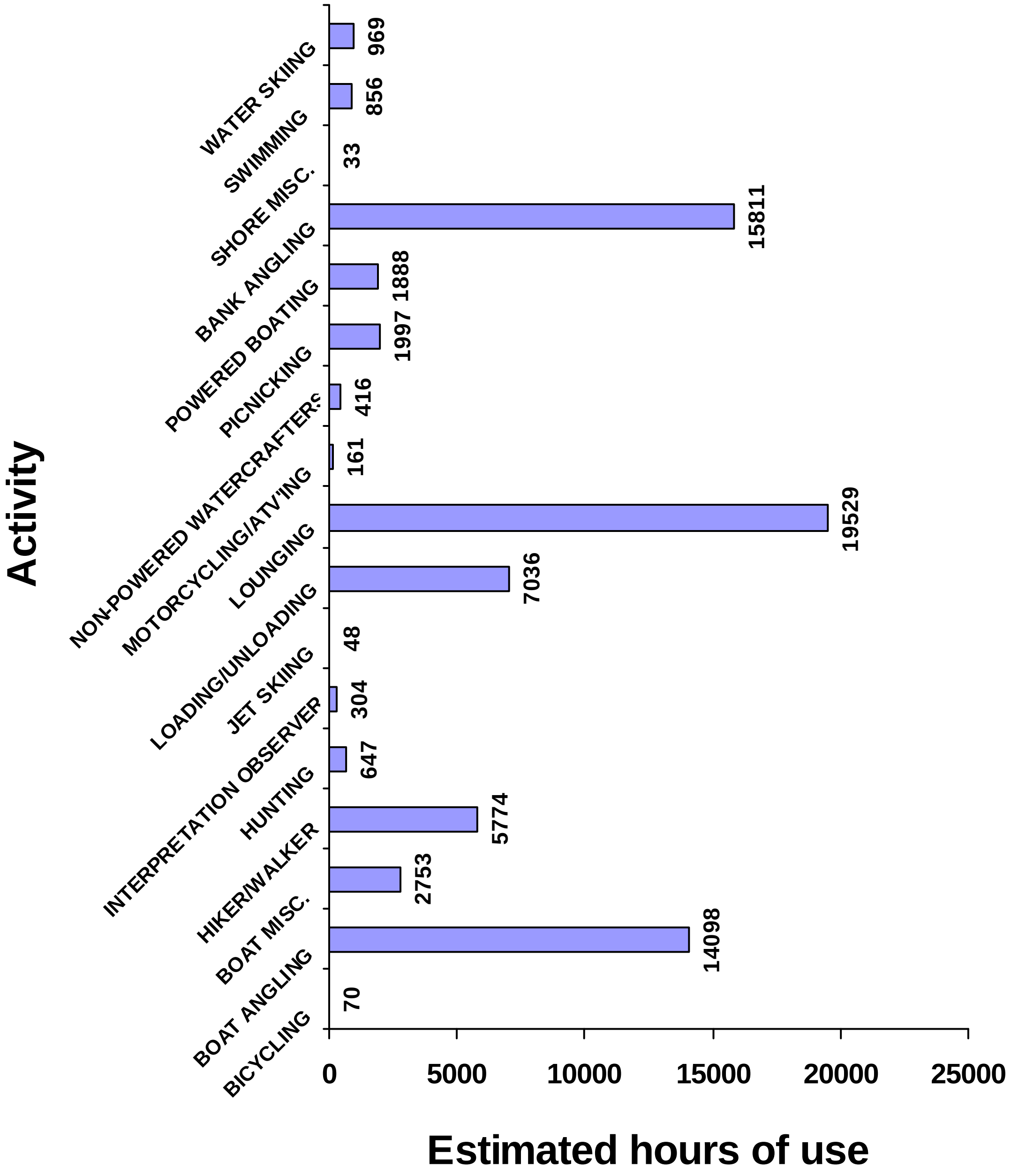


Figure E.5-8 Estimated hours of recreational use, by activity, in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2003).

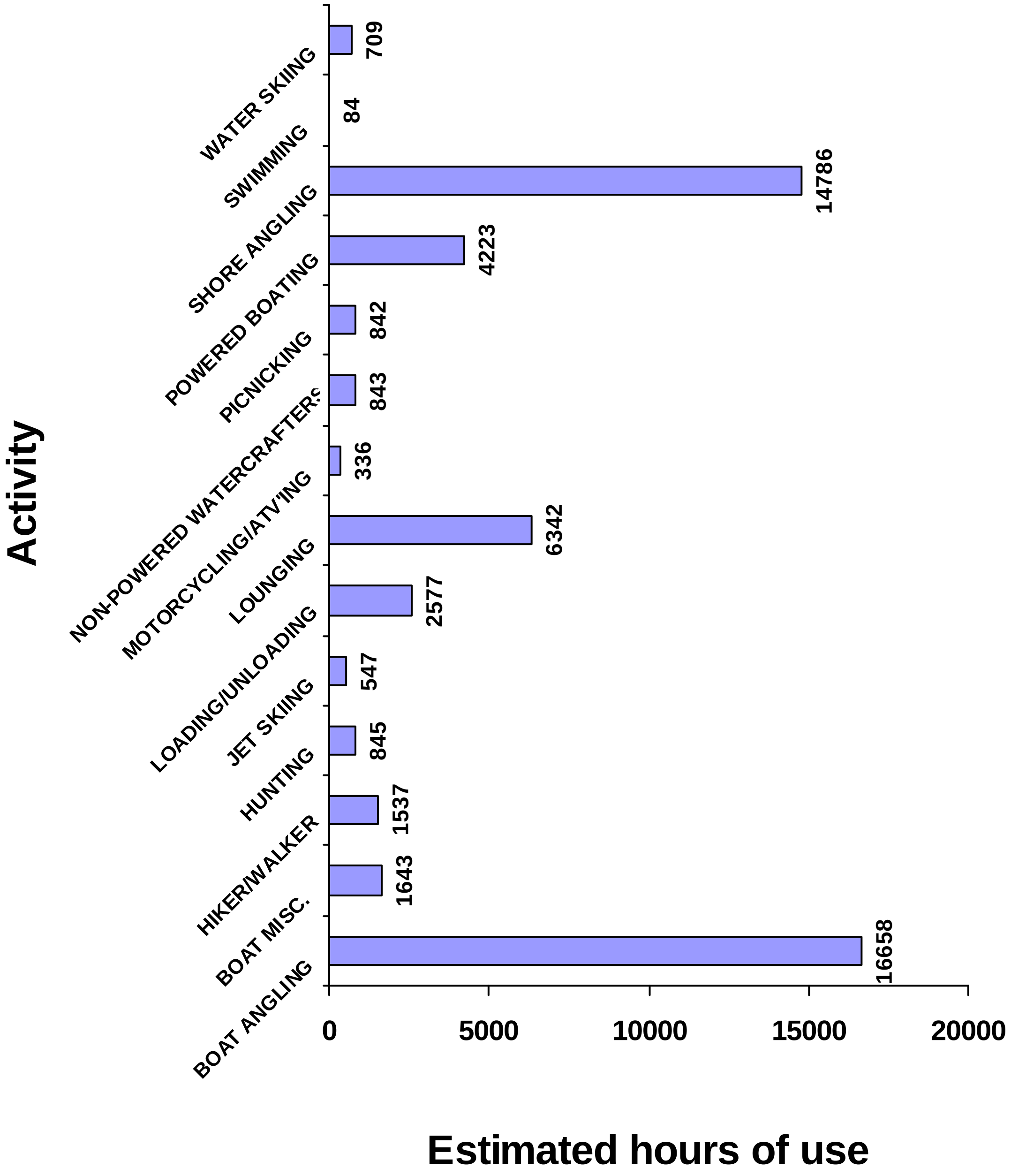


Figure E.5-9 Estimated hours of recreational use, by activity, in the FERC project area at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant at the Swan Falls Project during 2005).

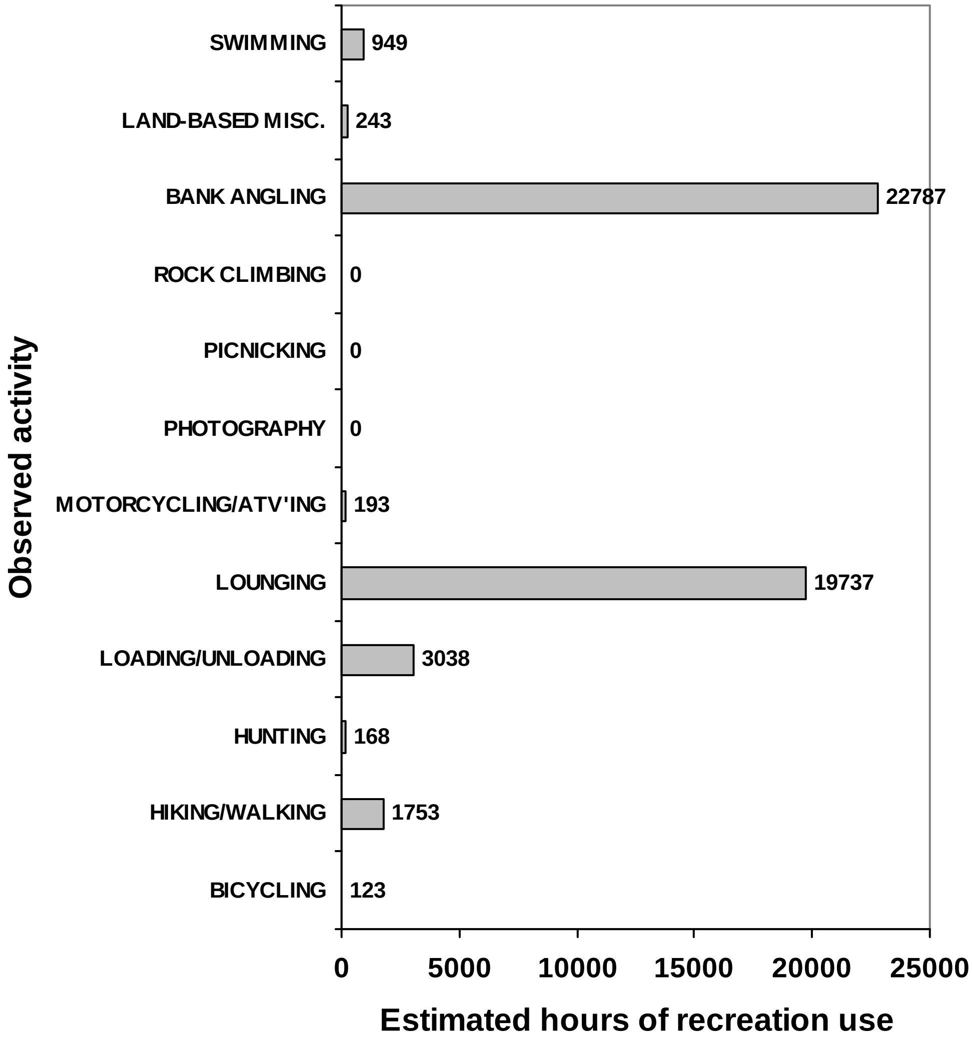


Figure E.5-10 Estimated hours of recreational use, by activity, at dispersed recreational areas associated with the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).

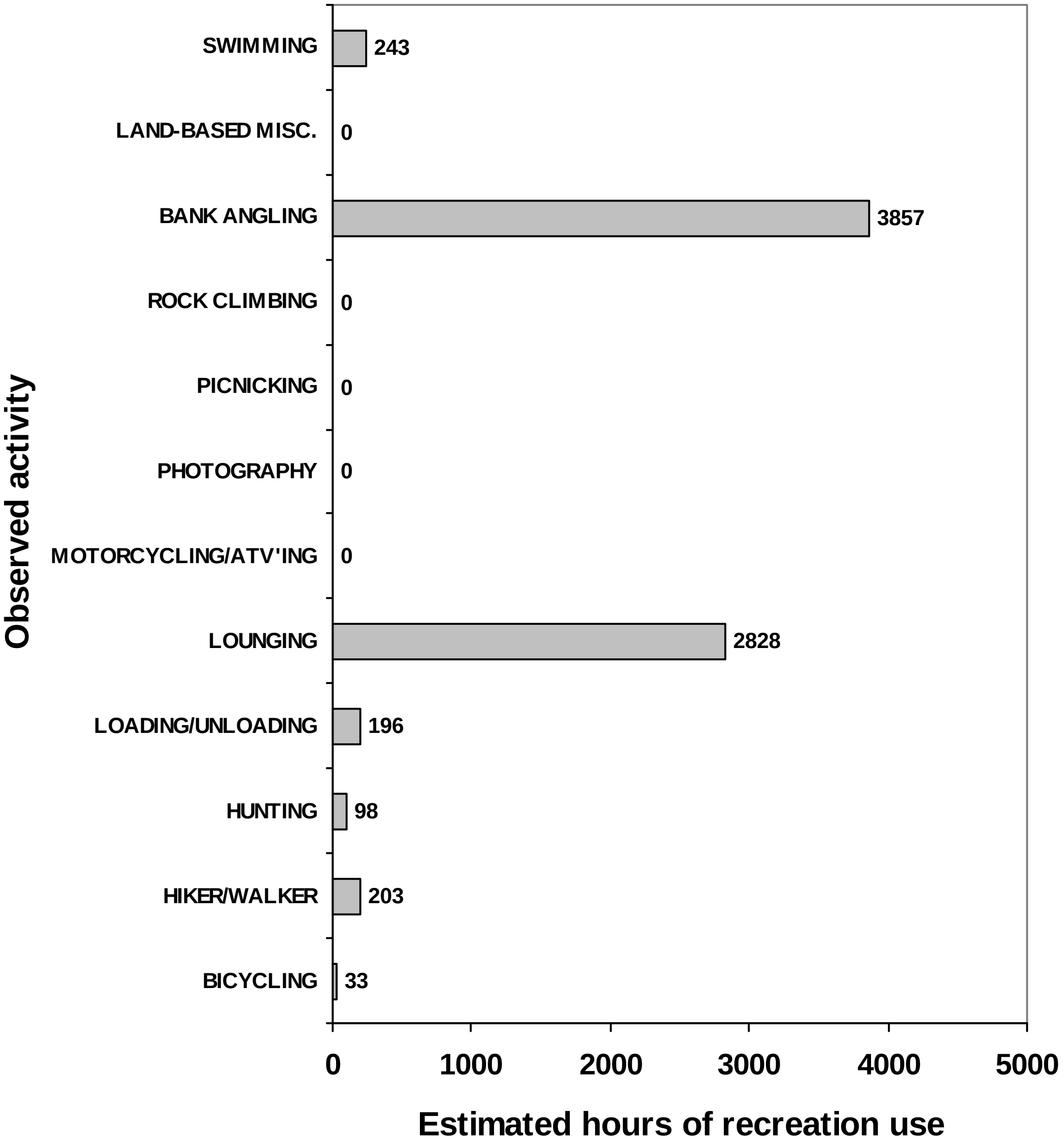


Figure E.5-11 Estimated hours of recreational use, by activity, at the STCM dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).

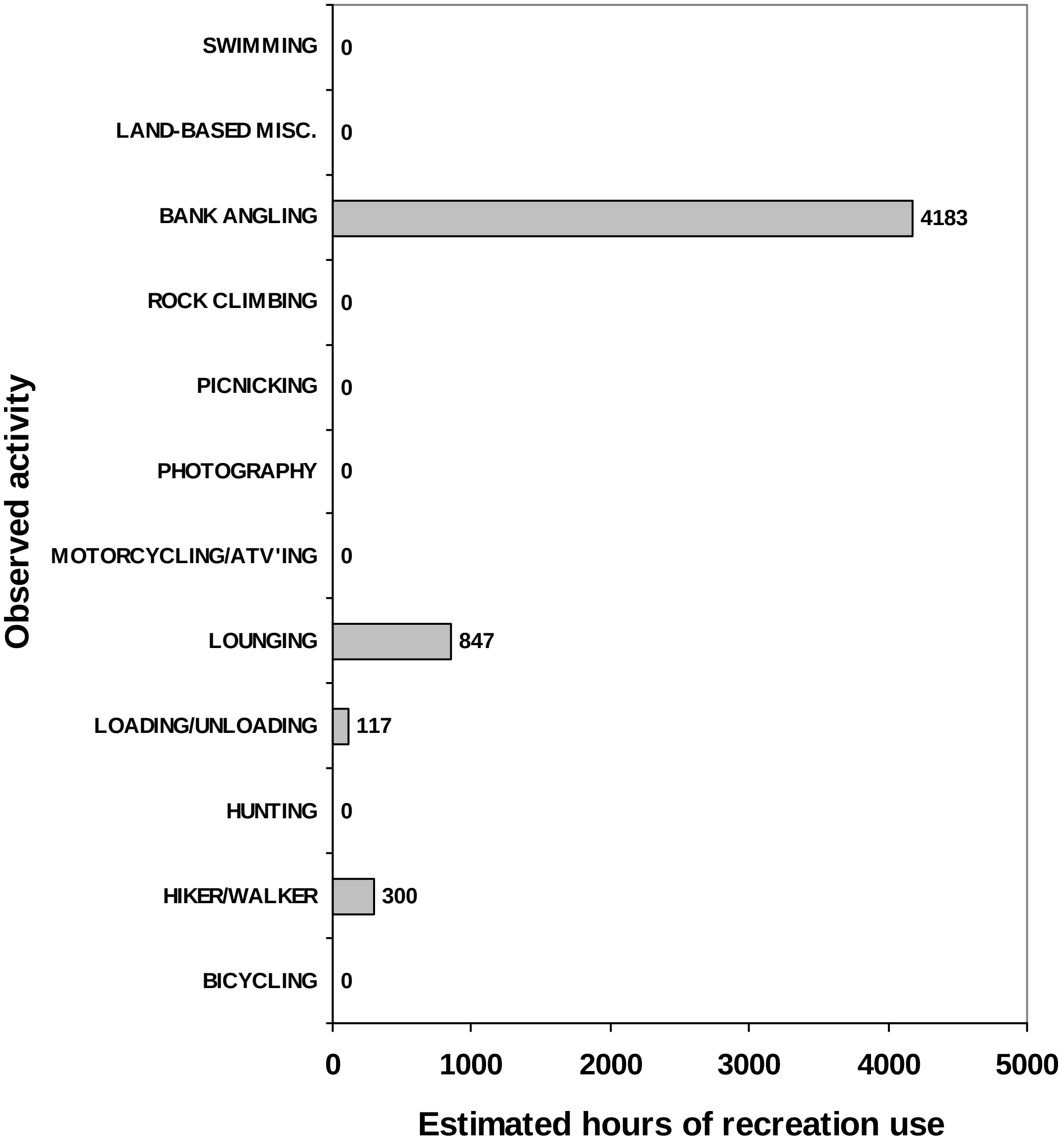


Figure E.5-12 **Estimated hours of recreational use, by activity, at the BSBD dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

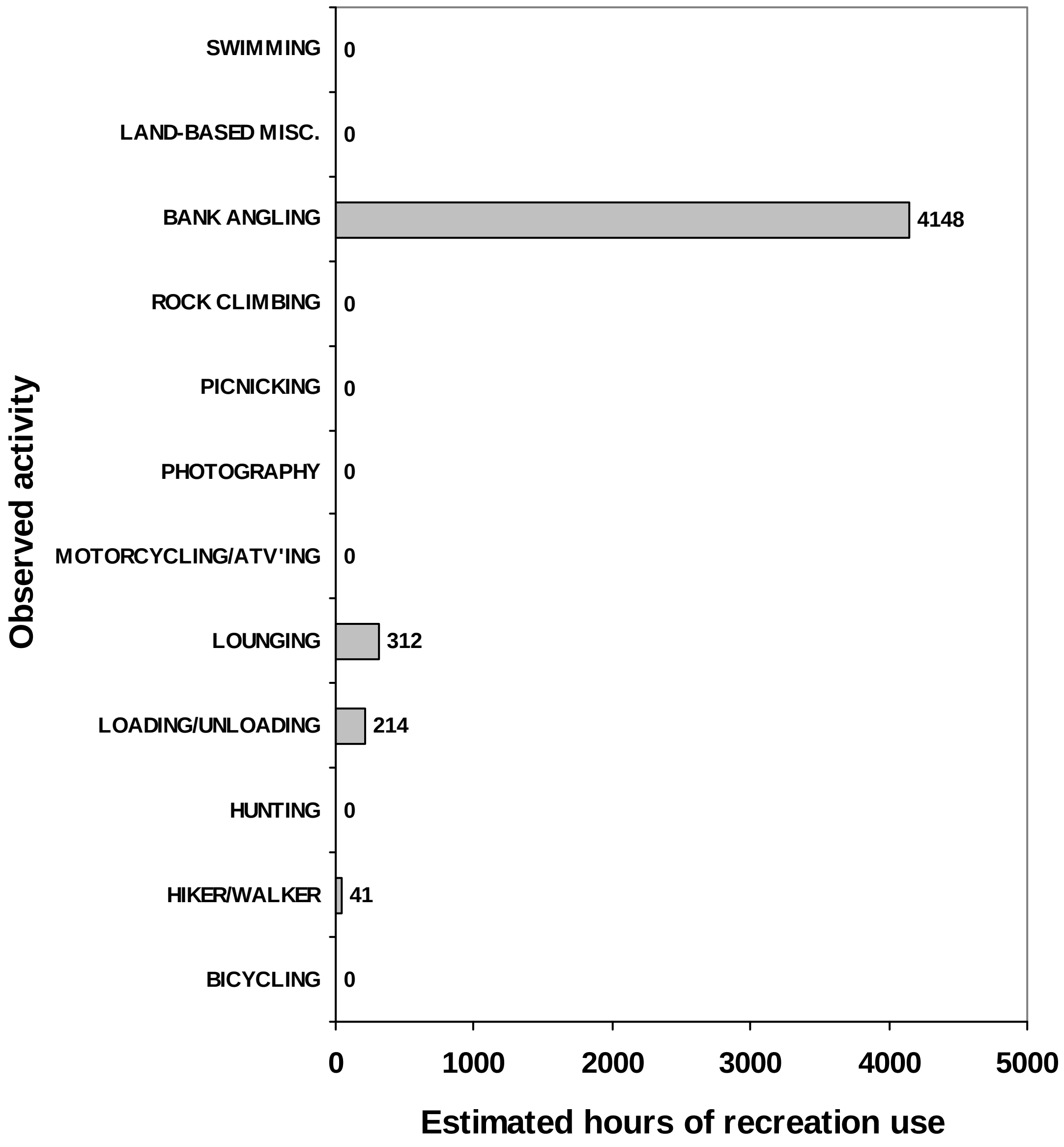


Figure E.5-13 **Estimated hours of recreational use, by activity, at the STFP dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

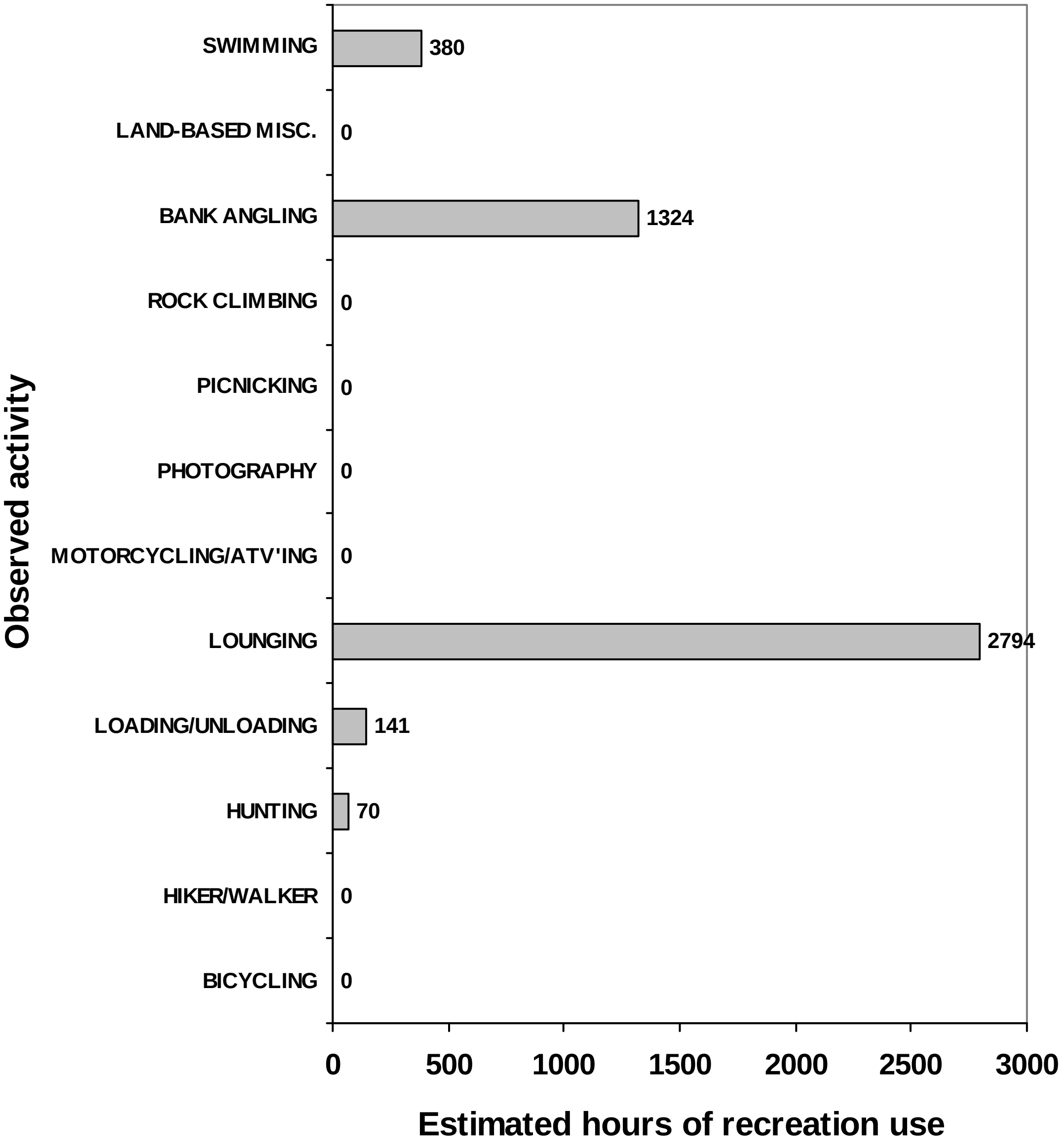


Figure E.5-14 **Estimated hours of recreational use, by activity, at the BLM1 dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

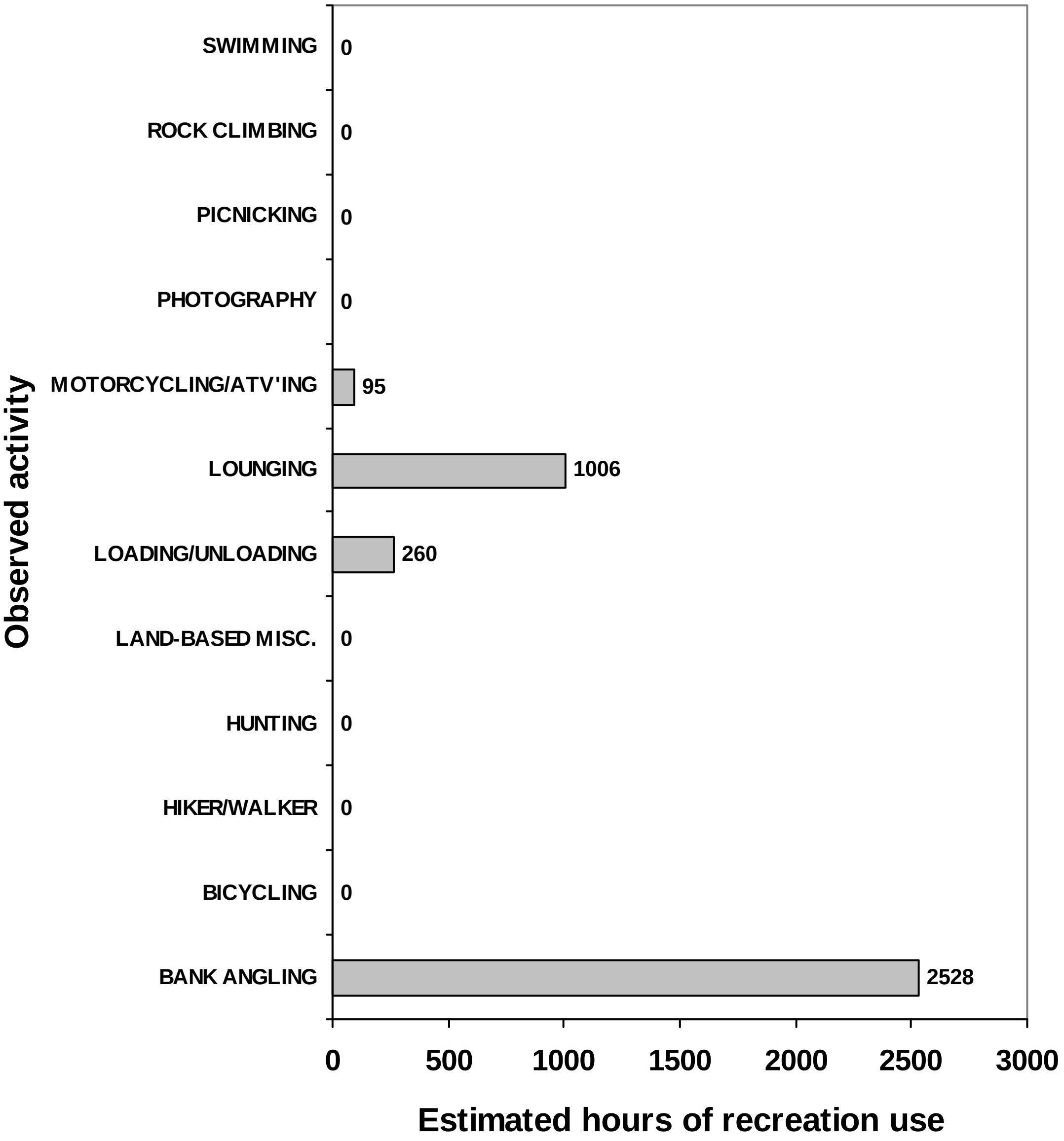


Figure E.5-15 **Estimated hours of recreational use, by activity, at the POFF dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

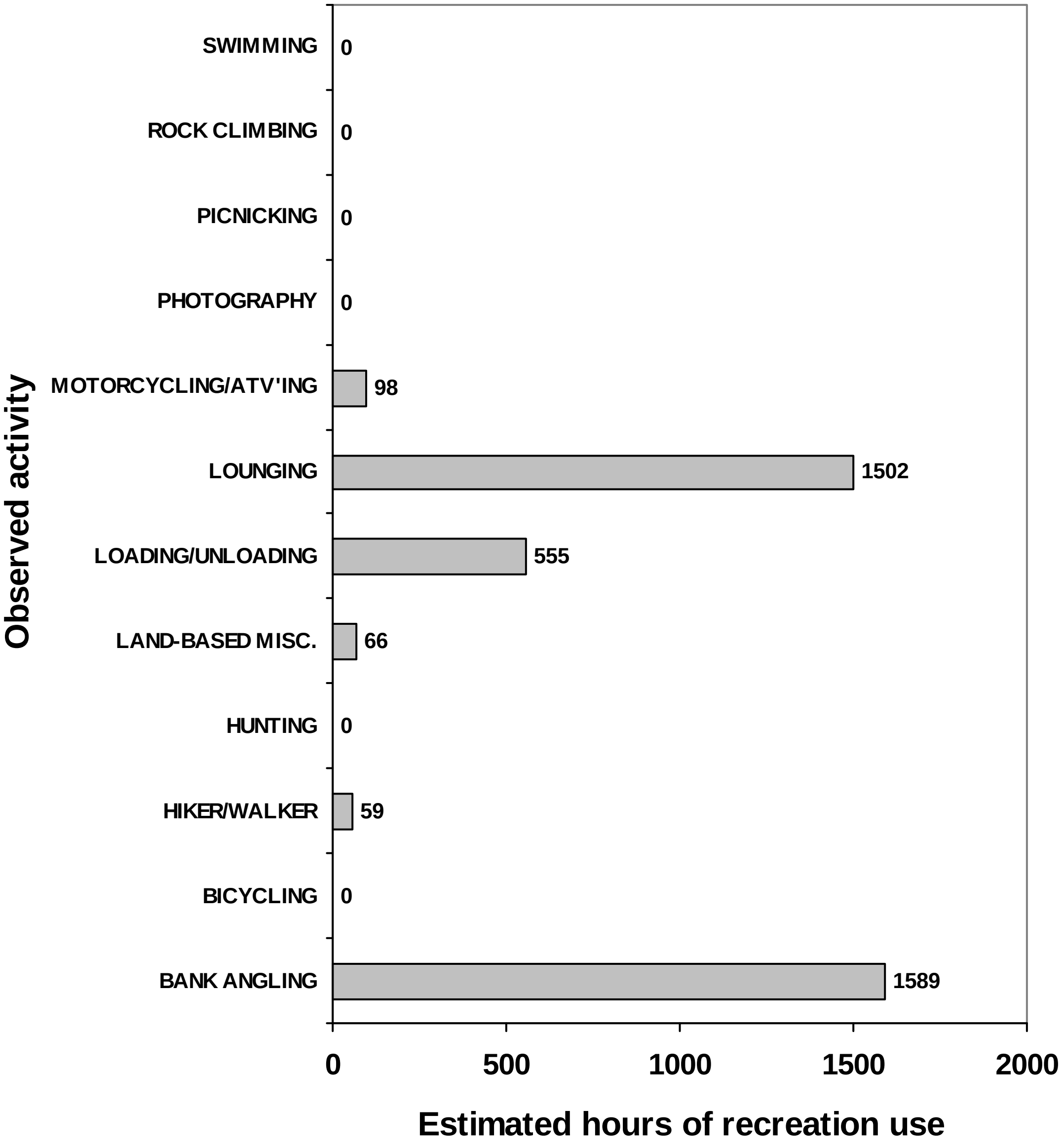


Figure E.5-16 **Estimated hours of recreational use, by activity, at the FISH dispersed site at the Swan Falls Hydroelectric Project (from the recreational-use study conducted by the Applicant during 2005).**

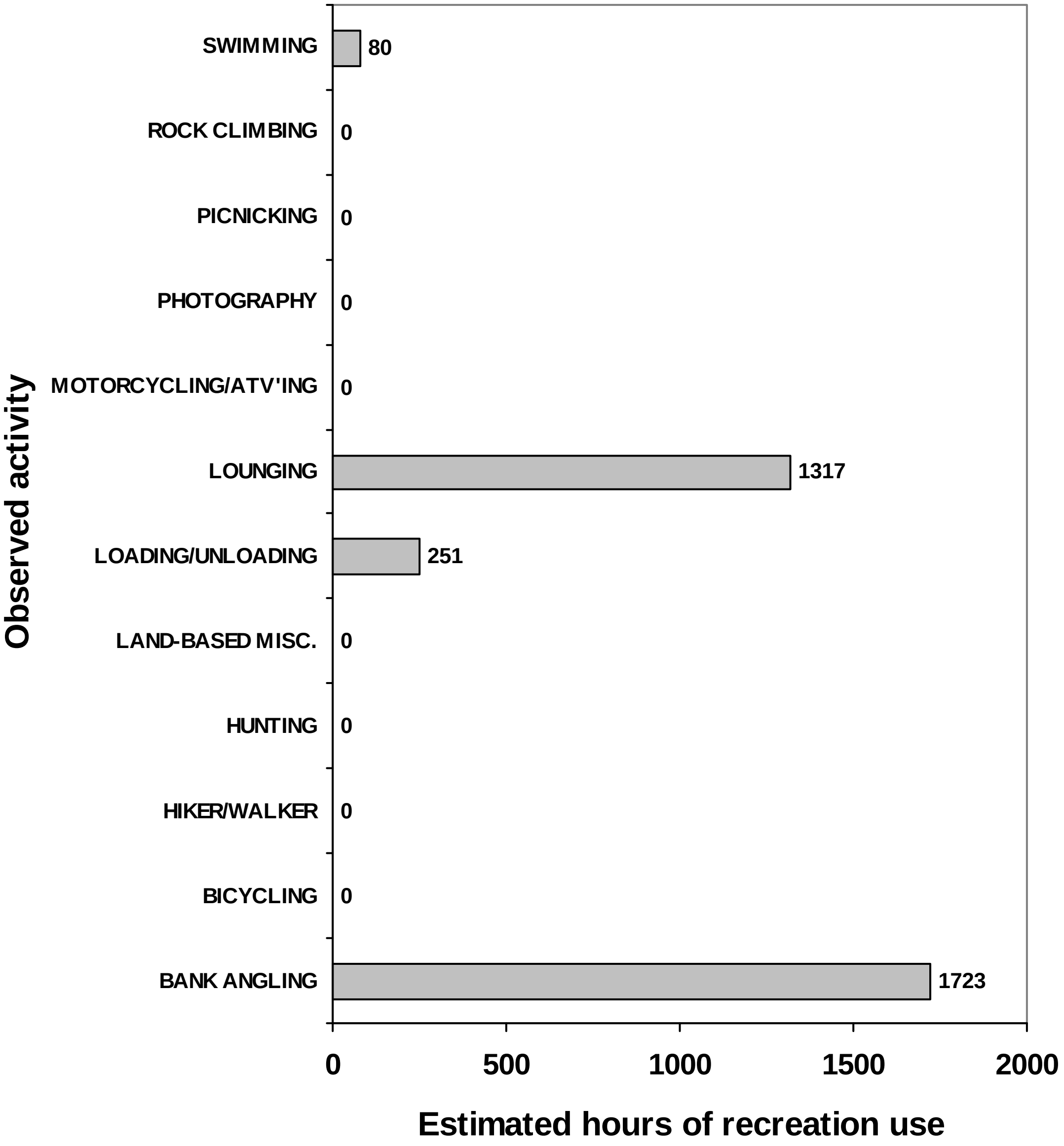


Figure E.5-17 Estimated hours of recreational use, by activity, at the BLM2 dispersed site at the Swan Falls Hydroelectric Project (from recreational-use study conducted by the Applicant during 2005).

The *Code of Federal Regulations* below—18 CFR § 4.51(f)(6)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(f)(6) *Report on land management and aesthetics*. The report must discuss the management of land within the proposed project boundary, including wetlands and floodplains, and the protection of the recreational and scenic values of the project. The report must be prepared following consultation with local and state zoning and land management authorities and any Federal or state agency with managerial authority over any part of the project lands. Consultation must be documented by appending to the report a letter from each agency consulted indicating the nature, extent, and results of the consultation. The report must contain:
>
> (i) A description of existing development and use of project lands and all other land abutting the project impoundment.
>
> (ii) A description of the measures proposed by the applicant to ensure that any proposed project works, rights-of-way, access roads, and other topographic alterations blend, to the extent possible, with the surrounding environment.
>
> (iii) A description of wetlands or floodplains within, or adjacent to, the project boundary, any short-term or long-term impacts of the project on those wetlands or floodplains, and any mitigative measures in the construction or operation of the project that minimize any adverse impacts on the wetlands or floodplains.
>
> (iv) A statement, including an analysis of costs and other constraints, of the applicant's ability to provide a buffer zone around all or any part of the impoundment, for the purpose of ensuring public access to project lands and waters and protecting the recreational and aesthetic values of the impoundment and its shoreline.
>
> (v) A description of the applicant's policy, if any, with regard to permitting development of piers, docks, boat landings, bulkheads, and other shoreline facilities on project lands and waters.
>
> (vi) Maps or drawings that conform to the size, scale and legibility requirements of § 4.39, or photographs, sufficient to show the location and nature of the measures proposed under paragraph (f)(6)(ii) of this section (maps or drawings in this exhibit may be consolidated).

E.6. REPORT ON LAND MANAGEMENT AND AESTHETICS

The Swan Falls Hydroelectric Project is located approximately 27 miles to the southeast of Boise, Idaho, and about 19 miles due south of the City of Kuna, on the Snake River (see Figure E.6-1). The Snake River in this location forms the boundary between Ada County, the most populous county in the state, and Owyhee County, a very rural area with extremely low population density. Population figures for both counties are provided in Table E.6-1.

E.6.1. Description of Existing Conditions

E.6.1.1. Historical Landownership and Use

Native Americans were present in the Snake River Canyon prior to historical settlement. Rock art and other cultural resources throughout this portion of the canyon document their presence and use of the canyon for hunting, fishing, and gathering. Swan Falls Dam and its associated power plant provided the first electric power to southwestern Idaho. Built in 1901 in response to mining in the Owyhee Mountains, these facilities soon provided electric power for domestic use in the Boise area.

Gold mining in the region began in the 1860s with the discovery of gold in Idaho's mountains. Placer mining along the Snake River continued after 1868 and well into the 1900s (Wells 1974). The site of Swan Falls Dam was discovered by engineers investigating the feasibility of hydroelectric power to serve The Trade Dollar Consolidated Mining Company at Silver City, 28 miles to the southwest. The site had a basaltic sill where water dropped 10 feet, plenty of water flowing all year, and good foundation material. A camp was built at the site and dam construction began in 1900 (Stacy 1991). The construction crew first built the access road down the nearly vertical walls of the north side of the canyon; construction of the dam and powerhouse followed. The project became more important with use of electricity for domestic purposes and later for pumping water from the river for agricultural use in the Gem Irrigation District in Owyhee County. A museum documenting the project's history is housed in the old project powerhouse and is available for public visitation by appointment.

In 1916, the Applicant was formed from a number of small electric companies in the area. The Swan Falls Project became the Applicant's property at that time and has been reconstructed several times under that ownership. The Snake River Canyon, within which the project lies, is an abrupt drop of over 600 feet from the flat, open plains above. Black basalt walls form sheer cliffs down to the river. At the point of the dam, the canyon width is just over 1,000 feet, the river taking up somewhat less than a quarter of that width with narrow bands of land on either side. Both above and below the canyon rim, very few man-made structures occur.

E.6.1.2. Existing Landownership and Use

The Swan Falls land use and aesthetics study area includes water and encompasses approximately 13,170 acres. The project area includes only about 2,192 total acres within the study area. The project boundary extends upstream about 12 miles from the Swan Falls Dam along Swan Falls Reservoir and only about a third of a mile below the dam. Landownership within the project boundary is almost equally distributed between private (668 acres) and federal and state ownership (587 acres) (Technical Report E.6-B). Most of the private lands are owned in fee title by the Applicant (584 acres). The Applicant owns an additional 203 acres downstream of Swan Falls Dam, but these lands are not within the Federal Energy Regulatory Commission (FERC) project boundary.

Because of the topography, remote location, and shortage of water, much of the area near the Swan Falls Project was never claimed for private use but remained in federal ownership. In 1971, the Secretary of the Interior designated approximately 26,311 acres of public land along the river as the Snake River Birds of Prey Natural Area under Public Land Order 5133 (USGS 1996). In 1980, under Public Land Order 5777, that area was extended to over 482,640 acres of public land. These lands were withdrawn from all forms of appropriation under public land laws and general mining laws, but not mineral leasing laws (BLM 1995). These withdrawals were instituted for 20 years to protect the ecosystems necessary to support the densest concentration of raptors recorded in North America. The withdrawals permitted development and use of other resources in the area under a multiple-use and sustained yield concept consistent with the protection of raptors and their prey. In 1993, Congress enacted Public Law 103-64, which permanently established the Snake River Birds of Prey National Conservation Area (NCA). Currently, the NCA encompasses 484,874 acres (J. Sullivan, Snake River Birds of Prey NCA Manager, personal communication, July 21, 2004). The project area lies in the west central area of the NCA and constitutes a power site withdrawal that dates to 1910.

Since land ownership in the project area and vicinity is owned primarily by federal and state governments and the Applicant (Figure E.6-2), land uses are very limited. Within the project area, Applicant-owned land lies primarily on the north side of the river and reservoir upstream of Swan Falls Dam. At the dam and for about a mile above it, the south side of the river is also under ownership by the Applicant. Below the dam within the project area the land on the north side of the river is also owned by the Applicant. Downstream of the project boundary, the Applicant owns land between the road and the river as well as several larger parcels further downstream. One very small privately owned parcel (owned by a private party other than the Applicant) lies at the very westerly end of the downstream area beyond the project boundary.

The Bureau of Land Management (BLM) manages much of the remaining land on both sides of the river. A large parcel of land owned by the state of Idaho and several smaller private ownerships occur near the center of the study area. At the upstream end of the study area, the state owns a parcel on the north side of the river while land on the south side is privately owned. Table E.6-2 provides a summary of landownership within the project and study areas.

Today, the Swan Falls Project encompasses the following structures or features and appurtenances:

- A project road from the top of the cliff, down to the project facilities
- An equipment yard, visible as one reaches the canyon bottom on the road
- The dam, with the old powerhouse museum and new powerhouse sitting atop a major portion of it
- Swan Falls Park, including a public restroom and a picnic area that includes an old boardinghouse, built to house project personnel in the early 1900s, and an older garage rebuilt in the 1990s
- A barn-like storage structure
- An old orchard
- Five contemporary residences
- A boat launch upstream of the dam and village area
- A boat launch just downstream of the dam
- A transmission line running from the powerhouse to the top of the cliff
- A yard where materials removed from the trash rack are dumped
- A canoe portage trail

Most land in the immediate project vicinity, except for Applicant-owned land, is federally owned and managed by the BLM as part of the NCA. Uses permitted in and near the project area include grazing, recreation, and mineral extraction, as long as these activities are consistent with the protection of raptors and their prey. Several parcels of state-owned land within the study area are similarly used. The few private lands, other than Applicant-owned lands, that lie upstream of the project area are used for cultivated agriculture. No private residences occur near the project area other than six residences inhabited by employees or lessees of the Applicant. Land use in the project and study areas is shown in Figure E.6-3. Table E.6-3 summarizes acreages of current land use shown in that figure.

Several special management areas have been established by the BLM in and adjacent to the project area. The western end of the Snake River Canyon within the NCA, which includes the project area, is designated as a Special Recreation Management Area. This Area provides for a variety of river and land-based recreational opportunities. Off-highway vehicles (OHV) are restricted to designated roads and trails in this management area. On the south side of the river, the project area is included within a designated avoidance, or exclusion area, for major realty actions, due to recreational controls, sensitive plant issues, and paleontological concerns. The Guffey Butte–Black Butte Archaeological District Area of Critical Environmental Concern (ACEC) includes all land in the project area south of the river (BLM 2006).

Additional limitations included in BLM’s management plan relevant to the study area are a year-round closure to shooting rifles and pistols within 0.5 miles of the Snake River downstream from Grand View, Idaho and a closure of the same area to all firearms from February 15 through August 31. The plan also declared most of the NCA a Designated Vehicle Management Area, requiring that vehicles remain on designated roads or trails (except for administrative purposes). The project area lies within three grazing allotments: the Sunnyside Winter Allotment on the north side of the river and the Sinker Butte and Montini FFR allotments on the south side of the river. An area on the south side of the river downstream of the project area has been withdrawn from grazing (BLM 2006).

E.6.1.3. Existing Aesthetic Values

E.6.1.3.1. Visual Resource Management System

The BLM manages its lands in accordance with its Visual Resource Management System (VRM) described in its manual (BLM 1980). The system designates landscape units into four classes that indicate the overall significance of the visual environment and establish objectives for the management of each class in order to define the level of change acceptable to that class from a proposed project. By comparing the effects from a project to the established visual objective for that area, the visual acceptability of that project and mitigation measures needed to decrease the visual contrast are determined (BLM 2006). At the current time, the BLM's VRM classes for the project area and surrounding lands are Class I, Preservation, on the Ada County side of the river, and Class II, Retention, on the Owyhee County side of the river. However Alternative D, BLM's Preferred Alternative in the *Draft Resource Management Plan/Environmental Impact Statement* (Draft RMP/EIS), proposes to amend these VRM classes to Class III, Partial Retention, on both sides of the river at the developed areas of the dam and village and downstream of the dam. Upstream from the developed area, the Draft RMP/EIS proposes a VRM designation of Class II, Retention (BLM 2006). These classes are defined by BLM as follows (BLM 1986):

- Class I—The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic (background) landscape should be very low and must not attract attention.

- Class II—The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic (background) landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

- Class III—The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

E.6.1.3.2. Project Facilities

Once the visitor has made the winding descent into the canyon, the project area offers an oasis reminiscent of the early 1900s. Above, the plains are dry and brown; in the canyon area, the project area offers green grass, quaint and historic buildings, old stone walls, an old orchard, several picnic tables, and, of course, the river. The older portion of the powerhouse is like an intriguing castle sitting in the middle of the river. Built as part of the original project, the powerhouse is on the National Register of Historic Places and now serves as a museum detailing the original project. The museum is open to the public by appointment. The Clubhouse, an old boarding house that once provided housing to original construction crews, is eligible for the National Register. The flow of water through the low profile dam frequently offers a view of rushing water on the downstream side. Visitors are generally surprised to find this place virtually in the middle of nowhere.

Approximately half a mile above the project entrance at the base of the cliffs, a gravel boat launch area offers access to the water. Several docks have been constructed in the launch area. Just below the dam and powerhouse is a second unpaved boat launch. Due to the protected status of the NCA, the fine ground-squirrel habitat, and the steep cliffs that provide nesting sites, raptors can often be seen in the canyon. Visitors frequently establish camps near the edge of the river both above and below the dam. Below the dam, the BLM has made efforts to close BLM-managed areas above the road to vehicles, directing campers to the area between the road and the river where impromptu campfire circles have been established. OHVs have, in the recent past, caused considerable damage to soil and vegetation resources on both BLM- and Applicant-owned lands. Both landowners have taken appropriate measures to protect these lands and the condition of the land and its vegetation has shown improvement where vehicle closure has occurred.

E.6.1.3.3. Key Observation Points

Consistent with the BLM’s Visual Resource Management system, four Key Observation Points (KOP) were identified in the project area: 1) the pull-off at the top of the cliff above the project;

2) the parking and restroom area near the powerhouse; 3) the boat launch above the dam and powerhouse; and 4) the boat launch area below the dam and powerhouse. Less sensitive viewpoints will also be discussed. Photos from these viewpoints, as well as the BLM Contrast Rating Forms for each KOP, are provided in Technical Report E.6-C.

E.6.1.3.3.1. Key Observation Point 1—Pull-off at top of cliff

From this viewpoint, the observer can see several miles up and down the river. Views are of the middle ground and essentially all project features can be seen. A single, relatively small transmission line ascends the hill from the powerhouse. The dam forms a light line perpendicular to the dark river with vertical features extending from it. Both old and new sections of the powerhouse are also light in color in contrast to the dark water. The old powerhouse appears as a large form sitting above the middle of the river. The Clubhouse and a newer house close by are readily apparent due to their reflective, light color and the grass and ornamental shrubs surrounding them. The line of a road leads to the south where first a small red building and then five newer, very light-colored houses appear against the dark tan of soils and vegetation. An unvegetated area near the river with several boat docks lies near the end of the road. From this vantage, the viewer sees unexpected, yet intriguing views of the old powerhouse's architecture, resembling a grand residence or castle in the middle of the river. Considerable contrast with the natural landscape occurs from project facilities, but the development also creates a great deal of interest for the viewer upon finding human occupation in what seems to be the middle of nowhere. This KOP may have the highest sensitivity level of the four since, for some visitors, it will factor in their decision of whether or not to descend the steep, winding road into the canyon.

E.6.1.3.3.2. Key Observation Point 2—Parking and restroom area near the powerhouse

Views from this point are panoramic as one turns, and are primarily in the foreground. A feeling reminiscent of the early 1900s comes over the viewer as he or she reaches the project area after descending the cliffs. The old powerhouse is the central object of attention, sitting on the dam in the middle of the river like a grand, old castle along the rivers in Europe. Visitors going into and out of the powerhouse suggest that the museum housed in the building is of interest, as is its architecture. The new portion of the powerhouse and adjoining shop are more industrial in appearance and of less interest. The transmission line traveling up the cliff from the powerhouse is notable in its steep ascent. The gray wrought iron fencing is substantial in appearance. A kiosk contains interpretive signs of interest, but its architecture is quite different from the other structures. Beyond the kiosk is the restroom, which is made of primarily gray to tan cinder block and a lighter color metal roof. The wood on this building needs paint. The slatted chain link fence, keeping visitors away from equipment next to the restroom, is also in need of maintenance.

Farther away, the Clubhouse and a more modern house draw the curious visitor into a shaded, grassy area that is extremely welcoming on hot summer days. Several old stone walls and mature landscaping suggest this area was probably developed as part of the original project. Several picnic tables are located on these grounds, interspersed with large cottonwood trees. Poplar and pine trees are located nearer the houses. Small areas of riparian vegetation can be seen upstream, along with the buoy line and the yellow buoys. The low-profile linear dam extending out from the powerhouse has numerous vertical elements.

Signage observed as one continues upstream and passes through the area is inconsistent and irregular, often needing maintenance. Traveling on toward KOP 3, an old orchard and a pasture are visible, along with a small, red, barn-like building with pens. Poles and trestles are piled nearby. Five newer residences of a light color are situated above the road, along with associated vehicles and travel trailers.

E.6.1.3.3.3. Key Observation Point 3—Upper boat launch area

The upper boat launch area consists of an open, partially graveled area; two docks (one wood and one metal); and a port-a-potty. The area is visually unattractive because it is poorly defined. The orange port-a-potty contrasts strongly with the surrounding landscape, and trash has been left by users. From the boat docks, however, one can see areas of riparian vegetation along the banks and the project reservoir. Here, the reservoir appears as a slow-moving river. Perhaps a mile or so upstream, on the opposite bank, a white pumphouse can be seen. Downstream, the old powerhouse is the most noticeable element, standing above the river. The dam, because of its low profile, is not especially noticeable, except for the numerous vertical elements rising from it. The project housing can also be seen in the distance.

E.6.1.3.3.4. Key Observation Point 4—Lower boat launch area

Just below the dam and powerhouses on the gravel road is another boat launch area. The powerhouses and dam are in the foreground view here. A large crane and the newer, more industrial-looking powerhouse present a more operational appearance than the view from the upstream side. The architecture of the old powerhouse, however, remains of great interest from this viewpoint, and is even more pronounced since the water level is lower and more of the building is visible. During frequent releases, water can be seen rushing through the gates and spreading across the width of the dam. On the road, where one turns into this area, is a compressor available for inflating rafts. Looking back toward the cliffs, one can see the relatively small transmission line traveling up the hill and into the cliffs.

As one travels northwest below the dam (downstream), fences are located on either side of the road for a short distance. Vegetation is natural. Approximately a quarter of a mile below the dam is an area of ongoing habitat restoration effort by the Applicant. Approximately a half-mile below the dam on the river side of the road is a cleared area where material taken off the trash racks is dumped. From the road, the view is somewhat screened by trees and shrubs that appear to be dead. As one continues down the road (on the side away from the river), efforts have been made by the BLM to block, with rocks and boulders, trails created by OHVs on the side away from the river. Campsites have been designated with rock-formed firepits on the river side of the road. Farther downstream, soil and vegetation damage by OHVs is also occurring on Applicant-owned land outside of the project area. Some visual contrast in texture, line, and color occurs as a result of the destruction of vegetation and the ridges and swales left in the soil, though this is not noticeable from the KOPs.

E.6.1.4. Short and Long-Term Impacts on Aesthetic Values

The access to the Swan Falls Project provides a very important recreational and viewing opportunity to Treasure Valley residents, thereby making the KOPs identified here relatively sensitive. While the project features clearly are very noticeable and attract attention, portions of them have been part of the existing environment here for over 100 years. Furthermore, and more importantly, portions of the project facilities enhance and add a great deal of interest to the visual resources. While the natural appearance of the canyon is dramatic and of great visual interest, the unexpected find of the elegant old powerhouse and the refreshing oasis of the picnic grounds within the dramatic canyon is exciting. This view is a highly photographed scene in Idaho that appears on local television spots. The public open space and the historical and architectural nature of the project attract viewers to the area.

While many project features do add visual and historic interest, certain project features detract from the overall appearance of the area. From KOP 1 at the top of the canyon, the light colors of project structures, particularly the reflection from the roofs, attract greater attention than perhaps somewhat darker colors that would better blend with the landscape. While the historic structures and those in close proximity should retain their historic colors, the five newer houses upstream of the older village should be modified to reduce reflection. Changing roof materials and/or painting roofs and houses slightly darker tones that would blend better with the soils and vegetation could achieve this reduction. However, the siding and roof materials are both metal, and painting the baked-on finishes would result in a substantial increase in maintenance.

At KOP 2 near the restrooms, the slatted chain-link fence that keeps visitors away from project equipment, as well as other wood trim on the restroom building, could use fresh paint to improve their appearance. Signage here and throughout the project is inconsistent and in need of maintenance. The red, barn-like building just upstream of this village is oddly inconsistent with the color of other buildings.

The upper boat launch area, KOP 3, is in need of the greatest improvement of the four viewpoints. Here, the parking and launch area are not defined or separated from the surrounding fields, resulting in an unkempt appearance, not to mention damage to soil and vegetation. Trash left by visitors creates a further unpleasant appearance and the orange port-a-potty contrasts with natural colors and appears shabby. Its placement in the open area offers no privacy and is unpleasant.

The lower boat launch at KOP 4 also suffers from a lack of definition, though it is more confined than, and therefore not as amorphous, as KOP 3. While the transmission line from this viewpoint is not visually dominant and cannot be screened, less reflective wire might be used in the future to minimize its visibility.

On the road below the project, the trees and shrubs intended to screen the view of the lay-down yard where material caught by the trash racks is deposited, are in poor condition, thus failing to successfully screen the yard.

While project facilities do not meet the BLM’s current VRM requirements of Class I on the north side of the river and Class II on the south side, with reasonable mitigation measures, they would appear to meet the proposed Class III designation currently proposed by the BLM for this area.

E.6.1.5. Wetlands Within or Adjacent to the Project Boundaries

Section E.3.3.1.1 addresses wetlands in greater detail as part of the botanical resources of the study and project areas. Vegetation was mapped for 20,612.9 acres, using 23 land-use cover types. Riparian cover types comprised 458.9 acres or 3.8% of the total study area. *Emergent Herbaceous Wetland* showed the highest acreage (211.9 acres), followed by *Scrub-Shrub Wetland* (184.9 acres), *Forested Wetland* (35.9 acres), and *Shore and Bottomland Wetland* (26.3 acres).

Within the project area, riparian cover types cover about 208.6 acres, or 16.4% of lands, not including water. *Emergent Herbaceous Wetland* (109.6 acres), *Scrub-Shrub Wetland* (63.6 acres), *Forested Wetland* (29.1 acres), and *Shore and Bottomland Wetland* (6.3 acres) were delineated (Table 6 and Figures 2.1–2.6 in Technical Report E.3.3-A). Although the project boundary extends only several hundred meters below Swan Falls Dam, the relative proportion of the cover types is similar upstream and downstream of the dam (Table 6 in Technical Report E.3.3-A).

Four riparian cover types were identified and mapped: *Shore and Bottomland Wetland*, *Emergent Herbaceous Wetland*, *Scrub-Shrub Wetland*, and *Forested Wetland* (Figures 2.2–2.6 in Technical Report E.3.3-A). The term *Wetland* refers only to the designations developed specifically for the cover type mapping effort, and are not based on formal definitions for jurisdictional wetlands developed by the U.S. Army Corps of Engineers for purposes of applying Section 404 of the Clean Water Act (ACOE 1987). The actual extent of legally recognized wetland boundaries was not indicated on the cover-type map. In the summer of 2005, 176 riparian sample sites were sampled and classified into four riparian cover types: *Emergent Herbaceous*

Wetland (60 transects), *Scrub-Shrub Wetland* (56 transects), *Forested Wetland* (39 transects), and *Shore and Bottomland Wetland* (21 transects). Technical Report E.3.3-A describes plant assemblages in these cover types. Each of the four cover types are described in the following.

Five plant assemblages were identified within the *Emergent Herbaceous Wetland* cover type (Appendix 2 in Technical Report E.3.3-A). The *Emergent Herbaceous Wetland* cover type was dominated by monocot species (primarily *Phalaris arundinacea* [reed canarygrass], *Paspalum distichum* [knotgrass], *Schoenoplectus acutus* [hardstem bulrush], *Typha latifolia* [broadleaf cattail], and *Distichlis spicata* [saltgrass]). In general, trees and shrubs were present at low cover levels (with the exception of *Salix exigua* [narrowleaf willow] in shrub form that occurred in the assemblages at up to 5.4% average cover). This cover type was comparatively species rich, although most species occurred at low average covers, constancies, or both. Assemblages in the *Emergent Herbaceous Wetland* cover type were found throughout the study area. *Lythrum salicaria* (purple loosestrife), *Cirsium arvense* (Canada thistle), *Cardaria draba* (whitetop), and *Lepidium latifolium* (perennial pepperweed) were found in this cover type but at a low average cover and constancy.

Four plant assemblages were identified within the *Scrub-Shrub Wetland* cover type (Appendix 1 in Technical Report E.3.3-A). Most of the sample sites were dominated by *Salix exigua* with *Elaeagnus angustifolia* (Russian olive) as a co-dominant species. Other shrub species present were *Rhus trilobata* (skunkbrush sumac), *Salix lucida* (Pacific willow), *Rosa woodsii* (Woods' rose), *Celtis laevigata* (netleaf hackberry), and *Tamarix parviflora* (smallflower tamarisk). Dominant grass species were *Distichlis spicata, Bromus tectorum* (cheatgrass), and *Paspalum distichum*. The forb layer was species rich, dominated by *Cardaria draba, Bassia scoparia* (burningbush), *Lepidium latifolium,* and *Chenopodium* sp. (goosefoot). The *Scrub-Shrub* cover type was found along the length of the study area. However, the *Rhus trilobata/Bromus tectorum* assemblage was only found well below the dam on the downstream reach, and the *Elaeagnus angustifolia/Distichlis spicata* assemblage was primarily limited to the reservoir reach. Noxious weeds present were *Cardaria draba, Lepidium latifolium, Acroptilon repens* (Russian knapweed), *Lythrum salicaria,* and *Tribulus terrestris* (puncturevine). The noxious weed community was dominated by *Lepidium latifolium*.

Six plant assemblages were identified within the *Forested Wetland* cover type (Appendix 2 in Technical Report E.3.3-A). This cover type was dominated by several introduced and native woody tree species: *Acer saccharinum* [silver maple], *Acer negundo* [boxelder], *Robinia pseudoacacia* [black locust]), *Elaeagnus angustifolia, Salix lucida,* and *Celtis laevigata*. The shrub layer was typically dominated by shorter individuals of the dominant tree species for the assemblage, but *Ribes aureum* (golden currant), *Sarcobatus vermiculatus* (black greasewood), *Toxicodendron rydbergii* (western poison ivy), *Clematis ligusticifolia* (western white clematis), and *Salix exigua* were also present at significant cover levels. The grass layer was typically sparse (less than 25% average cover). The *Forested Wetland* cover type occurred throughout the length of the study area, several of the individual assemblages were geographically restricted. The *Celtis laevigata* assemblage was only found at the lower end of the downstream reach, while the *Salix lucida/Cardaria draba* assemblage only was encountered on the reservoir reach. The *Elaeagnus angustifolia/Cardaria draba* assemblage was recorded throughout the reservoir reach, and then clustered at the bottom of the downstream reach. The noxious weed *Cardaria draba* was often found in the forb layer, in addition to *Lepidium latifolium, Cirsium arvense,* and *Tribulus terrestris.* The invasive riparian species *Elaeagnus angustifolia* and *Tamarix parviflora* were also present.

In the *Shore and Bottomland Wetland* cover type trees were absent, and the shrub layer was composed of *Salix exigua*, *Elaeagnus angustifolia, Rosa woodsii,* and *Salix* spp. The forb layer was poorly developed (less than 1% average cover). *Schoenoplectus acutus* and *Paspalum distichum* were present in the grass layer, which was poorly developed (less than 1% average cover). The *Shore and Bottomland Wetland* cover type was scattered throughout the study area, except for the lowest portion of the downstream reach. The noxious weed *Lythrum salicaria* was present as well as the invasive riparian tree *Elaeagnus angustifolia*.

E.6.1.6. Floodplains Within or Adjacent to the Project Boundaries

Flood Insurance Rate Maps (FIRM) have been prepared by the Federal Emergency Management Agency (FEMA) for Ada County, but not for Owyhee County. The steep and narrow canyon topography contains the river floodplain within a very narrow area immediately adjacent to the river. Few habitable structures lie within the canyon in or near the project area.

The FERC-approved Inflow Design Flood for the project is 105,112 cubic feet per second (cfs), while the historic maximum daily flow here between October 1, 1913, and September 30, 2003, was 46,100 cfs.

E.6.1.7. Short- and Long-Term Impacts on Wetlands and Floodplains

The project has little or no impact on floodplains either above or below the Swan Falls Dam. Operated as a run-of-river project, the reservoir does not provide significant flood control capability.

Four wetland cover types were identified in the FERC project boundary upstream reach above the dam: *Emergent Herbaceous Wetland* (108.6 acres), *Scrub-Shrub Wetland* (58.0 acres), *Forested Wetland* (29.1 acres), and *Shore and Bottomland Wetland* (3.9 acres) (Table 6 in Technical Report E.3.3-A). Wetland cover types are concentrated in the upper part of Swan Falls Reservoir, which is relatively shallow. Relatively stable water levels and a shallow topography favor the development of wetland cover types, specifically *Emergent Herbaceous Wetland* and *Forested Wetland*. Section E.3.3 discusses impacts on noxious weeds, rare plant species, and shoreline in association with wetlands.

The Applicant evaluated operational impacts of the C.J. Strike Project downstream of C.J. Strike Dam to Swan Falls Dam for the C.J. Strike final license application (IPC 1998). Mitigation was proposed in that license application to offset project-related impacts. FERC directed the Applicant to conduct additional evaluations of project operations downstream of the C.J. Strike Project (Wulforst et al. 2000). The FERC *Final Environmental Impact Statement* made recommendations to mitigate for daily flow fluctuations resulting from the operations of the C.J. Strike Project (FERC 2002) on terrestrial ecosystems. In C.J. Strike Article 412 (Riparian Habitat Acquisition), FERC ordered the Applicant to acquire at least 170 acres of riparian habitat to mitigate for downstream operational impacts of the project. Therefore, no further impact studies are proposed for the reservoir reach of the Swan Falls study area.

Downstream of the dam, the Applicant's proposed operations of the Swan Falls Project may affect the persistence and establishment of perennial riparian vegetation along shorelines of the

Snake River. Therefore, one issue for relicensing is the potential impact of future operations on riparian habitat. In response to this issue, the Applicant assessed the extent (acreage) of riparian habitat (i.e., cover types) impacted by proposed operations and provided information for the development of proposed mitigation, protection, and enhancement of riparian habitat in the study area (Technical Report E.3.2-A). The evaluation area for this study is the shoreline fluctuation zone in the river reach downstream of Swan Falls Dam to the Guffey Bridge (river mile [RM] 470 to 447.2).

The shoreline fluctuation zone is a polygon that follows the contours formed by the characteristic maximum and minimum daily flows (section 4.2.2 in Technical Report E.3.2-A), extending from Swan Falls Dam to Guffey Bridge (Figure 1 in Technical Report E.3.2-A). Shoreline geometry and stage-discharge relationships (section 4.2.3 in Technical Report E.3.2-A) defined the lateral (or upslope) boundaries of the evaluation area. The evaluation period was the growing season for riparian vegetation, from June 1 to August 31.

CHEOPS®, a simulation package for hydropower systems, was used to model flow data to simulate proposed operations. Average daily minimum and maximum flows for the three runoff years from 15-min CHEOPS output were calculated, and then averaged to determine characteristic flows. The modeled characteristic minimum and maximum flows for proposed operations of the Swan Falls Projects were 6,885 cfs and 7,458 cfs, respectively (Table 1 in Technical Report E.3.2-A). Subsequently, stage-discharge relationships were determined for each of the 45 cross sections in the downstream reach below Swan Falls Dam using the characteristic flows as input to MIKE 11-GIS®. The cross-sectional elevation data was used to determine the vertical width of the fluctuation zone, which averaged 0.26 feet. This vertical distance resulted in an average width of 1.3 feet given the slope of the land. Given the length of the downstream reach, 2.89 acres of land were calculated to be in the fluctuation zone (Table 2 in Technical Report E.3.2-A). The fluctuation zone was intersected with the cover type map to calculate the acres of each cover type impacted by the fluctuation zone. Of the 2.89 acres in the fluctuation zone, 2.00 acres were riparian cover types (i.e., 0.76 acres of *Emergent Herbaceous Wetland*, 0.60 acres of *Shore and Bottomland Wetland*, and 0.69 acres of *Scrub-Shrub Wetland*) (Table 2 in Technical Report E.3.2-A). It was estimated that 0.87% of riparian vegetation in the downstream reach of the Swan Falls study area would be impacted by proposed operations (Table 2 in Technical Report E.3.2-A).

Furthermore, recreational activities impact an estimated 3.72 acres of riparian habitat in the project area below the dam (Figure E.3.2-6, panels A and B). Therefore, a total of 5.72 acres of riparian vegetation in this area is impacted by the project.

E.6.1.8. Existing Transmission Line and Associated Service Roads

Only one transmission line is associated with the project area—the Swan Falls Tap (Line 954). The Swan Falls Tap is a 138-kV line that runs from the new powerhouse directly up to the top of the cliffs. It connects the project to an existing 138-kV line between the Bowmont substation and C.J. Strike Project, a portion of the Strike Junction–Caldwell transmission line (Line 920). No service road, except for the project road, serves this line.

E.6.2. Measures or Facilities Recommended by the Agencies

To consolidate measures, the Applicant has included measures or facilities recommended by the agencies in section E.6.3.7. The measures are listed by agency. Measures that the Applicant has accepted, if any, appear first. They are followed by measures that the Applicant has rejected, if any, as well as reasons for their rejection.

E.6.3. Applicant's Existing and Proposed Measures or Facilities

E.6.3.1. Existing Measures or Facilities

FERC issued the following articles regarding the Swan Falls Project on December 22, 1982.

> Article 41. The Licensee shall consult and cooperate with the Bureau of Land Management (BLM) to ensure that redevelopment of the Swan Falls Project is consistent with existing land

management objectives for the area. The Commission reserves the right to resolve any dispute that may occur between the Licensee and BLM regarding land management practices.

In late December 1986 and spring 1987, two disturbed sites were reclaimed by the Applicant in consultation with the BLM: the lower part of the island, located about 200 meters (m) downstream of the Swan Falls Project, and the Owyhee County bank on the south side of the spillway gates (Idaho Power Company, *Amendment to Swan Falls License*, submitted to FERC on April 24, 1989). The BLM completed a site visit in November 1997. In its letter of November 19, 1997, the BLM stated, "We believe that the rehabilitation effort that has been completed to date has been adequate to give the established vegetation a good chance of being successful. It is our opinion that the site is clean and well kept." Thus, the Applicant believes that Article 41, as it relates to the rebuilding of the spillway and associated ground disturbance, was successfully completed.

E.6.3.2. Mitigation for Construction Impacts to Wetlands and Floodplains

No construction is proposed as part of this license application, and therefore no mitigation measures are proposed.

E.6.3.3. Mitigation for Operations of the Swan Falls Project on Wetlands and Floodplains

The Applicant proposes to protect, enhance, and restore 5.72 acres of riparian land as restoration for project impacts as described below. These measures are the same as proposed for riparian and wetlands habitat in section E.3.2.3.2.1.

Plant native riparian species—Riparian habitat along 4.7 miles of shoreline (Figure E.3.2-6, panel A) will be enhanced and restored with a mix of native species that would be selected in consultation with resource agencies.

Restore channel flow at island below Swan Falls Dam—Changes in flow, possibly associated with deepening the tailrace when the new Swan Falls Powerhouse was constructed, silted in the existing culvert that provides water to the channel around the island (Figure E.3.2-6, panel A). Water will be restored to the channel to enhance and restore riparian vegetation. Siltation is likely to remain a problem in the future and placement of a culvert may not be a viable option. Other engineering options will be explored to provide water to the channel.

Protect riparian habitat at lay-down yard—Macrophytes are removed from the river at the power plant. Removed plant materials are deposited at the lay-down yard for further processing and, ultimately, disposal. However, this disposal site has encroached on riparian habitat fringing the lay-down yard (Figure E.3.2-6, panel A). Plant materials deposited along the top of the embankment will be removed and habitat will be restored. The disposal site will be moved away from the embankment to avoid future impacts to riparian habitat. Finally, a barrier will be installed that will avoid any accidental spillage of disposed plant material down the embankment and prevent future impact on riparian vegetation.

Restore riparian habitat impacted by human use—Existing developed recreation sites, are associated with the boat launches upstream and downstream of Swan Falls Dam (graveled roads and parking areas). Additionally, several existing, impromptu sites provide access to the reservoir and river. These recreation sites are proposed to be improved (see section E.5.4). The estimated 3.72 acres of roadbed and other impacted area will be recontoured and revegetated using native riparian species. Vehicular access will be restricted to designated roadways and defined, improved sites using strategicallly placed boulders and berms.

E.6.3.4. Proposed Measures or Facilities for Land Use and Aesthetics and Cost Analysis

Implementation of the following program would bring the project features into reasonable consistency with the BLM's proposed VRM classification of Class III, Partial Retention, for the project area. All costs are expressed in 2008 nominal dollars. Unless otherwise indicated in this application, no escalation rate is assumed. Consistent with FERC's methodology for calculating economic impacts, the Applicant has assumed a 30-year period for its cost analysis. However, the Applicant is not proposing a 30-year license term.

Modify the colors of the five newer houses to blend with soils and vegetation—These newer houses, constructed in the 1970s and located about a quarter of a mile above the dam, have metal siding, onto which the current reflective color is baked. When and if painting is needed on these units during normal maintenance, they will be re-sided or painted a color to blend with the tan and brown soil in the area. The total estimated operations and maintenance (O&M) cost for this measure is $40,000, incurred during the new license term as follows: $20,000 in year 20 and $20,000 in year 25.

Paint the wooden elements associated with KOP 2—The slatted wood fence next to the restrooms and wooden portions of the restroom building would be painted the same color they are presently. To maintain consistency with the historical and present color of the Clubhouse, white is an appropriate color for the buildings that are nearby. The total estimated O&M cost associated for this proposal is $3,000, spread over the first 3 years of the new license term.

Develop and implement a consistent signage program for the entire project area—A variety of sign types are found throughout the project area, including informational/educational, directional, and warning signs. There is currently no consistency in the appearance within a signage type, or between the types. While standardization of some project area signage with similar signage elsewhere (e.g., for traffic regulation) would be logical, signage should be approached comprehensively, with a plan developed to address each type. The plan will include specifications for mounting signs and address materials to be used for signs, as well as define the composition (line, form, color, and texture) of each type of sign. The historic nature of the project will be considered, and reflected, in the plan. The objective of this measure is to improve the appearance and consistency of all types of signs throughout the project area and adjoining Applicant-owned lands. This measure is consistent with the signage proposal in section E.5 of this document, though it may be more inclusive of each sign type. The total estimated capital cost of the sign package is $30,000 ($10,000. in year 1 and $5,000 in years 2, 4, 6, and 8.)

Define the upper boat launch area—The circular drive, parking area, and launch will be defined using materials such as boulders, logs, or fencing, to keep vehicles within the appropriate area. Enhancing the appearance of the area by establishing a border for vehicles and protecting the condition of the vegetation is the objective of this measure, though it is the same measure as proposed in section E.5. The cost is also addressed in that section.

Provide garbage containers—At the upper and lower boat launches and at the picnic area, garbage containers will be provided and a method to collect garbage from the containers defined. The grounds will be monitored and garbage left by users will be cleaned up. Improving the appearance of the boat launch areas by eliminating debris is the objective of this measure, though it is the same measure as proposed in section E.5. That section also addresses the cost of the measure.

Replace the orange port-a-potties—The orange port-a-potties at the upper and lower boat launches will be replaced with vault toilets that are either tan or brown to blend with vegetation and soils. The objective of this measure is to make the toilets blend with the surrounding landscape, though this is the same measure as proposed in section E.5. Cost for this measure is addressed in that section.

Define the lower boat launch area—The parking area and launch will be defined using materials such as boulders, logs, or fencing to keep vehicles within the appropriate area. While this measure is the same as proposed in section E.5, its intent here is to enhance the appearance of this area by establishing a defined border of the area for vehicles and protecting the condition of the vegetation. The cost of this measure is addressed in section E.5.

Establish screening around the lay-down yard—The existing trees and shrubs that screen the lay-down yard from the road below the dam will be replaced with native or other non-invasive species of trees and shrubs. Irrigation will need to be provided at least until they become established. Total capital costs are estimated to be $30,000 in year 2 of a new license term. Total O&M associated with irrigation is estimated to be $10,000, spread over years 3 through 5.

Visual Guidelines Plan—New improvements and facilities can introduce additional visual contrast to the project. To ensure that construction considers the protection of visual resources from important viewpoints, a process is needed to ensure that project plans result in minimal visual contrast. This process would be applied only when construction or major ground disturbance is proposed, therefore the cost is uncertain. The estimated annual O&M cost, based on past experience, is $3,000 in years 1 to 30 of a new license term.

E.6.3.5. Buffer Zone for Protecting Recreational and Aesthetic Values

The Resource Management Plan, Technical Report E.6-A, will include provisions for the buffer zone. These provisions will be included in this section upon completion of the final license application. The cost of implementation will be estimated at that time.

E.6.3.6. Applicant’s Policies for Permitting Piers, Boat Docks, and Other Facilities on Project Lands and Waters

In 1993, the Applicant adopted its current policy regarding the permitting of piers, docks, and other shoreline facilities associated with project lands and waters. In summary, permits for private boat docks and similar structures are issued only to applicants who own or lease land adjacent to a project reservoir or adjacent to Applicant-owned freeboard land. Since little private land exists in the project area, there are few, if any, cases where docks would be permitted. The dock must be accessed from the reservoir bank adjacent to a permittee’s land by means of a gangplank, ramp, or walkway, though this access may be on the Applicant-owned portion of freeboard land. In addition, the relevant private land must have at least 75 feet of freeboard frontage. Permits may be issued to property associations if the dock is intended to serve single family dwellings and designed to accommodate no more than four watercraft at a time. The docks must also be attached to the reservoir bank. A number of specifications for such structures must be met, including proof of compliance with all local, state, and federal regulations. The Applicant’s Land Management Services division manages a program for administering this and other management policies. An application must be submitted, reviewed, and evaluated before a permit is issued; the permit must then be signed by the permittee.

E.6.3.7. Measures or Facilities Recommended by the Agencies

The following measures recommended by the agencies were taken from comment letters received on the draft *New License Application: Swan Falls Hydroelectric Project*. The comment letters often did not clearly indicate specific recommended measures. However, the Applicant made a good faith effort to extract as many recommended measures as possible. In this section, the Applicant includes agency-recommended measures where those measures were clearly stated and contained specific elements. Statements regarding the Applicant's proposed measures, general observations, or vague references to measures are not included as recommended measures, because to do so would be speculative as to what the agencies intended. In addition, Applicant-proposed measures that the agencies supported without qualification are not included in this section. In all cases, the Applicant has responded to agency comments on the draft license application. Full responses to these comments are in Attachment F of the Consultation Appendix.

Measures in this section are categorized as either accepted or rejected by the Applicant and then listed by agency. Following each recommendation, the Applicant provides a response explaining why the measure was either accepted or rejected. In some cases, the responses in this section are abbreviated from the responses provided in Attachment F of the Consultation Appendix. Once again, refer to the Consultation Appendix for full responses.

E.6.3.7.1. Accepted or Conditionally Accepted Measures or Facilities

Of the recommended measures that the Applicant was able to identify in agency comment letters, there were none accepted.

E.6.3.7.2. Rejected Measures or Facilities and Explanations for Rejection

U.S. Fish and Wildlife Service comment letter, dated December 21, 2007

FWS-20

> The U.S. Fish and Wildlife Service recommends that the Applicant explore the possibility of converting the existing lay-down yard into a "more aesthetically pleasing and beneficial fish and wildlife area" and find another site to dry and dispose of material removed from the trash rack.

Response

The laydown yard is an integral component of operations of the Swan Falls Hydroelectric Project. As such, the area is used for storing necessary project equipment, as well as providing an appropriate area for drying and disposing of organic materials removed from the trash racks. Therefore, operation of the Swan Falls Project would be unreasonably hindered if the laydown yard were decommissioned and restored to wildlife habitat. Furthermore, in the Applicant's Land Management Plan for the Swan Falls Project, the laydown yard is identified as "Industrial," thereby reflecting the need to maintain the area as an important project facility.

In an effort to improve the habitat value and aesthetics of the laydown yard area, the Applicant has proposed measures to 1) avoid impacts to riparian habitat adjoining the laydown yard by disposing organic materials (section 3.2.3.2.1), and 2) improve the aesthetics of the laydown yard by screening the area with vegetation (section E.6.2.4, Proposed Measures for Land Use and Aesthetics and Cost Analysis).

FWS-22

> The U.S. Fish and Wildlife Service recommends that the Applicant evaluate its lands to determine their "natural resource values…for potential inclusion within the Project Boundary."

Response

The Applicant did examine and evaluate natural, as well as recreational, resource values on its lands in the vicinity of the project. This information is presented in detail within the Human Use Report and Botanical Reports (E.3.2.B, E.3.3.A, E.3.3.B, and E.3.3.C.). The Applicant does not have jurisdiction to place lands within the FERC project boundary.

E.6.4. Consultation

For a summary of consultation efforts to date for the Swan Falls Hydroelectric Project, see the Consultation Appendix.

E.6.5. Consistency with Other Plans

Because most of the land in and adjacent to the project area lies within the NCA and is managed by the BLM, that agency's management policies are most relevant to the area. According to the Draft RMP/EIS (BLM 2006), a number of policies from various plans currently apply in the NCA.

> The NCA is managed in accordance with the Kuna and Bruneau management framework plans (BLM 1983a,b) and the Cascade, Jarbidge, and Owyhee resource management plans (RMP) (BLM 1987, 1988, 1999). The *Snake River Birds of Prey NCA Management Plan* (BLM 1995) is not a stand-alone land use plan, but rather a management plan composed of decisions carried forward from existing land use plans…(the) changes in management policy, coupled with new issues and concerns and increasing demands on NCA resources drive the need for a comprehensive plan that provides clear direction to both BLM and the public.
>
> The new *Snake River Birds of Prey NCA RMP* will provide the BLM with a stand-alone, comprehensive framework for managing public lands in the NCA over the next 20+ years to meet the purposes of the NCA-enabling legislation.

The only plan mentioned above that applies in the NCA and is currently on "FERC's List of Comprehensive Plans" is the Cascade RMP (BLM 1988), the decisions of which, according to the BLM, have been carried forward in the NCA Management Plan (BLM 1995). Therefore, the management goals of the 1995 plan will be considered as representative of the Cascade RMP. Since these older plans mentioned above, according to the BLM, do not reflect current conditions and proposed policies for the NCA, the desired future conditions and policies stated in the Draft RMP/EIS will also be discussed.

E.6.5.1. Snake River Birds of Prey NCA Management Plans

E.6.5.1.1. Snake River Birds of Prey NCA Management Plan (BLM 1995)

Management goals of the *Snake River Birds of Prey NCA Management Plan* include the following:

- Provide for the conservation, protection, and enhancement of raptor populations and habitats, and the scientific, cultural, and educational resources and values of the NCA.
- Provide for continued and diverse public uses that are consistent with the objectives of protecting raptor populations, conserving and enhancing their habitats, and properly managing other resources and values of the NCA.
- Coordinate research and studies of raptors, raptor prey, and their habitats to support needs identified by BLM management.
- Demonstrate vegetation and habitat management and enhancement practices and techniques that may be applied elsewhere.
- Enhance public understanding of, and appreciation for, natural processes and special resources and values through public education and interpretive programs.

Management actions continued under this plan included several special designations. The western end of the Snake River Canyon within the NCA, which includes the study area, was designated as a Special Recreation Management Area. This area provides for a variety of river- and land-based recreational opportunities. OHVs are restricted to designated roads and trails in this management area. On the south side of the river, the study area is included within a designated avoidance, or exclusion area, for major realty actions, due to recreational controls, sensitive plant issues, and paleontological concerns. The Guffey Butte–Black Butte Archaeological District ACEC includes all land in the study area south of the river.

Additional limitations included in the plan relevant to the study area are a year-round closure to shooting rifles and pistols within one-half mile of the Snake River downstream from Grand View, and closure of the same area to all firearms from February 15 through August 31. The plan also declared most of the NCA a Designated Vehicle Management Area, requiring that vehicles remain on designated roads or trails (except for administrative purposes). The study area lies within three grazing allotments: the Sunnyside Winter Allotment on the north side of the river and the Sinker Butte and Montini FFR allotments on the south side of the river. An area on the south side of the river downstream of the project area has been withdrawn from grazing.

Several specific actions were proposed by the plan in or near the study area, including the following:

- Define a single route on the road below Swan Falls Dam where it enters public land and gravel it, provide pullouts at popular fishing spots, and eliminate all other roads in this area.

- Close this road below Swan Falls Dam to motorized traffic from the pump station downstream to the cattleguard, just upstream from Celebration Park.

- Designate a non-motorized trail extending downstream on the south side of the Snake River from Swan Falls Dam to the proposed Guffey Butte Trail.

- Establish or upgrade vehicle parking areas at the top of Swan Falls grade on the north side of the canyon and above Swan Falls Dam on the south side of the canyon.

- Remove, rehabilitate, or screen to be less conspicuous the visual distractions in Class I, II, and III VRM areas, where possible. All new developments will be subordinate to the existing landscape character and will be developed in a manner to maintain or improve existing VRM classes. Existing facility designs will be improved to reduce visual impacts as maintenance or reconstruction allows.

- Prohibit rock climbing and rappelling within the canyon (except for research purposes as may be permitted).

- Limit permits for commercial outfitters and guides to five on the river and five on land. Also limit the size of groups.

- Prohibit paintball guns and equipment within the canyon and within one-quarter mile of the canyon.

E.6.5.1.2. NCA Draft Resource Management Plan/Environmental Impact Statement (BLM 2006)

Desired future conditions relevant to the study area include the following:

- Cultural and historic resources would be protected; past, present, and future traditions and practices would be preserved.

- The distribution, abundance, and quality of wildlife habitats would be maintained or improved to provide food, cover, and space for healthy populations of game and nongame wildlife through the seasons and through various life stages.

- Distribution and condition of habitats would contribute to the long-term viability of federally listed and BLM sensitive species and to the resilience to environmental change.

- Raptor nest sites would be protected, maintained, and enhanced.

- Uplands would support healthy sagebrush and salt dessert shrub communities, and would provide habitats to sustain or increase raptor and raptor prey populations (Area 1 on the north side of river and Area 2 on the south side of river).

- Uplands would provide habitats to increase populations of shrub-obligate animals.

- Habitat conditions would contribute to long-term viability of special status species.

- Desirable native and adapted non-native plant communities would show an upward trend in species diversity, productivity, and structure.

- Noxious weeds would be present only in small, isolated areas.
- Plant communities would show an upward trend in species diversity, productivity, and structure.
- Sagebrush and salt desert shrub communities would be the dominant vegetation type and would include a mosaic of multi-aged shrubs, forbs, and native and adapted non-native perennial grasses (Area 1—north of river).
- Sagebrush and salt desert shrub communities would increase and would include a mosaic of multi-aged shrubs, forbs, and native and adapted non-native perennial species (Area 2—south of river).
- There would be a decrease in the severity, frequency, and size of wildfires (Areas 1 and 2).
- A mosaic of multi-aged shrubs, forbs, and native and adapted non-native perennial grasses would be present (Areas 1 and 2).
- Upland and riparian conditions would support water quality that is consistent with state of Idaho water quality standards.
- Riparian areas would provide habitats to sustain or increase raptor populations.
- Riparian areas would provide habitats to sustain riparian obligate species, especially those that are special status species.
- Public lands would be consolidated to facilitate land management.
- Administrative and public access to the public lands would exist where needed and where consistent with resource values.
- All major utility and transportation right-of-ways would be located in designated corridors, and all wind energy sites would be located within an identified right-of-way use area.

- Resource values on public lands would be protected to prevent loss of revenue due to the use of public lands.
- Forage would be made available to support ranching operations to the extent compatible with the NCA-enabling legislation.
- A range of motorized, nonmotorized, undeveloped, and developed recreational opportunities would exist in a manner compatible with the NCA-enabling legislation.
- Environmental impacts and user conflicts would be reduced by improving public awareness of birds and their prey.
- Special or unique natural, historical, cultural, scenic, and recreational values would be protected through special designations, as needed.
- Consumptive and nonconsumptive uses, determined to be compatible with the purposes of the NCA, would contribute to the socio-economic well being of the region.

Most of the BLM management actions and controls that would affect the study area and the project remain the same in the Draft RMP/EIS as in the current plan. Only three apparent changes were noted that are considered significant for land-use purposes. First, campfires would be restricted to established (improved) campsites. Second, visual designations are currently Class I, Preservation, on the Ada County side of the river and Class II, Retention, on the Owyhee County side. The Draft RMP/EIS would change these to Class III, Partial Retention, in the area of the dam and village on both sides of the river and downstream of the dam and Class II, Retention, several miles upstream of the dam and village. This change would facilitate development in the project area because compliance with the new visual resource objectives would be easier to achieve.

The third change is one of area status. The eligibility of the river running through the NCA had not previously been determined, as required by Section 5(d)(1) of the Wild and Scenic Rivers Act. A determination of whether the river or segment of a river is free-flowing and possesses one or more outstandingly remarkable values must be made for a river to be found eligible for National Wild and Scenic status. If it is found to be eligible, the river/segment must be classified as wild, scenic, or recreational, depending on its remarkable values. A determination of suitability must then be made for the river to be included in the National Wild and Scenic Rivers System. In the Draft RMP/EIS, the BLM found 49 miles of the Snake River to be free-flowing and to have wildlife values unique to the Snake River Canyon: the river segment from C.J. Strike Dam to just above Swan Falls Dam and the segment below Swan Falls Dam to the NCA boundary. However, in the Preferred Alternative, the BLM did not recommend either segment of the river as suitable for designation under the Wild and Scenic Rivers Act.

The Applicant has attempted to propose policies in its Resource Management Plan (Technical Report E.6-A) that are consistent with the BLM's Snake River Birds of Prey NCA Management Plans. Based on comments received from the BLM, the Applicant concludes that our proposed policies are consistent with those of the BLM's plans for the NCA.

E.6.5.2. FERC's List of Comprehensive Plans

The following plans are included in "FERC's List of Comprehensive Plans" for Idaho, adopted September 2006, and are relevant to the Swan Falls Project:

E.6.5.2.1. Cascade Resource Management Plan (BLM 1988)

Based on the BLM's statement quoted above, decisions of this plan have been carried forward into the 1996 NCA management plan—which is more relevant to the study area. Therefore, the discussion of the NCA management plan presented above replaces any further consideration of the Cascade RMP.

Since policies of this plan have been carried forward into the NCA plans, and since the Applicant's proposed policies are consistent with the NCA plans, we conclude that our policies are also consistent with the Cascade RMP.

E.6.5.2.2. Idaho Fisheries Management Plan, 2001–2006 (IDFG 2001)

The statewide management policies of this plan generally provide for the following: 1) protecting/ enhancing fish and wildlife populations for ecosystem, esoteric, and recreational purposes; 2) maintaining and restoring wild native populations in suitable waters; and 3) providing recreational opportunities, including public education and both consumptive and nonconsumptive activities concerning fish and wildlife, while protecting private property rights. Program direction of the plan provides more detailed objectives for the resource: 1) increase emphasis on habitat protection; 2) continue emphasis on protecting and enhancing wild trout; 3) continue emphasis on hatchery trout programs in streams, lakes, and reservoirs; and 4) continue emphasis on protecting and enhancing salmon and steelhead. The second part of the plan provides specific management direction for, and lists objectives and programs specific to, each drainage. The drainage involved in the project area is the Snake River from C.J. Strike Reservoir downstream to Hells Canyon Dam. For this drainage, bull trout and redband trout are to be given management priority to protect wild stocks from over-harvest and habitat degradation. Objectives for the resource here are to provide a diversity of fishing experiences for smallmouth bass within river and mainstem impoundments, enhance largemouth bass fisheries in reservoirs by increasing their habitats, increase the abundance of sturgeon, and protect native bull trout and redband trout populations in the Snake River tributaries.

All the measures proposed in section E.2.4. of this license application to protect, mitigate, or enhance water quality, as well as measures in sections E.3.1.3., E.3.2.3., and E.3.3.3. for fish, wildlife, and botanical resources, are consistent with this plan’s policies.

E.6.5.2.3. Draft White Sturgeon Management Plan: Status and Objectives of Idaho’s White Sturgeon Resources in the Snake River (IDFG 2003)

The 2003 document is no longer available. The current document that is available is dated April 2005. Data presented in the plan are as of 2004. The intent of this management plan is to document present status (as of 2002) and provide direction for future management by addressing population goals and activities to restore white sturgeon populations to acceptable levels in the Snake River. The plan describes the conditions of sturgeon and their habitat in each of nine fragmented reaches. For the C.J. Strike to Swan Falls reach, the following goals and actions are established:

Goal

A population abundance of 1,340 fish that are greater than 60 cm total length, of which 60% are between 60 and 92 cm total length, 30% are between 92 and 183 cm total length, and 10% are greater than 183 cm total length.

Actions

- Monitor the success of white sturgeon spawning and early life history survival (priority 1).
- Conduct periodic population assessments (priority 1).
- Determine usable habitat for adjustments in the population goal (priority 1).
- Evaluate the impact of sport-based catch and release angling in cooperation with the Applicant (priority 1).
- Cooperate with the Applicant to mitigate adverse effects of load-following operations on spawning, incubation, and fry/juvenile life history stages (priority 1).
- Evaluate the potential of using this population as adult translocation source to other river reaches (priority 1).
- Develop a genetics plan to address the current status and implications of potential translocation (priority 2).
- Develop and implement a translocation plan to improve genetic diversity and productivity for other river reaches (priority 2).

The goals and actions for the Swan Falls to Brownlee reach are as follows:

Goal

A population abundance of 7,100 white sturgeon greater than 60 cm total length, of which 60% are between 60 and 92 cm total length, 30% are between 92 and 183 cm total length, and 10% are greater than 183 cm total length.

Actions

- Monitor success of white sturgeon spawning and early life history survival (priority 1).
- Work cooperatively with the Applicant and the Idaho Department of Environmental Quality (IDEQ) to implement measures to improve water quality to sustain all aquatic resources in this reach of the river (priority 1).
- Conduct periodic population assessments (priority 1).
- Determine usable habitat for adjustments in the population goal (priority 1).
- Develop genetics plan to address current status and implications of potential translocation or hatchery introductions (priority 2).
- Develop and implement a translocation plan to improve productivity, if necessary (priority 2).
- Develop and implement a hatchery introduction program, if necessary (priority 3).

The Applicant's White Sturgeon Conservation Plan was developed and implemented collaboratively with the Idaho Department of Fish and Game (IDFG) and other wildlife agency personnel participating in the White Sturgeon Technical Advisory Committee. Implementation of this plan is consistent with the IDFG's Draft White Sturgeon Management Plan.

E.6.5.2.4. Pacific Northwest Rivers Study (IDFG and BPA 1986)

The stated purpose of this study was to identify environmental and institutional considerations that could affect hydroelectric development in the Northwest. River segments were evaluated for their environmental significance based on resident fish, wildlife, natural features, cultural features, and recreational resources. At specific locations, each of these resources was rated as outstanding, substantial, moderate, limited, or unclassified. A matrix showing the number of locations by rating for each resource was then provided for the river segment at various locations.

This license application is consistent with this report since extensive studies of the conditions of the resources that were conducted for this document contribute to the knowledge established originally in the report. Resource monitoring proposed by the Applicant would continue to provide additional information about the resources.

E.6.5.2.5. Idaho Water Quality Standards and Wastewater Treatment Requirements (IDHW 1985)

Originally, published in 1985, this document was updated in 2001 (IDEQ 2001). This document establishes water quality standards applicable to the project reservoirs and downstream flows. In addition to providing beneficial uses consistent with the state plan, the Applicant has participated in developing, and will implement, appropriate measures developed for the draft total maximum daily load (IDEQ and ODEQ 2004) for this river basin that will improve water quality conditions.

E.6.5.2.6. Idaho SCORP 2003–2007: Statewide Comprehensive Outdoor Recreation Plan (IDPR 2003)

The title of the 2003–2007 plan is the “State Comprehensive Outdoor Recreation and Tourism Plan” (SCORTP). Presumably, this is the document included in FERC’s “List of Comprehensive Plans.” The document assesses recreation needs throughout the state and discusses how they should be met. The plan’s goals are as follows:

- Develop a SCORTP website where planning products are easily accessible

- Implement a revised strategic planning process

- Develop a program for implementation of ongoing, reliable, and valid outdoor recreational research

- Provide a full range of outdoor recreational opportunities that recognize the multiplicity of activities in Idaho
- Create an Idaho outdoor recreational and natural resources education initiative
- Protect existing access to outdoor recreation
- Continue the promotion of outdoor recreational partnerships
- Provide diversity funding for outdoor recreation
- Promote a unified recreational and tourism marketing program
- Recognize the importance of transportation in planning projects
- Integrate historic, cultural, and heritage opportunities in outdoor recreation and tourism
- Develop, maintain, and promote high-quality fish and wildlife recreational opportunities
- Balance outdoor recreational opportunities with sensitivity to the environment

Objectives are stated within the plan for each goal. The plan's components include a statewide assessment of outdoor recreation supply and demand, public involvement, and consideration of wetlands.

The Applicant's proposals to enhance recreational facilities and opportunities in the Swan Falls Project Area, presented in section E.5 of this license application, are consistent with the state's outdoor recreation plan.

E.6.5.2.7. Idaho State Water Plan (IWRB 1986)

This document establishes water use, conservation, protection, management, and river basin objectives and policies that apply generally throughout the state. Many of these objectives and policies are not directly relevant to the Swan Falls Project; therefore, they will not be affected by the project. Those objectives and policies that are relevant and may be affected by the project are summarized and addressed below:

- Include certain nonconsumptive water uses (including fish and wildlife habitat and hydropower) as beneficial uses
- Protect against “unreasonable contamination or deterioration in quality” to maintain designated beneficial uses
- Consider the need for adequate water treatment, not simply dilution
- Consider public interests in decision making to maintain sustainable populations of species threatened by human actions, and cooperate in efforts to conserve and restore listed species
- Maintain appropriate waters for instream flow when determined to be in the public interest
- Protect “the ecological viability of riparian habitat and wetlands”
- Protect floodplains and rely on management to reduce or prevent flood damage
- Consider public interest, existing water rights, related settlement agreements, and future water and energy needs of the state in hydropower licensing
- Maintain a minimum average daily flow of 5,000 cfs a minimum of 95% of the time in the Snake River at Johnson Bar
- Recognize hydropower as a beneficial use of water, as long as minimum flows are maintained
- Provide sufficient water for commercial and recreational navigation by the minimum flows established in this plan

The Applicant has participated in the tota; maximum daily load (TMDL) process and proposes to implement measures that will improve water quality in the basin. The Applicant's project contributes toward those nonconsumptive water uses identified in the state plan as beneficial uses. Proposals are included in this license application that will protect and enhance riparian habitat and wetlands. The processing of this license application provides opportunity to consider public interest, existing water rights, related settlement agreements, and future water and energy needs of the state.

E.6.5.2.8. Columbia River Basin Fish and Wildlife Program (NPCC 2000)

The Columbia River Basin Fish and Wildlife Program addresses the Northwest Power and Conservation Council's (NPCC) charges to recover, rebuild, and mitigate impacts on fish and wildlife. The 2000 program establishes a basin-wide vision for fish and wildlife, as well as biological objectives and action strategies that are consistent with the vision. Ultimately, the program will be implemented through subbasin plans developed locally in the more than 50 tributary subbasins of the Columbia and amended into the program by the NPCC. Those plans will be consistent with the basin-wide vision and objectives of the program, and its underlying foundation of ecological science. The 2000 program addresses the four major impacts on fish and wildlife in the basin: hydropower, habitat, hatcheries, and harvest. The "overarching objectives" of the plan are as follows:

- A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife.

- Mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem.

- Sufficient populations of fish and wildlife for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest.

- Recovery of the fish and wildlife affected by the development and operation of the hydrosystem that are listed under the Endangered Species Act.

- Basin-wide strategies include habitat; artificial production; harvest; hydrosystem passage and operations; wildlife; ocean conditions; and research, monitoring, and evaluation.

The two most relevant strategies for this license application are artificial production strategies and hydrosystem passage and operations, as follows:

- Artificial production can be used, under the proper conditions, to complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and replace lost salmon and steelhead in blocked areas.

- Artificial production can provide conditions within the hydrosystem for adult and juvenile fish that most closely approximate the natural physical and biological conditions; provide adequate levels of survival to support fish population recovery based in subbasin plans; support expression of life-history diversity; and assure that flow and spill operations are optimized to produce the greatest biological benefits with the least adverse effects on resident fish while also assuring an adequate, efficient, economical, and reliable power supply.

The investigation conducted for this license application, the ongoing monitoring of resident fish populations proposed, and the Applicant's existing hatchery program are consistent with relevant strategies established in this plan.

E.6.5.2.9. The Fifth Northwest Electric Power and Conservation Plan (NPCC 2005)

A vision for the regional power system is presented in the plan. NPCC's vision is a well-functioning (adequate, economical, efficient, and reliable) electrical system comprised of a mix of independent and utility-owned generation, regulated transmission and distribution, and an effective consumer demand response mechanism. It is a system in which efficiency and renewable resources compete on an equal footing with conventional generation, and that includes environmental considerations when making resource decisions. It is a system that recognizes the risk inherent in the power industry, and plans and implements actions in ways that effectively manages that risk. The characteristics of that system are as follows:

- Resource planning and adequacy
- Market rules and regulations
- Conservation renewables and high-efficiency resources
- Fish and wildlife issues
- The Bonneville Power Administration oversight

Actions of this plan directly relevant to this project license application are as follows:

Action F&W-1: The Council will work with the federal agencies, states, tribes and others to broaden the focus of the forums created to address issues surrounding fish and wildlife operations, especially those related to long-term planning. The forums should broaden their focus to include "expertise in both biological and power-system issues," and to directly address longer-term planning concerns, not just weekly and in-season issues. One important objective would be to put in place an emergency operation strategy in the event of extreme dry conditions. Such a strategy would guide decisions on the operation of the hydroelectric system to minimize adverse effects on both the power system and fish mitigation.

This relicensing process and the proposed protection, mitigation, and enhancement (PM&E) measures that incorporate collaboration with agencies and other groups is consistent with the relevant policy.

E.6.5.2.10. Columbia River Basin Fish and Wildlife Program (NPPC 1987) and the subsequent Protected Areas Amendments and Response to Comments (NPPC 1988)

These amendments pertained to sections of the program document regarding protected areas and clarified that the protected areas designation applies only to new hydroelectric projects and not to existing projects or their relicensing. Since the Swan Falls Project already exists and is undergoing relicensing, these documents are not applicable.

E.6.5.2.11. Mainstem Amendments to the Columbia River Basin Fish and Wildlife Program (NPCC 2003)

These amendments adopt the biological objectives of the “2000 Biological Opinions on Operations of the Federal Columbia River Power System” (2000 BiOp) issued by National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service, proposing additional strategies for dam operations. Besides the inclusion of provisions to establish consistency of the program with the 2000 BiOp, the NPPC’s mainstem program includes provisions regarding water management, spill, juvenile fish transportation, adult fish passage, reservoir elevations, and operations relating to resident fish and wildlife, water quality, mainstem habitat, and research.

Since this plan addresses federal dam operations on the mainstem, it is not relevant to the Applicant’s project.

E.6.5.2.12. Columbia River Basin Fish and Wildlife Program (NPPC 1994)

The 1994 revision of the Columbia River Basin Fish and Wildlife Program supplements the 1987 document, but is no longer available. This response is, therefore, based on the *Draft Fiscal Year 1998 Annual Implementation Work Plan* (NPPC 1997), which implements the original document. The work plan pertains to the Upper Snake River subbasin, (above Hells Canyon Dam), and calls for five actions:

1. Investigate conditions of native salmonids

2. Quantify changes in resident fish and wildlife habitat resulting from flow augmentation for anadromous fish

3. Rebuild recoverable populations of native salmonid species in the Fort Hall Bottoms

4. Implement several specific measures in the Owyhee River subbasin and Malheur River

5. Recover and protect native trout species through habitat improvement and protection

The investigation conducted for this license application and on-going monitoring of resident fish populations proposed by the Applicant are consistent with these policies.

E.6.5.2.13. Northwest Conservation and Electric Power Plan (NPPC 1986)

This document was replaced with the *Draft Fourth Northwest Conservation and Electric Power Plan*, adopted on March 13, 1996 (NPPC 1996), which was later replaced by the *Revised Fourth Northwest Conservation and Electric Power Plan* (NPPC 1998). In response to the restructuring of the electric industry, the NPPC prepared the 1996 document as a first step toward, "…making recommendations for changes in the institutional structure of the region's electric utility industry." Such changes were designed to protect natural resources and equalize costs and benefits of the competitive marketplace, while allowing the region to maintain the advantages of its power system. Rather than identifying recommended actions or policy decisions, the 1996 and 1998 documents provide background on the industry and its restructuring and analysis of major issues expected to be addressed as deregulation occurs. Aside from encouraging awareness of the issues and considering them in future planning—actions that the Applicant already takes—the plan requires no compliance actions.

E.6.6. Maps, Drawings, or Photographs for Proposed Measures

Photographs of Key Observation Points discussed in section E.6.1.2, which relates to the proposed measures to minimize project impacts to visual resources, are provided in Technical Report E.6-C.

LITERATURE CITED

Bureau of Land Management (BLM). 1980. Visual resource management program. U.S. Government Printing Office, Washington, D.C.

Bureau of Land Management (BLM). 1983a. Kuna management framework plan. U.S. Department of the Interior, BLM, Boise District, Boise, ID.

Bureau of Land Management (BLM). 1983b. Bruneau management framework plan. U.S. Department of the Interior, BLM, Boise District, Boise, ID.

Bureau of Land Management (BLM). 1986. BLM manual, 8431-1: visual resource contrast rating. U.S. Government Printing Office, Washington, D.C.

Bureau of Land Management (BLM). 1987. Jarbidge resource management plan. U.S. Department of the Interior, BLM, Boise District, Boise, ID. 79 p., plus appendices.

Bureau of Land Management (BLM). 1988. Cascade resource management plan. U.S. Department of the Interior, BLM, Boise District, Boise, ID.

Bureau of Land Management (BLM). 1995. Snake River Birds of Prey National Conservation Area management plan. U.S. Department of the Interior, BLM, Bruneau Resource Area, Lower Snake River District Office, Boise, ID. 179 p.

Bureau of Land Management (BLM). 1999. Owyhee resource management plan. U.S. Department of the Interior, BLM, Lower Snake River District, Boise Field Office, Boise, ID. 48 p., plus appendices.

Bureau of Land Management (BLM). 2006. Snake River Birds of Prey National Conservation Area draft resource management plan and environmental impact statement. U.S. Department of the Interior, BLM, Boise District Office, Boise, ID. ID 111 2006 EIS-1740.

Federal Energy Regulatory Commission (FERC). 2002. Relicensing the C.J. Strike Project in the Snake River Basin, (FERC Project 2055). FERC, Office of Energy Projects, Division of Environmental and Engineering Review, Washington, D.C.

Idaho Department of Environmental Quality (IDEQ). 2001. Idaho water quality standards and wastewater treatment requirements. IDEQ, Boise, ID.

Idaho Department of Environmental Quality (IDEQ) and Oregon Department of Environmental Quality (ODEQ). 2004. Snake River–Hells Canyon total maximum daily load (TMDL). Revised version. IDEQ, Boise Regional Office, Boise, ID, and ODEQ, Pendleton Office, Pendleton, OR. 638 p.

Idaho Department of Fish and Game (IDFG). 2001. Idaho fisheries management plan, 2001–2006. IDFG, Boise, ID.

Idaho Department of Fish and Game (IDFG). 2003. White sturgeon management plan, status and objectives of Idaho's white sturgeon resources in the Snake River, Idaho. Draft. IDFG, Boise, ID.

Idaho Department of Fish and Game (IDFG) and Bonneville Power Administration (BPA). 1986. Pacific Northwest rivers study. Final report: Idaho. Boise, ID. 12 p., plus appendices.

Idaho Department of Health and Welfare (IDHW). 1985. Idaho water quality standards and wastewater treatment requirements. Boise, ID. 72 p., plus appendices.

Idaho Department of Parks and Recreation (IDPR). 2003. Idaho SCORP 2003–2007: statewide comprehensive outdoor recreation plan. IDPR, Boise, ID.

Idaho Power Company (IPC). 1998. New license application for C.J. Strike Hydroelectric Project. 8 volumes. IPC, Boise, ID.

Idaho Water Resource Board (IWRB). 1986. Idaho state water plan. IWRB, Boise, ID.

Northwest Power and Conservation Council (NPCC). 2000. Columbia River Basin fish and wildlife program. Portland, OR. Council document 2000-19.

Northwest Power and Conservation Council (NPCC). 2003. Mainstem amendments to the Columbia River Basin fish and wildlife program. NPCC, Portland, OR. Council document 2003-11.

Northwest Power and Conservation Council (NPCC). 2005. The fifth Northwest electric power and conservation plan. NPCC, Portland, OR. Council document 2005-07.

Northwest Power Planning Council (NPPC). 1986. Northwest conservation and electric power plan. NPPC, Portland, OR.

Northwest Power Planning Council (NPPC). 1987. Columbia River Basin fish and wildlife program. NPPC, Portland, OR.

Northwest Power Planning Council (NPPC). 1988. Protected areas amendments and response to comments. NPPC, Portland, OR. Council document 88-22.

Northwest Power Planning Council (NPPC). 1994. Columbia River Basin fish and wildlife program. NPPC, Portland, OR.

Northwest Power Planning Council (NPPC). 1996. Draft fourth Northwest conservation and electric power plan. NPPC, Portland, OR. Council document 96-5.

Northwest Power Planning Council (NPPC). 1997. Draft fiscal year 1998 annual implementation work plan. NPPC, Portland, OR.

Northwest Power Planning Council (NPPC). 1998. Revised fourth Northwest conservation and electric power plan. NPPC, Portland, OR. Council document 98-22.

Stacy, S. M. 1991. Legacy of light: a history of Idaho Power Company. Idaho Power Company, Boise, ID. 256 p.

U.S. Army Corps of Engineers (ACOE). 1987. Wetland delineation manual. ACOE Environmental Laboratory, Vicksburg, MS. 99 p., plus appendices.

U.S. Census Bureau. 2007. State & county quickfacts. <http://quickfacts.census.gov/qfd>. Accessed on: March 30, 2007.

U.S. Geological Survey (USGS). 1996. Effects of military training and fire in the Snake River Birds of Prey National Conservation Area. Bureau of Land Management/Idaho Army National Guard research project final report. U.S. Department of the Interior, Geological Survey, Biological Research Division, Snake River Field Station, Boise, ID. 130 p.

Wells, M. W. 1974. Gold camps and silver cities. Idaho Bureau of Mines and Geology, Moscow, ID.

Wulforst, J., G. Annandale, and A. M. A. Holthuijzen. 2000. Terrestrial effects of load following. Response to the Federal Energy Regulatory Commission Additional Information Request No. 13. Idaho Power Company, Boise, ID.

Table E.6-1 Ada, Canyon, and Owyhee county population (U.S. Census Bureau 2007).

County	1990 Population	2000 Population	Percent Growth	2000 Persons per Square Mile
Ada	205,775	300,904	46.2	285.2
Canyon	90,076	131,441	45.9	222.8
Owyhee	8,392	10,644	26.8	1.4

Table E.6-2 Landownership within the Swan Falls FERC project boundary and Swan Falls land use and aesthetic study area[a].

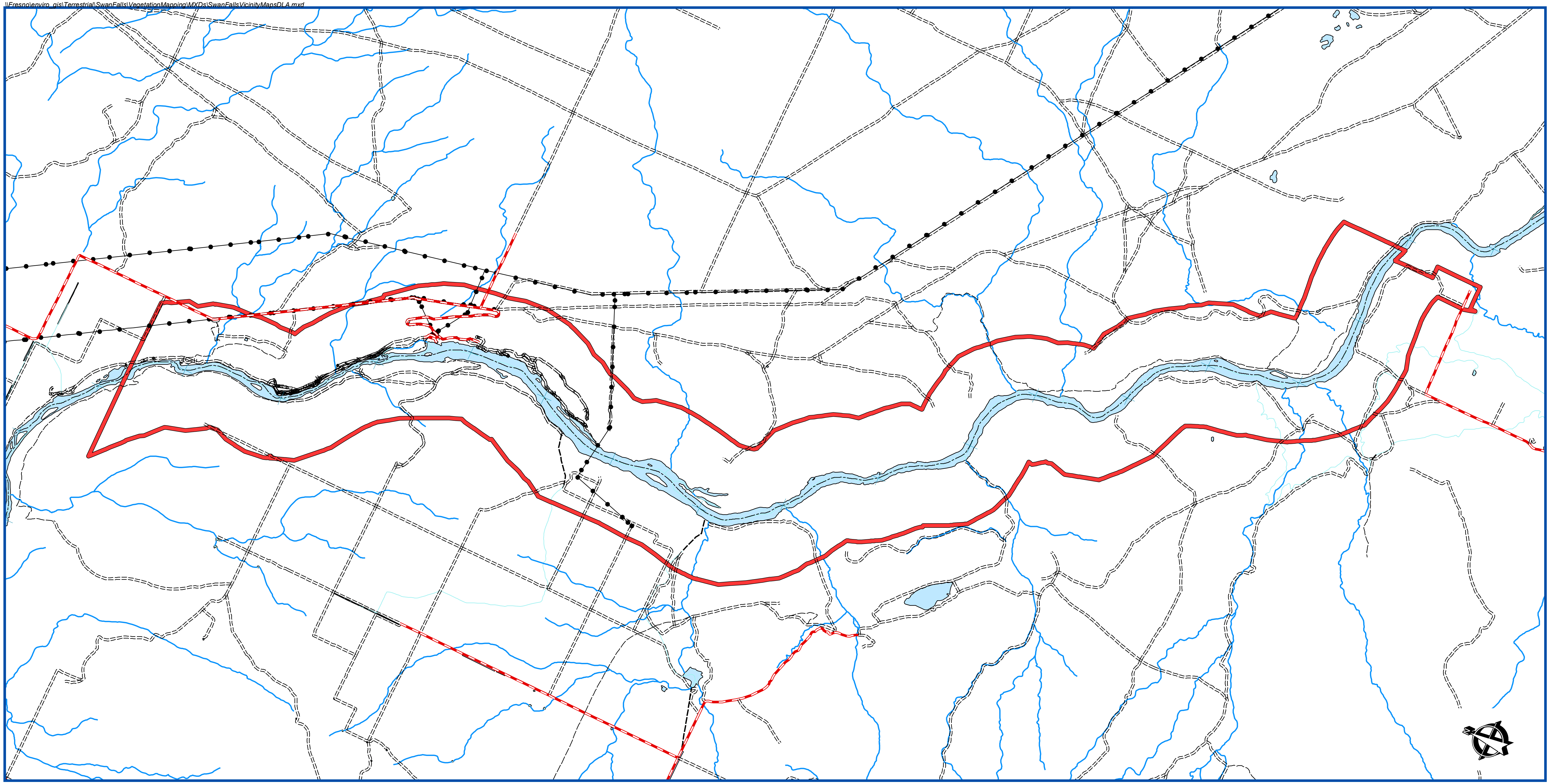
Owner	Project Area (Acres)	Study Area (Acres)
Private		
Applicant	584	849
Other Private	84	822
Total Private	**668**	**1,671**
Public		
BLM	529	9,776
State of Idaho	58	649
Total Public	**587**	**10,425**
Total Landownership	**1,255**	**12,096**
Water	937	1,074
Total (Land and Water)	**2,192**	**13,170**

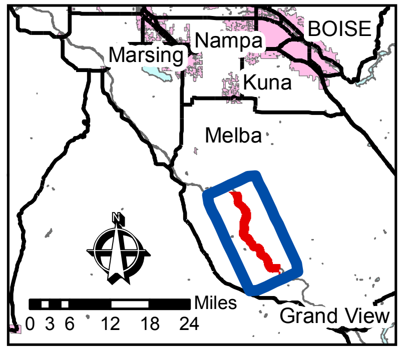
a. The Swan Falls land use and aesthetic study area is defined in section 2 and Figure 2 in Technical Report E.6-B.

Table E.6-3 Current land use within the project and study areas.

Land Use	Project Area (Acres)	Study Area (Acres)
Urban or Developed	20	0
Agriculture	47	644
Rangeland	992	10,990
Forest Land	0	43
Vacant	0	10
Water	1,133	1,463
Total Land Use	2,192	13,150

\\Fresno\enviro_gis\Terrestrial\SwanFalls\VegetationMapping\MXDs\SwanFallsVicinityMapsDLA.mxd





Features Legend

🟥	Primary Road	—	Stream
====	Tertiary Road	—	Ditch or Canal
— —	Trails	- - -	Pipeline
—·—	River Center Line	🟦	Waterbody
+	River Mile Markers	🟥	Swan Falls Land Use and Aesthetics Study Area
		●—●	Transmission Lines

IDAHO POWER
An IDACORP Company

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503

IDAHO POWER COMPANY, BOISE, ID 2007

License Application Figure E6-1

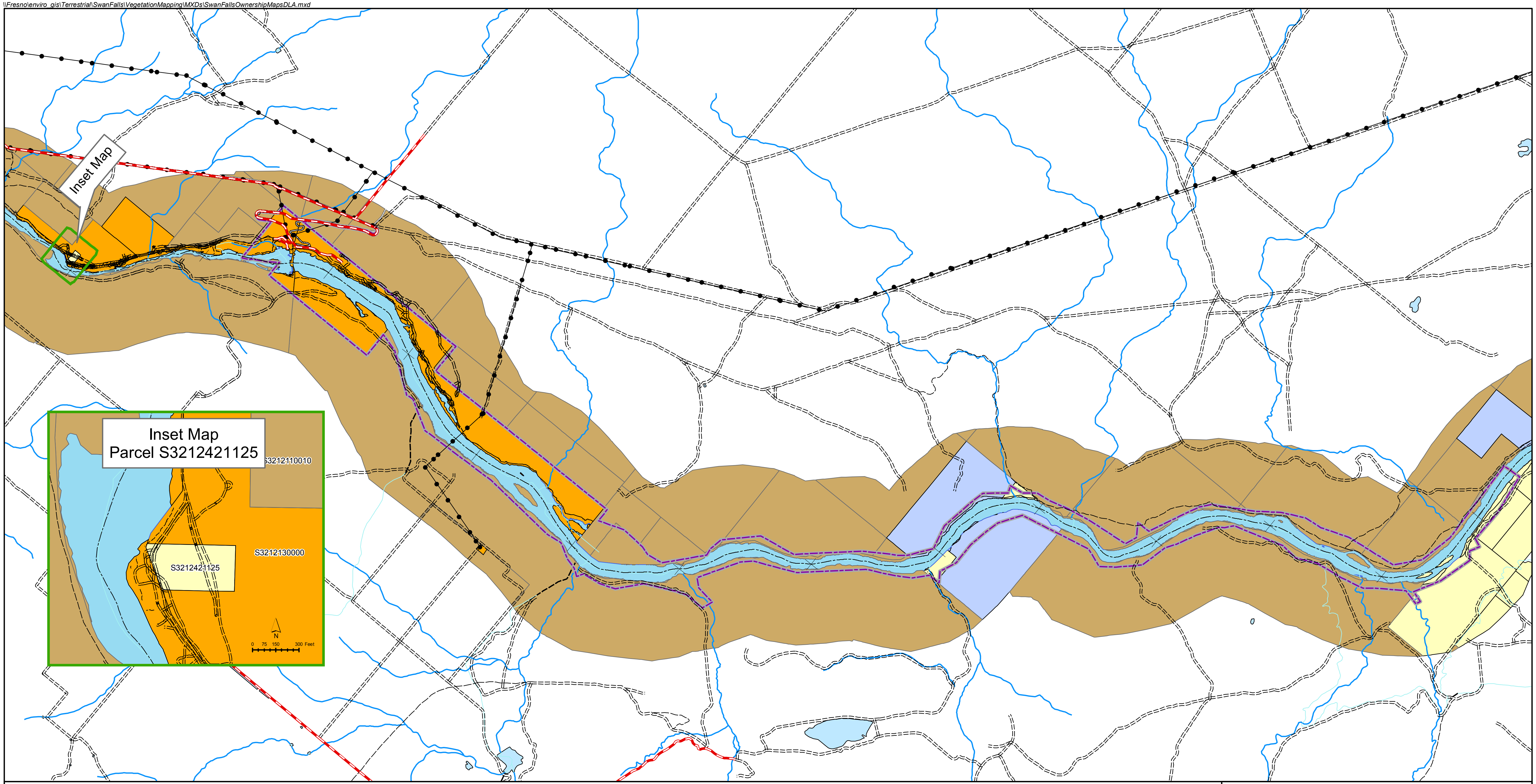
Swan Falls Land Use and Aesthetics Study Area & Vicinity

0 2,500 5,000 10,000 15,000
Feet

08/30/07

This page left blank intentionally.

\\Fresno\enviro_gis\Terrestrial\SwanFalls\VegetationMapping\MXDs\SwanFallsOwnershipMapsDLA.mxd



Vicinity Map

Features Legend

- Primary Road
- Tertiary Road
- Trails
- River Center Line
- River Mile Markers
- Stream
- Ditch or Canal
- Pipeline
- Waterbody
- Swan Falls Project Boundary
- Transmission Lines

Thematic Features Legend

Owner

🟪	BIRDS OF PREY
🟫	BLM
▭	COUNTY
▭	DEPT INTERIOR
🟧	IDAHO POWER
🟨	PRIVATE
🟦	STATE
🟦	WATER

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503
IDAHO POWER COMPANY, BOISE, ID 2007

License Application Figure E6-2

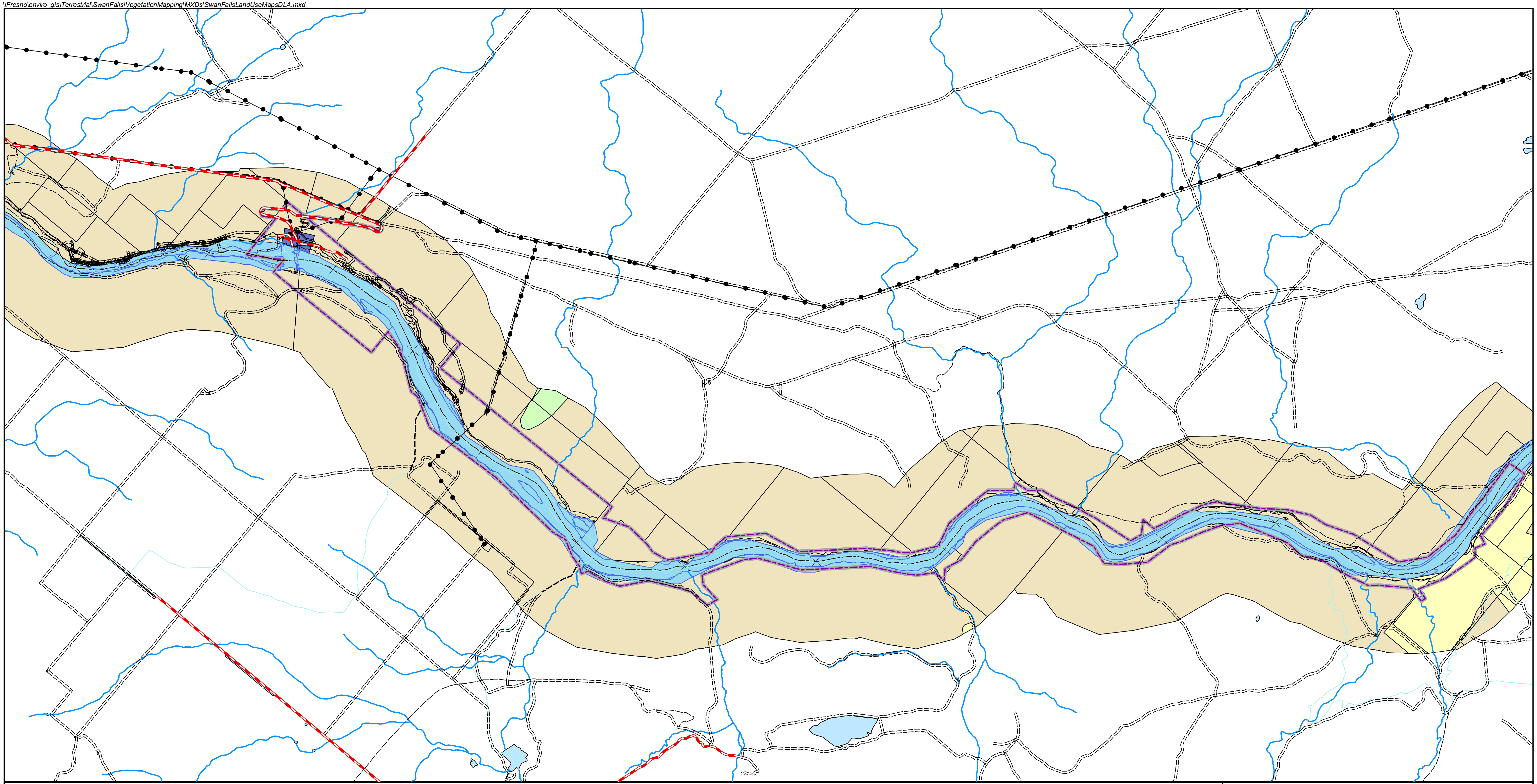
Current Land Ownership
Swan Falls Land Use and Aesthetics Study Area

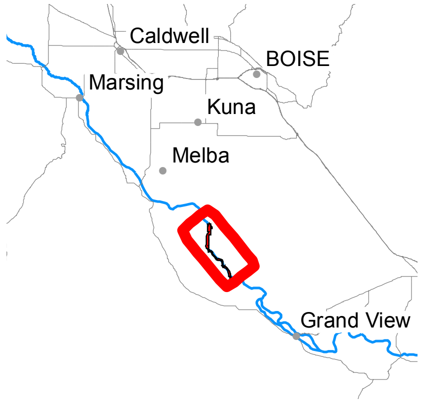
0 1,650 3,300 6,600 9,900 Feet

08/30/07

This page left blank intentionally.

\\Fresno\enviro_gis\Terrestrial\SwanFalls\VegetationMapping\MXDs\SwanFallsLandUseMapsDLA.mxd





Vicinity Map

IDAHO POWER
An IDACORP Company

Features Legend

- Primary Road
- Tertiary Road
- Trails
- River Center Line
- River Mile Markers
- Stream
- Ditch or Canal
- Pipeline
- Waterbody
- Swan Falls Project Boundary
- Transmission Lines

Thematic Features Legend

Land Use

⬜ Vacant	🟦 Urban or Built-up Land
🟨 Agricultural	🟫 Rangeland
⬜ Residential	🟩 Forest Land
🟪 Commericial / Industrial	🟦 Waterbodies
	🟪 Wetlands

SWAN FALLS HYDROELECTRIC PROJECT - FERC NO. 503

IDAHO POWER COMPANY, BOISE, ID 2007

License Application Figure E6-3

Current Land Use
Swan Falls Land Use and Aesthetics Study Area

0 1,700 3,400 6,800 10,200 Feet

08/30/07

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Exhibit F
General Design Drawings

The *Code of Federal Regulations* below—18 CFR § 4.51(g)—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

> § 4.51(g) *Exhibit F* consists of general design drawings of the principal project works described under paragraph (b) of this section (Exhibit A) and supporting information used to demonstrate that existing project structures are safe and adequate to fulfill their stated functions.
>
> (1) The drawings must show all major project structures in sufficient detail to provide a full understanding of the project, including:
>
> (i) Plans (overhead view);
>
> (ii) Elevations (front view); and
>
> (iii) Sections (side view).
>
> (2) Supporting design report. The applicant must furnish, at a minimum, the following supporting information to demonstrate that existing structures are safe and adequate to fulfill their stated functions, and must submit such information in a separate report at the time the application is filed. The report must include:
>
> (i) A description of the physical condition or state of maintenance and repair of any existing and proposed structures or equipment; and
>
> (ii) Information relating to composition and competency of foundations and other structures, gradation of filter and riprap material, design strength and ultimate strength of concrete and steel, stress and stability analysis, spillway rating curves, water levels, and other appropriate data.
>
> (3) The applicant must submit two copies of the supporting design report as described in paragraph (g)(2) of this section at the time general design drawings are submitted to the Commission for review.

F.1. GENERAL DESIGN DRAWINGS

The drawings for Exhibit F contain Critical Energy Infrastructure Information (CEII). The Applicant filed these drawings with the Federal Energy Regulatory Commission (FERC) in a separate attachment, along with the final license application.

Procedures for obtaining access to CEII may be found at 18 CFR § 388.133. Requests for access to CEII should be made to the CEII coordinator at FERC.

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Exhibit G
Maps of the Project

The *Code of Federal Regulations* below—18 CFR § 4.51(h)—specifies the content of this chapter and the scope and nature of the research from which it was compiled

> § 4.51(h) *Exhibit G* is a map of the project. The map must conform to the specifications of §4.39. If more than one sheet is issued, the sheets must be numbered consecutively and each sheet must bear a small inset sketch showing the entire project (or development) and indicating the portion depicted on the sheet. The map must show:
>
> (1) Location of the project and principal features. The map must show the location of the project as a whole with reference to the affected stream or other body of water and, if possible, to a nearby town or any permanent monuments or objects, such as roads, transmission lines or other structures, that can be noted on the map and recognized in the field; the map must also show the relative locations and physical interrelationships of the principal project works and other features described under paragraph (b) of this section (Exhibit A).
>
> (2) Project boundary. The map must show a project boundary enclosing all of the principal project works and other features described under paragraph (b) of this section (Exhibit A) that are to be licensed. If accurate survey information is not available at the time the license application is filed, the applicant must so state, and a tentative boundary may be submitted. The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources (see paragraph (f) of this section (Exhibit E)). Existing residential, commercial or other structures may be included within the boundary only to the extent that underlying lands are needed for project purposes (e.g., for flowage, public recreation, shoreline control, or protection of environmental resources). If the boundary is on land covered by a public land survey, ties must be shown on the map at sufficient points to permit accurate platting of the position of the boundary relative to the lines of the public land survey. If the lands are not covered by a public land survey, the best available legal description of the position of the boundary must be provided, including distances and directions from fixed monuments or physical features. The boundary must be described as follows:
>
> (i) Impoundments. (A) The boundary around a project impoundment may be described by any of the following:
>
> (1) Contour lines, including the contour elevation (preferred method);
>
> (2) Specified courses and distances (metes and bounds);
>
> (3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
>
> (4) Any combination of the above methods.
>
> (B) The boundary must be located no more than 200 feet (horizontal measurement) from the exterior margin of the reservoir, defined by the normal maximum surface elevation, except where deviations may be necessary in describing the boundary according to the above methods, or where additional lands are necessary for project purposes, such as public recreation, shoreline control, or protection of environmental resources.
>
> (ii) Continuous features. The boundary around linear (“continuous”) project features such as access roads, transmission lines, and conduits may be described by specified distances from center lines or offset lines of survey. The width of such corridors must not exceed 200 feet, unless good cause is shown for a greater width. Several sections of a continuous feature may be shown on a single sheet, with information showing the sequence of contiguous sections.
>
> (iii) Noncontinuous features. (A) The boundary around noncontinuous project works such as dams, spillways, and powerhouses may be described by:
>
> (1) Contour lines;
>
> (2) Specified courses and distances;
>
> (3) If the project lands are covered by a public land survey, lines upon or parallel to the lines of the survey; or
>
> (4) Any combination of the above methods.
>
> (B) The boundary must enclose only those lands that are necessary for safe and efficient operation and maintenance of the project, or for other specified project purposes, such as public recreation or protection of environmental resources.
>
> (3) Federal lands. Any public lands and reservations of the United States (see 16 U.S.C. 796(1) and (2)) (Federal lands) that are within the project boundary, e.g., lands administered by the U.S. Forest Service, Bureau of Land Management, National Park Service, or Indian tribal lands, and the boundaries of those Federal lands, must be identified on the map:
>
> (i) By legal subdivisions of a public land survey of the affected area (a protraction of identified township and section lines is sufficient for this purpose);

(ii) By the Federal agency, identified by symbol or legend if desired, that maintains or manages each identified subdivision of the public land survey within the project boundary; and

(iii) In the absence of a public land survey, by the location of the Federal lands according to the distances and directions from fixed monuments or physical features. When a Federal survey monument or a Federal bench mark will be destroyed or rendered unusable by the construction of project works, at least two permanent, marked, witness monuments or bench marks must be established at accessible points. The maps must show the location (and elevation, for bench marks) of the survey monument or bench mark which will be destroyed or rendered unusable, as well as of the witness monuments or bench marks. Connecting courses and distances from the witness monuments or bench marks to the original must also be shown

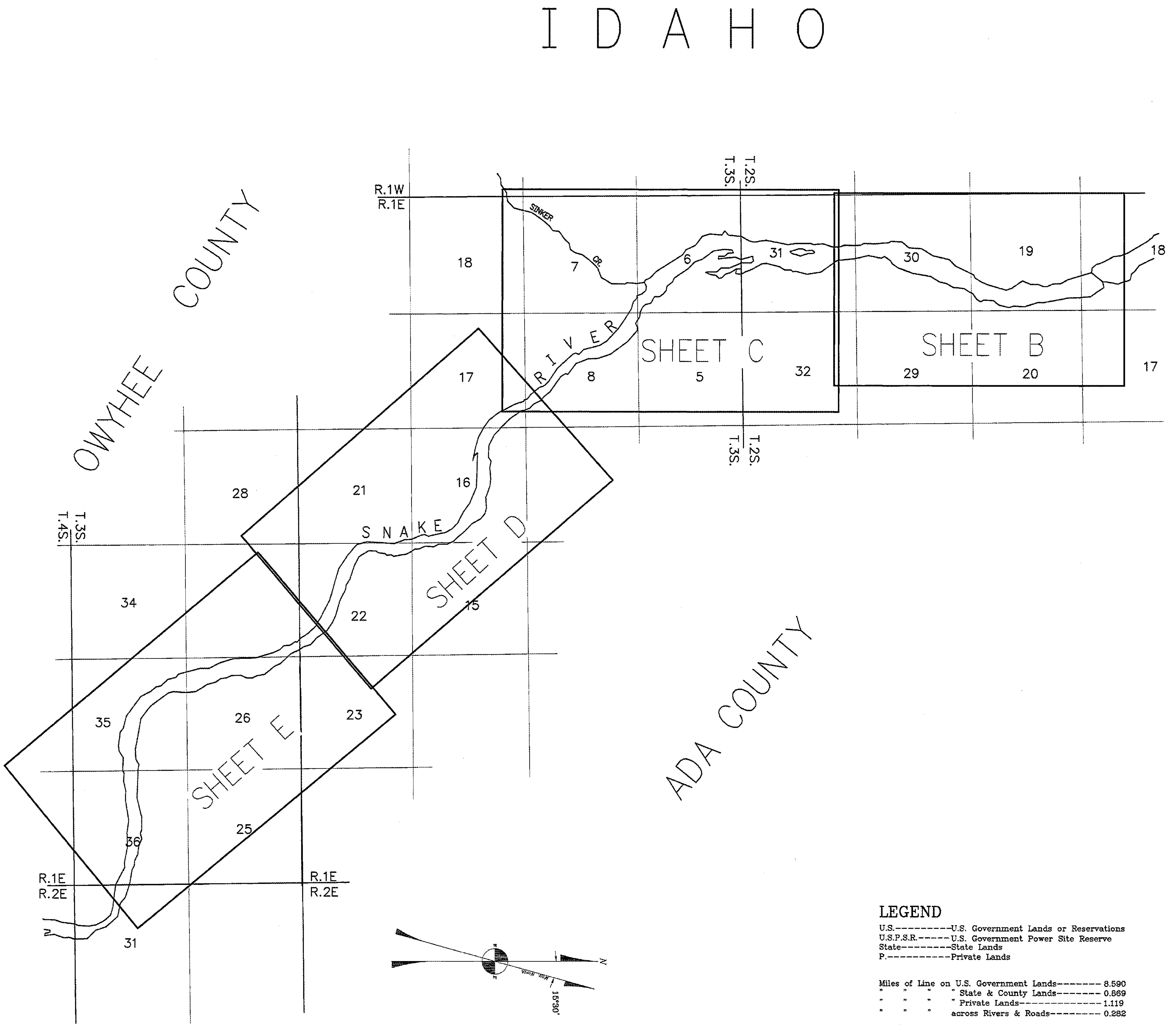
(4) Non-Federal lands. For those lands within the project boundary not identified under paragraph (h)(3) of this section, the map must identify by legal subdivision:

(i) Lands owned in fee by the applicant and lands that the applicant plans to acquire in fee; and

(ii) Lands over which the applicant has acquired or plans to acquire rights to occupancy and use other than fee title, including rights acquired or to be required by easement or lease.

G.1. MAPS OF THE PROJECT

The GIS shape files depicting the project boundary for this Exhibit G have been filed with the Federal Energy Regulatory Commission.



UTM GRID AND 1992 MAGNETIC
NORTH DECLINATION AT CENTER OF
HAGERMAN QUADRANGLE.

PARCEL OF LAND B. M. IDAHO		AREA BETWEEN MEANDER LINES AND PROJECT BOUNDARY IN ACRES		
T.2S. R.1E.	SECTION	PSR	U.S.	PRIVATE
	17			2.22
	18		6.10	89.85
	19	6.12		196.05
	20			1.80
	30	24.54	5.15	152.18
	31		25.09	140.50
T.3S. R.1E.				
	5		3.42	
	6		132.86	
	7		18.74	
	8		52.36	
	15		13.50	1.48
	16			95.50
	17		15.01	
	21		4.77	5.81
	22		82.18	
	26		70.51	
	27		17.87	
	35		49.00	22.70
	36		1.62	18.51
TOTALS		30.66	498.18	726.60

LEGEND

U.S.----------U.S. Government Lands or Reservations
U.S.P.S.R.------U.S. Government Power Site Reserve
State---------State Lands
P.-----------Private Lands

Miles of Line on U.S. Government Lands--------	8.590
" " " " State & County Lands--------	0.869
" " " " Private Lands---------------	1.119
" " " across Rivers & Roads---------	0.282
Total Miles of Line----------------------	10.860

PROJECT No. 503-IDAHO
Swan Falls Hydroelectric Project
IDAHO POWER COMPANY BOISE, IDAHO
EXHIBIT G
Project Lands

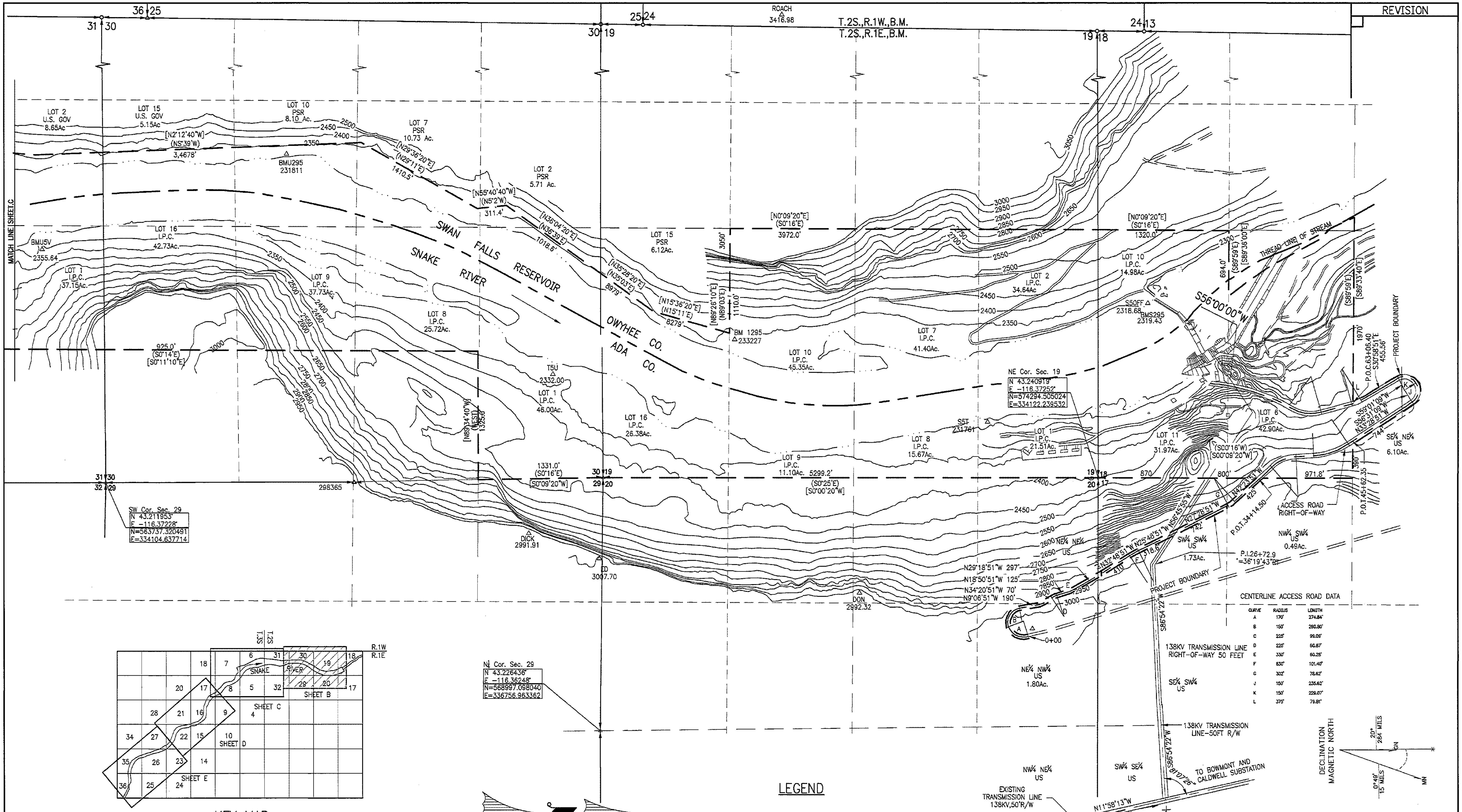
SCALE: 1"=2000'
2000' 1000' 0 2000'

April 18, 2007

20E-155502A

VAULT NO. E-50104-AA

e: K:\PRODUCTION PROJECTS\SWAN FALLS RELIC\155502A.DWG saved: 09/11/07 06:39 by: THJ1710



KEY MAP

CENTERLINE ACCESS ROAD DATA

CURVE	RADIUS	LENGTH
A	170'	274.84'
B	150'	280.80'
C	225'	99.09'
D	225'	60.87'
E	330'	60.28'
F	830'	101.40'
G	302'	78.62'
J	150'	235.62'
K	150'	229.07'
L	375'	79.81'

I HEARBY STATE THAT THE SWAN FALLS POWER PLANT PROJECT BOUNDARY DELINEATION FOR THE SWAN FALLS POWER PLANTS PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18 CFR 4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO THE USGS QUADRANGLE MAPPING WITHIN +/- 40 FEET. THE SWAN FALLS POWER PLANTS DOCUMENTED PROJECT BOUNDARY WAS ADJUSTED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

JAMES J. HOWARD
2471
3-27-08

BY: J J Howard
J.J. HOWARD, SURVEYOR

3/27/08
DATE

COORDINATE PROJECTIONS

Latitude, Longitude: NAD 27
Idaho State Plane Coordinates
Units: US Foot

N 43°.126855
E-116°.29332

2479374.00444
532543.840711

LEGEND

— — —	PROJECT BOUNDARY (METES & BOUNDS)
∿	MAXIMUM WATER LEVEL AT DAM (CREST OF OVERFLOW DAM)
∿	MINIMUM WATER LEVEL ELEV
~ · · ~	ORIGINAL WATER CHANNEL
═	TRANSMISSION LINE WITH EASEMENT
═	ROAD PRIMARY
= =	ROAD SECONDARY
△	SURVEY STATION & ELEVATION
⊙	I.P.Co. MONUMENT
✛	SECTION CORNER SURVEYED IN
✛	SECTION CORNER FOUND
✛	SECTION CORNER NOT FOUND
[ ]	GRID BEARING
( )	TRUE BEARING

PROJECT No. 503-IDAHO
Swan Falls Hydroelectric Project
IDAHO POWER COMPANY BOISE, IDAHO
EXHIBIT G
Project Boundary

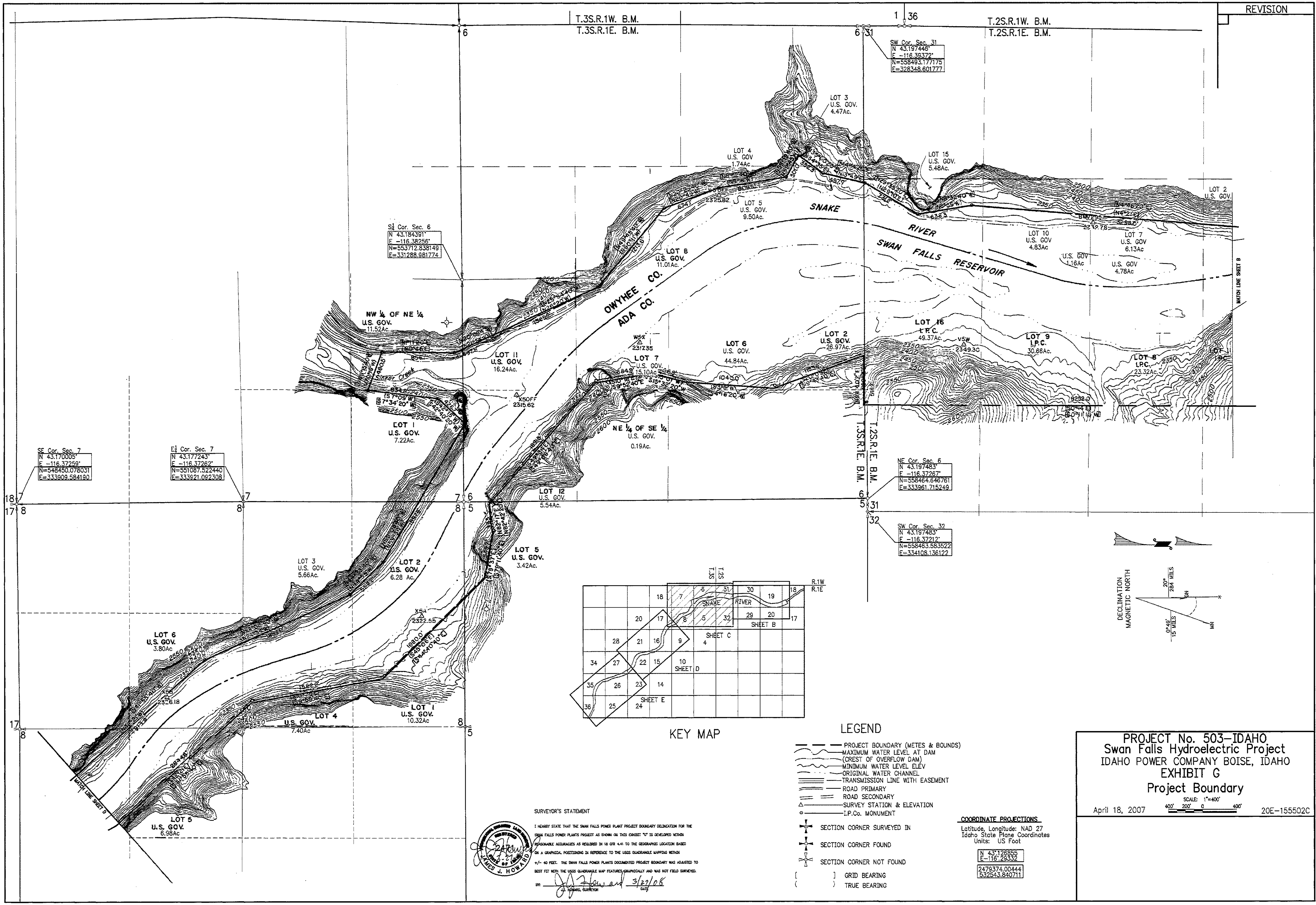
SCALE: 1"=400'
400' 200 0 400'

April 18, 2007

20E-155502B

VAULT NO. E-50104-AA

C:\DOCUMENTS AND SETTINGS\AUTOMANAGER WORKSPACE\THJ1710\M-SEDONA\D-ENG\VAULT\FERCDOC\20\SWPO\55\155502B.DWG saved: 09/11/07 11:21 by: THJ1710



LEGEND

- PROJECT BOUNDARY (METES & BOUNDS)
- MAXIMUM WATER LEVEL AT DAM (CREST OF OVERFLOW DAM)
- MINIMUM WATER LEVEL ELEV
- ORIGINAL WATER CHANNEL
- TRANSMISSION LINE WITH EASEMENT
- ROAD PRIMARY
- ROAD SECONDARY
- △ SURVEY STATION & ELEVATION
- ⊙ I.P.Co. MONUMENT
- SECTION CORNER SURVEYED IN
- SECTION CORNER FOUND
- SECTION CORNER NOT FOUND
- [ ] GRID BEARING
- ( ) TRUE BEARING

COORDINATE PROJECTIONS

Latitude, Longitude: NAD 27
Idaho State Plane Coordinates
Units: US Foot

N 43°.126855
E-116°.29332

2479374.00444
532543.840711

SURVEYOR'S STATEMENT

I HEARBY STATE THAT THE SWAN FALLS POWER PLANT PROJECT BOUNDARY DELINEATION FOR THE SWAN FALLS POWER PLANTS PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18 CFR 4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO THE USGS QUADRANGLE MAPPING WITHIN +/- 40 FEET. THE SWAN FALLS POWER PLANTS DOCUMENTED PROJECT BOUNDARY WAS ADJUSTED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

JAMES J. HOWARD

BY: J.J. Howard 3/27/08
J.J. HOWARD, SURVEYOR DATE

PROJECT No. 503–IDAHO
Swan Falls Hydroelectric Project
IDAHO POWER COMPANY BOISE, IDAHO
EXHIBIT G
Project Boundary

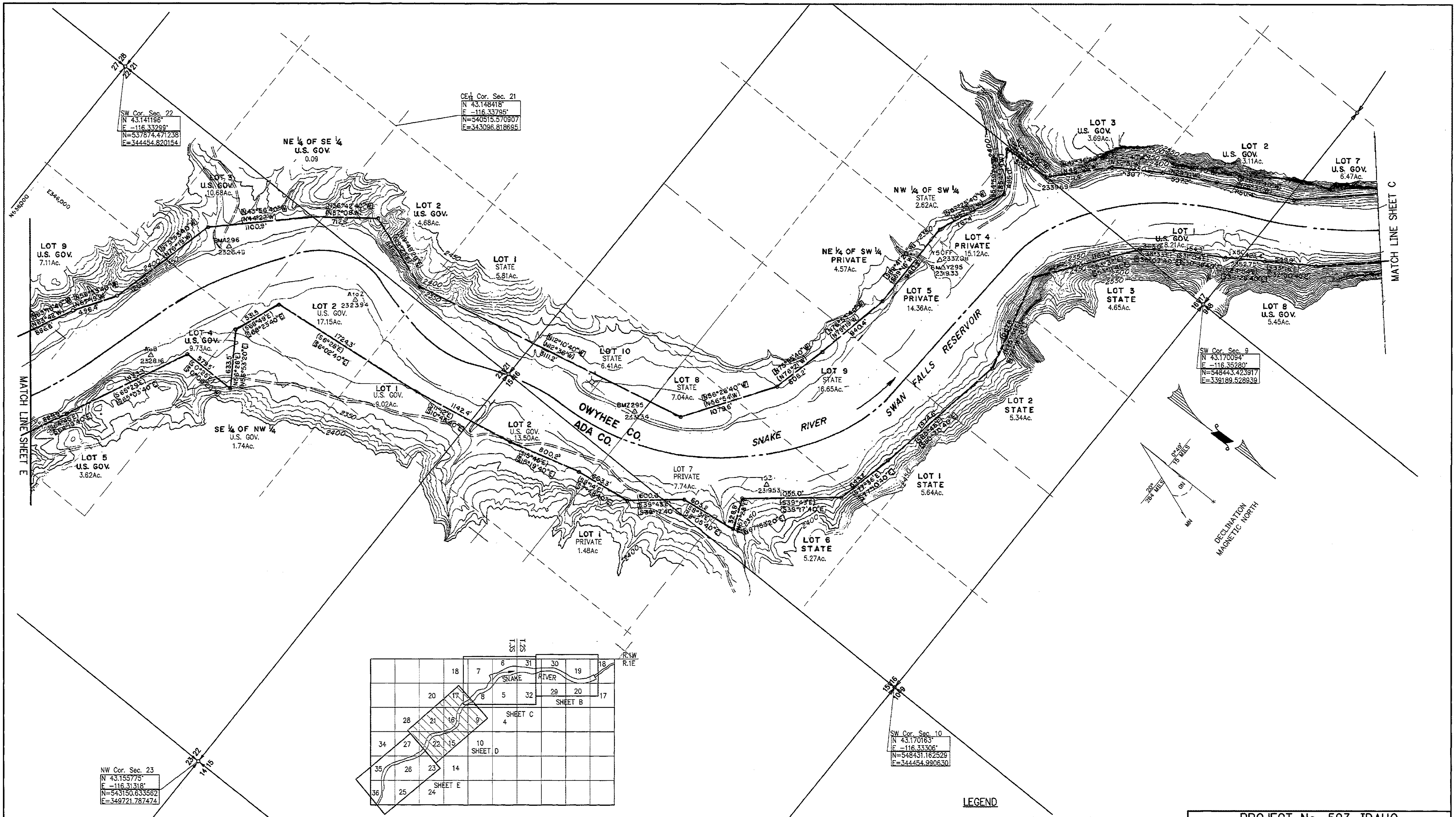
SCALE: 1"=400'
400' 200' 0 400'

April 18, 2007

20E–155502C

VAULT NO. E–50104–AA

C:\DOCUMENTS AND SETTINGS\AUTOMANAGER WORKSPACE\IHJ1710\M–SEDONA\D–ENGVAULT\FERCDOC\20\SWPO\55\155502C.DWG saved: 09/11/07 10:55 by: IHJ1710



LEGEND

- PROJECT BOUNDARY (METES & BOUNDS)
- MAXIMUM WATER LEVEL AT DAM
- (CREST OF OVERFLOW DAM)
- MINIMUM WATER LEVEL ELEV
- ORIGINAL WATER CHANNEL
- TRANSMISSION LINE WITH EASEMENT
- ROAD PRIMARY
- ROAD SECONDARY
- △ SURVEY STATION & ELEVATION
- ⊙ I.P.Co. MONUMENT
- SECTION CORNER SURVEYED IN
- SECTION CORNER FOUND
- SECTION CORNER NOT FOUND
- [ ] GRID BEARING
- ( ) TRUE BEARING

COORDINATE PROJECTIONS

Latitude, Longitude: NAD 27
Idaho State Plane Coordinates
Units: US Foot

N 43°.126855
E-116°.29332

2479374.00444
532543.840711

SURVEYOR'S STATEMENT

I HEARBY STATE THAT THE SWAN FALLS POWER PLANT PROJECT BOUNDARY DELINEATION FOR THE SWAN FALLS POWER PLANTS PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18 CFR 4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO THE USGS QUADRANGLE MAPPING WITHIN +/- 40 FEET. THE SWAN FALLS POWER PLANTS DOCUMENTED PROJECT BOUNDARY WAS ADJUSTED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

JAMES J. HOWARD 3-27-08

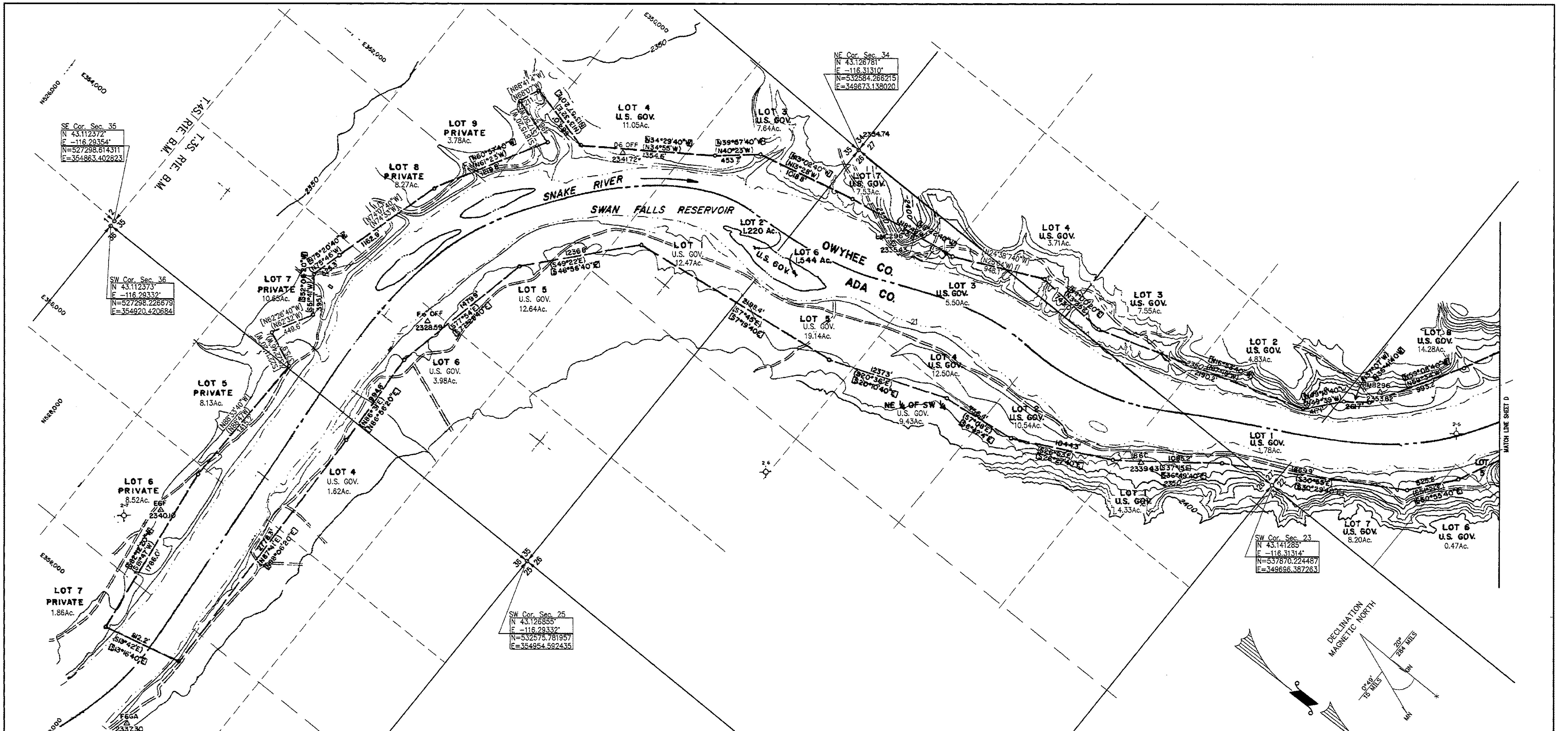
BY: ______ J.J. HOWARD, SURVEYOR   3/27/08 DATE

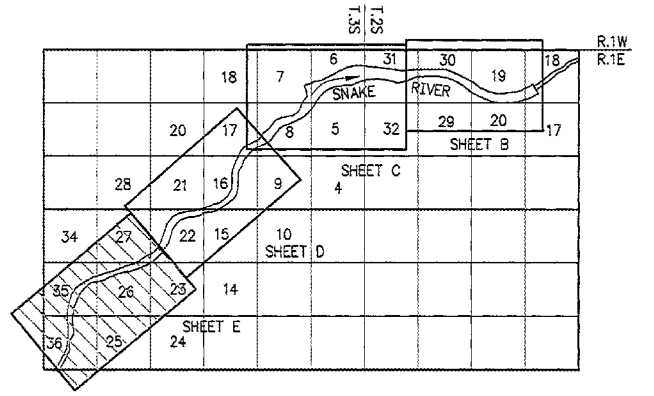
PROJECT No. 503–IDAHO
Swan Falls Hydroelectric Project
IDAHO POWER COMPANY BOISE, IDAHO
EXHIBIT G
Project Boundary

SCALE: 1"=400'

April 19, 2007   2000' 1000' 0 2000'   20E–155502D

VAULT NO. ##





KEY MAP

SURVEYOR'S STATEMENT

I HEARBY STATE THAT THE SWAN FALLS POWER PLANT PROJECT BOUNDARY DELINEATION FOR THE SWAN FALLS POWER PLANTS PROJECT AS SHOWN ON THIS EXHIBIT "G" IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18 CFR 4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO THE USGS QUADRANGLE MAPPING WITHIN +/- 40 FEET. THE SWAN FALLS POWER PLANTS DOCUMENTED PROJECT BOUNDARY WAS ADJUSTED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

JAMES J. HOWARD
2471
3-27-08

BY: J J Howard
J.J. HOWARD, SURVEYOR

3/27/08
DATE

COORDINATE PROJECTIONS

Latitude, Longitude: NAD 27
Idaho State Plane Coordinates
Units: US Foot

N 43°.126855
E-116°.29332

2479374.00444
532543.840711

LEGEND

- PROJECT BOUNDARY (METES & BOUNDS)
- MAXIMUM WATER LEVEL AT DAM
- (CREST OF OVERFLOW DAM)
- MINIMUM WATER LEVEL ELEV
- ORIGINAL WATER CHANNEL
- TRANSMISSION LINE WITH EASEMENT
- ROAD PRIMARY
- ROAD SECONDARY
- △ SURVEY STATION & ELEVATION
- ⊙ I.P.Co. MONUMENT
- SECTION CORNER SURVEYED IN
- SECTION CORNER FOUND
- SECTION CORNER NOT FOUND
- [ ] GRID BEARING
- ( ) TRUE BEARING

PROJECT No. 503-IDAHO
Swan Falls Hydroelectric Project
IDAHO POWER COMPANY BOISE, IDAHO
EXHIBIT G
Project Boundary
SCALE: 1"=400'
400 200' 0 400'
April 19, 2007
20E-155502E

VAULT NO. ####

e: C:\DOCUMENTS AND SETTINGS\AUTOMANAGER WORKSPACE\IHJT/10\M-SEDONA,D-ENGVAULT\FERCDOC\20\SWPO\55\155502E.DWG saved: 09/11/07 11:11 by: IHJT/10

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Exhibit H
General Information

The *Code of Federal Regulations* below—18 CFR § 16.10—specifies the content of this chapter and the scope and nature of the research from which it was compiled.

§16.10 Information to be provided by an applicant for new license.

(a) Information to be supplied by all applicants. All applicants for a new license under this part must file the following information with the Commission:

(1) A discussion of the plans and ability of the applicant to operate and maintain the project in a manner most likely to provide efficient and reliable electric service, including efforts and plans to:

(i) Increase capacity or generation at the project:

(ii) Coordinate the operation of the project with any upstream or downstream water resource projects; and

(iii) Coordinate the operation of the project with the applicant s or other electrical systems to minimize the cost of production.

(2) A discussion of the need of the applicant over the short and long term for the electricity generated by the project, including:

(i) The reasonable costs and reasonable availability of alternative sources of power that would be needed by the applicant or its customers, including wholesale customers, if the applicant is not granted a license for the project;

(ii) A discussion of the increase in fuel, capital, and any other costs that would be incurred by the applicant or its customers to purchase or generate power necessary to replace the output of the licensed project, if the applicant is not granted a license for the project;

(iii) The effect of each alternative source of power on:

(A) The applicant's customers, including wholesale customers;

(B) The applicant's operating and load characteristics; and

(C) The communities served or to be served, including any reallocation of costs associated with the transfer of a license from the existing licensee.

(3) The following data showing need and the reasonable cost and availability of alternative sources of power:

(i) The average annual cost of the power produced by the project, including the basis for that calculation;

(ii) The projected resources required by the applicant to meet the applicant's capacity and energy requirements over the short and long term including:

(A) Energy and capacity resources, including the contributions from the applicant's generation, purchases, and load modification measures (such as conservation, if considered as a resource), as separate components of the total resources required;

(B) A resource analysis, including a statement of system reserve margins to be maintained for energy and capacity; and

(C) If load management measures are not viewed as resources, the effects of such measures on the projected capacity and energy requirements indicated separately;

(iii) For alternative sources of power, including generation of additional power at existing facilities, restarting deactivated units, the purchase of power off-system, the construction or purchase and operation of a new power plant, and load management measures such as conservation:

(A) The total annual cost of each alternative source of power to replace project power;

(B) The basis for the determination of projected annual cost; and

(C) A discussion of the relative merits of each alternative, including the issues of the period of availability and dependability of purchased power, average life of alternatives, relative equivalent availability of generating alternatives, and relative impacts on the applicant's power system reliability and other system operating characteristics; and

(iv) The effect on the direct providers (and their immediate customers) of alternate sources of power.

(4) If an applicant uses power for its own industrial facility and related operations, the effect of obtaining or losing electricity from the project on the operation and efficiency of such facility or related operations, its workers, and the related community.

(5) If an applicant is an Indian tribe applying for a license for a project located on the tribal reservation, a statement of the need of such tribe for electricity generated by the project to foster the purposes of the reservation

(6) A comparison of the impact on the operations and planning of the applicant s transmission system of receiving or not receiving the project license, including;

(i) An analysis of the effects of any resulting redistribution of power flows on line loading (with respect to applicable thermal, voltage, or stability limits), line losses, and necessary new construction of transmission facilities or upgrading of existing facilities, together with the cost impact of these effects;

(ii) An analysis of the advantages that the applicant's transmission system would provide in the distribution of the project's power; and.

(iii) Detailed single-line diagrams, including existing system facilities identified by name and circuit number, that show system transmission elements in relation to the project and other principal interconnected system elements. Power flow and loss data that represent system operating conditions may be appended if applicants believe such data would be useful to show that the operating impacts described would be beneficial.

(7) If the applicant has plans to modify existing project facilities or operations, a statement of the need for, or usefulness of, the modifications, including at least a reconnaissance-level study of the effect and projected costs of the proposed plans and any alternate plans, which in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in section 10(a)(1) of the Federal Power Act.

(8) If the applicant has no plans to modify existing project facilities or operations, at least a reconnaissance-level study to show that the project facilities or operations in conjunction with other developments in the area would conform with a comprehensive plan for improving or developing the waterway and for other beneficial public uses as defined in section 10(a)(1) of the Federal Power Act.

(9) A statement describing the applicant's financial and personnel resources to meet its obligations under a new license, including specific information to demonstrate that the applicant's personnel are adequate in number and training to operate and maintain the project in accordance with the provisions of the license.

(10) If an applicant proposes to expand the project to encompass additional lands, a statement that the applicant has notified, by certified mail, property owners on the additional lands to be encompassed by the project and governmental agencies and subdivisions likely to be interested in or affected by the proposed expansion.

(11) The applicant's electricity consumption efficiency improvement program, as defined under section 10(a)(2)(C) of the Federal Power Act, including:

(i) A statement of the applicant's record of encouraging or assisting its customers to conserve electricity and a description of its plans and capabilities for promoting electricity conservation by its customers; and

(ii) A statement describing the compliance of the applicant's energy conservation programs with any applicable regulatory requirements.

(12) The names and mailing addresses of every Indian tribe with land on which any part of the proposed project would be located or which the applicant reasonably believes would otherwise be affected by the proposed project.

(b) Information to be provided by an applicant who is an existing licensee. An existing licensee that applies for a new license must provide:

(1) The information specified in paragraph (a).

(2) A statement of measures taken or planned by the licensee to ensure safe management, operation, and maintenance of the project, including:

(i) A description of existing and planned operation of the project during flood conditions;

(ii) A discussion of any warning devices used to ensure downstream public safety;

(iii) A discussion of any proposed changes to the operation of the project or downstream development that might affect the existing Emergency Action Plan, as described in Subpart C of Part 12 of this chapter, on file with the Commission;

(iv) A description of existing and planned monitoring devices to detect structural movement or stress, seepage, uplift, equipment failure, or water conduit failure, including a description of the maintenance and monitoring programs used or planned in conjunction with the devices; and

(v) A discussion of the project's employee safety and public safety record, including the number of lost-time accidents involving employees and the record of injury or death to the public within the project boundary.

(3) A description of the current operation of the project, including any constraints that might affect the manner in which the project is operated.

(4) A discussion of the history of the project and record of programs to upgrade the operation and maintenance of the project.

(5) A summary of any generation lost at the project over the last five years because of unscheduled outages, including the cause, duration, and corrective action taken.

(6) A discussion of the licensee's record of compliance with the terms and conditions of the existing license, including a list of all incidents of noncompliance, their disposition, and any documentation relating to each incident.

(7) A discussion of any actions taken by the existing licensee related to the project which affect the public.

(8) A summary of the ownership and operating expenses that would be reduced if the project license were transferred from the existing licensee.

(9) A statement of annual fees paid under Part I of the Federal Power Act for the use of any Federal or Indian lands included within the project boundary.

H.1. EFFICIENCY AND RELIABILITY

The Applicant has over 85 years of experience operating and maintaining hydroelectric resources and a history of providing efficient and reliable electricity at relatively low cost. The Applicant operates 17 hydroelectric facilities, totaling 1,709 megawatts (MW) of installed (nameplate) capacity. Under normal streamflow conditions, these facilities provide approximately 55% of the Applicant's total system generation. The Applicant intends to draw on this extensive experience in operating all of its hydroelectric facilities in the future. The Applicant has operated the Swan Falls Project efficiently and reliably since assuming ownership in 1916 and anticipates continuing to do so.

H.1.1. Plans for Increased Capacity or Generation

The Applicant does not propose to increase capacity or generation at the Swan Falls Project. The Applicant may elect to request license amendments for project modifications to accommodate any new license conditions that may adversely affect project generation to restore or enhance generating efficiencies and economies of the project.

H.1.2. Project Coordination with Other Water Resource Projects

The Applicant owns and operates eight other hydroelectric power plants on the Snake River upstream of Swan Falls Project: C.J. Strike, Bliss, Lower Salmon Falls, Upper Salmon Falls, Twin Falls, Shoshone Falls, Milner, and American Falls. The Milner Power Plant is appurtenant to Milner Dam, which is owned by irrigation and canal entities. The American Falls Power Plant is appurtenant to American Falls Dam, financed and operated by the U.S. Bureau of Reclamation (BOR). In addition to the Applicant's upstream power plants, four federal dams with hydroelectric power plants on the Snake River are located upstream (Jackson Lake, Palisades, American Falls, and Minidoka). The Applicant also owns the Hells Canyon Complex (HCC) downstream of Swan Falls, with three dams and hydroelectric plants.
Four other federal dams and hydroelectric power plants are located on the Snake River downstream of the HCC (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor).

The first upstream project with substantial storage, American Falls, is operated primarily for irrigation and is controlled by the BOR and the Water District Watermaster. The two projects with substantial storage upstream of American Falls—Palisades and Jackson—are operated for flood control by the U.S. Army Corps of Engineers.

Excluding three of the upstream federal dams (Jackson Lake, Palisades, and American Falls), the upstream hydroelectric plants are largely run-of-river plants; that is, they do not have long-term water storage associated with them. Because the hydroelectric projects near the Swan Falls do not have relevant storage and because the federal dams with significant usable storage are hundreds of miles away, daily and weekly operation of Swan Falls is largely independent of the operation of the upstream plants. On a daily basis, the operation of the Swan Falls Project is also largely driven by and coordinated with the operation of the C.J. Strike Project, which is roughly 36 river miles upstream.

H.1.3. Project Coordination with Other Electrical Systems

The Applicant owns and operates the load and generation scheduling, dispatching, transforming, conditioning, and distribution infrastructure throughout southern Idaho and associated with Swan Falls. The Applicant also owns approximately 2,827 MW of hydroelectric and thermal generating capacity in the region, including Swan Falls and currently has 94 long-term, regulated-price contracts with independent power producers for approximately 498 MW of non-dispatchable generation. These resources are an integral part of, and are operated in coordination with, the regional electrical power system.

The Applicant is a member of the Western Electricity Coordinating Council (WECC). The intent of the WECC and its members is to establish performance standards that ensure a reliable electric power system for the western part of the continental United States, Canada, and Mexico. As an integral part of the Applicant's system, the Swan Falls Project is operated according to WECC guidelines.

H.2. SHORT- AND LONG-TERM NEED FOR PROJECT GENERATION

The nameplate capacity of the Swan Falls Project is 27.2 MW. The annual production during normal water conditions is 161,300 megawatt hours (MWh) (net), roughly equivalent to 18.4 average MW. The estimated project capacity during the critical peak planning period for the Applicant (the lowest daily average on record) is 7.5 MW. If no new license were issued, the Applicant would be faced with replacing this energy and capacity at current costs.

The Applicant's 2006 *Integrated Resource Plan* (IRP) (Technical Report H.2-A) identifies the Applicant's current and projected generating capacity and production, as well as current and estimated future loads. The IRP describes the Applicant's ability to provide enough energy to meet the expected peak power demand in each month.

Customer growth is the primary driving force behind the Applicant's need for additional resources. The 2008 Integrated Resource Plan Update (2008 IRP Update) indicates the number of customers in the Applicant's service area is expected to increase from around 480,500 in 2007 to nearly 740,000 customers in 2027. Population growth in southern Idaho is an inescapable fact that the Applicant will need to add significant new physical resources within the 20-year IRP planning horizon to meet the both instantaneous peak and sustained energy needs.

The Swan Falls Project is an inexpensive, clean, and dependable source of electricity for the Applicant. Without this source of power, the Applicant would be forced to increase the size of new physical resources to provide the lost electricity. However, all of the new physical resources have a much higher cost than the Swan Falls Project, and any additional cost resulting from a loss of the Swan Falls Project would be passed onto the Applicant's customers.

H.2.1. Costs and Availability of Alternatives

Estimates of the costs and availability of alternatives are subject to change due to the volatility in the power and natural gas markets, continuing uncertainty about industry restructuring and changing regulatory policies, and the fact that any decision to replace capacity and energy generated by the Swan Falls Project is unlikely to be made until after the application has been reviewed when circumstances are likely to be substantially different. Given these factors, the Applicant considers the following estimates to be preliminary and subject to periodic reassessment based on new developments.

The Applicant's 2006 IRP (Technical Report H.2-A) was used as the basis for evaluating several alternatives that would replace the project. Several options were considered in the IRP, the least-cost options that were more seriously considered included: increasing the size of transmission lines to allow the Applicant to purchase and import more power from the wholesale market, constructing additional wind generators, developing additional demand-side measures, adding nuclear power, adding geothermal generation, and constructing additional conventional coal facilities. However, in the fall of 2007 the political and regulatory climate for new coal plants changed. For all practical purposes, the construction of new conventional coal facilities was no longer feasible.

Based on evaluations of the possible alternatives to the existing project, a combined-cycle natural gas-fired generating resource was determined to be the least expensive and most feasible alternative. All other resources were determined to be either more costly than a combined-cycle natural gas generation facility, or not feasible for other reasons. Purchasing power on the wholesale market and relying on other parties to replace the lost power was not considered to be a viable alternative given the energy deficits that already exist in the northwestern United States and because the wholesale market could fluctuate greatly over the 30-year license period. Additional wind generation was not considered to be a viable alternative because it would not provide the dependable, baseload generation that the Swan Falls Project provides. Developing additional DSM was not considered to be an alternative because the Applicant is already planning to implement considerable DSM in the 30-year license period and further opportunities to increase DSM beyond the IRP plan are minimal. Nuclear power may be feasible, but would require a considerable time period to develop, and would not be generating power until far into the license period. All other options, as listed in the IRP, are more costly than developing a combined-cycle natural gas-fired generation facility.

Based on the above considerations, the estimated cost of alternative sources of power is based on the estimated cost of procuring and operating new natural gas generation resources, specifically, a combined-cycle gas plant. The Applicant estimates that a minimum of four years would be needed to develop a new natural gas generating resource to replace the existing Swan Falls Project's generation and capacity.

In the 2006 IRP, the Applicant identified the need to construct a 250 MW baseload resource by 2013. If the Swan Falls Project was not available for generation, the Applicant would likely increase the size of this plant to 270 MW, which reflects the addition of 20 average annual MW (assuming the Swan Falls Project provides 18.4 average MW during a normal water year and an 85% availability factor for natural gas generation facilities). Also, because power from a small power plant would be proportionately more expensive than power from a large, efficient plant, the Applicant based power replacement estimates on a percentage of power from the proposed 270 MW combined-cycle gas facility.

H.2.2. Replacement Costs of Alternatives and Increase in Costs If License Not Granted

The estimated 30-year average annual levelized cost of owning and operating the Swan Falls Project, starting in August 2010 and including the costs of the Applicant’s proposed protection, mitigation, and enhancement (PM&E) measures is $7.2 million ($6.7 million before proposed PM&E measures). The expected minimum cost to replace the Swan Falls Project’s generation and capacity with new combined-cycle natural gas-fired turbine generators, also starting in August 2010, is $16.8 million annually. These estimates are based on 2005 costs escalated to 2010 at an annual inflation rate of 3%.

The costs associated with replacing the hydroelectric generation from the Swan Falls Project with natural gas turbines include a conservative estimate of the costs of the probable air pollution and greenhouse gas emissions that would result from this new fossil fuel generation. Generating 161,300 MWh of energy each year with a combined-cycle natural gas-fired turbine would likely produce approximately 60,142,000 kilograms (kg) of carbon dioxide. Over a 30-year period, these emissions equate to 1,804,236,000 kg of carbon dioxide. Significant amounts of other pollutants, such as carbon monoxide and particulates would also be emitted over the life of the project. The quantity of carbon dioxide produced by generating electricity each year with natural gas-fired turbines will have much greater greenhouse gas emissions than the relatively small amount of methane produced annually by anaerobic decomposition in the Swan Falls Reservoir. In the 2006 IRP, the Applicant attempted to provide market-based estimates of air pollution costs to society where the air pollution costs of a combined-cycle natural gas-fired facility were estimated as approximately $7.50 per MWh on average for the 2010–2039 period. The Applicant's cost estimates for power replacement assume that the costs of the other environmental impacts associated with natural gas-fired turbines are included in the estimated fuel costs. These impacts include the long-term costs of consumption of finite natural resources and of environmental impacts resulting from natural gas production and transmission.

H.2.3. Effects of Alternative Sources of Capacity and Generation

H.2.3.1. Effects on Customers

Under current laws and regulations governing the Applicant's operations, dependence on any viable alternative to the existing project would raise the electrical service costs for the Applicant's existing customers. The Applicant is a regulated, asset-based, vertically integrated electric utility company. As such, most of the costs of power production, procurement, and distribution are passed directly on to residential, irrigation, commercial, and industrial customers within the Applicant's service territory. Distribution of costs between customer classes is regulated by state public utility commissions. Because each of the alternatives to the Swan Falls Project is, under current conditions, more expensive than the existing project, replacing the existing project with any other viable alternative would increase the power costs for the entire service territory.

If the Swan Falls Project were replaced with an alternative power source, the effect on the Applicant's wholesale customers would be the same or similar to the effect on the Applicant's other customers—their cost of power would increase. The distribution of higher costs between customer classes is under the jurisdiction of the state public utilities commissions, in accordance with existing laws and regulations.

Currently, and for the foreseeable future, when the Applicant has surplus generation—a scenario that occurs intermittently throughout any year—the Applicant sells this generation via a wholesale power market or other approved contract mechanism. Because no buyer of the Applicant's surplus power is compelled to purchase surplus power from the Applicant, no individual wholesale customer can be identified as harmed if the Applicant must depend on a higher-cost alternative to the existing project. However, if the Swan Falls Project were not licensed to continue operation, a low-cost source of power would be eliminated from the northwestern United States. In the short term, given current capacity deficits in the western United States, if the Swan Falls Project's capacity and generation were lost, the cost of power for all wholesale power buyers in the western United States would likely increase.

H.2.3.2. Effects on Operating and Load Characteristics

The Applicant has decided to pursue the permitting of most of the associated transmission and transmission substation resources separately from the Swan Falls Project license. Therefore, for this analysis, the Applicant assumes that the associated transmission and transmission substation resources would be retained by the Applicant regardless of whether the Swan Falls Project was relicensed.

Replacement of the Swan Falls Project with any credible alternative power source would be expected to have relatively few impacts on the operating characteristics of the Applicant's electrical system. The principal expected impact would be a loss of power supply. For the long term, thermal and, by extension, market purchase resources are much less reliable economically because of potential volatility in fuel price, as well as in supply and environmental risks. Because any alternative power source would be substantially more expensive than the existing project, loss of the project license would increase power costs of the Applicant's customers.

H.2.3.3. Effects on Communities Served

The communities served are the residential and business customers described in section H.2.3.1. Under current law, conversion to any alternative would probably increase power costs for all consumers and communities within the Applicant's service territory (see section H.2.3.1).

If the license were transferred to a different licensee, the project's low-cost power benefits, and most of the operating costs, would be transferred to the new licensee's customers. Therefore, transferring the project license from the existing licensee would reallocate the project benefits, and most of the costs, away from the power users in the Applicant's service territory. This reallocation would raise the cost of power to consumers living in the project region, while reducing the power costs to the new licensee's customers. If the Swan Falls Project license were transferred, accurately estimating the increase in power costs to the communities served would be difficult. In addition, since construction of the Swan Falls Project, several population centers near the project have grown significantly and many people enjoy the convenience of recreation offered at the Swan Falls Project because it is relatively close to the major population centers.

H.3. COST, NEED, AND AVAILABILITY OF ALTERNATIVES

The following sections address specific costs, needs, and availability of the identified alternative resources.

H.3.1. Cost

The estimated annual cost of the existing project is $7.2 million. This annual cost includes the cost of capital, property taxes, operation and maintenance, and other expense components. The annual estimated cost of capital for the Swan Falls Project represents levelized costs over an assumed 30-year license period (2010–2039) and is the Applicant's annual revenue requirement. Estimated annual operation and maintenance (O&M), property taxes, and other expenses are derived from the averages of the annual escalated cash outflows expected over the license period. Because these estimates are based on current information, they could change as new information is obtained. The economic parameters used in the estimations are an escalation rate of 3%, based on an annual trend of consumer price inflation; a discount rate of 7.16%, based on the Applicant's authorized capital structure; and an assumed 30-year license period.

Over a 30-year license period, the annual costs for the project in 2010 dollars, including costs of proposed PM&E measures, are estimated to be $5.2 million in cost of capital, $0.5 million in property taxes, $1.2 million in O&M, and $0.3 million in other expenses. Based on these costs, the estimated 30-year annual power production cost for the Swan Falls Project, starting in August 2010, is $7.2 million for a projected average annual generation of 161,300 MWh. Assuming average annual generation at the project of 161,300 MWH, this annual cost estimate equates to a projected production cost of $45 per MWh. The actual project production cost could differ if additional PM&E measures were required under the conditions of a new license.

Information regarding the PM&E measures the Applicant proposes as conditions of a new license can be found in Exhibit E.

The Applicant is providing the total cost of the project over the 30-year license period with no assumed escalation. The base year for cost estimating purposes is 2010. The total costs for the project, with no assumed escalation, including costs of proposed PM&E measures, are estimated to be $134.6 million in cost of capital, $8.8 million in property taxes, $26.3 million in operations and maintenance, and $7.1 million in other expenses.

H.3.2. Need

The Applicant's projected capacity and energy requirements over the short and long term are shown in the Applicant's 2006 IRP (Technical Report H.2-A). The Applicant expects to meet these power demands by using four primary sources of energy and capacity. These sources are the Applicant's power plants (both hydroelectric and thermal), power purchase contracts with multiple cogeneration and small power producers (CSPP) throughout the Applicant's service area, and both short- and long-term power purchase contracts.

As shown in the sales and load forecast in the 2008 IRP Update, the Applicant includes the projected resources required to meet its capacity and energy requirements over the short and long term. In 2007, the average system-wide load was approximately 1,800 MW for the year, and the peak-hour load was as high as 3,193 MW in the summertime. It is expected that summertime peak-hour loads will increase by 70 MW per year. The high summertime peak loads usually exceed the combined generation from CSPP projects and the Applicant's generation assets, including the Swan Falls Project. The 2008 IRP Update also states that the lack of available transmission capacity limits the Applicant's ability to import additional energy during the summertime. The loss of the Swan Falls Project's capacity and energy would directly increase these deficits in the summertime. The IRP (Technical Report H.2-A) provides greater detail on the Applicant's expected future loads and generating capacity, including estimated ranges for different river flows and regional demand growth.

H.3.2.1. Resources Required

The Applicant plans to supply the regional power demands for the foreseeable future by using four primary sources of energy and capacity. These sources are the Applicant's power plants, power purchase contracts with multiple CSPPs throughout the Applicant's service area, and both short- and long-term power purchase contracts. The Applicant also has near-term plans to either construct or acquire energy from a number of generation resources, including a combined-cycle gas-fired turbine, wind, and geothermal generation projects.

Including the Swan Falls Project, the Applicant has interests in the following long-term generating and power supply resources:

- The Applicant owns 17 hydroelectric power plants in the Snake River basin, with an aggregate nameplate capacity of 1,709 MW.
- The Applicant is a joint owner of three coal-fired generating facilities. The Applicant's share of the capacity of these three facilities is approximately 1,118 MW.
- The Applicant owns four simple-cycle natural gas-fired turbines near Mountain Home, Idaho that provide 436 MW of peaking capacity.
- The Applicant owns two dispatchable 2.5-MW diesel generators in Salmon, Idaho.
- The Applicant currently has long-term power purchase contracts with 94 CSPP projects, with a total non-coincident and non-dispatchable capacity of approximately 498 MW.
- The Applicant may also seek approval to increase capacity at its other hydroelectric facilities, if economically prudent.

The Applicant expects to supply power for part of its future loads with both long- and short-term wholesale market purchases, as well as through bilateral capacity and generation contracts. The

Applicant has participated in wholesale power markets and has intermittently had seasonal power exchange contracts for many years.

In the Applicant's 2008 IRP Update and this application, reductions in load due to Demand-Side Management (DSM) programs are accounted for in the Applicant's projected loads and not as supply-side resources. In 2007, DSM programs resulted in total annual savings of over 7 average MW (aMW) and approximately 57 MW in peak demand savings in the Applicant's system-wide load. The Applicant currently supports 12 different energy efficiency and 2 demand-response programs. In addition to these incentive programs, the Applicant manages customer education initiatives, a Local Energy Efficiency Fund program, and—since the mid-1990s—helped fund the Northwest Energy Efficiency Alliance (NEEA).

NEEA's mission is to promote the market transformation of energy efficiencies in the region and thereby maximize the conservation benefits resulting from participants' expenditures. NEEA's programs are believed to create compounding benefits, resulting in higher energy savings each successive year. In 2007, NEEA estimated the Applicant's annual savings attributed to NEEA funding to be 3.3 aMW. Because NEEA's initiatives are designed to promote market transformations rather than simply reduce discreet power demands at specific locations, the load reduction benefits of NEEA's programs are considered to be distributed throughout the northwestern United States and globally, rather than just in the Applicant's service area.

With direction and approval from the Idaho Public Utilities Commission (IPUC), the Applicant began a new set of energy efficiency and demand-response programs, partially in response to the wholesale power market disruptions that occurred in 2000 and 2001. In May 2002, the Applicant applied to the IPUC for an Energy Efficiency Rider that, when approved, created a specific funding source for energy efficiency and demand-response programs. The rider appears as a separate line item on customers' bills. An Energy Efficiency Rider was approved by the OPUC in 2005. Income from these tariffs are used to implement energy efficiency measures in the Applicant's Idaho and Oregon service territories. The Applicant's energy efficiency programs and initiatives are designed with input from the Energy Efficiency Advisory Group, comprised of representatives of various interest groups from throughout the Applicant's service area. In early 2002, the Applicant began receiving funding from the Bonneville Power Administration (BPA) under the Conservation and Renewables Discount Program, which later became the Conservation Rate Credit Program. These BPA funds were used to offer new energy efficiency programs designed to reduce the demand for electricity within the Applicant's service area. However, the BPA programs were suspended in March of 2007.

In addition to its contributions to NEEA and the offering of programs and initiatives funded by the Energy Efficiency Riders, the Applicant continues to support energy efficiency programs sponsored by the Northwest Power and Conservation Council (NWPCC) and the BPA, as well as the Weatherization Assistance for Qualified Customers programs and the Oregon Commercial Audit Program.

H.3.2.2. Resource Analysis and Planning Criteria

The Applicant's current resource analysis is the 2006 IRP (Technical Report H.2-A) and the 2008 IRP Update. Current and projected available resources and needs are described in detail in the IRP and briefly in section H.1 and section H.2. The 2006 IRP also provides a thorough discussion of the planning criteria used.

Though relatively small, the Swan Falls Project is a dependable part of the Applicant's mix of power resources. With consistent load growth in the Applicant's service territory and transmission and other constraints limiting the availability of replacement resources at comparable costs, the Swan Falls Project is expected to remain important to the Applicant's ability to provide reliable and economic electric service to its customers.

Because the Swan Falls Project is a run-of-river project with negligible active storage, the reserve margin for this project is normally not accounted to the Swan Falls Project. Instead, this reserve margin is typically pooled with the Applicant's reserve margins for its other projects and assigned to those that have reservoirs with active storage.

H.3.2.3. Load Management

In cooperation with regional regulatory agencies and others, the Applicant has implemented DSM over the years to offset load growth (see section H.3.2.1). During times of extremely high wholesale prices, the Applicant has also created short-term programs to compensate its large power users for temporarily reducing load. However, over the past 25 years, load growth has been substantial and steady in the Applicant's service area, mainly because of population and economic growth. The peak-hour load growth in the Applicant's service area is estimated to average 70 MW per year, nearly three times the peak capacity of the Swan Falls Project. Therefore, although new load management measures might offset demand equal to the Swan Falls Project's capacity and energy, such measures would ultimately not reduce the need for the project's capacity and generation because of the concurrent growth in the Applicant's capacity and energ load.

H.3.3. Alternative Sources of Power

Chapter 5 of the Applicant's IRP (Technical Report H.2-A) describes the resource options evaluated by the Applicant for future load growth. The options evaluated include market purchases concurrent with additions to transmission-system capacity; seasonal exchanges; acquisition of power from the Federal Columbia River Power System (FCRPS); new hydroelectric and thermal generating resources; power generation via renewable resources, including solar, wind, and geothermal resources; energy storage systems; and distributed ("near-point-of-use") generation resources. In addition to these alternatives, the Applicant continues to support several demand-side programs, as described in section H.3.2.1.

The most feasible alternative to the Swan Falls Project's generation and capacity is a percentage of a new, large, combined-cycle natural gas-fired turbine. This conclusion is based on information in the IRP, current energy prices, and the Applicant's extensive experience with alternative power supplies, wholesale market trading, and demand-side programs. To match the Swan Falls Project's average annual generation and peak-hour capacity under normal water conditions (161,300 MWh), the least-cost alternative estimate was based on producing the existing project's annual generation with a combined-cycle natural gas-fired turbine having an 85% availability factor.

H.3.3.1. Total Annual Cost of Alternatives

The estimated annual cost of owning and operating the Swan Falls Project, beginning in August 2010, including costs associated with PM&E measures being proposed, is $7.2 million. The estimated annual cost to replace the current Swan Falls Project energy and capacity with generation from a combined-cycle natural gas-fired turbines, starting in August 2010, is $16.8 million. The economic parameters used in both estimations are an escalation rate of 3% based on an annual trend forecast of consumer price inflation, a discount rate of 7.16% based on the Applicant's authorized capital structure, and an assumed 30-year license period. All cost estimates for a combined-cycle natural gas-fired turbine are from the Applicant's 2006 IRP except where noted otherwise. The estimated cost for replacing the Swan Falls Project does not include any continuing costs for maintaining or mitigating the existing project.

H.3.3.2. Bases of Alternative Cost Estimates

The estimated cost of a new combined-cycle natural gas-fired resource equivalent to the Swan Falls Project capacity and energy is based on the following information:

Swan Falls average energy production, normal wateryear	161,300 MWh
Swan Falls average megawatt, normal water year	18.4 MW
Required equivalent natural gas replacement energy	161,300 MWh
Equivalent required size of natural gas plant, assuming an 85% availability factor	21.6 MW

For this application, the estimated cost of new, natural gas generation is based on replacing the Swan Falls energy with a combined-cycle natural gas-fired turbine that would produce an equivalent amount of energy over the year. The annual estimated cost of capital component for the natural gas turbine represents the levelized costs over an assumed 30-year period (2010–2039) and is the Applicant's estimated annual revenue requirement. The Applicant also provides the total cost of capital for the replacement turbine with and without assumed escalation. The natural gas price used for the analysis is based upon the NWPCC's 2007 natural gas proce forecast. Annual fuel costs have been stated in both current dollars (no escalation) and on an average escalated basis over the assumed 30-year period using a current trend of consumer price inflation.

Annual estimates for fixed and variable O&M are stated in both current dollars and on an average annual escalated basis over the assumed 30-year period. The base year for cost-estimating purposes is 2010.

Capacity needed to replace 161,300 MWh/year @ 85% capacity factor	21.6 MW
Construction cost of 270 MW combined-cycle gas generation at $1,206/kW	$325,600,000
Proportional construction cost of 21.6 MW of the facility	$26,100,000
Annual levelized cost of capital, 30-year facility life	$35,044,000/year
Proportional annual levelized cost of capital (21.6 MW; 30-year facility life)	$2,800,000/year
Average annual fuel cost for 21.6 MW combined-cycle gas generation assuming NWPCC 2007 forecast gas prices (real dollars)	$7,400,000/year
Average annual fuel cost for 21.6 MW combined-cycle gas generation assuming NWPCC 2007 forecast gas prices (nominal dollars)	
Fixed annual O&M cost for 21.6 MW combined-cycle gas generation ($19.30/kW × 21,600 kW)	$417,000/year
Average annual escalated fixed O&M for 21.6 MW combined-cycle gas generation over a 30-year period	$489,000/year
Variable annual O&M cost for 21.6 MW combined-cycle gas generation ($3.00/MWh × 161,300 MWh)	$484,000/year
Average annual escalated variable O&M for 21.6 MW combined-cycle gas generation over a 30-year period	$767,000/year
Annual emissions costs for 21.6 MW combined-cycle gas generation	$903,000/year
Average annual escalated emissions costs for 21.6 MW combined-cycle gas generation over a 30-year period	$1,200,000/year
Total estimated annual costs, 21.6 MW replacement combined-cycle gas generation—no escalation assumed	$12,040,000/year
Total estimated annual costs, 20 MW replacement combined-cycle gas generation—escalation assumed	$16,800,000/year
Total cost of replacement combined-cycle gas generation: (30-year, present value)	$183,750,000

H.3.3.3. Relative Merits of Alternative Generating Resources

Compared with alternative power sources, the existing Swan Falls Project has an exceptional availability factor. Hydroelectric power plants, including the Swan Falls Plant, are inherently more robust and less prone to outages from system disruptions or mechanical breakdowns than even the most reliable natural gas-fired plants. Therefore, they have better availability over the short term. Also, because hydroelectric plants are relatively immune to long-term variability in the fuel markets, while new natural gas generation market purchases are highly dependent on fuel prices and variability in the power market, hydroelectric plants are more economically reliable over the long term. However, the dependability of many hydroelectric plants, including those in the Snake River Basin, is affected by streamflows, which can vary considerably from year to year. Though, even during the lowest daily average on record, the Swan Falls Project can provide 7.5 MW of dependable generation. Therefore, for any planning period, the Swan Falls Project has better dependability and availability than a natural gas-fired facility.

For the Applicant’s analyses, the project life of each alternative was set at 30 years. If a new license is granted to the Applicant, its period will be limited; therefore, the Applicant cannot base an economic analysis on an indefinite operating life for the project. However, from a regional, economic perspective, the 30-year lifespan somewhat undervalues the existing project relative to the alternative natural gas-fired turbine. The reliable physical life and operating cost of the Swan Falls Project is considerably greater than 30 years, while the reliable life and operating cost of a natural gas-fired turbine or market purchases would probably not extend beyond 30 years. If the cost of each alternative were estimated using a longer period, such as 50 or 100 years, the costs for the natural gas-fired turbine and market purchase alternatives would be somewhat higher relative to the cost of the existing project. The difference in price would reflect the considerably greater risk of significant changes from external influences such as fuel price volatility or emission-reduction mandates.

Overall, differences between alternatives are probably not significant for short-term system reliability and other operating characteristics. Although the alternatives to the existing project are inherently less reliable and because the Swan Falls Project is a relatively small component of the Applicant’s generating resources, replacing its generation and capacity with a new natural gas-fired turbine would probably not significantly affect the Applicant’s system reliability and stability.

H.3.4. Effect of Alternate Sources on Direct Providers

Because power from any of the viable alternatives to the existing project would be considerably more expensive than power from the existing project, any alternative source of power would probably raise the power costs to any direct providers served by contract sales from the Applicant and, in turn, to their customers. Therefore, the Applicant anticipated having only one or two small, off-system sales contracts active as of January 2006.

H.4. EFFECT ON APPLICANT INDUSTRIAL FACILITIES AND RELATED OPERATIONS

The Applicant does not operate any industrial facilities dependent on the power production from the Swan Falls Project.

H.5. INDIAN TRIBE NEED FOR ELECTRICITY

The Applicant is not an Indian tribe.

H.6. IMPACTS ON THE TRANSMISSION SYSTEM

This section includes an analysis of the potential impacts on the Applicant’s transmission system if a new license were not issued to the Applicant.

H.6.1. Redistribution of Power Flows

The Swan Falls Power Plant is connected to the interconnected transmission system by a 138-kilovolt (kV) wood pole H-frame transmission line (Swan Falls Tap [Line 954]). The Swan Falls Tap extends from the power plant east for 1.2 miles, rising out of the canyon and across the plain, to connect into the Strike Junction–Caldwell 138-kV transmission line (Line 920). The Swan Falls Tap serves no other purpose than to transmit power from the power plant to the interconnected transmission system. Redistributing power flows on the transmission system is possible without the energy contributions of this plant.

If the project were not relicensed, replacement power to help meet loads in the vicinity of the project would either enter the area from outside sources, which would increase the loading on transmission facilities along the way, or from newly constructed local generation, which would probably have little additional effect on the backbone transmission system. The farther away the power-generating resource, the greater the required size of the resource to replace the 18.4 average MW of lost generation due to transmission line losses. Replacement energy either imported from outside the Applicant's control area or delivered over the backbone transmission system from native generation would necessitate additional transmission or generation capacity to alleviate eventual transmission-line constraints. Constructing a new 138-kV transmission line could cost between $150,000 and $300,000 per mile, and a new 230-kV line, between $300,000 and $600,000 per mile. Additional voltage support requirements would be minimal and probably made up locally.

If the new license were awarded to an entity other than the Applicant, one that would operate the facilities in much the same way as the Applicant has, neither the transmission system nor its operation would likely be adversely affected.

H.6.2. Advantages of Applicant's Transmission System

The existing transmission system is sufficiently adequate to accommodate local area loads without contributions from the Swan Falls Project.

H.6.3. Single-Line Diagram

A single-line diagram showing existing system facilities, transmission elements, and other principal interconnected system elements is included in Figure H-1.

H.7. PLANS TO MODIFY PROJECT AND CONFORMANCE WITH COMPREHENSIVE PLANS

The Applicant proposes no generating plant modifications unless new license conditions are mandated that would economically justify appropriate project modifications to restore or enhance generating efficiencies and economies. If such modifications were pursued, an assessment of whether the proposed modifications comply with applicable comprehensive plans would be made at that time.

H.8. CONFORMANCE WITH COMPREHENSIVE PLANS UNDER EXISTING CONDITIONS

Section 10 of the Federal Power Act, as amended, stipulates that the Federal Power Commission (FPC, now the Federal Energy Regulatory Commission [FERC]) will select the project best adapted to a comprehensive plan for improving or developing a waterway for the use or benefit of interstate or foreign commerce; for the improvement and use of waterpower development; for the adequate PM&E of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e) of the act.

In recent FERC orders issuing new licenses for C.J. Strike (Project No. 2055), Bliss (Project No. 1975), Lower Salmon Falls (Project No. 2061), Upper Salmon Falls (Project No. 2777), and Shoshone Falls (Project No. 2778), FERC concluded that there were no conflicts between applicable comprehensive plans and the projects.[1] Swan Falls is operated in coordination with each of these projects and is largely dependent upon operations at C.J. Strike, which is about 36 river miles upstream from Swan Falls Dam. Therefore, consistent with the above referenced projects, it is anticipated that the Swan Falls Project will not be in conflict with applicable comprehensive plans.

H.9. FINANCIAL AND PERSONNEL RESOURCES

H.9.1. Financial Resources

Past performance has proven that the Applicant’s sources of financing and annual revenues are sufficient to meet the continuing O&M requirements of all its hydroelectric projects. Technical Report H.9-A includes a copy of the Applicant’s latest annual report to its shareholders.

---

[1] See FERC *Order Issuing New License* dated August 4, 2004, for each project.

H.9.2. Personnel Resources

The Applicant has over eight decades of experience operating and maintaining hydroelectric projects. Past performance has demonstrated the Applicant's ability and commitment to operate all projects in a safe, efficient manner and in accordance with license orders. Currently, the Applicant employs approximately 2,000 people. Of these, approximately 180 people are assigned directly to operating and maintaining the hydroelectric power plants, with many others providing corporate office; transmission, distribution, and communications systems; and other support to the hydroelectric production resources. Four of the Applicant's employees work full time on site within the Swan Falls Project boundaries, operating and maintaining the project facilities. In addition, the Applicant regularly retains independent contractors for other system maintenance, repairs, and improvements and for technical assistance. The plant operating and maintenance personnel receive extensive training to ensure competency and familiarity with the project facilities and with the license and other regulatory and legal requirements. Each of the plant operators is required to receive training customized for hydroelectric specialists, including classroom time and formal testing. The maintenance personnel have expertise in stator rewinds, turbine repair, bearing repair, spill gate rehabilitation, and complete hydroelectric generator unit renovations.

Although changes in O&M requirements, as well as changing requirements for providing administrative, security, and surveillance support, can be expected to dictate future staffing adjustments, the Applicant believes that its history of operating and maintaining its developments is strong evidence of its ability to continue to comply with the terms of a new license.

H.10. EXPANSION NOTIFICATION

The Applicant has no plans to expand the Swan Falls Project boundary to encompass additional land.

H.11. ELECTRICITY CONSUMPTION EFFICIENCY IMPROVEMENT PROGRAM

H.11.1. Customer Energy Efficiency Programs

Although the Applicant has encouraged DSM programs and promoted the wise use of energy since the mid-1970s, it has dramatically increased its efforts since 2002. The Applicant's current DSM and energy efficiency programs are described in Appendix B, *Demand-Side Management 2007 Annual Report* (Technical Report H.3-A). In 2007, the Applicant's energy efficiency programs resulted in total annual savings of over 7 aMW in the Applicant's system-wide load. As described in the IRP, the Applicant continues to support several energy efficiency and demand-response programs. As described in section H.3.2.1, in May 2002 the Applicant applied to the IPUC for an Energy Efficiency Rider that created a specific funding source for energy efficiency and demand-response programs. The rider appears as a separate line item on customers' bills. Income from this tariff is used to implement energy efficiency measures in the Applicant's service area. These measures are designed with input from the Energy Efficiency Advisory Group, comprised of representatives of various interest groups from throughout the Applicant's service area.

NEEA's mission is to promote the market transformation of energy efficiencies in the region to maximize the conservation benefits resulting from participants' expenditures. NEEA's programs are believed to create compounding benefits, resulting in higher energy savings each successive year. Because NEEA's initiatives are designed to promote market transformations rather than simply reduce discreet power demands at specific locations, the load reduction benefits of NEEA's programs are considered to be distributed throughout the northwestern United States and globally, rather than just in the Applicant's service area.

In addition to its contributions to NEEA and the programs supported by the Energy Efficiency Rider as approved by the IPUC, the Applicant continues to support energy conservation programs sponsored by the Northwest Power Planning Council and the BPA, as well as the Weatherization Assistance for Qualified Customers programs and the Oregon Commercial Audit Program.

The Applicant also participates in Project Share, a program operated by the Salvation Army to assist low-income residents with home heating bills. Project Share helps these families by paying for furnace repairs or improvements and for firewood, coal, propane, oil, electricity, or gas heating costs. The Applicant solicits contributions to Project Share as a component of each customer's bill, and then receives and transfers all Project Share contributions to the Salvation Army. In addition, the Applicant matches 10% of all customer contributions and normally contributes an additional $25,000 to the program each year. In 2001, to help mitigate the impact of an extraordinary spike in energy costs, the Applicant contributed an additional $100,000 to the program for a total corporate contribution of approximately $139,000, plus approximately $138,000 contributed by the Applicant's customers. In 2002, the Applicant contributed $42,930 to Project Share.

In 2001, in response to an extraordinary spike in wholesale power costs that was concurrent with a regional drought, the Applicant implemented a temporary incentive program to reduce the 2001 peak summer power demand. The incentive amount paid for load reductions for this limited period was 150 mills/kWh. This incentive payment, which was based on bids made by irrigation customers throughout the Applicant's service area, resulted in a 30% decrease in the annual overall energy consumption by the irrigation sector of the Applicant's load base, equating to a peak irrigation load reduction estimated at 250 MW. There was a parallel industrial load reduction measure also implemented for this period: one of the Applicant's industrial customers was paid 150 mills/kWh to reduce its load by approximately 50 MW.

H.11.2. Compliance with Energy Conservation Regulatory Requirements

The Applicant's energy conservation programs comply with all known regulatory requirements.

H.12. TRIBE MAILING LIST

No part of the project is located on Native American land. However, the Shoshone–Bannock Tribes and the Shoshone–Paiute Tribes were consulted during the development of the license application. The Burns Paiute and Fort McDermitt Tribes also were contacted for consultation after the draft *New License Application: Swan Falls Hydroelectric Project* was submitted in September 2007. The following are the addresses of the consulted tribes.

Shoshone–Bannock Tribes
P.O. Box 306
Fort Hall, ID 83203

Shoshone–Paiute Tribes
P.O. Box 219
Owyhee, NV 89832-0219

Burns Paiute Tribe
100 Pasigo Street
Burns, OR 97720

Fort McDermitt Paiute and Shoshone Tribe
P.O. Box 457
McDermitt, NV 89421

H.13. MANAGEMENT, OPERATION, AND MAINTENANCE MEASURES

The Applicant maintains state-of-the-art dam and plant safety, employee safety, and public safety programs. These programs, based both on industry risk management and FERC standards, are designed to minimize risks to the community, the public, the Applicant's operating personnel, the environment, and the physical plant. Each of the Applicant's safety programs is managed by full-time professional personnel who ensure that any identifiable risks are discovered and minimized. The resources assigned to each of the safety programs are described in the following sections.

H.13.1. Operation During Flood Conditions

Because the project has negligible reservoir storage, potential risks are minimal to the public and other downstream interests during flood conditions. If the project experienced inflows large enough to cause dam overtopping and failure, the effect would probably not be noticeable downstream because the temporarily increased flow from the dam failure would be dwarfed by the preceding flow. Nonetheless, in accordance with license article 30, the Applicant maintains the Emergency Action Plan (EAP) (on file with FERC) to prescribe operating and notification procedures during emergency conditions. Annually, the Applicant tests the EAP’s notification procedures and ensures that all operating personnel receive formal training in EAP objectives and procedures. Quarterly, plant operating personnel review the EAP to maintain familiarity with it and to update notification data if needed. The EAP’s guidelines and notification flow charts help the Applicant take all the appropriate actions to protect the public and provide people downstream with early warning about emergency conditions.

The probable maximum flood for various locations along the Snake River has been reviewed repeatedly. These studies have concluded the Swan Falls Project can safely pass the probable maximum flood without endangering the stability of any of the dam or reservoir.

H.13.2. Warning Devices for Downstream Public Safety

The Applicant is vitally concerned about public safety at the project, as well as downstream and upstream of the project. To minimize risk to the public, potentially hazardous areas are secured against public entry to the extent practical. Multiple warning devices, including sirens, signs, warning buoys, and boat barriers, have also been installed to warn the public of hazards and guide them to safe areas. The Applicant’s public safety plans are described in the Public Safety Program (Technical Report H.13-A).

The Applicant’s personnel observe the project daily and inspect it weekly, monthly, and biannually to ensure that measures and devices designed to protect the public are maintained and working. In addition, personnel inspect the entire project biannually to identify potential hazards that may have been overlooked. After each inspection, the Applicant aggressively monitors the status of recommended changes to ensure that they are implemented.

Besides using safety and warning devices at its project, the Applicant, in concert with various local and state entities, supports public education programs on water safety, such as Water Awareness Week. Developed by the Idaho Department of Water Resources and others, including the Applicant, this program instructs elementary school children throughout Idaho on basic water safety concepts, focusing primarily on water safety in and around reservoirs, dams, and rivers. The Applicant continues to contribute financially to this program.

H.13.3. Proposed Changes That Might Affect the Emergency Action Plans

The Applicant proposes no changes to the operation of the project that would be expected to affect the existing EAPs, nor has any downstream development occurred that would affect the EAPs. In accordance with current FERC standards, the EAPs are reviewed and updated annually to ensure that any downstream development or changes in operation are accurately reflected in the plans. Copies of the updated plans are then distributed to all plan holders, including all regional emergency response agencies.

H.13.4. Existing and Planned Monitoring Devices

The Dam Safety Checklist (Technical Report H.13-B) identifies the inspections and monitoring devices used to detect structural movement or stress, seepage, uplift, or failure of equipment or water conduits. Most Swan Falls Project components are easily monitored by observation and inspection for adequacy and stability, so they are not instrumented. Because the project facilities are observed daily and inspected weekly, monthly, and biannually, any unusual or potentially damaging conditions can be observed fairly quickly. Annually, the Applicant's dam safety engineer performs a complete inspection of the entire project, using a checklist similar to the dam operators' monthly inspection checklists. In addition to monthly and annual inspections, a precise settlement and alignment survey is performed to discover any movement of the structure. The plant operating and electrical equipment is also extensively instrumented with monitoring devices and alarms to immediately notify operators and the Generation Dispatch Center in Boise of equipment problems or failures.

H.13.5. Safety Record

In addition to the structural safety program described in section H.13.4, the Applicant operates state-of-the-art employee and public safety programs to eliminate risks to employees and the public. The Applicant has an overall employee safety record that is among the best of like-sized utilities in the nation. Currently, the Applicant's Corporate Safety Department is staffed by 10 full-time, professional safety consultants who manage the Applicant's employee and public safety programs. Also, teams composed of safety department and operating employees inspect projects biannually to identify and correct potential hazards to the public.

As part of the Applicant's safety programs, all operating employees are required to attend regular safety training classes throughout the year to ensure that they have the ability and direction to recognize and correct potential hazards.

A recent audit of the Applicant's accident records determined that no "lost-time" accidents involving employees or contractors have been recorded or attributed to operations and maintenance of the Swan Falls Project. Since the new license was issued, three accidents unrelated to the project are known to have occurred within the project boundary. However, no public safety accidents related to project operations have occurred.

H.14. CURRENT OPERATION

The project is currently operated to comply with existing license requirements and other constraints adopted subsequent to the new license being issued. Descriptions of proposed project operations and proposed license constraints are contained in Exhibit B and in sections H.1.2, H.1.3, H.2.3.2, H.3.2, H.3.3.1, and H.6.

H.15. PROJECT HISTORY

The Swan Falls Project was the first dam built on the Snake River. The site was first dammed for power generation by The Trade Dollar Consolidated Mining Company in 1901. The early dam was a crib-type dam and was constructed by bolting timbers to the rock bottom, filling in behind them with rock, and then covering the crib with timber planking. The power was generated with three 300-kW generators that used a shaft and belt system to connect to four vertical turbines. Since then, the plant, dam, and spillway have undergone several additions, modifications, and reconstructions. The most recent reconstruction to the spillway occurred in 1987 when the spillways were completely reconstructed. The most recent reconstruction to the powerhouse occurred in 1994 when the powerhouse was rebuilt and two modern 1,250-kW, Kaplin-type turbines were constructed. At that time, all of the old turbines and generators were decommissioned. The following outlines the project's construction and major repairs and upgrades:

Description of Work	Year of Completion
Installation of the crib dam and powerhouse with three 300-kW units	1901
Addition of the powerhouse with two 700-kW units	1907
Addition of a powerhouse with two 1,282.5-kW units	1910
Reconstruction of the original 1901 powerhouse, installation of two 1,250-kW units, and removal of the three original 300-kW units	1913
Reconstruction of the original crib dam	1917
Addition of two 1,250-kW units in the reconstructed 1901 powerhouse, addition of four 800-kW units, and removal of the two 700-kW units	1918
Installation of a new concrete spillway with tainter gates to replace a section of the original crib dam	1920
Construction of an embankment at the west abutment to replace a section of the original crib dam and extension of concrete spillway	1936
Replacement of two 1,282.5-kW units in the 1910 powerhouse with two 1,100-kW units	1944
Removal of the original spillway and construction of a new spillway	1986
Reconstruction of the powerhouse, to add two 1,250-kW, Kaplin-type generators	1994

H.16. GENERATION LOST DUE TO OUTAGES

Table H-1 describes the most recent five-year history of outages by unit, cause, duration, and reason. In the five year period from January 1, 2000, through January 26, 2007, the estimated total of lost power due to unscheduled outages was 867 MWh. This estimate is approximately 0.2% of the electrical energy produced at this plant during the same period.

H.17. RECORD OF COMPLIANCE

The Applicant has at all times placed a high priority on full compliance with all terms and conditions of the license. FERC has jurisdiction to assess license compliance. Any incident or action that appears to be a violation of the license is investigated by FERC to determine whether a violation has occurred. During a recent review of the project documentation, the Applicant's records indicated that there has been one FERC determined license violation in the history of the project. FERC determined that a violation of article 39 occurred on May 6, 1994, no enforcement action or penalties were recommended by FERC. Currently, the Applicant uses a computer-based tracking system to monitor and document compliance at each licensed project.

H.18. ACTIONS AFFECTING THE PUBLIC

The principal action taken by the Applicant that affects the public is providing reliable electric service while attempting to responsibly balance the overall cost and environmental impacts. Through the conscientious development and operation of its power plants and electrical system, the Applicant attempts to minimize the cost of electrical service in its service territory while also minimizing the environmental impacts of its operations. As a result of its efficient development and operation of the regional electrical system, the Applicant has contributed significantly to the creation of vibrant, economically and environmentally healthy, and globally competitive communities throughout the service territory.

As a result of the Applicant’s efficient construction and operation of its electrical systems, attention to responsible environmental stewardship, and contributions and support to the communities and residents throughout its service territory, the Applicant is generally recognized as one of the nation’s lowest-cost and most environmentally conscientious private providers of electric service.

H.18.1. Public Recreation Outreach and Information

As part of its efforts to enhance public use of recreational resources associated with the Swan Falls Project, as well as with its other hydroelectric projects, the Applicant created and supports several programs to advertise the recreational opportunities available in the project area and provide information to the public. For example, the Applicant publishes and distributes brochures describing the recreation available in the area and inviting public use. The Applicant has been publishing these brochures, with updates as the parks are improved, for nearly 40 years. The Applicant also publishes the system-wide parks brochure, *Fun Country*, which briefly describes the recreational opportunities available at all of the Applicant’s power sites, from the Jim Bridger coal-fired plant in Wyoming to the north end of the HCC.

In the mid-1990s, the Applicant set up a toll-free telephone number with a menu that provides current information to callers on parks, recreation, water levels, boating access, and river flows. The telephone number is widely advertised in the Applicant's recreation brochures, in bill inserts, in newspaper ads, and via regular news outlets and state and county recreation departments. Also, since 1996, the Applicant has provided extensive recreation information on its website at http://www.idahopower.com.

For some years, the Applicant has had a project underway to automatically collect streamflow data from streamflow gaging sites throughout the Applicant's hydroelectric system and transmit these data to the Applicant's operating offices in Boise, Idaho to help operate the Applicant's hydroelectric generating system. This information is transmitted via the Applicant's regional electronic energy management system. In 2001, the Applicant started making data from this system available to the public via the Applicant's website so that visitors assessing the recreational opportunities can also access real-time data regarding streamflows along the Snake River.

As noted in section E.5.1, the Applicant also maintains an informational kiosk and signs at the Swan Falls Project. Among other things, this kiosk and signs provide information to travelers about the location and characteristics of the recreational resources in the area. The Applicant's employees in the area also regularly assist visitors as needed.

H.18.1.1. Public Safety Resources

As part of operating the Swan Falls Project, the Applicant maintains roads, communications systems, an airport, and helicopter landing sites within the Swan Falls Project, all of which facilitate emergency medical evacuations, if needed, for public recreationists as well as for Applicant employees. Also, in the event of an accident involving the public, the Applicant's employees normally provide emergency communication, transportation, and, on occasion, medical assistance. The Applicant also attempts to ensure that any public hazards associated with the Applicant's facilities are eliminated, either by eliminating the hazards; preventing public access where necessary; or providing adequate warning devices, such as buoys and booms in the reservoirs and plant tailraces.

H.19. EXPENSE IMPACT FROM TRANSFER OF LICENSE

If the project license were transferred from the existing licensee, the Applicant's ownership and operating costs (see section H.3.1) would be largely eliminated. These costs would be $7.2 million (see section D.4.4).

H.20. ANNUAL FEES

Table H-3 lists the annual fees paid under Part I of the Federal Power Act for the use of any federal land included in the project boundary.

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000.

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
2	Maintenance	2/2/2000 13:10	2/2/2000 15:45	2:35	Testing	
2	Maintenance	2/3/2000 13:10	2/3/2000 13:25	0:15	Testing Relays	
2	Forced	3/31/2000 14:21	3/31/2000 15:02	0:41	Line Trip	
2	Maintenance	5/3/2000 8:02	5/3/2000 12:30	4:28	Cooling Water	Replacing Cooling Water Plates
1	Forced	2/13/2001 11:30	2/13/2001 11:46	0:16	Inadvertent trip by Worker	
1	Maintenance	3/6/2001 10:40	3/6/2001 10:50	0:10	Generator	Testing Wicket Gate Position Calibration
2	Maintenance	3/6/2001 10:51	3/6/2001 15:35	4:44	Generator	Calibration of Wicket Gates
1	Forced	4/10/2001 3:07	4/10/2001 4:01	0:54	High Amps	
1	Planned	5/7/2001 8:12	5/8/2001 10:02	25:50:00	Unit Inspection	Clearance Released to Run Unit Test Online
1	Planned	5/8/2001 13:16	5/11/2001 12:16	71:00:00	Unit Inspection	
2	Planned	5/22/2001 7:41	7/18/2001 18:29	1378:48:00	Generator	Install Shear Coupling
1	Forced	7/11/2001 8:44	7/11/2001 8:53	0:09	Inadvertent trip by Worker	
2	Forced	7/21/2001 17:14	9/6/2001 16:25	1127:11:00	Vibration	Sheer coupler sheered from unit vibration
2	Planned	9/6/2001 16:49	9/7/2001 7:44	14:55	Testing	Unit Alignment.
2	Maintenance	9/10/2001 11:07	9/12/2001 15:47	52:40:00	Oil Leak	Gear Box Shaft Seal Leak
2	Maintenance	10/26/2001 12:43	10/26/2001 13:28	0:45	Generator	Fix Battery Ground
2	Planned	10/30/2001 8:33	10/30/2001 14:21	5:48	Generator	Fixing Oil Leaks on Unit

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Forced	11/19/2001 7:20	11/19/2001 7:49	0:29	Generator	BOMT-SWPO Line Trip
2	Forced	11/19/2001 7:20	11/19/2001 7:46	0:26	Generator	BOMT-SWPO Line Trip
1	Maintenance	11/20/2001 10:50	11/20/2001 14:45	3:55	Generator	Instal PSI Meters
1	Maintenance	11/28/2001 9:07	11/28/2001 19:12	10:05	Generator	TMS Cut Over
2	Maintenance	12/11/2001 12:54	12/11/2001 15:07	2:13	Generator	Replace a Nylon Bushing for Blade Sensing (Blade Position)
1	Maintenance	12/19/2001 9:35	12/19/2001 11:43	2:08	Generator	Replacing Shaft Seal and Putting Drain in
2	Forced	12/26/2001 8:38	12/26/2001 8:53	0:15	Generator	Reason unknown
1	Maintenance	12/26/2001 12:48	12/26/2001 14:27	1:39	Cooling Water	Clean Heat Exchanger
1	Maintenance	12/27/2001 13:11	12/27/2001 15:23	2:12	Generator	Install Heat Exchange Fibers
2	Maintenance	1/8/2002 9:00	1/8/2002 13:42	4:42	Generator	Fix Oil Leak
2	Maintenance	3/26/2002 10:48	3/26/2002 21:08	10:20	Generator	Air Cooler Leak
1	Forced	4/13/2002 23:08	4/14/2002 0:10	1:02	Generator	False Cooling Temperature Indication from Computer
1	Forced	6/4/2002 21:00	6/4/2002 21:54	0:54	Line Trip	SKPR-BOMT Line Trip
2	Planned	6/10/2002 8:53	6/21/2002 10:18	265:25:00	Governor	Fixing Oil Leaks on Unit
2	Forced	7/24/2002 10:32	7/24/2002 10:38	0:06	Inadvertent trip by Worker	
1	Planned	7/29/2002 8:23	8/8/2002 13:15	244:52:00	Unit Inspection	
2	Planned	8/12/2002 11:30	9/26/2002 13:54	1082:24:00	Unit Inspection	

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
2	Forced	11/9/2002 3:39	11/9/2002 4:32	0:53	Generator	Reason unknown
1	Forced	11/9/2002 4:05	11/9/2002 4:27	0:22	Generator	Reason Unknown
2	Planned	11/18/2002 10:28	11/21/2002 17:09	78:41:00	Generator Guide Bearings	Fixing Oil Leaks on Unit
1	Maintenance	12/3/2002 7:57	12/3/2002 14:28	6:31	Generator	Replace Oil Skid Oil Pump
1	Maintenance	1/15/2003 10:55	1/15/2003 12:35	1:40	Generator	Replace Restoring Cable Arm Bearing
2	Forced	7/26/2003 23:17	7/27/2003 0:16	0:59	Generator	
2	Forced	7/27/2003 1:48	7/27/2003 2:46	0:58	Generator	Generator Cooler Sensing Unit Failure
2	Planned	7/31/2003 9:49	8/13/2003 10:40	312:51:00	Generator	Annual Maintance
2	Maintenance	8/23/2003 7:38	8/26/2003 9:52	74:14:00	Generator	Excessive Trash Rack Loss
2	Forced	9/11/2003 15:37	9/11/2003 17:16	1:39	Line Trip	SKPR-BOMT Line Trip Unlocked
1	Forced	9/27/2003 11:56	9/27/2003 12:23	0:27	Line Trip	
2	Forced	9/27/2003 11:56	9/27/2003 12:25	0:29	Line Trip	
2	Forced	12/16/2003 15:47	12/17/2003 16:10	24:23:00	Generator	Voltage Regulator Trouble Regulator in Servive
1	Planned	12/18/2003 9:44	12/18/2003 9:51	0:07	Generator	Testing Regulator
2	Planned	12/18/2003 9:53	12/18/2003 11:38	1:45	Generator	Testing Regulator
2	Maintenance	1/8/2004 14:20	1/8/2004 16:43	2:23	Generator	Wiring in Relay into RTU
2	Maintenance	1/13/2004 16:15	1/13/2004 17:15	1:00	Relay	Calibrate a Relay

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Maintenance	1/29/2004 10:29	1/29/2004 15:52	5:23	Generator	Rewiring
2	Maintenance	1/30/2004 8:37	1/30/2004 15:10	6:33	Generator	Installed Drip Pan Around Shear Coupling
2	Forced	1/30/2004 18:09	1/30/2004 19:01	0:52	Vibration	Oil Probe Problem
2	Forced	1/30/2004 19:31	1/30/2004 21:12	1:41	Vibration	Oil Probe Problem
2	Maintenance	2/4/2004 12:40	2/4/2004 13:50	1:10	Generator	Turbine Overspeed Probe Repair
1	Planned	2/6/2004 11:10	2/6/2004 15:11	4:01	Generator	Wiring on Unit 1
2	Maintenance	2/17/2004 14:29	2/17/2004 15:08	0:39	Testing Relays	Testing the 86N Lockout Relays
1	Maintenance	2/24/2004 8:16	2/24/2004 8:20	0:04	Testing	
1	Forced	2/24/2004 13:35	2/24/2004 13:57	0:22	Relay	DC Ground
1	Maintenance	3/11/2004 13:11	3/11/2004 15:26	2:15	Generator	Working on Synch Check
1	Planned	3/30/2004 14:57	3/30/2004 15:02	0:05	Testing	
1	Maintenance	5/25/2004 10:42	5/25/2004 11:31	0:49	Generator	WECC Required Testing
1	Maintenance	5/25/2004 12:52	5/25/2004 13:02	0:10	Generator	WECC Required Testing
1	Maintenance	5/25/2004 13:07	5/25/2004 13:11	0:04	Generator	WECC Required Testing
2	Maintenance	5/25/2004 14:16	5/25/2004 14:26	0:10	Generator	WECC Required Testing
2	Maintenance	5/25/2004 15:09	5/25/2004 15:11	0:02	Generator	WECC Required Testing
2	Maintenance	5/25/2004 15:17	5/25/2004 15:32	0:15	Generator	WECC Required Testing
2	Maintenance	5/25/2004 15:41	5/25/2004 16:09	0:28	Generator	WECC Required Testing

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Maintenance	5/25/2004 16:15	5/25/2004 16:17	0:02	Generator	WECC Required Testing
1	Maintenance	5/25/2004 16:21	5/25/2004 16:32	0:11	Generator	WECC Required Testing
1	Planned	6/1/2004 7:33	6/15/2004 14:43	343:10:00	Generator	Annual Unit Inspection
2	Forced	6/3/2004 14:05	6/3/2004 14:20	0:15	Inadvertent trip by Worker	Techs Testing Unit#1 and Got the Wrong Terminal Block and Tripped Unit #2
2	Forced	6/30/2004 17:42	7/1/2004 12:52	19:10	System	SKPR-BOMT Line Trip
2	Forced	7/26/2004 11:37	7/26/2004 12:00	0:23	Generator	Reason Unkown
1	Forced	8/7/2004 0:05	8/7/2004 1:17	1:12	Line Trip	SKPR-BOMT Unit was not put online. Change of status only. Foced Outage to Reserve Outage.
2	Forced	8/7/2004 0:05	8/7/2004 1:17	1:12	Line Trip	SKPR-BOMT Line Trip
2	Forced	8/8/2004 20:53	8/13/2004 14:56	114:03:00	Generator	Bad Module
2	Planned	8/23/2004 8:31	9/8/2004 16:16	391:45:00	Unit Inspection	
2	Forced	10/5/2004 15:14	10/5/2004 15:24	0:10	Vibration	
1	Forced	10/27/2004 9:15	10/27/2004 11:26	2:11	Line Trip	
2	Forced	10/27/2004 9:15	10/27/2004 11:30	2:15	Line Trip	
1	Forced	2/23/2005 7:26	2/23/2005 9:09	1:43	Disturbance	
2	Forced	2/23/2005 7:26	2/23/2005 9:15	1:49	Disturbance	
2	Forced	2/23/2005 9:16	2/23/2005 17:14	7:58	Stator Ground	

Table H-1 **Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)**

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Forced	2/23/2005 16:38	2/23/2005 17:07	0:29	Inadvertent trip by Worker	Testing on Unit #2, Triggerd incorrect relay.
1	Maintenance	4/4/2005 11:11	4/4/2005 15:17	4:06	Generator	Replace Control Arm Bearing on Restoring Cable
1	Maintenance	4/5/2005 11:05	4/5/2005 16:42	5:37	Governor	Work on Wicket Gates
1	Forced	4/18/2005 17:05	4/21/2005 12:01	66:56:00	Disturbance	Line Trip
2	Forced	4/21/2005 10:50	4/21/2005 11:06	0:16	Line Trip	SWPO-BOMT 104A Line Trip SKPR-BOMT Line Trip
1	Forced	5/3/2005 16:07	5/3/2005 16:25	0:18	System	SKPR-BMNT Line Trip
2	Forced	5/3/2005 16:07	5/3/2005 16:28	0:21	System	SKPR-BMNT Line Trip
1	Forced	5/5/2005 14:17	5/5/2005 14:34	0:17	Line Trip	Lost SKPR/BOMT Line
2	Forced	5/5/2005 14:17	5/5/2005 14:38	0:21	Line Trip	SKPR/BOMT Line Trip
1	Forced	6/14/2005 18:42	6/14/2005 19:53	1:11	Relay	Canyon Creek/BOMT Line Tripped Tripping Unit Off Line 101A Open.
2	Forced	6/14/2005 18:42	6/14/2005 19:49	1:07	Relay	Canyon Creek/BOMT Line Trip
1	Planned	8/15/2005 8:01	8/25/2005 14:21	246:20:00	Unit Inspection	
2	Planned	8/26/2005 7:37	9/17/2005 9:37	530:00:00	Breaker Failure	Broken Unit PCB
1	Forced	9/1/2005 10:00	9/1/2005 10:01	0:01	Testing	Tripped from Local Service Being Transpered.
1	Planned	9/1/2005 10:41	9/1/2005 10:49	0:08	Testing	
1	Planned	9/1/2005 11:49	9/1/2005 12:06	0:17	Governor	Replace Card in Govener

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Maintenance	9/8/2005 10:05	9/8/2005 10:15	0:10	Generator	Install Rebuilt PCB and Take #1 PCB in to be Rebuilt
1	Maintenance	9/12/2005 11:20	9/12/2005 11:47	0:27	Generator	Breaker Maintenance
1	Maintenance	9/15/2005 10:21	9/15/2005 10:31	0:10	Station	Changing out Local Service Breaker
1	Forced	1/5/2006 14:30	1/5/2006 14:48	0:18	Inadvertent trip by Worker	
1	Maintenance	1/16/2006 9:04	1/16/2006 13:58	4:54	Generator	To Inspect a Probe and Make Sure it Was Not Cracked
1	Maintenance	6/7/2006 14:44	6/7/2006 15:38	0:54	Testing Relays	SEL-300G Testing
2	Maintenance	6/7/2006 15:42	6/7/2006 15:44	0:02		SEL-300G Testing
1	Forced	7/2/2006 21:11	7/2/2006 22:17	1:06	Line Trip	
2	Forced	7/2/2006 21:11	7/2/2006 22:13	1:02	Line Trip	
1	Forced	7/2/2006 21:12	7/2/2006 22:18	1:06	Line Trip	
2	Forced	7/2/2006 21:12	7/2/2006 22:13	1:01	Line Trip	
1	Forced	7/11/2006 6:11	7/11/2006 7:35	1:24	Line Relays	101A relay trip
2	Forced	7/11/2006 6:11	7/11/2006 7:39	1:28	Line Relays	101A Relay Trip
1	Forced	8/11/2006 2:24	8/11/2006 4:57	2:33	Line Trip	
2	Forced	8/11/2006 2:24	8/11/2006 4:55	2:31	Line Trip	
1	Maintenance	8/14/2006 7:41	8/24/2006 16:00	248:19:00	Unit Inspection	
2	Planned	8/28/2006 8:52	9/28/2006 11:51	746:59:00	Unit Inspection	

Table H-1 Summary of outages recorded at the Swan Falls Hydroelectric Project from January 2000. (Continued)

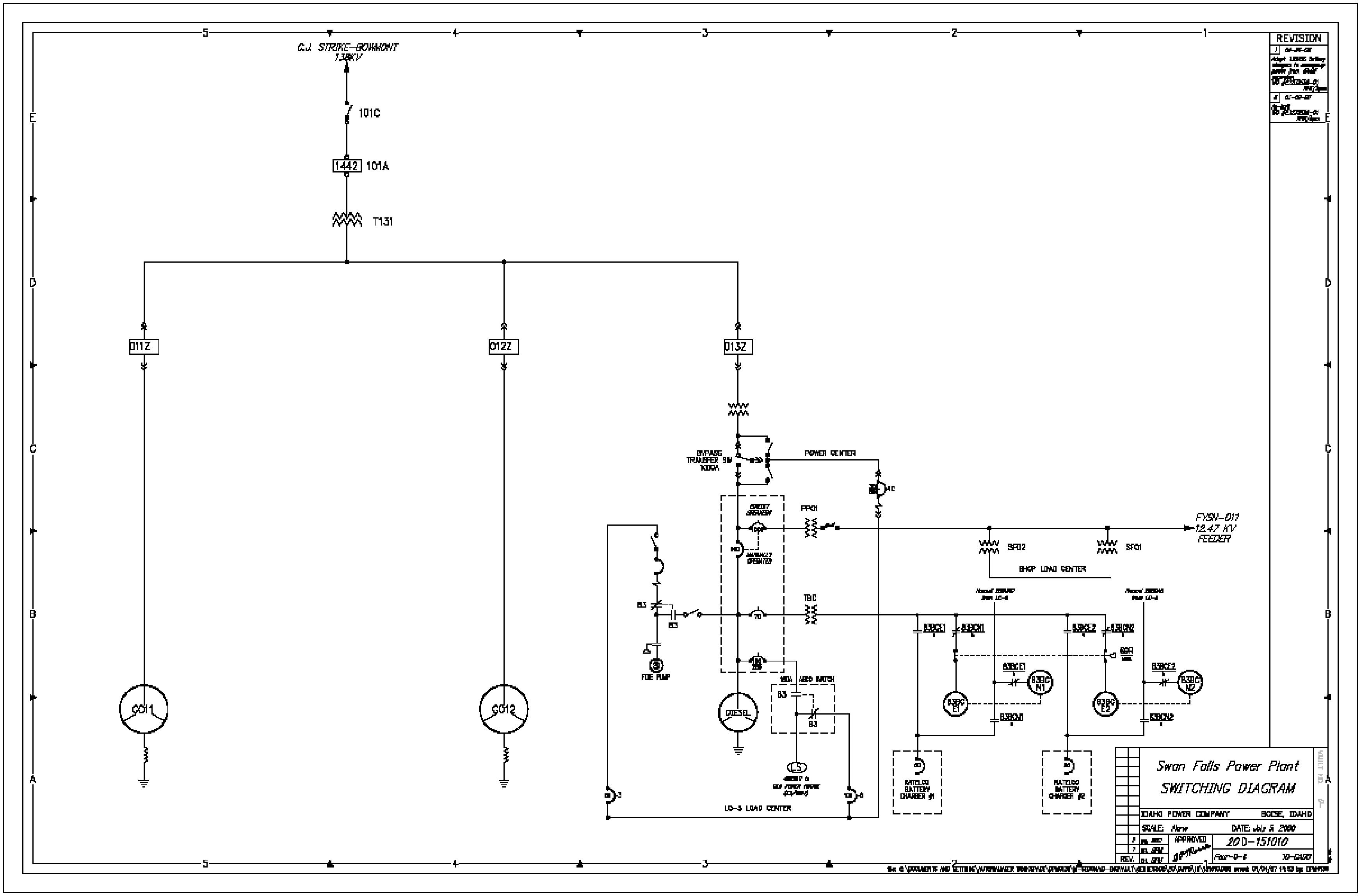
Unit	Cause	Off Date Time	On Date Time	Duration Hr:Min	Reason	Comments
1	Maintenance	9/13/2006 16:22	9/13/2006 19:18	2:56	Trash Rack	
2	Planned	9/29/2006 12:49	9/29/2006 13:06	0:17	Generator	Installation of Flow Meter
1	Planned	9/29/2006 13:10	9/29/2006 13:27	0:17	Generator	Installation of Flow Meter
1	Forced	10/4/2006 12:25	10/4/2006 12:42	0:17	Disturbance	
2	Forced	10/4/2006 12:25	10/4/2006 12:39	0:14	Line Trip	
1	Forced	10/15/2006 22:12	10/16/2006 0:32	2:20	Line Relays	
2	Forced	10/15/2006 22:12	10/16/2006 0:35	2:23	Line Relays	
1	Maintenance	10/25/2006 10:07	10/25/2006 15:38	5:31	Generator	Blande Restoring Mechanism
2	Maintenance	11/9/2006 10:38	11/9/2006 14:35	3:57	Generator	Bearing Replaced
2	Maintenance	11/21/2006 8:58	11/21/2006 12:06	3:08	Generator	Bearing Replaced
2	Maintenance	1/17/2007 10:41	1/17/2007 12:07	1:26	Trash Rake	
1	Forced	1/26/2007 14:18	1/26/2007 16:02	1:44	System	
2	Forced	1/26/2007 14:18	1/26/2007 16:06	1:48	System	
2	Forced	1/26/2007 14:18	1/26/2007 16:21	2:03	Disturbance	

Table H-2 The annual fees paid under Part I of the Federal Power Act.

Date	For Year	Annual Fee Paid
03/16/2007	2006	$7,806.83
03/03/2006	2005	$7,515.74
02/13/2005	2004	$7,282.18
02/14/2004	2003	$7,123.57
2/14/2003	2002	$7,016.50

This page left blank intentionally.

Figure H-1. Single line diagram for the Swan Falls Project.



This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Definitions

DEFINITIONS

abutment	The part of a valley side (wall) against which a dam is constructed
achenes	Dry, one-seeded fruit lacking special seams that split to release the seed; the fruits of many plants in the buttercup family and the rose family are achenes
acuminate	Tapering to a slender point
adjudication	Settle judicially
aesthetic	Dealing with the nature of beauty, art, and taste and with the creation and appreciation of beauty; pleasing to the senses, especially sight
Agriculture	Land-use cover type designating an area that is used principally for producing agricultural crops
algicide	An agent used to kill algae
algorithm	A procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation or a step-by-step procedure for solving a problem
alluvium	Sediment deposited by flowing water
anadromous	Fish that migrate from saltwater to freshwater to spawn
anaerobic	Life processes that occur in the absence of molecular oxygen
anoxic	Greatly deficient in oxygen
anthers	The part of a stamen that produces and contains pollen and is usually borne on a stalk
anthropogenic	Of, relating to, or resulting from the influence of human beings on nature
appressed	Pressed close to or lying flat against something
apron	A section of concrete or riprap constructed upstream or downstream from a control structure to prevent undercutting of the structure
aquaculture	The science of farming organisms that live in water, such as fish, shellfish, and algae
Archaic	Of or relating to the period from about 7800 years before present to 250 years ago and the North American cultures of that time

Area of Critical Environmental Concern (ACEC)	Acreage within Bureau of Land Management public lands where special management attention is required to protect and prevent irreparable damage to important historical, cultural, or visual values or fish and wildlife resources and other natural systems or processes
area of potential effect (APE)	Area that may be directly or indirectly altered in character or use of historic properties
Aridisols	Soils found in arid or semiarid regions characterized by light colors and little organic material
aspect	A particular status or phase in which something appears
assemblages	Vegetation associations
available	Present or ready for immediate use or present in such chemical or physical form as to be usable (as by a plant)
Avoidance Area	Bureau of Land Management designation indicating an area should be avoided for real estate transactions
badlands	A region marked by intricate erosional sculpturing, scanty vegetation, and fantastically formed hills
baffle	A device (as a plate, wall, or screen) to deflect, check, or regulate flow or passage (as of a fluid, light, or sound)
Barrenland	Land-use cover type designating an undisturbed (by direct human influence) upland area with a total vegetation cover of 5% or less
basal	Of or relating to the foundation, base, or essence
basalt	A dark gray to black dense-to-fine-grained igneous rock that consists of basic plagioclase, augite, and usually magnetite
bathymetry	The measurement of water depth at various places in a body of water and the information derived from such measurements
behavior guidance structures (BGS)	Supplements other fish passage systems by enhancing attraction and collection conditions
benthic	Of, pertaining to, or living on the bottom or at the greatest depths of a large body of water
best management practice (BMP)	A practice or combination of practices determined by a state or an agency to be the most effective and practical means (technological, economic, and institutional) of management
bilocular	Having two cells
bipinnate	Plant whose primary leaflets are divided into secondary leaflets
biseriate	Arranged in two rows
boreal	Of, relating to, or comprising the northern biotic area characterized especially by dominance of coniferous forests

bracts	A leaf from the axil of which a flower or floral axis arises
brail	A dip net with which fish are hauled aboard a boat from a purse seine or trap
broodstock	A group of mature fish that is kept separate and used for producing fry
buteos	Any of a genus (*Buteo*) of hawks with broad rounded wings, relatively short tails, and soaring flight
butt-matching	Placing corresponding seams of pictures together in order to form a larger image
calcareous	Resembling calcite or calcium carbonate especially in hardness or consisting of or containing calcium carbonate**;** also, growing on limestone or in soil impregnated with lime
calyx	The usually green outer whorl of a flower consisting of sepals or a cuplike animal structure
campanulate	Bell shaped
candidate species	A species for which enough information about vulnerability and threats is on hand to justify listing under the Endangered Species Act (1973)
capture and transport	Fish are actively and selectively captured (rather than passively trapped) and transported upstream of a dam
carrion	Dead and putrefying flesh
catch per unit of effort (CPUE)	The number of fish caught per the effort in time or distance, for example number of fish per mile of shoreline
catostomids	Family of freshwater fish in the order Cypriniformes; commonly called suckers
caudal	Directed toward or situated in or near the tail or posterior part of the body
cauline	Of, relating to, or growing on a stem and especially on the upper part
centrarchid	Sunfish and bass species
char	Any trout of the genus *Salvelinus*
CHEOPS	A simulation package for hydropower systems that uses daily average inflow, target elevations, plant capacity, and minimum flow requirements to calculate daily average project outflows
chlorophyll *a*	The green photosynthetic pigment found chiefly in the chloroplasts of plants
circumpolar	Continually visible above the horizon or surrounding or found in the vicinity of a terrestrial pole

Cliff/Talus Slope	Natural-feature cover type designating an area of nearly vertical rock or bare soil face, or slopes of unconsolidated rock material, with a total vegetation cover of 5% or less
clinometer	Measures angles of elevation or inclination
coarse particulate organic matter (CPOM)	Drifting clumps of macrophytes and filamentous algae
colluviums	Loose deposit of rock at the base of a cliff or slope, accumulated mainly by gravity
connate water	Water entrapped in the interstices of a sedimentary or extrusive igneous rock at the time of its deposition
corollas	The part of a flower that consists of the separate or fused petals and constitutes the inner whorl of the perianth
cover types	Categories of land cover and land use; land cover is the vegetation or other kind of material that covers the land surface and land use is the purpose of human activity on the land
creel surveys	Estimation of anglers' catches, usually by a sampling program involving interviews and inspection of individual catches
crenulate	Having an irregularly wavy or serrate outline
crib dam	Dam built of boxes, cribs, crossed timbers, or gabions filled with earth or rock
crustose	Having a thin thallus adhering closely to a substrate (as of rock, bark, or soil)
cuspidate	Having a cusp terminating in a point
cyprinids	Any of a family (Cyprinidae) of soft-finned freshwater fishes including the carps and minnows
Daubenmire frames	The Daubenmire method consists of systematically using 20 x 50-centimeter quadrat frames in order to monitor canopy cover, frequency, and composition by canopy cover
debitage	Waste created from manufacturing stone tools
declination	Angle formed between a magnetic needle and the geographical meridian
deflation	Sweeping erosive action of wind over the ground
degradation	Geologic process during which materials are carried away, causing the bottom of the river or water body to be lower in elevation
demographics	The statistical characteristics of human populations
dependable capacity	The peak capacity available for a one-hour period under critical water or reservoir elevation conditions

Desertic Herbland	Vegetation cover type designating an upland community with 1% to 25% total vegetation cover and nonwoody plants (including lichens and mosses) forming the dominant vegetation stratum; includes sparsely vegetated habitats in nondesert areas.
dichotomies	Divisions into two especially mutually exclusive or seemingly contradictory groups
diel	Involving a 24-hour period that usually includes a day and the adjoining night
dimorphic	Occurring in two distinct forms or combining qualities of two kinds of individuals in one
dispersed site	Nondeveloped recreation site
diurnal	Occurring or active during the daytime
dormer	A window set vertically in a structure projecting through a sloping roof
drift fence	Tool used to sample amphibians, reptiles, or small mammals; involves creating a short “fence” that the desired animal can not get over; when the animal moves laterally along the fence, it falls into a bucket or some other receptacle that has been buried in the ground and from which it can not escape
easements	An interest in land owned by another that entitles its holder to a specific limited use or enjoyment
ecological succession	The sequence of communities and their composition that develops in a particular region over time, from initial stages of colonization to climax
ecosystem function	Processing of energy and nutrients by communities
ecotones	A transitional area between two adjacent ecological communities
edaphic	Of or relating to the soil
electrofishing	Fishing that employs a direct electric current to attract and usually temporarily immobilize fish for easy capture
element occurrence (EO)	Standard Idaho Conservation Data Center term to describe a local grouping of same-species individuals
ellipsoid	A surface where all plane sections are ellipses or circles
Emergent Herbaceous Wetland	Vegetation cover type designation for a wetland community dominated by erect and rooted herbaceous plants that grow in water and are present for most of the growing season in most years; usually dominated by perennial plants; total vegetation cover is at least 30%, while woody vegetation is less than 30%
endangered	One in danger of extinction

endangered species	Listed under the Endangered Species Act (1973), a species in imminent danger of extinction through all or a portion of its range
Endangered Species Act (ESA) (1973)	Statute enacted in 1973 to conserve species and ecosystems; species facing possible extinction are listed as threatened or endangered, or as candidate species for such listings; when such a listing is made, recovery and conservation plans are drawn up to ensure the protection of the species and its habitat
endemic	Native to a particular area or environment
entrainment	To draw in and transport (as solid particles or gas) by the flow of a fluid
environmental impact statement (EIS)	The statement required of federal agencies by Section 102(c) of the National Environmental Policy Act of 1969, for major federal actions that may significantly affect the quality of the human environment
ephemeral	Lasting a very short time or only one day
eradication	To do away with completely
escapement	Number of fish that survive natural and human-caused mortality to spawn
escarpments	A long cliff or steep slope separating two comparatively level or more gently sloping surfaces and resulting from erosion or faulting
esoteric	Of special, rare, or unusual interest
ethnographic	Of or relating to the study and systematic recording of human cultures
eutrophic	Rich in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen
exceedence	An act or instance of exceeding a limit or certain amount
exserted	Projecting beyond an enclosing organ or part
extirpated	Destroyed completely; wiped out
family	An assemblage of genera possessing certain characters in common by which they are distinguished
Federal Energy Regulatory Commission (FERC)	FERC, formerly called the Federal Power Commission, regulates and oversees energy industries in the economic, environmental, and safety interests of the American public; the Federal Power Commission was created in 1920 and was renamed FERC in 1977
fire-cracked rock (FCR)	Rock placed around a hearth that shows evidence of being heated

fish ladder	Method for providing adult fish passage over man-made obstacles that breaks a large vertical hydraulic drop into a series of 1 foot or shorter drops that are compatible with the swimming and behavioral characteristics of the targeted fish
fish lift	Similar to a fish lock, except fish are moved vertically in a mechanically driven hopper rather than forcing them up a rising water column
fish lock	Method for providing fish passage through man-made obstacles that consists of a top and bottom chamber connected with a sloping chamber; a controlled flow is released from the top gate and moves down the sloping chamber into the bottom chamber; the flow empties into the tailrace, providing attraction to upstream migrating fish; lock sequences are initiated when sufficient fish have entered the lock or a predetermined time period has passed; the downstream gate is closed, the upstream gate is opened, and the lock is filled with water; the fish swim up the lock shaft and exit into the forebay
flood plain	A strip of relatively flat land bordering a stream channel that is inundated at times of high water
fluctuation zone	The area between the maximum water level and minimum water level impacted by load following
fluvial	Inhabiting a river or stream
flyway	A specific air route taken by birds during migration
Forbland	Vegetation cover type designating an upland community with a total vegetation cover of at least 25% and dominated by nonwoody plants (including lichens and mosses), of which forbs (native or introduced) are dominant; includes many weedy fields, old fields, and other types in early successional stages
forbs	An herb other than grass
forebay	The part of a reservoir immediately upstream of and adjacent to the penstock intakes
Forested Upland	Vegetation cover type designating an upland community dominated by trees (taller than 5 meters) and having a tree canopy cover of at least 25%
Forested Wetland	Vegetation cover type designating a riparian community dominated by woody wetland vegetation at least 6 meters tall, with a total vegetation cover of at least 30%
fossorial	Adapted to digging
fry	Recently hatched or juvenile fishes
gauging station	A particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained

generating reserves	Operation of the powerhouse below the immediately available peak generating capacity to ensure that an “operating cushion” is available to respond to unscheduled changes in system load and/or system disturbances
genets	Any of a genus (*Genetta*) of small, Old World, usually carnivorous viverrid mammals related to the civets and having retractile claws, spotted or striped fur, and a ringed tail
genotypic	All or part of the genetic constitution of an individual or group
geographic information system (GIS)	A computer system for storage, analysis, and retrieval of information in which all data are spatially referenced by their geographic coordinates (latitude, longitude)
geologic unit	A stratum or body of strata recognized as a unit for description, mapping, or correlation of rocks
geomorphic provinces	An area of the earth's surface that has particular physical characteristics
geomorphology	Landforms and their material composition
gill-net	A flat net suspended vertically in the water with meshes that allow the head of a fish to pass but entangle the gills upon withdrawal
glandular	Of, relating to, or involving glands, gland cells, or their products; having the characteristics or function of a gland
global positioning system (GPS)	A navigational system using satellite signals to fix the location of a radio receiver on or above the earth's surface
graminoid	Grass or grasslike
G-rank	Indicates the overall (global) status of a species or ecological community
Grazing Land/Pasture	Land-use cover type designating an area used principally for pasture or grazing of domestic livestock
grout curtain	A barrier produced by injecting grout into a vertical zone in the foundation parallel to the dam centerline to reduce seep rates under a dam
guild	A group of organisms that use the same ecological resource in a similar way
head loss	The reduction in total head (sum of elevation, pressure, and velocity head) resulting from friction losses associated with fluid motion; at a hydropower plant, water flowing through or past any equipment including the trash rack, intake, penstock, turbine, and outlet results in head loss; hydropower generation is a function of the elevation difference between the water source and outflow (headwater and tail water) and head loss effectively reduces this elevation difference, which reduces hydropower generation

herpetofauna	Amphibians or reptiles of a particular region or period
herptile	Amphibian or reptile
hibernacula	A shelter occupied during the winter by a dormant animal (as an insect or reptile)
histogram	A representation of a frequency distribution by means of rectangles whose widths represent class intervals and whose areas are proportional to the corresponding frequencies
histological	Tissue structure or organization
Holocene Period	The most recent epoch of the Quaternary Period of geologic time, preceded by the Pleistocene epoch; the Holocene is considered to span the time interval from 10,000 years ago to the present
homogenous	Of the same or a similar kind or nature
hopper	A storage bin or a funnel that is loaded from the top and discharges through a door or chute in the bottom
hummocky	A rounded knoll or hillock
hydraulic	Operated, moved, or effected by means of water
hydrograph	Graph showing variation of water elevation, velocity, streamflow, or other property of water with respect to time
hydrology	The science that deals with water as it occurs in the atmosphere, on the surface of the ground, and underground
hydrophyte	A plant that grows in water or saturated soils
hypersaline	Salinity well in excess of that of sea water; found in enclosed water bodies, derived from land salts
hypolimnion	Lower layer or region in a stratified lake that is poorly oxygenated and illuminated
hyporheic zone	Group of underground habitats through the sediment deposit area of the channel and floodplain
hypoxia	Condition characterized by a low level of dissolved oxygen in a water body
Industrial	Land-use cover type designating an area used principally for larger businesses and corporations such as office complexes, manufacturing plants, and warehouses
inflorescences	The mode of development and arrangement of flowers on an axis or a floral axis with its appendages
infrared	Radiation wavelength situated outside the visible spectrum at its red end
infraspecific taxa	A taxon rank below species

interstitial	Relating to or situated in the spaces that intervene between things
introduced species	With respect to a particular ecosystem, any species that is not native to that ecosystem; introduced species are also called exotic, non-native, and alien species
intuitive controlled survey pattern	A variable intensity survey protocol designed to cover all ground within a study unit at a level sufficient to locate all occurrences of the identifiable target species; the intuitive controlled protocol is particularly suited to floristic surveys of semi-arid habitats, and is widely used in impact assessment applications
inundation zone	Area that becomes covered with water
invasive species	An introduced species that out-competes native species for space and resources
involucral/involucres	One or more whorls of bracts situated below and close to a flower, flower cluster, or fruit
isothermal	Water at a constant temperature
Kaplan-style turbine	A hydraulic turbine using a propeller-type runner and wicket gates in which the pitch of the propeller blades and wicket gates is adjustable under load to achieve optimum performance in the generation of hydroelectric power
Kendall's tau	A measure of correlation between two variables
Key Observation Point (KOP)	One or a series of points on a travel route or at a use area or a potential use area, where the view of a management activity would be most revealing
keystone species	Species whose impact on its community or ecosystem is disproportionately large compared to its relative abundance
lacustrine	Relating to lakes
latilong survey blocks	The rectangular areas formed between adjacent meridians of longitude and parallels of latitude; on average the areas are 47 miles (76 kilometers) wide by 69 miles (111 kilometers) long, or approximately 3,200 square miles (8436 square kilometers)
laydown yard	Where material caught by the trash racks is deposited and operation and maintenance equipment is sometimes stored
lek	An assembly area where animals (such as sage grouse) carry on display and courtship behavior
Lentic	Natural-feature cover type designating standing open-water habitat
linear regression	The process of finding a straight line (as by least squares) that best approximates a set of points on a graph
lithic	Pertaining to stone artifacts

load	The demand for electricity by customers in the Idaho Power Company service territory, or the power output of a generator
load curve	A graph that plots the power demand of an electric power system versus time
load following	Operation of units necessary to respond to real-time changes in system load
load shaping	Operation of units necessary to follow regional demand for electricity (also called “load”)
loess	A buff-to-gray, fine-grained, calcareous silt or clay thought to be a deposit of wind-blown dust
Lotic	Natural-feature cover type designating moving open-water habitat such as rivers and streams
lunately	Shaped like a crescent
macroinvertebrate	A small animal lacking a backbone and internal skeleton, such as an insect, mollusk, or worm; during aquatic surveys, these organisms must be at least 2 millimeters to be retained on coarse sieves
macrophytes	A member of the macroscopic (observable by the naked eye) plant life, especially of a body of water
mainstem	A river segment into which tributaries flow
mass wasting	Processes by which large masses of earth are moved by gravity, either quickly or slowly
mean	A value that is computed by dividing the sum of a set of terms by the number of terms
mean column velocities	Average velocity of the water measured on an imaginary vertical line at any point in a stream or river
mean sea level (msl)	The elevation of the ocean halfway between high and low tide
median water year	A year of average, or normal, water flow
melon gravels	Gravels that are commonly larger than 5 feet and originated from local basaltic flows
mesic	Characterized by a moderate amount of water
metabolite	A product of intermediary metabolism
Mid-Snake projects	Upper Salmon Falls, Lower Salmon Falls, Bliss, and Malad hydroelectric projects
Miocene	Of, relating to, or being an epoch of the Tertiary between the Pliocene and the Oligocene or the corresponding series of rocks
mitigation	Actions taken to avoid, reduce, or compensate for the effects of human-induced environmental impacts

monocot	One of two subgroups of flowering plants (the other being dicots) that are characterized by one seed leaf (cotyledon) rather than two; mature plants usually have leaves with parallel veins and flowering parts in groups of three
montane	Of, pertaining to, or inhabiting cool upland slopes below the timber line; characterized by the dominance of evergreen trees
morphology	Dealing with the form and structure of plants and animals
multivariate analysis	Analysis involving a number of independent mathematical or statistical variables
myolysis	Tissue degeneration
National Historic Preservation Act (NHPA)	Passed in 1966, the NHPA is the primary federal law dealing with historic preservation; the Act gave authority to State Historic Preservation Officers to handle preservation at the state and local level and created the National Register of Historic Places
National Register of Historic Places (NHRP)	Created in 1966 with passage of the National Historic Preservation Act; the register documents buildings, structures, or sites importance to an area’s history or prehistory
necropsy	An autopsy performed on an animal
neotropical	From one of the six major biogeographic areas of the world; defined by its animal life; the area spans from the Mexican desert through most of South America
nephelometric turbidity units (NTU)	Common measure of turbidity
net head	The difference in water surface elevation between the forebay and tailrace minus friction losses
net investment	Historical costs minus the accumulated depreciation; also referred to as net book value
niche	The ecological role of an organism in a community, especially in regard to food consumption
nomenclature	A system of scientific naming in which each species of animal or plant receives a name of two terms: the first identifies the genus to which it belongs and the second the species itself
nonemergent	Submerged
nonpoint source	A source (of any water-carried material) from a broad area, rather than from discrete points
nonspecular	Nonreflective
nonvascular species	Organisms with no tissues or vessels to carry water or minerals; i.e. Mosses, algae, fungi, and lichens
noxious weeds	Weeds that are physically harmful or destructive to living beings

nutlets	One of several small, nut-like parts of a compound fruit; a diminutive nut
oblanceolate	Inversely shaped like a lance head
obligate	Biologically essential for survival
ogee	A molding with an S-shaped profile
orographic	Pertaining to mountains, in regard to their location and distribution; said of the precipitation caused by the lifting of moisture-laden air over mountains
orthophosphate	A salt or ester of orthophosphoric acid
ortho-rectified	Describing an image in which image displacements due to tilt and relief have been removed
ovate	Shaped like an egg
ovoid	Resembling an egg in shape
Paleo-Indian	Era from 11,000 to 8,000 B.C. during the arrival and earliest colonization of American regions
pappus	An appendage or tuft of appendages that crowns the ovary or fruit in various seed plants and functions in dispersal of the fruit
passerine	Birds of the order Passeriformes; includes perching birds and songbirds such as warblers, tanagers, and thrushes
peaking turbine	Combustion turbine that is economic to operate only during peak load periods
pectoral fin	Either of the fins of a fish that correspond to the forelimbs of a quadruped
pedicels	A slender basal part of an organism or one of its parts
peduncle	A stalk bearing a flower or flower cluster or a fructification
penstock	A pipe or conduit that carries water from a reservoir to a turbine in a hydroelectric plant
pentiles	Any of the four points that divide an ordered distribution into five parts, each containing 20% of a population or group
petioles	A slender stem that supports the blade of a foliage leaf
phenology	A branch of science dealing with the relations between climate and periodic biological phenomena
phenotypes	The observable properties of an organism that are produced by the interaction of the genotype and the environment
pheophytin *a*	A chlorophyll molecule lacking a magnesium ion
physiognomic	Discovering temperament and character from outward appearance

physiographic	Physical geography
physiology	A branch of biology that deals with the functions and activities of life or of living matter (as organs, tissues, or cells) and of the physical and chemical phenomena involved
phytoplankton	The passively floating or weakly swimming usually minute animal and plant life of a body of water
piezometer	An instrument for measuring pore water pressure within soil, rock, or concrete
pilose	Covered with usually soft hair
pinnate	Resembling a feather, especially in having similar parts arranged on opposite sides of an axis like the barbs on the rachis of a feather
placer	A surficial mineral deposit formed by mechanical concentration of mineral particles from weathered debris
planimetry	The identification and geolocation of basic land cover types, drainages, and anthropogenic features in the x, y plane
plant factor	The ratio of actual generation at a power plant to the amount of energy it could produce if operated continuously at its rated output
playa	A dry, flat area at the lowest part of an undrained desert basin in which water accumulates and is quickly evaporated; underlain by stratified clay, silt, or sand and commonly by soluble salts
Pleistocene	Epoch of the Quaternary Period of geologic time, also known as the Ice Age
Pliocene	Of, relating to, or being the latest epoch of the Tertiary or the corresponding series of rocks
point sources	Originating at any discrete source
polychlorinated biphenyl (PCB)	Any of a family of highly toxic and possibly carcinogenic compounds that have been banned in the United States because of concern over water contamination
polygon	Closed plane figure bounded by straight lines
polythetic	Taxa defined by many shared characteristics
population viability analysis (PVA)	Determines the theoretical minimum viable breeding population for any one species to survive in a given range
portage	The carrying of boats or goods overland from one body of water to another or around an obstacle (as in rapids)
Precontact	Archaeological site and materials associated with Native American occupations that predate the arrival of Euroamericans in the project area (ca. A.D. 1810)

pressurized fish passage system	A horizontal shaft and vertical shaft installed on the downstream dam face, with two pressurized gates, a collection facility, and three mechanical crowders that use pressure to pass fish through a dam
procumbent	Having stems that trail along the ground without rooting
progenies	Offspring of animals or plants
proportional stock density (PSD)	A measure of species size structure
prostrate	Completely overcome and lacking vitality, will, or power to rise
protection, mitigation, and enhancement (PM&E) measures	To adequately protect, mitigate for damage, and enhance fish and wildlife, along with their habitats, each license includes terms and conditions required by the Federal Energy Regulatory Commission; PM&Es are measures taken by utility companies to offset the effects of hydroelectric power generation on these natural resources
Protohistoric	Refers to a time immediately before written history
puberulent	Covered with short, soft hairs
***p*-value**	The probability of an event or outcome in a statistical experiment
Pythagorean Theorem	The square of the length of the hypotenuse of a right triangle equals the sum of the squares of the lengths of the other two sides
quadrats	A usually rectangular plot used for ecological or population studies
raceme	A simple inflorescence (as in the lily of the valley) in which the flowers are borne on short stalks of about equal length at equal distances along an elongated axis and open in succession toward the apex
rachis	The elongated axis of an inflorescence or an extension of the petiole of a compound leaf that bears the leaflets
radial gate	A spillway gate whose face, a section of a cylinder, rotates about a horizontal axis on the downstream end of the gate, which can be closed under its own weight (also known as a Tainter gate)
radio telemetry	Use of radio transmitters to track movements and behavior of fish and wildlife
ramets	An independent member of a clone
ramping rate	Rate of change in instantaneous output from a hydroelectric facility
raptor	A bird of prey such as a hawk or eagle
reaeration	The replenishment of oxygen in water from which oxygen has been removed

recruitment	The process of adding new individuals to a population or subpopulation by growth, reproduction, immigration, or stocking
redds	The spawning ground or nest of various fishes
regional study area (RSA)	A geographic buffer zone that extends from river mile 439.3 to river mile 482.3 and extended inland 2.0 miles (3,219 meters) from the county line on both sides of the river
regression analysis	A statistical method to estimate any trends that might exist among important factors; an example in fisheries management is the link between catch and other factors like fishing effort and natural mortality
removable spillway weir (RSW)	Removable steel structure that is attached to the forebay of an existing spill bay, creating a raised overflow weir above and upstream of the existing spillway crest
rhizomatous	Having, resembling, or being a somewhat elongate usually horizontal subterranean plant stem that is often thickened by deposits of reserve food material, produces shoots above and roots below, and is distinguished from a true root in possessing buds, nodes, and usually scalelike leaves
riparian	Relating to the bank of a natural watercourse (as a river)
rosettes	A cluster of leaves in crowded circles or spirals arising basally from a crown (as in the dandelion) or apically from an axis with greatly shortened internodes (as in many tropical palms)
rufous	Reddish
run of river	Average daily project inflows equal average daily project outflows; reservoir is not used to store water on a seasonal basis
sagebrush obligates	Birds that are specifically tied to sagebrush habitat for their life requirements (food, cover, and reproduction)
scour	Erosion by flowing water and sediment on a stream channel
scree	An accumulation of loose stones; rocky debris lying on a slope or at the base of a hill or cliff
Scrub-Shrub Wetland	Vegetation cover type designating a riparian community dominated by woody wetland vegetation (less than 6 meters tall) and having a woody vegetation cover of at least 30% and a total vegetation cover of at least 30%
scurfy	A scaly deposit or covering on surfaces or some plant parts
secund	Describes a plant that is twisted or turned to one side
sedimentary	Of, relating to, or containing material deposited by water, wind, or glaciers, or matter that settles to the bottom of a liquid

seines	A large net with sinkers on one edge and floats on the other that hangs vertically in the water and is used to enclose and catch fish when the ends are pulled together or drawn ashore
sensitive species	Bureau of Land Management term for species managed under the same policy as candidate species
seral	A series of ecological communities formed in ecological succession
seral	The developmental stage of ecological succession (from initial stage to the climax) for communities occupying an area
serrate	Notched or toothed on the edge
sessile	Attached directly by the base; not raised upon a stalk or peduncle
Shore & Bottomland Wetland	Vegetation cover type designating a riparian area that may have bare sand, gravel, or rocky areas; vegetation, if present, has a total cover less than 30% and is dominated by rooted plants that grow in water much of the year
shrub map	Map showing different land cover classes in a certain area
Shrub Savanna	Vegetation cover type designating an upland community having a canopy cover of shrubs (including trees shorter than 5 meters) between 5% and 25% and a total vegetation cover of at least 25% (area between shrubs is typically dominated by grasses or other herbaceous vegetation)
Shrubland	Vegetation cover type designating an upland vegetation community dominated by shrubs (including trees shorter than 5 meters) and having a shrub canopy cover of at least 25% and a total vegetation cover greater than 25%
silicic	Of, relating to, or derived from silica or silicon
single-line diagram	A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit, including major devices used (for example, generator, transformer, and circuit breaker)
slumping	A landslide; the separation of a land or soil mass from a land surface and its movement downslope
smolt	An adolescent salmon that has metamorphosed and is found on its way downstream toward the sea
Snake River Canyon	Bisects the Snake River Plain; characterized by cliffs and sheer canyon walls ranging in height from 6 to 375 feet, with the river cutting as much as 750 feet below the surrounding terrain; elevation of the canyon near Swan Falls Dam, where the canyon is deepest, ranges from 2,100 feet above mean sea level at the canyon floor to 2,760 feet at the rim

Snake River Plain	Flat lands surrounding the Snake River; characterized by thick accumulations of geologically recent basalt flows interbedded with sedimentary strata of lake and stream origins
spatial analysis	Formal techniques used to study entities using their topological, geometric, or geographic properties
spatulate	Shaped like a spatula
Special Recreation Management Area	Bureau of Land Management administrative units established to direct recreation program priorities, including the allocation of funding and personnel, to those public lands where a commitment has been made to provide specific recreational activities and experience opportunities on a sustained yield basis
special status wildlife species	See species of special concern
species distribution	Geographical area where a species can be found
species diversity	Measure of the variety of species in a community; takes into account the relative abundance of each species
species of special concern	An Idaho Department of Fish and Game term for native species that are either low in numbers or limited in distribution or that have suffered significant habitat losses
species richness	The number of species in a community or region
spectrophotometric method	Compares the color intensities of different spectra
spiciform	Shaped like a spike
S-rank	Indicates the subnational conservation status of a species or community within a particular state or province
stage	Elevation of a water surface above or below an established reference point
stewardship	The conducting, supervising, or managing of something
stipitate	Having a stem
stipules	Either of a pair of appendages borne at the base of the petiole in many plants
stoplogs	Used to block water so that construction, maintenance, or repair work can be done in a dry environment
stubble height	Amount of vegetation that remains after animals have grazed in an area (measure in height above the ground)
subsidence	To sink or fall to the bottom
substrate	The base on which an organism lives
Swan Falls Hydroelectric Project	A 1,218-foot-long concrete gravity and rock-fill dam built in 1901 and located approximately 35 miles south of Boise, Idaho, on the Snake River in Ada and Owyhee counties

Swan Falls Tap	A 138-kilovolt power line extending approximately 1.2 miles from the Swan Falls Power Plant to the Strike Junction–Caldwell 138-kilovolt transmission line
switchyard	Enclosed area for the switching facilities of a power station
synergistic	Having the capacity to act in interaction of discrete agencies, agents, or conditions such that the total effect is greater than the sum of the individual effects
tailings	Rock that remains after processing ore to remove the valuable minerals
tailrace	Body of water immediately downstream from a powerplant; a reservoir or pool that regulates fluctuating discharges from a hydroelectric power plant
tailwater	The water in the natural stream immediately downstream from a dam
talus slope	Bare soil faces or slopes of unconsolidated rock material, usually with a total vegetation cover of 5% or less
taprooted	Having a single, thick root
telemeter	An instrument that provides its data readout to a location remote from the sensing device (i.e., can be fixed to a sturgeon in order to gather data remotely)
temporal	Of or relating to time
terrestrial	Of or relating to land as distinct from air or water
threatened species	Listed under the Endangered Species Act (1973), a species likely to become endangered in the foreseeable future
tomentose	Covered with densely matted woolly hairs
topography	Physical shape of the ground surface; collective features of the Earth's surface, especially the relief and contour of the land; the arrangement of hills and valleys in a geographic area
topology	Topographic study of a particular place
total Kjeldahl nitrogen (TKN)	Measure of the total amount of organic nitrogen by summing organic nitrogen and ammonia; measured in milligrams per liter
total maximum daily load (TMDL)	Amount of pollutant that a water body can receive and still meet water quality standards; set by the Environmental Protection Agency
traditional cultural property (TCP)	Ethnographic resources eligible for listing in the National Register of Historic Places
transect	A sample area (as of vegetation) usually in the form of a long continuous strip
translocation	The act, process, or an instance of changing location or position

trap and transport	A trap structure located at the base of the dam uses an attraction-water system to attract fish to the trap entrance; a vehicle then transports fish upstream of the dam
trash rack	A screen or rack of parallel bars installed in the headrace to collect debris and prevent damage to the turbine
trash rake	A mechanism used to clean the trash rack
Tree Savanna	Vegetation cover type designating an upland community with a canopy cover of trees (taller than 5 meters) between 5% and 25% and having a total vegetation cover of at least 25% (area between trees is typically dominated by grasses or other herbaceous vegetation)
trigonous	Three angled
trophic	Involving the feeding habits or food relationships of different organisms in a food chain; any of the feeding levels through which nutrients pass through an ecosystem
trunnions	A pin or pivot on which something can be rotated or tilted
***t*-tests**	A statistical test involving confidence limits for the random variable *t* of a *t* distribution and used especially in testing hypotheses about means of normal distributions when the standard deviations are unknown
turbidimeter	An instrument for measuring and comparing the turbidity of liquids by viewing light through them and determining how much light is cut off
turbidity	A measure of the extent to which light passing through water is reduced by suspended materials
turbine exclusion	Protective measure designed to stop sturgeon and adult fish above a certain size from passing through the project turbines and being injured
U.S. Geological Survey (USGS) topographic quadrangle map	1:24,000-scale topographic maps, also known as 7.5-minute quadrangles because they show an area that spans 7.5 minutes of latitude and 7.5 minutes of longitude; map is usually named after the most prominent feature in the quadrangle; only uniform map series that covers the entire area of the United States in considerable detail
ungulates	Hoofed, typically herbivorous, quadruped mammals
uniformitarianism	Geological doctrine that processes acting in the same manner as at present and over long spans of time are sufficient to account for all current geological features and all past geological changes
unilocular	Containing a single cavity or cell
vascular species	A plant composed of or provided with vessels or ducts that convey water or sap

vernacular design	The common building style of a period or place
vigor	Active, healthy, well-balanced growth, especially of plants
Visual Resource Management (VRM)	The inventory and planning actions taken to identify visual values and to establish objectives for managing those values
water quality	Term used to describe biological, chemical, and physical characteristics of an aquatic environment, usually in relation to the uses of water
water rights	Legal rights to the use of water
water year	Continuous 12-month period selected to present data relative to hydrologic or meteorological phenomena during which a complete annual hydrologic cycle normally occurs; the water year used by the U.S. Geological Survey runs from October 1 through September 30, and is designated by the year in which it ends
weighted usable area (WUA)	The surface area (in square feet or square meters) of a stream, weighted by its suitability to an aquatic organism
weir	An overflow structure built across an open channel to raise the upstream water level and/or to measure the flow of water
Wilcoxon signed rank tests	Designed to test a hypothesis about the location (median) of a population distribution, often involving matching pairs (e.g., before and after data)
xeric	Dry
year class	The age group to which a fish belongs
young-of-year (YOY)	Young fish produced in one reproductive year; small fish, hatched from eggs spawned in the current year, are considered young-of-year (age 0)

This page left blank intentionally.

Swan Falls Project
FERC No. 503
License Application

Abbreviations & Acronyms

ABBREVIATIONS & ACRONYMS

t	tau
° C	degrees Celsius
° F	degrees Fahrenheit
µg	micrograms
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACOE	U.S. Army Corps of Engineers
ADA	Americans with Disabilities Act (1990)
AIC	Akaike Information Criterion
AIRFA	American Indian Religious Freedom Act (1978)
AMS	Accelerator Mass Spectrometry
AOU	American Ornithologists' Union
APE	area of potential effect
APHA	American Public Health Association
ARPA	Archaeological Resources Protection Act (1979)
ASI	Archaeological Survey of Idaho
asl	above sea level
ATV	all-terrain vehicle
B.P.	before present
BGS	behavioral guidance structures
BiOp	biological opinion
BLM	Bureau of Land Management
BMP	best management practice
BN&O	Boise, Nampa, and Owyhee Railroad
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
Btu	British thermal unit
C	candidate species (under the Endangered Species Act [1973])

ca.	circa
CEII	Critical Energy Infrastructure Information
cf.	compare with
CFR	Code of Federal Regulation
cfs	cubic feet per second
cm	centimeter(s)
CPOM	coarse particulate organic matter
CPUE	catch per unit of effort
CSPP	cogeneration and small power producer
CWMA	Cooperative Weed Management Areas
dbh	diameter at breast height
DDT	dichloro-diphenyl-trichloroethane
DE&S	Duke Engineering and Services
DLA	draft license application
DNA	deoxyribonucleic acid
DO	dissolved oxygen
DOE/HeTO	Department of Energy/Heritage Tribal Office
Draft RMP/EIS	Draft Resource Management Plan/Environmental Impact Statement
DRMP/EIS	Draft Resource Management Plan/Environmental Impact Statement
DSM	demand side measures
DSP	downstream passage
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
EO	Element Occurrences
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act (1973)
ESRI	Environmental Systems Research Institute
FAAT	full analytical digital aerotriangulation
FCP	Formal Consultation Package
FCR	fire-cracked rock
FCRPS	Federal Columbia River Power System

FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds
FIRM	Flood Insurance Rate Maps
FLA	final license application
FLPMA	Federal Land Policy and Management Act (1976)
FPA	Federal Power Act (1930)
FPC	Federal Power Commission
fps	foot per second
FR	Federal Register
ft	feet
g	gram(s)
GIS	geographic information system
gpm	gallon(s) per minute
GPS	global positioning system
GWh	gigawatt-hour(s)
ha	hectare(s)
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HCC	Hells Canyon Complex
HDPE	high-density polyethanol
HEP	habitat evaluation procedure
hp	horsepower
HPMP	Historic Properties Management Plan
HSC	habitat suitability criteria
HWUA	hourly weighted usable area
ICC	Indian Claims Commission
IDAPA	Idaho Administrative Procedures Act
IDARNG	Idaho Army National Guard
IDCDC	Idaho Conservation Data Center (formerly IDNHP, Idaho Natural Heritage Program)

IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
IHSI	Idaho Historic Sites Inventory
INPS	Idaho Native Plant Society
IPC	Idaho Power Company
IPUC	Idaho State Public Utilities Commission
IRP	Integrated Resource Plan
ISDA	Idaho State Department of Agriculture
ISHS	Idaho State Historical Society
ISU	Idaho State University
ITD	Idaho Transportation Department
IWRB	Idaho Water Resource Board
JAPC	joint agency public consultation
kg	kilogram(s)
km	kilometer(s)
KOP	Key Observation Point
kV	kilovolt(s)
kVA	kilovolt ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
L	liter(s)
LE	listed endangered (under the Endangered Species Act [1973])
LT	listed threatened (under the Endangered Species Act [1973])
m	meter(s)
MACRS	modified accelerated cost recovery system
MAF	million acre-feet
mg	milligram(s)
mg/L	milligrams/liter

MHWM	mean high water mark
mi	mile(s)
mm	millimeter(s)
MOU	memorandum of understanding
msl	mean sea level
MW	megawatt(s)
MWh	megawatt hour(s)
N	nitrogen
n.d.	no date
NAGPRA	Native American Graves Protection and Repatriation Act (1990)
NCA	National Conservation Area
NEEA	Northwest Energy Efficiency Alliance
NEPA	National Environmental Protection Act (1969)
NHPA	National Historic Preservation Act (1966)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NPCC	Northwest Power and Conservation Council
NPPC	Northwest Power Planning Council
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
O&M	operations and maintenance
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicles
ortho-P	orthophosphate
ORV	off-road vehicle
P	phosphorus
PA	Programmatic Agreement
PC	personal computer

PCB	polychlorinated biphenyl
PIT	passive integrated transponder
PLC	programmable logic controller
PLO	Public Land Order
PM&E	protection, mitigation, and enhancement
PNNL	Pacific Northwest National Laboratories
PSD	proportional stock density
PUC	Public Utilities Commission
PURPA	Public Utility Regulatory Policies Act (1978)
PVA	population viability analysis
RI	risk index
RM	river mile
RMP	recreation management plan
ROW	right(s)-of-way
rpm	revolutions per minute
RSA	regional study area
RSR	Rain Shadow Research, Inc.
RSW	removable spillway weir
SAIC	Science Applications International Corporation
SCORTP	State Comprehensive Outdoor Recreation and Tourism Plan
SD	standard deviation
sf	square feet
SHPO	State Historic Preservation Office
SI	suitability index
sp.	one species
spp.	two or more species
SR-SC TMDL	Mid-Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load
TCP	traditional cultural properties
TDG	total dissolved gas
TKN	total Kjeldahl nitrogen

TL	total length
TLP	Traditional Licensing Process
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TWINSPAN	two-way indicator species analysis
UCWSRI	Upper Columbia White Sturgeon Recovery Initiative
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
USP	upstream passage
UTM	Universal Transverse Mercator
VIF	Variance Inflation Criterion
VRM	Visual Resource Management
WECC	Western Electricity Coordinating Council
WSCP	White Sturgeon Conservation Plan
WSE	water surface elevation
WSTAC	White Sturgeon Technical Advisory Committee
WSU	Washington State University
WUA	weighted usable area
YOY	young-of-year

This page left blank intentionally.