20100513-3057 FERC PDF (Unofficial) 05/13/2010

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Spearfish, South Dakota Project No. 12775-001

NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL ASSESSMENT

(May 13, 2010)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission or FERC) regulations, 18 Code of Federal Regulations (CFR) Part 380 (Order No. 486, 52 Federal Register (FR) 47897), the Office of Energy Projects has reviewed the city of Spearfish's application for license for the Spearfish Hydroelectric Project (FERC Project No. 12775-001), located on Spearfish Creek near the city of Spearfish, in Lawrence County, South Dakota. The existing, but unlicensed project occupies a total of 57.26 acres of federal lands within the Black Hills National Forest managed by the U.S. Forest Service.

Staff prepared a draft environmental assessment (EA), which analyzes the potential environmental effects of licensing the project, and concludes that licensing the project, with appropriate environmental protective measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the draft EA is available for review at the Commission in the Public Reference Room or may be viewed on the Commission's website at www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at (866) 208-3676, or for TTY, (202) 502-8659.

You may also register online at www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

Any comments should be filed within 45 days from the date of this notice. Comments may be filed electronically via the Internet. See 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's website (http://www.ferc.gov/docs-filing/ferconline.asp) under the "eFiling" link. For a simpler method of submitting text-only comments, click on "Quick Comment." For assistance, please contact FERC Online Support. Although the Commission strongly encourages electronic filings, documents may also be paper-filed. To paper-file, mail an original and eight copies to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426. Please affix Project No. 12775-001 to all comments.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

For further information, contact Steve Hocking by telephone at (202) 502-8753 or by email at steve.hocking@ferc.gov.

Kimberly D. Bose,
Secretary.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

DRAFT ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSE

Spearfish Hydroelectric Project—FERC Project No. 12775-001

South Dakota

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

May 2010

20100513-3057 FERC PDF (Unofficial) 05/13/2010

TABLE OF CONTENTS

LIST OF FIGURES iv

LIST OF TABLES iv

ACRONYMS AND ABBREVIATIONS vi

EXECUTIVE SUMMARY vii

1.0 INTRODUCTION 1
- 1.1 APPLICATION 1
- 1.2 PURPOSE OF ACTION AND NEED FOR POWER 1
  - 1.2.1 Purpose of Action 1
  - 1.2.2 Need for Power 3
- 1.3 STATUTORY AND REGULATORY REQUIREMENTS 4
  - 1.3.1 Federal Power Act 5
    - 1.3.1.1 Section 18 Fishway Prescriptions 5
    - 1.3.1.2 Section 4(e) Conditions 5
    - 1.3.1.3 Section 10(j) Recommendations 6
  - 1.3.2 Clean Water Act 6
  - 1.3.3 Endangered Species Act 6
  - 1.3.4 National Historic Preservation Act 7
- 1.4 PUBLIC REVIEW AND CONSULTATION 7
  - 1.4.1 Scoping 8
  - 1.4.2 Interventions 9
  - 1.4.3 Comments on the License Application 10

2.0 PROPOSED ACTION AND ALTERNATIVES 11
- 2.1 NO-ACTION ALTERNATIVE 11
  - 2.1.1 Existing Project Facilities 11
  - 2.1.2 Project Safety 12
  - 2.1.3 Existing Project Operation 12
  - 2.1.4 Existing Environmental Measures 12
- 2.2 APPLICANT'S PROPOSAL 12
  - 2.2.1 Proposed Project Facilities 12
  - 2.2.2 Proposed Project Operation 12
  - 2.2.3 Proposed Environmental Measures 13
  - 2.2.4 Modifications to Applicant's Proposal—Mandatory Conditions 14
- 2.3 STAFF ALTERNATIVE 14
- 2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITONS 15
- 2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS 15
  - 2.5.1 Issuing a Non-power License 15

2.5.2 Retiring the Project ... 16
2.5.2.1 Project Retirement with Dam Removal ... 16
2.5.2.2 Project Retirement without Dam Removal ... 18

3.0 ENVIRONMENTAL ANALYSIS ... 20
3.1 GENERAL DESCRIPTION OF THE RIVER BASIN ... 20
3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS ... 21
3.2.1 Geographic Scope ... 21
3.2.2 Temporal Scope ... 21
3.3 PROPOSED ACTION AND ACTION ALTERNATIVES ... 22
3.3.1 Geology and Soils ... 22
3.3.1.1 Affected Environment ... 22
3.3.1.2 Environmental Effects ... 23
3.3.2 Aquatic Resources ... 23
3.3.2.1 Affected Environment ... 23
3.3.2.2 Environmental Effects ... 36
3.3.2.3 Cumulative Effects ... 50
3.3.3 Terrestrial Resources ... 51
3.3.3.1 Affected Environment ... 51
3.3.3.2 Environmental Effects ... 58
3.3.4 Recreation, Land Use, and Aesthetics ... 61
3.3.4.1 Affected Environment ... 61
3.3.4.2 Environmental Effects ... 69
3.3.4.3 Cumulative Effects ... 74
3.3.5 Cultural Resources ... 75
3.3.5.1 Affected Environment ... 75
3.3.5.2 Environmental Effects ... 76
3.3.6 Socioeconomics ... 78
3.3.6.1 Affected Environment ... 78
3.3.6.2 Environmental Effects ... 82
3.3.6.3 Cumulative Effects ... 88
3.4 NO-ACTION ALTERNATIVE ... 88

4.0 DEVELOPMENTAL ANALYSIS ... 89
4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT ... 89
4.2 COMPARISON OF ALTERNATIVES ... 90
4.2.1 No-action Alternative ... 90
4.2.2 Applicant's Proposal ... 91
4.2.3 Staff Alternative ... 91
4.2.4 Staff Alternative with Mandatory Conditions ... 92
4.3 COST OF ENVIRONMENTAL MEASURES ... 92

20100513-3057 FERC PDF (Unofficial) 05/13/2010

5.0 CONCLUSIONS AND RECOMMENDATIONS 96
5.1 COMPARISON OF ALTERNATIVES 96
5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE 98
5.3 UNAVOIDABLE ADVERSE EFFECTS 107
5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS 107
5.4.1 Fish and Wildlife Agency Recommendations 107
5.4.2 Land Management Agency's Section 4(e) Conditions 107
5.5 CONSISTENCY WITH COMPREHENSIVE PLANS 108

6.0 FINDING OF NO SIGNIFICANT IMPACT 109

7.0 LITERATURE CITED 110

8.0 LIST OF PREPARERS 115

APPENDIX A—U.S. FOREST SERVICE PRELIMINARY TERMS AND CONDITIONS FOR THE SPEARFISH HYDROELECTRIC PROJECT A-1

20100513-3057 FERC PDF (Unofficial) 05/13/2010

LIST OF FIGURES

Figure 1. Location of Spearfish Hydroelectric Project 2
Figure 2. Average monthly flow in Spearfish Creek, 1988–1998 24
Figure 3. Location of the gaining section and losing section of the bypassed reach, stream gages, and other features along Spearfish Creek in the project area 26
Figure 4. Spearfish Canyon recreation sites, shaded area represents the canyon corridor 63
Figure 5. Distribution of agricultural land in Lawrence County, South Dakota 80
Figure 6. Location of active water rights on Spearfish Creek between the Spearfish powerhouse and Spearfish Creek's confluence with the Redwater River 81
Figure 7. Average monthly flow in Spearfish Creek from 1988–1998 during the irrigation season 82

LIST OF TABLES

Table 1. Major statutory and regulatory requirements for the Spearfish Project. 4
Table 2. Permitted water right diversions along Spearfish Creek from upstream to downstream 27
Table 3. Mean density of adult trout for sites sampled in the reach of Spearfish Creek from the town of Savoy downstream to Maurice dam 32
Table 4. Mean density of adult trout for sites sampled in the bypassed reach of Spearfish Creek (Maurice dam downstream to the powerhouse near the city of Spearfish) 33
Table 5. Mean density of adult trout for sites sampled in the reach of Spearfish Creek from the powerhouse downstream to the confluence of Spearfish Creek with the Redwater River 35
Table 6. Number of days when flow releases would be reduced or suspended under the applicant's proposal and Forest Service condition 17, based on USGS historical flow data (water years 1988–2008) 39
Table 7. Estimated habitat conditions based on characteristics observed during the Delphi study 42
Table 8. Forest Service Region 2 sensitive species, species of local concern, and state-listed species 53
Table 9. Population characteristics of the city of Spearfish, Lawrence County, and South Dakota, 2000 78
Table 10. Parameters for the economic analysis of the Spearfish Hydroelectric Project 90
Table 11. Summary of the annual cost of alternative power and annual project cost for four alternatives for the Spearfish Hydroelectric Project 91

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Table 12 Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Spearfish Hydroelectric Project 93
Table 13. Forest Service preliminary section 4(e) conditions for the Spearfish Hydroelectric Project 108

20100513-3057 FERC PDF (Unofficial) 05/13/2010

ACRONYMS AND ABBREVIATIONS

A.D.	Anno Domini
AIR	additional information request
APE	area of potential effects
applicant	city of Spearfish
B.P.	Before Present
°C	degrees Celsius
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
DO	dissolved oxygen
EA	environmental assessment
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Forest Service
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
HPMP	Historic Properties Management Plan
LRMP	Land and Resource Management Plan
mm	millimeter
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NFS	National Forest System
NHPA	National Historic Preservation Act of 1966
NWPP	Northwest Power Pool
PA	Programmatic Agreement
project	Spearfish Hydroelectric Project
POR	period of record
SCORP	South Dakota Statewide Comprehensive Outdoor Recreation Plan
SD	Scoping Document
South Dakota DENR	South Dakota Department of Environment and Natural Resources
South Dakota DGF&P	South Dakota Department of Game, Fish and Parks
South Dakota SHPO	South Dakota State Historic Preservation Officer
TDS	total dissolved solids
TSS	total suspended solids
USGS	U.S. Geological Survey
WECC	Western Electricity Coordinating Council
WQC	water quality certification

20100513-3057 FERC PDF (Unofficial) 05/13/2010

EXECUTIVE SUMMARY

This draft environmental assessment (EA) evaluates the potential environmental and economic effects associated with licensing the existing but unlicensed 4.0-megawatt Spearfish Hydroelectric Project (project) located on Spearfish Creek in Lawrence County, South Dakota. The project occupies 57.26 acres of federal lands within the Black Hills National Forest managed by the U.S. Forest Service (Forest Service).

Proposed Action

The existing project consists of a 4-foot-high, 130-foot-long dam (Maurice dam); a 0.32-acre reservoir; a 4.5-mile-long concrete-lined underground aqueduct; a forebay pond; two 1,200-foot-long wood stave pipelines; four 54-foot-high surge towers; two 5,267-foot-long steel penstocks; and a powerhouse containing two Pelton turbine-generator units. The project is described in more detail in section 2.1.1, *Existing Project Facilities*.

The project is operated in a run-of-river mode. The city of Spearfish (applicant) does not propose any significant changes to project structures or facilities, but does propose the following measures to protect and enhance environmental resources: (1) release a minimum flow of 3 cubic feet per second (cfs) from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions to be defined by the South Dakota Department of Environment and Natural Resources; (2) design and install a system for releasing minimum flows at Maurice dam which may include a bypass pipe and other equipment; (3) prepare a one-year minimum flow progress report, in consultation with the resource agencies, that would assess the effects of the applicant's proposed minimum flows; and (4) enter into an agreement with the South Dakota Department of Game, Fish and Parks to periodically electroshock, remove, and relocate fish that are entrained into the project's forebay. These measures are described in more detail in section 2.2.3, *Proposed Environmental Measures*.

Alternatives Considered

The draft EA analyzes the effects of continued project operation and recommends conditions for an original license for the project. In addition to the applicant's proposal, we considered three alternatives: (1) the staff alternative; (2) the staff alternative with mandatory conditions; and (3) the no action alternative, which is continued project operation with no changes.

In the staff alternative, we recommend all of the applicant's proposed environmental measures except for its proposed one-year progress report on minimum flow releases. We also recommend all of the Forest Service's preliminary 4(e) conditions

except for one condition (condition 17) that would require the applicant to release higher minimum flows than those proposed by the applicant. We recommend the Forest Service's section 10(a) recommendation for installing nest boxes for the American dipper (a bird that feeds on benthic macroinvertebrates within streams); however, we do not recommend the Forest Service's section 10(a) recommendation for modifying Maurice dam to provide fish passage because resident fish populations both upstream and downstream of Maurice dam have sufficient habitats to meet all the needs of their life stages. We conclude that there would be no benefit to providing fish passage at the dam. Finally, we include one staff-recommended measure that would require the applicant to prepare a plan for installing, maintaining, and operating the minimum flow release structure and a continuous recording gage.

In the staff alternative with mandatory conditions, the project would be operated with all of our recommendations except that the Forest Service's minimum flows would be released instead of the applicant's proposed minimum flows.

Finally, under the no action alternative, there would be no change to the existing environment. The project would continue to be operated as it has been operated in the past, with no new environmental measures or minimum flows.

Public Involvement and Areas of Concern

Before filing its license application, the applicant conducted pre-filing consultation under the traditional licensing process. The intent of the Federal Energy Regulatory Commission's (Commission) pre-filing process is to initiate public involvement early in the project planning process and encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested parties on December 1, 2008, and scoping meetings were held in Spearfish, South Dakota, on January 13 and 14, 2009. On May 18, 2009, we requested terms, conditions, and recommendations in response to our notice that the project was ready for environmental analysis.

The primary issues associated with licensing this project are the costs and benefits of providing minimum flows to the project's bypassed reach and the effects of minimum flow losses (through aquifer recharge) on downstream aquatic resources and downstream water users, including irrigators. Other issues include fish entrainment, fish passage, and the potential for project effects on rare and sensitive species.

Aquatic Resources

Currently, the project diverts all flows at Maurice dam out of Spearfish Creek and into the project's underground aqueduct, up to the project's 120-cfs hydraulic capacity. This diversion leaves the first several hundred feet of the bypassed reach dry year-round, except when spill occurs at the dam. After the first several hundred feet, surface water begins to reappear in the stream channel due to contributions from groundwater and tributaries. The first 3.3 miles of the bypassed reach downstream of the dam receives between 2 and 20 cfs from groundwater and tributary inflows, depending on precipitation (this first 3.3 miles is called the gaining section of the bypassed reach). The remaining 4 miles of the bypassed reach crosses extremely porous rock formations that absorb surface flows. An estimated average of between 24 and 33 cfs are absorbed and recharged into underlying aquifers (this last 4 miles of the bypassed reach is called the losing section).

Both the applicant's proposal and the Forest Service's minimum flow condition (condition 17) would enhance aquatic habitat in the bypassed reach compared to existing conditions. The Forest Service's minimum flows would enhance aquatic habitat more than the applicant's proposal because 6 cfs would be released year-round (the applicant proposes to release 3 cfs during the irrigation season) and because at least 4 cfs would be released under extreme low-flow conditions (the applicant proposes to suspend minimum flows entirely under extreme low-flow conditions).

However, releasing minimum flows into the project's bypassed reach under any alternative, instead of routing this water through the project's underground aqueduct as currently occurs, would result in a net loss of water in Spearfish Creek downstream of the powerhouse compared to existing conditions. This would happen because minimum flows released into the bypassed reach would be absorbed into underlying aquifers in the losing section of the bypassed reach as discussed above. The Forest Service's condition would release higher minimum flows than the applicant's proposal, and therefore, would result in more water being lost in Spearfish Creek downstream of the project. A loss of water downstream of the project during extreme low-flow conditions, which periodically occurs during the summer irrigation season, can increase water temperatures and the risk of fish kills in downstream sections of Spearfish Creek.

Finally, the staff alternative includes two Forest Service conditions and one staff-recommended measure that would also help protect aquatic resources: (1) a Forest Service condition (condition 16) that would require a plan to protect threatened, endangered, and sensitive species (including aquatic species); (2) a Forest Service condition (condition 7) that would require development of a soil erosion control plan before any ground-disturbing activities; and (3) a staff-recommended plan for installing, maintaining, and operating the minimum flow release structure, including a provision for a continuous recording gage. These additional measures would help protect aquatic

resources from any project-related ground-disturbing activities and would help ensure that the applicant complies with any minimum flow conditions.

Terrestrial Resources

Both the applicant and the Forest Service's minimum flows would benefit riparian vegetation in the project's bypassed reach compared to existing conditions. However, the Forest Service's minimum flows would enhance riparian vegetation more than the applicant's proposal because 6 cfs would be released year-round and because 4 cfs would be released under extreme low-flow conditions, compared to the applicant's proposal as discussed above.

The staff alternative also includes two Forest Service conditions and one Forest Service section 10(a) recommendation that would affect terrestrial resources: (1) a Forest Service condition (condition 16) that would require a plan to protect threatened, endangered, and sensitive species (including terrestrial species); (2) a Forest Service condition (condition 15) that would require a noxious weed management plan; and (3) a Forest Service section 10(a) recommendation for installing nest boxes for the American dipper. These additional measures would help protect sensitive terrestrial species, control noxious weeds, and enhance breeding habitat for the American dipper compared to existing conditions and the applicant's proposal.

Recreation, Land Use, and Aesthetics

Both the applicant and the Forest Service's minimum flows would improve angling opportunities and aesthetics in the project's bypassed reach compared to existing conditions. The Forest Service's minimum flows would enhance these resources more than the applicant's proposal because higher minimum flows under this alternative would provide more aquatic habitat that could increase trout populations (and improve angling opportunities) and would improve the appearance of the bypassed reach compared to the applicant's proposal.

However, releasing minimum flows into the project's bypassed reach during extreme low-flow conditions, as specified by the Forest Service, could increase water temperatures and the risk of fish kills downstream of the project. Any adverse effects to the fishery could adversely affect angling opportunities and recreation along Spearfish Creek in downstream reaches.

Cultural Resources

Under the applicant's proposal, historic properties would be managed pursuant to the terms of a Historic Properties Management Plan (HPMP) that the applicant developed in consultation with the South Dakota State Historic Preservation Officer (SHPO). The HPMP would be formally implemented through execution of a Programmatic Agreement

pursuant to section 106 of the National Historic Preservation Act among the Commission, South Dakota SHPO, and the Advisory Council on Historic Preservation, if the Advisory Council on Historic Preservation chooses to participate.

Socioeconomics

Both the applicant and the Forest Service's minimum flows would improve angling opportunities and aesthetics in the bypassed reach which could draw more visitors to the area, but the applicant's and the Forest Service's minimum flows would cause the cost of electricity generated at the project to increase. The Forest Service's minimum flows would improve angling opportunities and aesthetics in the bypassed reach more than the applicant's proposal, but would increase the cost of electricity generated at the project more than the applicant's proposal.

As discussed above, releasing minimum flows into the project's bypassed reach under the applicant's proposal and the Forest Service's condition, instead of routing this water through the project's underground aqueduct as currently occurs, would result in a net loss of water in Spearfish Creek downstream of the powerhouse compared to existing conditions. The Forest Service's condition would release higher minimum flows than the applicant's proposal, and therefore, would result in more water being lost in Spearfish Creek downstream of the project. A net loss of water in Spearfish Creek downstream of the project under the applicant's proposal and higher net losses under the Forest Service's condition could adversely affect downstream water users, including irrigators.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by the applicant but with certain additional environmental measures as described above.

In section 4.2 of the EA, we compare the total project cost to the cost of obtaining power from a likely alternative source of power in the region, for each of the alternatives identified above. Our analysis shows that during the first year of operation, under the no-action alternative the project produces power at a cost of $381,920 (about $21.12/megawatt-hour [MWh]) less than the cost of alternative power. Under the staff alternative, the project would produce power at a cost of $306,840 (about $18.24/MWh) less than the cost of alternative power. Under the staff-recommended alternative with mandatory conditions, the project would produce power at a cost of $284,600 (about $17.39/MWh) less than the cost of alternative power.

On the basis of our independent analysis, we conclude that issuing an original license for the project with staff's recommended measures, would not be a major federal action significantly affecting the quality of the human environment.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

We chose the staff alternative as the preferred alternative because: (1) the project would continue to provide a dependable source of electrical energy for the region (16,363 MWh annually); (2) the project may save the equivalent amount of fossil-fueled generation and capacity; and (3) the recommended environmental measures would adequately protect and enhance environmental resources affected by the project. We conclude that the overall benefits of the staff alternative would be worth the additional costs of the recommended environmental measures.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

DRAFT ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

Spearfish Hydroelectric Project
FERC Project No. 12775-001—South Dakota

1.0 INTRODUCTION

1.1 APPLICATION

On September 10, 2008, the city of Spearfish, South Dakota (applicant) filed an application for an original license with the Federal Energy Regulatory Commission (Commission or FERC). The 4.0-megawatt (MW) existing but unlicensed Spearfish Hydroelectric Project (Spearfish Project or project) is located on Spearfish Creek near the city of Spearfish, in Lawrence County South Dakota (figure 1). The project occupies 57.26 acres of federal lands within the Black Hills National Forest managed by the U.S. Forest Service (Forest Service). The project as constructed can generate up to 18,084 megawatt-hours (MWh) of energy annually.[1] The applicant proposes no new capacity and no new construction.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The Commission must decide whether to issue a license to the applicant for the Spearfish Project and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife resources; the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

---

[1] The applicant reports that it has generated an average annual of 15,520 MWh since acquiring the project in 2005.

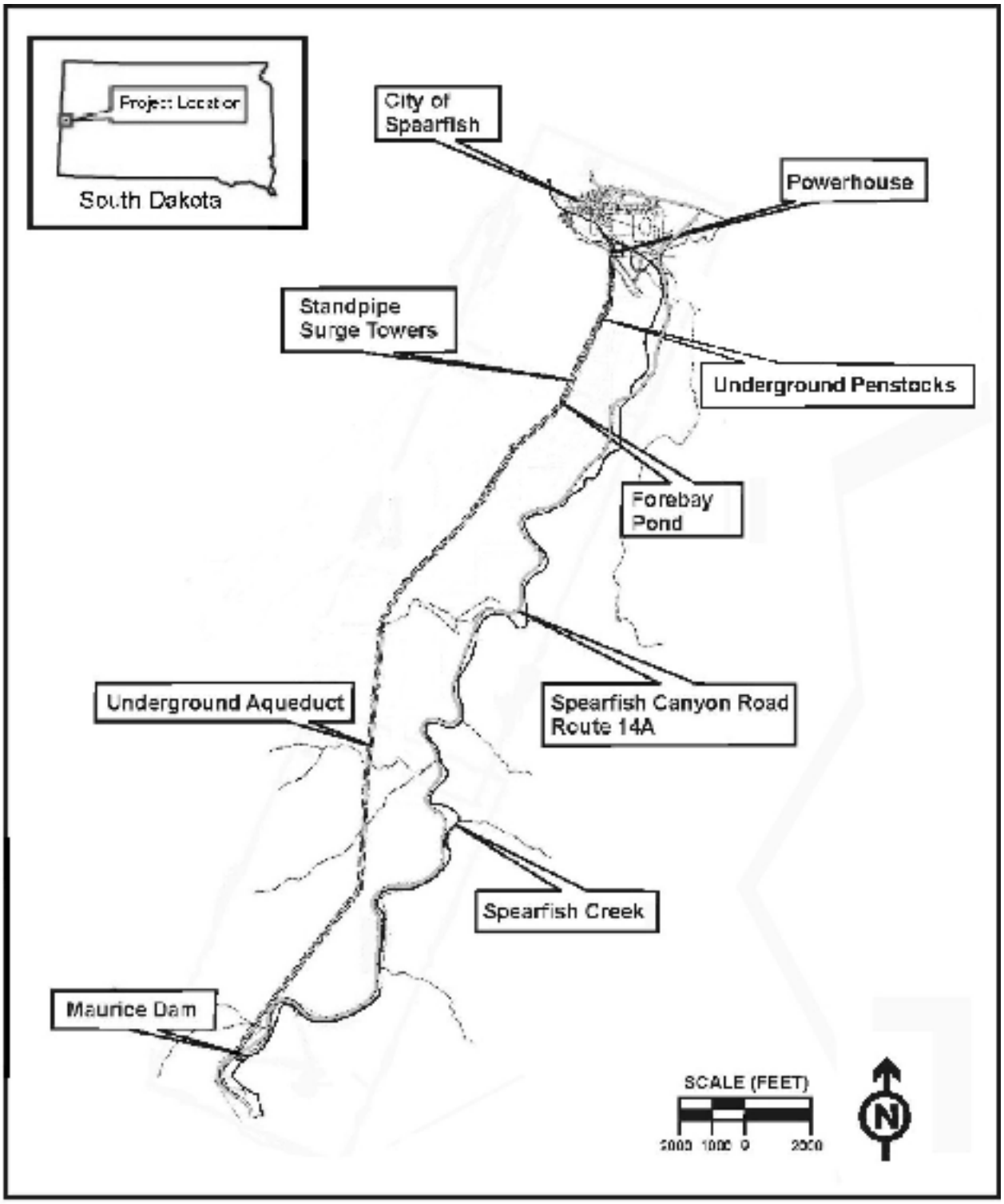

Figure 1. Location of Spearfish Hydroelectric Project (Source: city of Spearfish, 2009, as modified by staff).

Issuing a license for the Spearfish Project would allow the applicant to continue to generate electricity for the term of a license, making electrical power from a renewable resource available to its customers.

This draft environmental assessment (EA) assesses the effects associated with operation of the project and alternatives to the proposed project. It also includes recommendations to the Commission on whether to issue a license, and if so, includes the recommended terms and conditions to become a part of any license issued.

In this draft EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by the applicant; (2) as proposed by the applicant with our recommended measures (the staff alternative); (3) as proposed by the applicant with our recommended measures and any mandatory conditions (the staff alternative with mandatory conditions); and (4) under the no-action alternative. Important issues that are addressed include minimum flows in the project's bypassed reach, fish entrainment, fish passage, and rare and sensitive species.

1.2.2 Need for Power

Power from the Spearfish Project is currently sold to the Black Hills Power Company for local distribution, which includes the city of Spearfish. Thus, the Spearfish Project would continue to provide hydroelectric generation to meet part of the city of Spearfish's power requirements and to meet part of the Black Hills Power Company's power requirements, resource diversity, and capacity needs. The project currently has an installed capacity of 4.0 MW and can generate 18,084 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Spearfish Project is located in the Western Electricity Coordinating Council (WECC) region of the NERC, within WECC's Northwest Power Pool (NWPP) area subregion. The NWPP subregion is a winter peaking region. According to NERC's 2009 forecast, winter total internal demands for the U.S. portion of the NWPP subregion are projected to grow at a rate of 1.5 percent from 2009 through 2018. NERC projects winter planning resource capacity margins (generating capacity in excess of demand), which are currently at 37 percent with "planned" generation, and expected sales and reserve margins, is expected to decline from 37 percent in the winter of 2009/2010 to 22 percent by the winter of 2018/2019. During the period from 2009–2018, NERC estimates that about 3,146 MW of additional summer peak capacity will be brought on-line from hydropower in the entire NWPP subregion (which includes both the U.S. and Canadian portions of the NWPP subregion).

We conclude that power from the Spearfish Project would continue to help meet a need for power in the NWPP region in both the short and long term. The project provides low-cost power that displaces non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities may avoid some power plant emissions and provide an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Spearfish Project is subject to numerous requirements under the Federal Power Act (FPA) and other applicable statutes. We summarize the major regulatory requirements in table 1 and describe them below.

Table 1. Major statutory and regulatory requirements for the Spearfish Project.

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	FWS	No fishway prescriptions or requests for reservation of authority were filed.
Section 4(e) of the FPA (land management conditions)	Forest Service	The Forest Service filed preliminary conditions on July 15, 2009.
Section 10(j) of the FPA	South Dakota DGF&P, FWS	No section 10(j) recommendations were filed.
Clean Water Act—WQC	South Dakota DENR	Application for certification received by the South Dakota DENR on September 11, 2008. South Dakota DENR issued a draft WQC on July 24, 2009. The applicant withdrew and resubmitted its application, which was received by South Dakota DENR on August 18, 2009. Any WQC from South Dakota DENR is due August 18, 2010.
Endangered Species Act Consultation	FWS	In a letter filed June 2, 2009, FWS indicated that no listed species, species proposed for listing, or designated or critical habitat occur within the project area.

Requirement	Agency	Status
National Historic Preservation Act	South Dakota SHPO, participating Tribes, Forest Service	The applicant consulted with the South Dakota SHPO regarding the APE and historic properties. The applicant consulted with the South Dakota SHPO, Forest Service, and Tribes in developing a final HPMP, which was filed on April 10, 2009.

Notes: APE – area of potential effects

FWS – U.S. Fish and Wildlife Service

HPMP – Historic Properties Management Plan

South Dakota DENR – South Dakota Department of Environment and Natural Resources

South Dakota DGF&P – South Dakota Department of Game, Fish and Parks

South Dakota SHPO – South Dakota State Historic Preservation Officer

WQC – Water Quality Certification

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the Interior.

No fishway prescriptions or requests for reservation of authority to prescribe fishways under section 18 of the FPA have been filed for this project.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. On July 15, 2009, the Forest Service filed preliminary conditions pursuant to section 4(e) of the FPA (appendix A). These conditions are described in section 2.2.4, *Modifications to Applicant's Proposal—Mandatory Conditions*.

1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No recommendations pursuant to section 10(j) were filed by the fish and wildlife resource agencies in response to the Commission's notice requesting terms, conditions, and recommendations.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. The applicant submitted an application for water quality certification (WQC), which was received by the South Dakota Department of Environment and Natural Resources (South Dakota DENR) on September 11, 2008. South Dakota DENR issued a draft WQC on July 24, 2009, with seven conditions. On August 10, 2009, the Commission notified South Dakota DENR and the Forest Service that there was a conflict between condition 1 of the draft WQC and condition 17 of the Forest Service's preliminary 4(e) conditions. On August 14, 2009, the applicant simultaneously withdrew and resubmitted its application for WQC, which was received by South Dakota DENR on August 18, 2009. South Dakota DENR has not yet acted on the applicant's new WQC request. Any WQC from South Dakota DENR is due August 18, 2010.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. In a letter filed on June 2, 2009, the U.S. Fish and Wildlife Service (FWS) stated that there are no federally listed threatened, endangered, or proposed species or proposed critical habitat in the vicinity of the Spearfish Project. Therefore, issuing a license for the project would have no effect on listed species and additional consultation under section 7 is not needed.

1.3.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are listed in or eligible for inclusion in the National Register of Historic Places (National Register).

In response to the applicant's February 14, 2007 request, the Commission designated the applicant as a non-federal representative for the purposes of conducting section 106 consultation under the NHPA on February 22, 2007. Pursuant to section 106, and as the Commission's designated non-federal representative, the applicant consulted with the South Dakota State Historic Preservation Officer (SHPO) to locate, determine National Register eligibility, and assess potential adverse effects on historic properties associated with the project. By letter dated February 15, 2007, the Commission notified affected Tribes of the proposed undertaking. In response to requests for tribal consultation, Commission staff met with representatives of the Oglala Sioux, South Dakota SHPO, and the Forest Service on October 24, 2007, and met with the Oglala Sioux, Standing Rock Sioux, Forest Service, and Bureau of Indian Affairs on October 25, 2007.

In September 2008, the applicant prepared a draft Historic Properties Management Plan (HPMP), which was reviewed by the South Dakota SHPO, Tribes, the Forest Service, and Commission. A final HPMP was included with the applicant's final license application.

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the operation of the Spearfish Project. The terms of the PA would ensure that the applicant addresses and treats all historic properties identified within the project's area of potential effects (APE) through implementation of the existing HPMP.

1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 CFR § 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this draft EA, we conducted scoping to determine what issues and alternatives should be addressed. Scoping Document (SD) 1 was distributed to interested agencies and others on December 1, 2008. Scoping meetings were held in Spearfish, South Dakota, on January 13 and 14, 2009. A notice of the scoping meetings was published in the Federal Register on December 8, 2008, and notices were advertised in the *Rapid City Journal* and the *Black Hills Pioneer*. A court reporter recorded all comments and statements made at the scoping meetings, and all comments and statements have been included in the Commission's public record for the project. In addition to oral comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
ACTion for the Environment	September 29, 2008
South Dakota Department of Tourism and State Development	October 27, 2008, and January 20, 2009
Donna Watson	January 20, 2009
Spearfish Canyon Preservation Trust	January 21, 2009
Del Zambon	January 21, 2009
Jim Jennings	January 23, 2009
Spearfish Canyon Society	January 23, 2009
Keith and Dianna Williamson	February 2, 2009
Black Hills Flyfishers	February 11, 2009
Jerry Frank	February 12, 2009
Spearfish Canyon Society	February 12, 2009
South Dakota Department of Environment and Natural Resources	February 12, 2009
Ramsdell Irrigation Association	February 12, 2009
Cook Ditch Irrigators	February 13, 2009
Spearfish Canyon Owners Association	February 13, 2009
City of Spearfish, South Dakota	February 13, 2009
U.S. Forest Service	February 17, 2009

Commenting Entity	Date Filed
U.S. Bureau of Reclamation	February 20, 2009
Bill Coburn	February 25, 2009
U.S. Bureau of Land Management	March 2, 2009

A revised scoping document (SD2) that addresses these comments was issued on May 18, 2009. [2]

1.4.2 Interventions

On February 2, 2009, the Commission issued a notice that the city of Spearfish had filed an application to license the Spearfish Project. This notice set April 3, 2009, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene:

Intervenor	Date Filed
U.S. Forest Service	March 2, 2009
South Dakota Department of Game, Fish and Parks	March 12, 2009
Spearfish Canyon Society	March 16, 2009
ACTion for the Environment[3]	March 19, 2009
Spearfish Canyon Owners Association	March 23, 2009
South Dakota Department of Environment and Natural Resources	March 30, 2009
Trout Unlimited	April 3, 2009
American Rivers	April 3, 2009

[2] In a July 24, 2009 filing, Spearfish Canyon Society asked the Commission to reconsider its conclusion in SD2 that existing conditions would be used as the environmental baseline, because the proceeding involves an unlicensed project. We note, however, that although it is an unlicensed project, it is an existing project, and as a result, only new conditions included in the license represent a change from current conditions. We maintain that the baseline described in SD2 is appropriate.

[3] ACTion for the Environment filed a motion in opposition.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

1.4.3 Comments on the License Application

A notice stating that the project is ready for environmental analysis and requesting terms, conditions, and recommendations was issued on May 18, 2009. The following entities responded to this notice:

Commenting Agency and Other Entity	Date Filed
ACTion for the Environment	July 13, 2009
U.S. Department of the Interior	July 14, 2009
U.S. Forest Service	July 15, 2009
South Dakota Department of Environment and Natural Resources	July 17, 2009

The applicant did not file any reply comments.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed in the environmental document. The no-action alternative includes the existing facilities and current project operation.

2.1.1 Existing Project Facilities

The Spearfish Project was constructed by the Homestake Mining Company and has been in continual operation since 1912. Homestake Mining Company ceased operation of the associated mine in 2003 and conveyed ownership of the project to the applicant in 2004. The applicant states that its primary objective in purchasing the project was to maintain operations to protect the fishery of Spearfish Creek, which, as discussed above, has a unique flow regime due to an aquifer recharge zone in the project's bypassed reach (where an estimated average of 24 to 33 cubic feet per second (cfs) are absorbed into underlying aquifers). The applicant also wanted to continue generating renewable power.

The existing Spearfish Project includes Maurice dam, which is a 130-foot-long and 4-foot-high concrete dam that impounds a 0.32-acre reservoir. The dam has a concrete sill section, two stop-log sections, a trashrack, and an intake structure that leads to an approximately 24,000-foot-long, 6.6-foot-wide, and 9-foot-high underground concrete aqueduct, which empties into a forebay pond. Flows exit the forebay pond via two 1,200-foot-long, 4-foot-diameter, wood stave pipelines that lead to four, 3-foot-diameter, 54-foot-high surge towers. From the surge towers, flow continues to the powerhouse via two 30- to 34-inch diameter, 5,267-foot-long steel penstocks. The powerhouse contains two Pelton turbine-generator units and associated generating equipment. Project flows are discharged from the powerhouse via a 106-foot-long tailrace channel, which returns diverted flow to Spearfish Creek just upstream of the city of Spearfish. The two turbines, which operate at an average gross head of 695 feet, have a combined minimum and maximum hydraulic capacity of 6 and 120 cfs, respectively. The bypassed reach of Spearfish Creek is approximately 7.3 miles long. The project facilities roughly parallel the 7.3-mile-long bypassed reach of Spearfish Creek. Project transmission facilities at the powerhouse include a 5-megavolt-ampere generator lead and a 2.4/69-kilovolt step-up transformer with a direct connection to a distribution line. The project does not have any transmission lines.

The proposed project boundary for the Spearfish Project includes the land in the immediate vicinity of Maurice dam, the forebay, the powerhouse, and the land 75 feet on either side of the underground aqueduct, pipelines, and penstocks. The southern portion of the project boundary, including Maurice dam and more than half of the aqueduct, occupies 57.26 acres of Forest Service lands within the Black Hills National Forest.

2.1.2 Project Safety

As part of this licensing process, the Commission would review the adequacy of project facilities and would include any special articles, as appropriate, in any license issued for the project. Operational inspections would focus on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

2.1.3 Existing Project Operation

Currently, the applicant operates the project in a run-of-river mode and diverts all flows from Spearfish Creek for power production, up to the project's 120-cfs maximum hydraulic capacity. Water diverted by the project enters the intake gates at Maurice dam and travels through the 24,000-foot-long underground aqueduct, exiting the aqueduct at the forebay pond. From there, flow passes through two wood stave pipelines and into the two penstocks that lead to the powerhouse. Finally, the flow passes through the project turbines and is discharged from the powerhouse via a 106-foot-long tailrace channel, which returns diverted flows to Spearfish Creek just upstream of the city of Spearfish. Water in excess of 120 cfs flows over the dam or through the dam's stop log section and re-enters Spearfish Creek directly downstream of Maurice dam.

2.1.4 Existing Environmental Measures

There are no existing environmental measures or recreation sites associated with the project.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

The applicant does not propose any significant changes to project structures or facilities.[4]

2.2.2 Proposed Project Operation

The applicant does not propose any operational changes except to begin releasing minimum flows into the project's bypassed reach. The applicant proposes to release a minimum flow of 3 cfs from Maurice dam into the bypassed reach of Spearfish Creek

---

[4] The applicant originally proposed to seal a manhole to the aqueduct that provides access for operation and maintenance purposes but withdrew that proposed change in a filing on October 23, 2009.

during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions to be defined by South Dakota DENR.

In comments and analysis filed February 12, and July 17, 2009, South Dakota DENR preliminarily defined extreme low-flow conditions to be a flow of 40 cfs or less in Spearfish Creek at U.S. Geological Survey (USGS) gage 06431500 (Spearfish Creek at Spearfish) during the May 1 through September 30 irrigation season.

2.2.3 Proposed Environmental Measures

The applicant proposes the following protection, mitigation, and enhancement measures to avoid, minimize, or offset the project's environmental effects:

- Release a minimum flow of 3 cfs from Maurice dam into the bypassed reach of Spearfish Creek during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions to be defined by South Dakota DENR.

- Design and install a system for releasing minimum flows at Maurice dam, which may include a bypass pipe and other equipment.

- Prepare a one-year minimum flow progress report, in consultation with the resource agencies, which would assess the effects of the applicant's proposed minimum flows.

- Enter into an agreement with the South Dakota Department of Game, Fish and Parks (South Dakota DGF&P) to periodically electroshock, remove, and relocate fish that are entrained into the forebay. This action would be taken every 5 years and after high flow events upon South Dakota DGF&P's request.[5]

[5] This measure was proposed by the city of Spearfish in its comments on SD1 filed with the Commission on February 13, 2009. In the same letter, the applicant withdrew its original proposal to evaluate options for installing a new trash rack with closer bar spacing (to prevent fish from entering the aqueduct) due to potential ice accumulation during extreme low winter temperatures.

2.2.4 Modifications to Applicant's Proposal—Mandatory Conditions

The following mandatory conditions have been provided and would be made a part of any license issued, unless modified by the conditioning agency.

Section 4(e) Land Management Conditions

The conditions provided by the Forest Service under section 4(e) are as follows: conditions 1 through 6 are standard conditions that specify obtaining a special use authorization, Forest Service approval of final project design and project changes, annual consultation with the Forest Service to ensure the protection and development of natural resources, restoration of National Forest System (NFS) lands prior to surrendering the license, and reserving the Forest Service's right to modify conditions. Condition 7 specifies the implementation of an Erosion Control Measures Plan approved by the Forest Service. Condition 8 specifies that improvements and premises be maintained to meet Forest Service standards. Condition 9 specifies consultation prior to erecting signs related to safety issues and Forest Service approval of any other signs or advertising devices on Forest Service lands. Condition 10 specifies Forest Service approval of a safety during project construction plan prior to any ground disturbing activity related to new project construction. Condition 11 specifies indemnification of the United States for any acts or omissions by the licensee. Conditions 12 through 14 reserve the right of the United States to use roads and to permit the use and access of any NFS lands within the project, and restrict vehicle use to project roads or designated access routes. Condition 15 specifies preparation of a plan to control invasive and noxious weeds and aquatic nuisance species. Condition 16 specifies preparation of plans to protect listed and sensitive species prior to undertaking activities that could affect these species or their habitat. Condition 17 specifies a specific minimum flow regime, and condition 18 specifies construction of a system to release and monitor minimum flows.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would include all of the applicant's proposed environmental measures except for its proposed one-year progress report on minimum flow releases. The project would also include all of the Forest Service's preliminary 4(e) conditions except for one condition (condition 17) that would require the applicant to release higher minimum flows and would include one of the Forest Service's section 10(a) recommendations for installing nest boxes for the American dipper. Finally, the staff alternative would include one staff-recommended measure that would require the applicant to prepare a plan for installing, maintaining, and operating the minimum flow release structure and a continuous recording gage.

In summary, the staff alternative would include the following environmental measures: (1) the applicant's proposal to release a minimum flow of 3 cfs from Maurice dam into the bypassed reach of Spearfish Creek during the irrigation season (May 1

through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions; (2) the applicant's proposal to design and install a system for releasing minimum flows at Maurice dam, which may include a bypass pipe and other equipment; (3) the applicant's proposal to enter into an agreement with the South Dakota DGF&P to periodically electroshock, remove, and relocate fish that are entrained into the forebay; (4) a Forest Service condition (condition 7) to prepare an erosion control plan before any ground-disturbing activities; (5) a Forest Service condition (condition 15) to prepare a noxious weed management plan; (6) a Forest Service condition (condition 16) to prepare a plan to protect threatened, endangered, and sensitive species; (7) a Forest Service condition (condition 18) that duplicates the applicant's proposal to design and install a system for releasing minimum flows at Maurice dam but with the additional feature of a continuous recording gage; (8) a Forest Service section 10(a) recommendation for installing nest boxes for the American dipper; and (9) a staff-recommended plan for installing, maintaining, and operating the minimum flow release structure and continuous recording gage.

2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITONS

We recognize that the Commission is required to include valid section 4(e) conditions in any license issued for the project. The staff alternative with mandatory conditions includes staff-recommended measures along with one mandatory condition that we did not include in the staff alternative: a Forest Service condition (condition 17) that specifies a year-round minimum flow release of 6 cfs at Maurice dam with a provision for reducing minimum flow releases during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions.

Inclusion of the Forest Service's above mandatory condition for minimum flows in the license would cause us to eliminate our recommendation for the applicant's proposed minimum flows, which would no longer be necessary.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They include issuing a non-power license and retiring the project.

2.5.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency would assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no agency has suggested a willingness or ability to assume regulatory authority and

supervision over the project. No party has sought a non-power license and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a non-power license to be a realistic alternative to licensing in this circumstance.

2.5.2 Retiring the Project

We considered two alternatives for retiring the project but eliminated them from detailed study because they are not reasonable in the circumstances of this case.[6] These alternatives are project retirement with dam removal and project retirement without dam removal. Both alternatives would involve denying the applicant's license application. In both alternatives, retiring the project would eliminate this source of renewable energy and may require replacing project power with fossil-fueled generation.

2.5.2.1 Project Retirement with Dam Removal

Under this alternative, the dam would be either completely removed or breached in an effort to re-create a free-flowing river. The underground aqueduct would likely be sealed and abandoned. The forebay would likely be filled in and the four standpipes removed. Finally, the project's powerhouse would likely be retained for historical purposes or would be put to some other municipal use.

The primary benefit of this alternative would be to recreate a free-flowing river from the location of the former dam to the next diversion downstream, which is the applicant's municipal/irrigation water intake structure located about 3.3 miles downstream of Maurice dam. During high flows, water would pass through the former dam and over the applicant's municipal/irrigation water intake structure reaching as far as the city of Spearfish, a distance of about 7.3 miles downstream of Maurice dam. During lower flows, stream flow would pass through the former dam, over the applicant's municipal/irrigation water intake structure, and would likely be absorbed into underlying aquifers as the stream crosses outcrops of the Madison Limestone and Minnelusa Formation in the losing section of the bypassed reach. In summary, removing or breaching the dam in this alternative would enhance between 3.3 and 7.3 miles of Spearfish Creek depending on flow.

---

[6] In its letter filed September 29, 2008, ACTion for the Environment states that the public would be best served by shutting down the project (i.e. retiring the project). In subsequent letters filed on March 29 and May 4, 2010, ACTion for the Environment asked the Commission to collect additional data to determine "what would happen to the stream as a result of [ending diversions]." In this section, we provide just such an analysis based on Putnan and Long (2007). We conclude no further data collection and analysis is needed.

Eliminating the diversion of flows for hydropower production in Spearfish Creek would improve aquatic habitat and could increase the population of several important fish species, including rainbow, brook, and brown trout in the reach that is currently bypassed. Removing or breaching the dam and sealing the aqueduct would also prevent fish from being entrained into the aqueduct as currently happens with the existing project. Fish would move freely up and downstream past the former dam site.

Removing or breaching the dam would increase the amount of water present in Spearfish Creek for an additional 3.3 to 7.3 miles, as discussed above. More water would improve the creek's appearance and would generally enhance aesthetics in the project's bypassed reach. Highway 14A, which is the Spearfish Canyon Scenic Byway, runs adjacent to Spearfish Creek along the bypassed reach. More water in this section of the creek would enhance views for those traveling through Spearfish Canyon on the scenic byway. Improved aesthetics in the bypassed reach could draw more visitors to this section of Spearfish Canyon.

Finally, removing or breaching the dam would eliminate the project's 0.32-acre impoundment, which is currently used by recreationists for fishing. However, this loss would likely be offset by the increase in aquatic habitat in the reach just downstream of the former dam and the improved aesthetics of Spearfish Creek, which would likely draw more recreationists and anglers to the project area.

The primary negative effects of removing or breaching the dam would be the loss of flows that would be absorbed into underlying aquifers as the stream crosses outcrops of the Madison Limestone and Minnelusa Formation in the losing section of the bypassed reach, and the effects of this loss on downstream aquatic habitat in Spearfish Creek and on downstream water users, including irrigators. An estimated average of 24 to 33 cfs (Putnam and Long, 2007) would be lost to aquifer recharge if the project were retired and water not routed via the project's underground aqueduct around the losing section of the bypassed reach. This loss could negatively affect downstream water users who depend on this water, in part, for irrigation. This loss could also affect aquatic habitat, fishery resources, aesthetics, and recreation in Spearfish Creek downstream of the project.

Removing or breaching the dam would also require some in-water work and could result in sediments from behind the dam being released downstream into Spearfish Creek. Actions to seal and abandon the aqueduct, fill-in the forebay, remove the standpipes, and/or to retire and remove other project works could have significant, but likely temporary water quality effects on Spearfish Creek downstream of any construction activities.

Because all project features are likely eligible for listing on the National Register, removing or breaching the dam and rendering the project inoperable would constitute an adverse effect on historic properties.

Removal of the Spearfish dam, intake structure, forebay, and standpipes coupled with sealing off the aqueduct, would have considerable cost. Based on figures provided for a recent project whose removal was analyzed in an EA,[7] we estimate that this action could cost approximately 2 million dollars.

Finally, the Spearfish Project can generate up to 18,084 MWh of energy annually. Retiring the project would eliminate this source of renewable energy and may require replacing this power with fossil-fueled generation.

After considering the above costs and benefits associated with retiring the project and removing or breaching the dam, we do not consider this to be a reasonable alternative in the circumstances of this case. Instead, we recommend that the Commission consider an original license for the project with appropriate protection, mitigation, and enhancement measures.

2.5.2.2 Project Retirement without Dam Removal

This alternative would include retiring the project without removing or breaching the dam. Instead, the project's power generation equipment would be disabled or removed to render the project inoperable. Project works would remain in place, and all water would be spilled over the dam or through the dam's existing stop log section. This alternative would require us to identify another government agency willing and able to assume regulatory control and supervision over the project's facilities.

Retiring the project as described above would have many of the same costs and benefits as retiring the project with dam removal, except that the dam would remain in place. The same amount of aquatic habitat would be enhanced, benefiting the same fish species. The dam would likely continue to act as a fish barrier, but would no longer entrain fish into the project's forebay (assuming the aqueduct is sealed and abandoned). The dam's 0.32-acre impoundment would remain and would continue to provide recreational fishing opportunities, in addition to those fishing opportunities enhanced by the presence of more flow in Spearfish Creek downstream of Maurice dam. Further, the same aesthetic benefits would be realized downstream of the dam by spilling all water into Spearfish Creek.

Because the dam would not be removed or breached and other project facilities would remain in place, there would be little or no in-water work and little risk of

---

[7] *See* Final Environmental Assessment for Surrender of License for Childs Irving Project No. 2069 at: http://elibrary.ferc.gov/idmws/File_list.asp?document_id=4189966

20100513-3057 FERC PDF (Unofficial) 05/13/2010

sedimentation and temporary water quality effects on Spearfish Creek downstream of the project. However, an estimated average of 24 to 33 cfs would be lost to aquifer recharge if the project were retired and water were no longer routed via the underground aqueduct around the losing section of the bypassed reach.

Disabling or removing the power generation equipment and rendering the project inoperable would have an adverse effect on the project's eligibility to be listed on the National Register.

Finally, the Spearfish Project can generate up to 18,084 MWh of energy annually. Retiring the project would eliminate this source of renewable energy and may require replacing this power with fossil-fueled generation.

After considering the above costs and benefits associated with retiring the project but retaining the dam, we do not consider this to be a reasonable alternative in the circumstances of this case. Instead, we recommend that the Commission consider an original license for the project with appropriate protection, mitigation, and enhancement measures.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[8]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The headwaters of Spearfish Creek originate in the upper elevations of the Black Hills National Forest in western South Dakota. The creek flows in a generally northern direction through coniferous/mixed forest before entering the 20-mile-long Spearfish Canyon and passing through the city of Spearfish, South Dakota. Spearfish Creek then flows through semi-arid forest and grassland before joining the Redwater River near Belle Fourche, South Dakota. The total drainage area of Spearfish Creek is approximately 209 square miles and the total length of Spearfish Creek is 36 miles of perennial stream, with an additional 5 miles of intermittent stream. The topography of the area is characterized by mountainous and steep canyon areas in the south and within the Black Hills National Forest, followed by rolling to flat arid rangeland near the northern confluence with Redwater River. Water from Spearfish Creek and its tributaries is used as a domestic water source for the communities of Deadwood, Lead, and Spearfish, and water is diverted for irrigation downstream of the city of Spearfish. Water in Spearfish Creek is also used for hydropower and by the D.C. Booth Historic National Fish Hatchery operated by the FWS.

Most of the project area is located in the rugged, mountainous terrain of Spearfish Canyon. Upstream of the project area, drainage originates from the remote, coniferous Black Hills National Forest where elevations reach up to 7,000 feet. The elevation at Maurice dam is about 4,400 feet, bordered on either side by steep uphill slopes. The project aqueduct descends approximately 5 miles through the canyon to the forebay, penstock, and powerhouse located in the southern portion of the city of Spearfish. In the vicinity of the city of Spearfish, the terrain flattens, with more gradual

---

[8] Unless noted otherwise, our sources of information are the license application (city of Spearfish, 2008) and additional information filed by the city of Spearfish, including filings on January 6, February 13, and October 23, 2009.

downstream gradients, rolling hills, and a final elevation of approximately 3,700 feet. Downstream of the project tailrace, Spearfish Creek flows through the city of Spearfish for 2 miles, surrounded by residential developments and city parks, and then enters a primarily flat agricultural region of dry plains before converging with the Redwater River about 8 miles further downstream.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 CFR §1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified aquatic resources, recreation, aesthetics, and socioeconomics as having the potential to be cumulatively affected by the proposed project in combination with other past, present, and foreseeable future activities. We chose these resources because they could be affected by proposed changes in minimum flow and other proposed measures, as well as other ongoing activities in the project area such as the withdrawal of water for irrigation, municipal purposes, and aquaculture.

3.2.1 Geographic Scope

The geographic scope of analysis for cumulatively affected resources defines the physical limits or boundaries of the effects of the proposed action on the resources. We choose the Spearfish Creek Basin and the Redwater and Belle Fourche rivers from the Spearfish Creek confluence downstream to and including Belle Fourche reservoir as our geographic area for evaluation of cumulative effects. We chose this geographic area because any minimum flow releases included in the license could affect flow-dependent resources (i.e., fisheries, recreation, agriculture, and aquaculture) downstream of the powerhouse due to a loss of minimum flows absorbed into underlying aquifers in the losing section of the bypassed reach.

3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and future actions and their effects on aquatic, recreation, aesthetic, and socioeconomic resources. Based on the potential term of a license, the temporal scope looked 30 to 50 years into the future, concentrating on the effect on water quantity and fishery resources from reasonably foreseeable future actions. The historical discussion is limited, by

necessity, to the amount of available information for each resource. We identified the present resource conditions based on the license application, agency comments on the draft license application, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the site-specific and cumulative environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this draft EA. In a letter filed on June 2, 2009, FWS stated that there are no federally listed threatened, endangered, or proposed species or proposed critical habitat in the vicinity of the Spearfish Project. Therefore, effects on threatened and endangered species are not assessed in this draft EA. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

The project is located in the northeastern portion of the Black Hills and adjacent plains, an area of uplifted topography with elevations ranging from 3,000 to 7,200 feet. Precambrian igneous and metamorphic rocks form the core of the Black Hills and are overlain by a sequence of predominantly Paleozoic limestone, sandstone, and shale units (Hortness and Driscoll, 1998). Important regional groundwater aquifers are formed in the Paleozoic rock interval by the Deadwood Formation, Madison Limestone, Minnelusa Formation, and Minnekahta Limestone. The Madison Limestone and Minnelusa Formations contain the Madison and Minnelusa aquifers, which are used extensively for water supply in the project area. These aquifers are confined by the underlying Precambrian rocks and by the overlying Spearfish Formation (Hortness and Driscoll, 1998). The Mississippian-age Madison Limestone Formation, the most dominant geologic unit within Spearfish Canyon, is composed of limestone and dolomite with solution openings and fractures that permit high permeability and conduit flow. The Pennsylvanian and Permian-age Minnelusa Formation is composed of thick sandstone with thin limestone, dolomite, and mudstone in the upper portion and more shale, limestone, and dolomite in the lower portion. The upper portion (first 200 to 300 feet) of the Minnelusa Formation is considered more permeable than the lower portion because of the coarser sandstone and other collapse features. The lower portion of the formation generally limits flow between the Minnelusa and Madison aquifers (Putnam and Long, 2007). Well yields in the Madison and Minnelusa aquifers are variable; most range from 10 to 200 gallons per minute, but some yield as much as 1,700 gallons per

minute (Putnam and Long, 2007). Transmissivity in the Madison and Minnelusa aquifers is very heterogeneous, and hydraulic connection between the two aquifers is spatially variable (Putnam and Long, 2007).

3.3.1.2 Environmental Effects

Erosion Control

There are no known ongoing soil erosion control problems at the Spearfish Project, and the applicant does not propose any measures to control erosion or sedimentation. However, the Forest Service specifies in condition 7 that the applicant file with the Commission an erosion control plan at least 60 days prior to any ground-disturbing activity.

Our Analysis

The applicant does not propose any major new construction at the project, and the proposed minimum flows in the project's bypassed reach are within the range of flows that occurs during spill events, and are not likely to contribute to erosion. The applicant proposes to construct a system for releasing minimum flows at Maurice dam, which would involve some ground-disturbing activities that could cause erosion and sedimentation. The Forest Service also specifies in its condition 18 that the flow release structure include a system for monitoring minimum flow releases. Installing a flow monitoring system may involve some additional ground disturbance that could further contribute to erosion and sedimentation. Developing an erosion control plan as specified by the Forest Service would help ensure the protection of fish and wildlife species and would help minimize any degradation to aquatic habitat during ground-disturbing activities.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

The city of Spearfish receives approximately 21 inches of total rainfall per year, which occurs primarily during the spring and summer, and 61 inches of winter snowfall per year. Average temperatures in the project area range from 13ºF in the winter to 85ºF in the summer. Extreme temperatures from -32ºF to 109ºF have been reported. The growing season, during which time downstream irrigators divert water for agricultural uses, is approximately 213 days from April 1 through October 31. The critical months for irrigation occur from May through September.

For a period of 10 years (water years 1989–1998), there were three active streamflow gages located on Spearfish Creek:

- USGS gage 06430900 (Spearfish Creek upstream of Spearfish), located directly upstream of the project's intake, has a drainage area of 139 square miles;

- USGS gage 06431500 (Spearfish Creek at Spearfish), located directly downstream of the tailrace, has a drainage area of 168 square miles; and

- USGS gage 06432020 (Spearfish Creek below Spearfish), located immediately upstream of the junction of Spearfish Creek and the Redwater River, has a drainage area of 204 square miles.

USGS gage 06431500 remains active while USGS gage 06430900 was just discontinued on November 16, 2009, and USGS gage 06432020 was discontinued in September 1998. The average monthly flows for Spearfish Creek at these three gages for the period 1989–1998 are shown in figure 2.

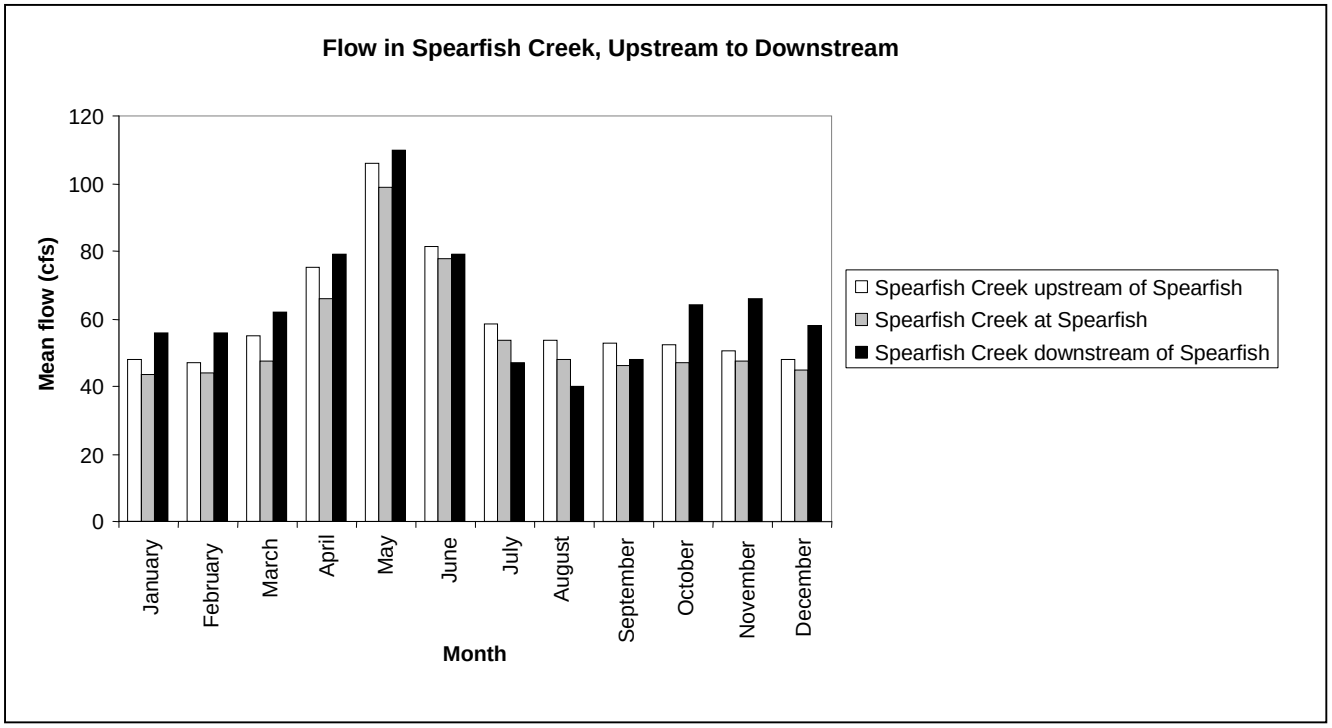

Figure 2. Average monthly flow in Spearfish Creek, 1988–1998 (Source: USGS, 2009, as modified by staff).

Under current project operations, all flows up to 120 cfs are diverted from Spearfish Creek at Maurice dam and are returned to lower Spearfish Creek at the powerhouse, bypassing approximately 7.3 miles of stream channel. During wet years, flow in Spearfish Creek at Maurice dam may exceed 120 cfs, especially during the period from April through June. During dry and normal years, however, flow rarely exceeds 120 cfs, which limits flow in the bypassed reach to runoff from local tributaries and spring discharge. The upper 3.3 miles of the bypassed reach from Maurice dam to the city of Spearfish's municipal/irrigation water intake (figure 3) gains approximately 2 to 20 cfs from surface runoff and groundwater contributions (Hortness and Driscoll, 1998). The remainder of the bypassed reach from the Spearfish municipal/irrigation diversion to the powerhouse tailrace loses up to an estimated average of 24 to 33 cfs to groundwater recharge. The mean annual flow of Spearfish Creek at USGS gage 06431500, located downstream from the powerhouse tailrace, is 55.5 cfs. Monthly average flows vary from a maximum of 100 cfs during May to a minimum of 44 cfs during January and February.

After flows from the project return to Spearfish Creek at the powerhouse tailrace, the creek flows north through the city of Spearfish to the Redwater River, which flows north and east to the Belle Fourche River. Downstream of the confluence of the Redwater and Belle Fourche rivers, all flow in the Belle Fourche River, except for the minimum instream flow requirement of 5 cfs, is diverted into Belle Fourche reservoir. Many small tributaries and springs flow into the 36 square miles of the Spearfish Basin between the tailrace and the confluence with the Redwater River, the largest of which is Higgins Gulch. These tributaries, springs, and other sources of flow accretion increase flow in Spearfish Creek by an average of 6.9 cfs from October through May.[9] This increased flow volume is not seen from June through September due to surface water withdrawals between the intake at Maurice dam and the junction of Spearfish Creek with the Redwater River.

There are 11 state permitted surface water diversions between Maurice dam and the junction of Spearfish Creek with the Redwater River (table 2), and with the exception for the city of Spearfish's municipal/irrigation diversion, they occur downstream of the powerhouse. Water rights for 10 of these diversions pre-date the City's water rights for the hydropower project. Water diverted from the stream at these sites is primarily used for irrigation during the summer months. While the total amount

---

[9] Based on the difference in flow data between USGS gage 06432020 (Spearfish Creek below Spearfish), located immediately below the confluence of Spearfish Creek and the Redwater River and USGS gage 06431500 (Spearfish Creek at Spearfish) for water years 1988 to 1998.

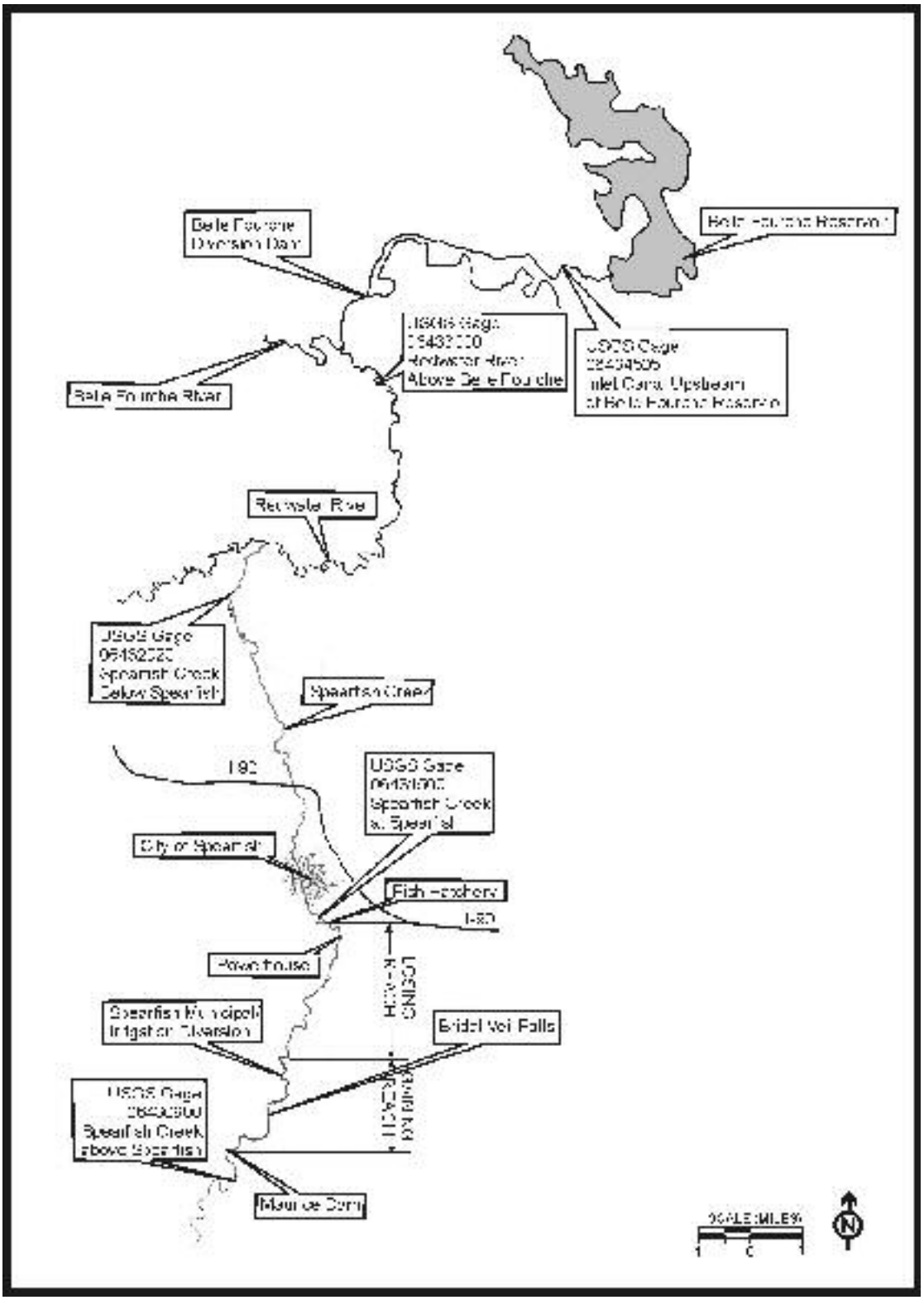

Figure 3. Location of the gaining section and losing section of the bypassed reach, stream gages, and other features along Spearfish Creek in the project area (Source: DTA, 2008a, as modified by staff).

of consumptive water rights equals approximately 102.6 cfs (the 6.6-cfs diversion for the D.C. Booth Historic National Fish Hatchery is non-consumptive), not all diversions are withdrawn to their maximum allowable volume at all times. During July and August, the overall flow in Spearfish Creek decreases an average of 14.7 cfs as it flows toward the Redwater River due to diversions for irrigation and other purposes. The effects are most pronounced in dry years, particularly in the reach downstream of the Cook diversion located about 4 miles downstream of the powerhouse. From 1989 to 1991, for example, total diversions between the gage downstream of the project tailrace and the gage near the confluence with the Redwater River were approximately 30 cfs.[10]

Table 2. Permitted water right diversions along Spearfish Creek from upstream to downstream (Source: city of Spearfish, 2008).

Permitted Water Right Diversions	**Amount of Diversion Permitted (cfs)**
City of Spearfish municipal/irrigation diversion[a]	2.5
FWS D.C. Booth Historic National Fish Hatchery	6.6 (nonconsumptive)
Owens-Gay & Ramsdell ditch	3.74
Walton-Schuler ditch	8.5
Mann ditch	1.45
Tonn-Evans ditch	14.4
Cook Ditch Company	21.6
Richard Cundy	0.6
Kemper ditch	24
Cook-Burns ditch	17.8
Bowman ditch	8

[a] The city of Spearfish's municipal/irrigation diversion is located approximately 3.3 miles downstream of Maurice dam.

Spearfish Creek flows north into the Redwater River, which flows northeast into the Belle Fourche River, which flows northeast toward the Belle Fourche reservoir. The U. S. Bureau of Reclamation completed construction of the Belle Fourche Project,

[10] Based on the difference in flow data between USGS gage 06432020 (Spearfish Creek below Spearfish), located near the confluence of Spearfish Creek and the Redwater River and USGS gage 06431500 (Spearfish Creek at Spearfish) for water years 1988 to 1998.

which includes the Belle Fourche reservoir, in 1914 (U.S. Bureau of Reclamation, 2010a). In 1949, the Belle Fourche Irrigation District, an organization formed by landowners within the area served by the Belle Fourche Project, took over the project's operation and maintenance. Flow to the reservoir is diverted to an inlet canal downstream of the town of Belle Fourche. A small amount of the water in the inlet canal is diverted to the Johnson lateral before the remaining water flows into Belle Fourche reservoir. Whitewood Creek and Horse Creek also provide a small amount of water to the system. Water from the reservoir is released into two canals for irrigation.

Belle Fourche reservoir receives approximately 60 percent of its water supply from the Northern Black Hills, conveyed via the Redwater River to the Belle Fourche River (letter from J. Nettleton, U.S. Bureau of Reclamation, to the Commission, filed February 20, 2009). Based on flow gaging at Spearfish Creek upstream of Spearfish and the Redwater River upstream of its confluence with the Belle Fourche (excluding July and August), Spearfish Creek contributes approximately 36 percent of the flow in the Redwater River and a maximum of about 22 percent of the flow in the Belle Fourche River. Mean annual inflow to Belle Fourche reservoir for water years 1985–2006 was 114,109 acre-feet, and the total storage capacity in Belle Fourche reservoir is 259,012 acre-feet (Ferrari, 2006). Storage in the Belle Fourche reservoir fluctuates from an average high of 144,778 acre-feet at the beginning of the irrigation season in May, to an average low of 60,803 acre-feet, at the end of the irrigation season in September (U.S. Bureau of Reclamation, 2009). Water surface elevations within Belle Fourche reservoir typically rise continuously during the winter months from an average low of 2,952 feet in September at the end of the irrigation season, to an average high of 2,969 in May at the beginning of the irrigation season (U.S. Bureau of Reclamation, 2009). Reservoir water surface elevations increase each month during the non-irrigation season until the beginning of the irrigation season, and flows are seldom released from the reservoir to the downstream river channel during the non-irrigation season (October through April). The Belle Fourche Irrigation District is allowed to divert all flow in the Belle Fourche River to the Belle Fourche reservoir, except 5 cfs required to maintain minimum flows in the river, until its storage right of 185,000 acre-feet is met. During water years 1997 to 2009, the end-of-month storage in the Belle Fourche reservoir has exceeded 185,000 acre-feet only four times (U.S. Bureau of Reclamation, 2010b).

An important source of recharge to the Madison and Minnelusa aquifers is streamflow loss that occurs as streams cross outcrops of the Madison Limestone and Minnelusa Formation. The 7.3-mile-long bypassed reach of Spearfish Creek has a gaining section in the first 3.3 miles immediately downstream of Maurice dam, and a losing section in the remaining 4 miles of the stream to where it converges with the powerhouse tailrace. Average flow loss for Spearfish Creek within the Madison limestone outcrop in the bypassed reach is 20 to 25 cfs, the largest streamflow recharge rate in the northern Black Hills (Hortness and Driscoll, 1998; Putnam and Long, 2007). Streamflow loss rate for the reach between the Madison outcrop and the powerhouse

tailrace is between 4 and 8 cfs (Putnam and Long, 2007). Total losses within the losing section of the bypassed reach are therefore 24 to 33 cfs. Karstic features (e.g., sinkholes, collapse features, solution cavities, and caves) are primarily responsible for rapid groundwater recharge from streamflow in the losing section of the bypassed reach (Hortness and Driscoll, 1998). The mean and median monthly flow losses within the project works (i.e., aqueduct, stave pipes, and penstocks) between October and March (1989–1996) were estimated to be 2 cfs and 4 cfs, respectively (Hortness and Driscoll, 1998).

Groundwater flow is generally from the losing section of the bypassed reach of Spearfish Creek toward the northeast, although flow directions vary due to anisotropic materials (porous medium without equal permeability in all directions), fractures and collapse features, higher gradients near recharge areas, variations in transmissivity, and discharge to artesian springs (Putnam and Long, 2007). Dye injection and tracing from the losing section of the bypassed reach of Spearfish Creek to wells and springs provides insights on groundwater flow paths, ages, and mixing (Putnam and Long, 2007). Dye tracers injected into Spearfish Creek were transported mainly toward the north but were also dispersed in an east-west direction. Analysis of apparent groundwater ages at wells and artesian springs also indicated that flow from the Madison and Minnelusa aquifers represents a mixture of younger water (months) and older water (years to decades) with different sources, flow paths, and residence times (Putnam and Long, 2007).

Artesian springs contribute about 10 cfs to Spearfish Creek downstream of the powerhouse. Higgins Gulch and Old Hatchery Springs, located between the city of Spearfish and the Redwater River, make up most of the spring discharge to Spearfish Creek (Putnam and Long, 2007). Total artesian springflow to the Redwater River upstream of its confluence with the Belle Fourche has been estimated to be about 94 cfs (Carter et al., 2001). The combined total estimated spring discharge rate from the area is more than the estimated average recharge rate in the area. Some of the flow recharged to the aquifer in the losing section of the bypassed reach of Spearfish Creek may be returned to surface flow upstream of Belle Fourche reservoir; however, we are unable to verify this.

Water Quality

As required by the CWA, the state of South Dakota has developed surface water quality standards that establish the uses of a water body, set criteria necessary to protect the uses, and establish policies to maintain and protect water quality. Chapters 74:51:01 of the Surface Water Quality of the Administrative Rules of South Dakota contains numeric and narrative water quality standards for 11 different beneficial uses assigned to streams and lakes. The beneficial use designations for waters within the project area are: domestic water supply; coldwater permanent fish life propagation; coldwater

marginal fish life propagation; immersion recreation; limited contact recreation; fish and wildlife propagation, recreation, and stock watering; and irrigation. In addition to meeting specific water quality criteria for the designated beneficial uses, all waters need to attain the criteria for toxic pollutants (Chapter 74:51:01:55 and Chapter 74:51:01). The toxic pollutants standards are measured in human health value concentrations and freshwater aquatic life value concentrations.

Two water quality monitoring stations maintained by the South Dakota DENR are located within or in proximity to the project area: (1) Station WQM MN35 located at the city of Spearfish municipal/irrigation diversion approximately 3.3 miles downstream of Maurice dam in the bypassed reach (referred to as the bypassed reach site) and (2) Station WQM 22 located at the Spearfish City Park downstream of the Spearfish Project powerhouse and approximately 500 feet downstream from the D.C. Booth Historic National Fish Hatchery (referred to as the downstream site). Selected water quality parameters have been monitored at the bypassed reach site since 1990[11] and at the downstream site since 1967.[12] The most recent state water quality assessment indicates that reaches of Spearfish Creek within the project area are supporting their designated uses (South Dakota DENR, 2006).

The reach of Spearfish Creek between the powerhouse and the Redwater River has exhibited high water temperatures in the past. These occurrences typically happen in dry years downstream of the irrigation withdrawals. Withdrawals during dry years can leave as little as 1 cfs in Spearfish Creek in this reach. The temperature of the water during these low-flow periods is raised by solar energy and has caused fish kills in the past.

---

[11] Water quality parameters measured at the bypassed reach site include total dissolved solids (TDS), nitrates as N, pH, total ammonia nitrogen as N, dissolved oxygen (DO), total suspended solids (TSS), temperature, fecal coliform, total alkalinity as calcium carbonate, and conductivity at 25 degrees Celsius (°C).

[12] Water quality parameters measured at the downstream site include TDS, nitrates as N, pH, total coliform, chlorides, fluoride, sulfate, total ammonia nitrogen as N, DO, undissociated hydrogen sulfide, TSS, temperature, fecal coliform, total alkalinity as calcium carbonate, conductivity at 25°C, and sodium adsorption rate.

Fishery Resources

Fish population data in Spearfish Creek, which have been collected intermittently both spatially and temporally from 1981 to 2008, provide information about fish species presence/absence and relative abundance at specific sampling sites (South Dakota DGF&P, 2008, 2007, 2006). Results from these surveys indicate that brown trout are the dominant fish species in Spearfish Creek from the town of Savoy, located approximately 4.5 miles upstream of Maurice dam, downstream to the confluence with the Redwater River. The fishery resource descriptions provided below rely heavily upon these sources unless otherwise noted.

Fishery Upstream of Maurice Dam

Fish resources in Spearfish Creek in the reach from Savoy downstream to Maurice dam include populations of brown trout, brook trout, and rainbow trout. Brown trout have been the dominant fish species observed in the reach. The 1-mile reach of Spearfish Creek immediately upstream of Maurice dam includes the only naturally reproducing population of rainbow trout in the Black Hills classified as a Class I fishery (>25 fish ≥200 millimeters [mm] per surface acre). Cleopatra Creek, a tributary to Spearfish Creek located approximately 0.75 mile upstream of Maurice dam, provides spawning and rearing habitat for rainbow and brook trout.

Data on fish abundance in the reach from the town of Savoy downstream to Maurice dam are available intermittently during the period of 1981–2007 for six sites (Sites 16, 26, 22, 4, 3, and 10) (South Dakota DGF&P, 2006, 2007). Site 16 is the most upstream site sampled in this reach and generally brown trout have been observed exclusively. Adult brown trout abundance at Site 16 averaged 1,198 fish per mile (table 3). Sites 26 and 22 were each sampled once, and these two sites had the highest average density of adult brown trout in the reach. Sites 3 and 4 are located between Cleopatra Creek and Maurice dam in the reach designated as a Class I rainbow trout fishery. Sites 3 and 4 both have relatively long-term data sets and show stable rainbow trout abundance and more variable brown trout abundance. These two sites had the highest density of adult rainbow trout in the reach. Site 10 is located in lower Cleopatra Creek and was sampled once in 2007 when adult rainbow trout and brook trout were observed in relatively low densities (South Dakota DGF&P, 2007).

Table 3. Mean density of adult trout for sites sampled in the reach of Spearfish Creek from the town of Savoy downstream to Maurice dam.

			Mean Density (fish per mile)		
Site #	**Location**	**Years Sampled**	**Brown**	**Rainbow**	**Brook**
16	3.5 miles upstream of Maurice dam	1998, 2004, 2005, 2007	1,198	0	4
26	1.5 miles upstream of Maurice dam	2004	4,699	338	0
22	0.7 mile upstream of Maurice dam	1999	2,237	499	16
4	0.5 mile upstream of Maurice dam	1991–1996, 1999–2004, 2007	1,114	647	0
3	0.4 mile upstream of Maurice dam	1991–1996, 2000–2003	1,339	584	0
10	Lower Cleopatra Creek (tributary 0.5 mile upstream of Maurice dam)	2007	0	16	48

Fishery in the Bypassed Reach

The bypassed reach extends from Maurice dam downstream to the powerhouse just upstream of the city of Spearfish. Fishery resources in the 7.3-mile bypassed reach include populations of brown trout and brook trout, with intermittent observations of rainbow trout and brook stickleback. Brown trout comprise greater than 95 percent of the fish population in the bypassed reach. Hydrology and flow conditions in the bypassed reach generally restrict fish to the upper 3.3-miles of the bypassed reach (gaining section) where there is perennial flow. The stream channel immediately downstream of the dam is generally dry for several hundred feet before flow is supplied by groundwater springs and tributaries with accretion ranging from approximately 2 cfs near the upstream end of the gaining section of the bypassed reach to approximately 20 cfs at the downstream end of the gaining section of the bypassed reach near the city of Spearfish municipal/irrigation diversion. This reach is classified by the state as "coldwater permanent fish life propagation waters."

The lower 4 miles of the bypassed reach (losing section) crosses the Madison Limestone and Minnelusa Formation outcrops where surface flow is lost to

groundwater. Most of this reach remains dry under existing conditions. The reach receives surface flow from local tributary runoff and from the upper watershed when flow in excess of the project's 120-cfs hydraulic capacity spills over Maurice dam. This reach is classified by the state as "coldwater marginal fish life propagation waters."

Data on fish abundance in the bypassed reach include six sites, four in the gaining section of the bypassed reach (Sites 339, 23, 327, and 17) and two in the losing section of the bypassed reach (Sites 18 and 19) (South Dakota DGF&P, 2008, 2006) (table 4). Sites 23, 339, and 327 are located upstream of Bridal Veil Falls and average abundance of adult brown trout for these sites was 668, 80, and 917 fish per mile, respectively. Site 17 is located in the gaining section of the bypassed reach downstream of Bridal Veil Falls and upstream of the city of Spearfish's municipal/irrigation diversion. Brown trout were the most abundant species of adult trout observed at Site 17. Brook and rainbow trout were also observed in low densities. Site 18 is located in the losing section of the bypassed reach downstream of the city of Spearfish diversion and was only surveyed in 1998. Adult brown trout abundance at this site was 48 fish per mile. Site 19 is located upstream of the Highway 14a Bridge, approximately 1 mile downstream of Site 17 and the city of Spearfish diversion, and was dewatered when the site was established in 1998. No additional surveys were conducted at Site 19.

Table 4. Mean density of adult trout for sites sampled in the bypassed reach of Spearfish Creek (Maurice dam downstream to the powerhouse near the city of Spearfish).

Site #	Location	Years Sampled	Mean Density (fish per mile)		
			Brown	Rainbow	Brook
339	0.3 mile downstream of Maurice dam	2008	80	0	80
23	0.4 mile downstream of Maurice dam	1999, 2005	668	0	8
327	0.9 mile downstream of Maurice dam	2008	917	0	0
17	0.1 mile downstream of Bridal Veil Falls	1981, 1988	1,653	15	73
18	0.1 mile downstream of the Spearfish Municipal/ Irrigation Diversion	1998	48	0	0
19	2.5 miles downstream of the Spearfish Municipal/ Irrigation Diversion	1998[a]	0	0	0

[a] Site 19 was dewatered in June 1998 and no fish were sampled.

Fishery Downstream of the Powerhouse

Fishery resources in the reach of Spearfish Creek from the powerhouse near the city of Spearfish downstream to the Redwater River include brown, brook, and rainbow trout, white sucker, longnose sucker, and longnose dace. Mountain sucker, a Region 2 sensitive species, has been observed in the lower reaches of Spearfish Creek near the Redwater River.

Downstream of the powerhouse, Spearfish Creek flows for approximately 2 miles through the city of Spearfish, and then through a mix of residential developments and agricultural lands for about 1 mile before crossing under Interstate 90. Downstream of Interstate 90, Spearfish Creek flows through agricultural lands for approximately 7 miles to its confluence with the Redwater River. Flow measured in the upper subreach (subreach 2) during instream flow studies conducted by the applicant using the Delphi method (DTA, 2008a) averaged approximately 50 cfs when no flow was released into the bypassed reach.

Surface water diversions downstream of Spearfish City Park substantially reduce surface flow. The subreach located downstream of the Cook diversion about 1 mile downstream of Interstate 90 is considered the driest and most sensitive subreach downstream of the powerhouse. Low inflow during some years in combination with irrigation withdrawals and warm water temperatures can cause water temperatures that exceed the thermal tolerance for brown trout, resulting in substantial mortality. A recent fish kill occurred in 2005 as a result of high water temperatures. Flow measured in this subreach (subreach 1) during the Delphi study averaged approximately 24 cfs (DTA, 2008a). Accretion from groundwater springs increases surface flow a short distance downstream of this subreach.

Spearfish Creek downstream of the powerhouse is classified by the state as "coldwater permanent fish life propagation waters." Resident trout populations and good public access (through municipal parks, trails, and bridges) provides a popular recreational fishery in the first 3.5 miles of Spearfish Creek downstream of the powerhouse. Private property limits access to fishing opportunities on Spearfish Creek downstream of Interstate 90.

Data on fish abundance within the upper part of the reach downstream of the powerhouse are available intermittently during the period of 1987–2005 for three sites (Sites 2, 5, and 1) (South Dakota DGF&P, 2006) (table 5). Based on these data, adult brown trout abundance averaged 1,637 fish per mile at Site 2; 2,231 fish per mile at Site 5; and 1,209 fish per mile at Site 1. Brown trout was the most abundant fish species in the upper part of this reach comprising more than 95 percent of the fish observed. Adult rainbow trout were observed in low densities at Sites 2 and 5. Data on fish abundance within the lower part of this reach are limited to only a few samples from three sites

(Sites 20, 21, and 24). Site 20 is located in the vicinity of Johnson Ranch and Site 21 is located less than a mile downstream of Site 20. Adult brown trout abundance at Sites 20 and 21 were 427 and 1,561 fish per mile, respectively. Site 24 is located immediately upstream of the Redwater River and was sampled once in 2000. The majority of fish observed at site 24 were brown trout (22 adult and 323 juvenile were estimated), with brook stickleback, longnose dace, and white sucker observed in low numbers (South Dakota DGF&P, 2006).

Table 5. Mean density of adult trout for sites sampled in the reach of Spearfish Creek from the powerhouse downstream to the confluence of Spearfish Creek with the Redwater River.

Site #	Location	Years Sampled	Mean Density (fish per mile)		
			Brown	Rainbow	Brook
2	0.2 mile downstream of powerhouse near the city campground	1987, 1988, 1990–1996, 1998, 1999, 2005	1,637	44	0
5	1.0 mile downstream of powerhouse	1987, 1988, 1990–1996, 1998, 1999, 2004, 2007	2,231	1	0
1	1.7 miles downstream of powerhouse near high school	1987, 1990–1996, 2005	1,209	0	0
20	Johnson Ranch (0.8 mile downstream of I-90)	1998, 2005[a]	460	0	0
21	Upstream of Camp Comfort Road (1.6 miles downstream of I-90)	1998	1,561	0	0
24	Downstream of Creekside Loop Road Bridge (0.6 mile upstream of the Redwater River)	1993	354[a]	0	0

[a] Trout abundance was estimated twice in 2005 (July and September); values shown are the average density over the two sampling periods.

3.3.2.2 Environmental Effects

Minimum Flows

The project currently diverts all flow in Spearfish Creek up to the project's hydraulic capacity of 120 cfs, eliminating or reducing flow into the bypassed reach. Reduced flow affects fisheries and aquatic habitat values in the bypassed reach.

The applicant proposes to release a minimum flow of 3 cfs from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions to be defined by South Dakota DENR. Based on an analysis of flow conditions that occurred in 1990 when a fish kill was reported in Spearfish Creek near the city of Spearfish, the South Dakota DENR stated in its comments on SD 1 that to protect beneficial uses downstream of the project, minimum flow releases to the bypassed reach would need to be suspended when a flow of 40 cfs or less occurs at USGS gage 06431500 (Spearfish Creek at Spearfish) during the May 1 through September 30 irrigation season.[13] South Dakota DENR did not identify a need to suspend minimum flow releases during the non-irrigation season.

There are currently no reliable means (e.g., spillway gates, valves, etc.) of releasing minimum flows at Maurice dam. Therefore, the applicant proposes to design and install a system for releasing minimum flows which may include a bypass pipe and other equipment.

Forest Service condition 17 specifies a year-round minimum flow release of 6 cfs at Maurice dam with a provision for reducing minimum flow releases during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions. The Forest Service defines extreme low-flow conditions as a 7-day average flow of less than 40 cfs measured at USGS gage 06431500 (Spearfish Creek at Spearfish) on or after May 1. The 7-day average flow would be computed based on flows measured from Monday through Sunday, with the flow to be adjusted on the following Monday. The Forest Service specifies that the flow release into the bypassed reach would be restored to 6 cfs on October 1.

Forest Service condition 18 specifies that the applicant design, construct, and maintain a minimum flow release structure at Maurice dam similar to the system for releasing minimum flows proposed by the applicant. However, condition 18 also specifies that the applicant install a measuring device, with continuous recording capability, to monitor and report compliance with minimum flow requirements.

---

[13] *See* South Dakota DENR's February 12 and July 17, 2009, filings.

Our Analysis

Water Quantity

The applicant proposes to design and install a system for releasing minimum flows at Maurice dam, which may include a bypass pipe and other equipment. Under Forest Service condition 18, the applicant would construct and install a similar system; however, the applicant would also be required to install a measuring device or gage, with continuous recording capability, for the purpose of monitoring minimum flows. Both proposals would permit the applicant to release minimum flows at Maurice dam; however, the Forest Service's proposal would also provide a means to measure flows and determine compliance with any required flow releases. Because of the flow gains and losses that occur between Maurice dam and the nearest gage downstream of the project (USGS gage 06431500; Spearfish Creek at Spearfish), this nearest gage would not provide an effective method for documenting compliance with any minimum flow requirements. A gage located at Maurice dam with continuous measuring capacity, as specified by the Forest Service, would provide the data needed to ensure the applicant's compliance with any minimum flow requirements.

Operational compliance monitoring is a standard requirement in Commission-issued licenses. Development and implementation of an operational compliance monitoring plan and schedule would be beneficial in that it would document the procedures the city of Spearfish would follow to demonstrate compliance with any license requirements for minimum flows.

The applicant's proposed minimum flow releases would increase the average annual flow allocation to the bypassed reach by a maximum of 2,523 to 3,433 acre-feet compared to existing conditions.[14] The streamflow loss threshold for the losing section of the bypassed reach (an estimated average of 24 to 33 cfs) is substantially higher than the minimum flow releases that are proposed by the applicant. As a result, minimum flows released into the bypassed reach would not produce surface flow over the full length of the bypassed reach, but would enter the Madison and Minnelusa aquifers as flow crosses outcrops of the Madison Limestone and Minnelusa Formation in the losing section of the bypassed reach (figure 3). Recharge of minimum flows to groundwater aquifers would reduce flow in downstream reaches of Spearfish Creek during low-flow periods, as well as flows in the downstream Redwater and Belle Fourche rivers, and

---

[14] The range of this estimate is bounded by a dry year in which the dry-year trigger is reached at the beginning of the irrigation season and a wet year when the dry-year trigger is never reached. These volumes represent maximum allocations in that they assume that no uncontrolled spills occur. Any spill would reduce the amount of additional flow release needed to meet the minimum flow requirement.

would reduce the annual surface water supply to Belle Fourche reservoir. Some of the water that passes into the aquifers may be returned to the lower reaches of Spearfish Creek and the Redwater River by increased flow at springs, but it is difficult to predict the magnitude of this effect.

Excluding any increased contribution from spring flows, which we do not have sufficient information to estimate, flows in the bypassed reach that are recharged to aquifers under the applicant's proposal would result in an average annual reduction of approximately 6.3- to 8.5-percent in flow at USGS gage 06431500 (Spearfish Creek at Spearfish).[15] Assuming that the amount of water that is withdrawn from irrigation diversions downstream of this gage is similar to what has been diverted in the past, the applicant's proposed flow releases would result in an average annual reduction of 5.5- to 7.5-percent of flow in Spearfish Creek between the powerhouse and the Redwater River, as measured at USGS gage 06432020 (Spearfish Creek below Spearfish),[16] an average annual reduction of 2.5- to 3.4-percent of flow in the Redwater River downstream from Spearfish Creek, as measured at USGS gage 06433000 (Redwater River upstream of its confluence with the Belle Fourche),[17] and an average annual reduction of 2.2- to 3.0-percent of flow to Belle Fourche reservoir, as measured at USGS gage 06434505 (Inlet Canal upstream of Belle Fourche) (U.S. Bureau of Reclamation, 2009).[18]

The applicant's proposed minimum flow releases would result in periodic wetting and dewatering of portions of the bypassed reach when: (1) flows change from 6 cfs during the non-irrigation season to 3 cfs during the irrigation season and (2) minimum flow releases into the bypassed reach are suspended during extreme low-flow conditions. Based on historical streamflows at the project, in some years the 40-cfs trigger identified by South Dakota DENR would result in the suspension of flow releases over extended periods. In a series of dry years between 1988 and 1993, flow releases would have been suspended for 16 to 125 days during the irrigation season (table 6). In 1992, for example, flow releases would have been suspended continuously from May 29 until October 1. During the relatively wet periods from 1994 to 2002, flows were always greater than 40 cfs. From 2003 to 2006, flow releases would have been suspended for shorter periods, typically during August and September. As shown in table 6, the 40-cfs trigger identified by South Dakota DENR would be expected to

---

[15] Based on water years 1947 to 2007.

[16] Based on water years 1989 to 1998.

[17] Based on water years 1946 to 2007.

[18] Based on water years 1995 to 2008.

trigger frequent fluctuations in flow releases from 0 to 3 cfs over periods as short as 1 day. In 1993, for example, the dry year trigger would have been reached on four separate occasions during August and September, resulting in flow fluctuations from 3 cfs to 0 cfs and back to 3 cfs on each occasion. Some suspension of flows would be expected over periods as short as 1 day, resulting in short-term periodic wetting and drying of the bypassed channel during the irrigation season.

Table 6. Number of days when flow releases would be reduced or suspended under the applicant's proposal and Forest Service condition 17, based on USGS historical flow data (water years 1988–2008) (Source: staff).

	Applicant's Proposal[a]		**Forest Service Condition 17[b]**
Year	**Days when Flow Releases Would be Suspended**	**Number of Times the Flow Releases would be Suspended**	**Days When Flow Releases Would be Reduced to 4 cfs**
1988	106	4	110
1989	89	6	83
1990	92	2	91
1991	79	3	71
1992	125	1	115
1993	16	4	18
1994–2002	0	0	0
2003	13	1	9
2004	23	3	11
2005	57	4	68
2006	22	1	0
2007–2009	0	0	0

[a] Assumes that flow releases would be suspended when daily flows at USGS gage 06431500 are 40 cfs or less during the irrigation season, and would be reinstated once the daily flows returned to 43 cfs, based on South Dakota DENR's preliminary threshold identified in its comments on SD1.

[b] Assumes that flow releases would be reduced from 6 to 4 cfs when the average daily flow as measured from Monday through Sunday at USGS gage 06431500 is less than 40 cfs during the irrigation season, based on Forest Service Condition 17.

The minimum flow releases to the bypassed reach under the applicant's proposal would generate a total maximum loss during the irrigation season of 910 acre-feet of water. This assumes that flows at USGS gage 06431500 (Spearfish Creek at Spearfish) are greater than 40 cfs from May 1 to September 30. Under extreme low-flow conditions, no diversions would occur and there would be no loss to downstream water users. Under historic flow conditions from 1988 to 2009, the number of days where flow releases would have been suspended under the applicant's proposal, or would have been reduced under Forest Service condition 17 are shown in table 6. Under historic flow conditions from 1988 to 2009, the average annual loss to downstream water users under the applicant's proposal during the irrigation season would have been expected to be 734 acre-feet of water. Flow releases to the bypassed reach during the irrigation season under the Forest Service's condition 17 are expected to fall between 1,241 acre-feet and 1,820 acre-feet of water.[19] Under historic flow conditions from 1988 to 2009, the average annual loss to downstream users under the Forest Service's condition 17 during the irrigation season would have been 1,717 acre-feet of water.

Under Forest Service condition 17, the average annual flow allocation to the bypassed reach would increase by a maximum of 3,753 to 4,344 acre-feet of water compared to existing conditions.[19] As with the applicant's proposed flows, all minimum flows released to the bypassed reach under the Forest Service's proposal would be recharged to the Madison and Minnelusa aquifers as flow crosses outcrops of the Madison Limestone and Minnelusa Formation in the losing section of the bypassed reach.

Excluding any increased contribution from spring flows, which we do not have sufficient information to estimate, flows in the bypassed reach that are recharged to aquifers under the Forest Service's condition would result in an average annual reduction in flow of approximately 9.3- to 10.8-percent at USGS gage 06431500 (Spearfish Creek at Spearfish).[20] Assuming that the amount of water that is withdrawn from irrigation diversions downstream of this gage is similar to what has been diverted in the past, the Forest Service's condition would result in an average annual reduction of

---

[19] The lower estimate of this range is bounded by a dry year in which the average flows for May 1 (falling on a Monday) through May 7 (falling on a Sunday) average less than 40 cfs, triggering a reduction in flow to the bypassed reach from 6 to 4 cfs on Monday, May 8. The upper estimate of this range is bounded by a wet year when a 7-day Monday through Sunday average flow of less than 40 cfs is never reached. These volumes represent maximum allocations in that they assume that no uncontrolled spills occur. Any spill would reduce the amount of additional flow release needed to meet the minimum flow requirement.

[20] Based on water years 1947 to 2007.

8.1- to 9.4-percent of flow in Spearfish Creek between the powerhouse and the Redwater River, as measured at USGS gage 06432020 (Spearfish Creek below Spearfish),[21] an average annual reduction of 3.7- to 4.3-percent of flow in the Redwater River downstream from Spearfish Creek, as measured at USGS gage 06433000 (Redwater River upstream of its confluence with the Belle Fourche),[22] and an average annual reduction of 3.3- to 3.8-percent of flow to Belle Fourche reservoir, as measured at USGS gage 06434505 (Inlet Canal upstream of Belle Fourche) (U.S. Bureau of Reclamation, 2009).[23]

The minimum flows specified by the Forest Service would result in less frequent and lower magnitude fluctuations in wetted channel length in the bypassed reach than the applicant's proposed flows because flow releases would be reduced to 4 cfs during the irrigation season when extreme low-flow conditions occur, rather than ceasing flow releases as proposed by the applicant. As discussed previously and presented in table 6, flows of 40 cfs or less do not occur in most wet years, but may occur for 10 or more weeks in drier years.

The effect of flow releases on water levels in Belle Fourche reservoir cannot be precisely determined due to uncertainties in numerous factors, including the timing and magnitude of: (1) flows in Spearfish Creek, the Redwater River, the Belle Fourche River, and other tributaries to Belle Fourche reservoir; (2) surface water diversions in those river systems; and (3) water releases from Belle Fourche reservoir. The effect can be assessed in a relative context, however, using the area-capacity curve for Belle Fourche reservoir and conservatively assuming that none of the water released into the bypassed reach enters Belle Fourche reservoir. Since the effect is cumulative throughout the irrigation season, the largest anticipated effect on reservoir water surface elevations would occur at the end of the irrigation season. The average water surface elevation in Belle Fourche reservoir at the end of the irrigation season is approximately 2,952 feet and the maximum potential water allocation proposed for minimum flows to the bypassed reach is 4,344 acre-feet of water under Forest Service condition 17. Using the 2006 area-capacity curve for Belle Fourche reservoir (Ferrari, 2006), the maximum reduction in water surface elevation that could be caused by Forest Service condition 17 would be less than 1 foot. The Belle Fourche reservoir typically fluctuates as much as 20 feet per year, based on water years 1984 to 2009 (U.S. Bureau of Reclamation, 2009).

---

[21] Based on water years 1989 to 1998.

[22] Based on water years 1946 to 2007.

[23] Based on water years 1995 to 2008.

Fishery Resources

During pre-filing consultation, the agencies and other interested parties requested that the applicant evaluate a range of alternative minimum flows. A Delphi study was conducted to evaluate how much aquatic habitat could be gained by releasing flow to the bypassed reach, while avoiding or minimizing adverse effects on the tailwater fishery downstream of the powerhouse. Results from the Delphi study (DTA, 2008a) provide the most comprehensive assessment available of the effects of releasing flow from Maurice dam on the habitat characteristics in the bypassed reach, and are the primary source of information used to describe habitat characteristics likely to occur in the project area. We used these data to estimate channel conditions for flows proposed by the applicant and specified by the Forest Service, using functions best fit by least squares regression analysis (table 7). These estimated values were used to describe habitat characteristics unless identified otherwise.

Table 7. Estimated habitat conditions based on characteristics observed during the Delphi study (Source: staff).

	Gaining Section of the Bypassed Reach[a]	**Losing Section of the Bypassed Reach[b]**	**Downstream of the Powerhouse[c]**
Release		**Depth (feet)**	
0 cfs	0.47	0.09	0.94
3 cfs	0.57	0.43	0.92
4 cfs	0.61	0.46	0.91
6 cfs	0.66	0.51	0.90
9 cfs	0.74	0.57	0.87
18 cfs	0.88	0.69	0.78
		Wetted Width (feet)	
0 cfs	14.8	1.0	27.2
3 cfs	16.8	13.2	27.0
4 cfs	17.3	15.0	27.0
6 cfs	18.3	18.0	26.8
9 cfs	19.5	21.6	26.5
18 cfs	21.5	29.4	25.1
		Wetted Perimeter (feet)	
0 cfs	15.9	1.2	28.0
3 cfs	18.2	14.3	27.8

Release	Gaining Section of the Bypassed Reach[a]	Losing Section of the Bypassed Reach[b]	Downstream of the Powerhouse[c]
	Depth (feet)		
4 cfs	18.7	16.2	27.7
6 cfs	19.8	19.3	27.5
9 cfs	21.2	23.0	27.2
18 cfs	23.3	31.0	25.8
	Increase in Wetted Channel Length (feet)		
0 cfs	No change	No change	No change
3 cfs	No change	590	No change
4 cfs	No change	1,025	No change
6 cfs	No change	2,250	No change
9 cfs	No change	4,908	No change
18 cfs	No change	18,664	No change

[a] The gaining section of the bypassed reach includes the upper 3.3 miles of the bypassed reach from Maurice dam downstream to the city of Spearfish municipal/irrigation water supply diversion (reported value is the average of five transects monitored during the Delphi study).

[b] The losing section of the bypassed reach includes the lower 4 miles of the bypassed reach from the city of Spearfish municipal/irrigation water supply diversion downstream to the powerhouse (reported value is the average of three transects monitored during the Delphi study).

[c] This reach includes the 10-mile reach from the powerhouse downstream to the confluence with the Redwater River (reported value is the average of six transects monitored during the Delphi study).

The Delphi study produced data that allow estimation of aquatic habitat conditions downstream of Maurice dam. The applicant's proposed flows would increase habitat for resident trout and other aquatic species compared to existing conditions. During the non-irrigation season (October 1–April 30), the proposed minimum flow of 6 cfs would increase wetted perimeter in the gaining section of the bypassed reach by approximately 3.9 feet and average depth by approximately 0.2 foot compared to existing conditions. In the losing section of the bypassed reach, the length of wetted stream would increase by approximately 2,250 feet, wetted perimeter would increase by approximately 18 feet, and average depth would increase by approximately 0.4 foot compared to existing conditions (table 7). The 2,250-foot increase in wetted

channel represents an approximately 13 percent increase in overall wetted channel length in the bypassed reach.[24] When average flow at USGS gage 06431500 (Spearfish Creek at Spearfish) falls to 40 cfs or less during the irrigation season, flows would be suspended and the habitat conditions would be similar to existing conditions.

Based on the period of 1988–2008, flow releases would be suspended approximately 1 out of every 2 years,[25] and in the 6 years from 1988 to 1993, flow releases would have been suspended for 16 days in the wettest year and for 125 days in the driest year. In years when flow releases are suspended, the length of wetted surface flow in the losing section of the bypassed reach would decrease by approximately 590 feet (table 7) from the amount that was wetted during the irrigation season flow of 3 cfs, and the average wetted perimeter would decrease by approximately 16.25 feet (table 7). This reduction in flow and wetted area would reduce habitat quality and quantity. In most years that flow would be suspended, the 40-cfs low-flow threshold would be met intermittently resulting in multiple flow suspension and rewatering events a year.

Overall, trout habitat in the bypassed reach would increase under the applicant's proposal; however, the extent of this increase would vary depending on the frequency of extreme low-flow conditions, during which flows to the bypassed reach would be suspended.

The applicant proposes to develop a one-year minimum flow progress report to evaluate minimum flow releases to the bypassed reach. The effects of the applicant's proposed minimum flows are well known because of the applicant's Delphi study, which provided a comprehensive assessment of the effects of releasing minimum flows on habitat characteristics in the bypassed reach. Consequently, the benefits of any information gained from the applicant's proposed one-year minimum flow progress report would be minor.

Minimum flows specified in Forest Service condition 17 would provide more habitat for adult trout and other aquatic species compared with existing conditions and the applicant's proposed flows during the irrigation season. During the non-irrigation season, in the gaining section of the bypassed reach, the release of 6 cfs would increase wetted perimeter by approximately 3.9 feet and average depth by approximately 0.2 foot under both the Forest Service condition and the applicant's proposal (table 7). In the

---

[24] The overall wetted channel length under current conditions when there is no flow to the bypassed reach is approximately 17,424 feet.

[25] Flows of 40 cfs or less at USGS gage 06431500 (Spearfish Creek at Spearfish) have occurred in 10 of the last 20 years (1988–2008) and 33 of the past 62 years (1947–2008).

losing section of the bypassed reach, the length of wetted stream would increase by approximately 2,250 feet, wetted perimeter would increase by approximately 18 feet, and average depth would increase by approximately 0.4 foot compared to existing conditions for both proposals (table 7). The 2,250-foot increase in wetted channel represents an approximately 13 percent increase in overall wetted channel length in the bypassed reach

When the Forest Service dry-year conditions are implemented, the flow release would decrease from 6 cfs to 4 cfs, and the average wetted perimeter would decrease by an average of approximately 1.0 foot in the gaining section of the bypassed reach. In the losing section of the bypassed reach, length of wetted stream would be reduced by approximately 1,225 feet, and wetted perimeter would decrease by an average of approximately 3.1 feet (table 7). The 1,225-foot decrease in wetted stream length would reduce the amount of trout habitat that is available.

Overall, trout habitat in the bypassed reach is expected to increase under the Forest Service's specified flows compared to existing conditions and the applicant's proposal. The amount of increase would likely be variable over time, depending on the frequency of extreme low-flow conditions.

In reaches downstream of the powerhouse, adult trout habitat may decrease slightly as a result of either the applicant's proposal or the Forest Service's condition 17. Excluding potential increases in spring flows in lower Spearfish Creek associated with increased groundwater recharge, a 4 cfs minimum flow would decrease the average depth in the reach immediately downstream of the powerhouse by approximately 0.03 foot and would reduce the average wetted perimeter by approximately 0.3 foot. A 6 cfs minimum flow would decrease the average depth in the reach immediately downstream by approximately 0.04 foot and would reduce the average wetted perimeter by approximately 0.5 foot. Because these are relatively minor changes in physical habitat, we do not expect that the fish population immediately downstream of the powerhouse would be adversely affected by either proposal. These minor effects would be further attenuated in downstream reaches further from the project.

Trout populations downstream of the powerhouse are known to experience periodic fish kills due to high water temperatures exacerbated by irrigation withdrawals during extreme low-flow conditions. In its comments on SD 1, filed with the Commission on February 12, 2009, South Dakota DENR provided an analysis of flow conditions that existed at the time of a fish kill that occurred in Spearfish Creek near the city of Spearfish in 1990. South Dakota DENR's preliminary conclusion was that minimum flows should be suspended to limit the potential for fish kills associated with high water temperatures and low streamflows associated with peak irrigation diversions

downstream of the project.[26] Under the applicant's proposal, flows to the bypassed reach would be suspended when flows above Maurice Dam fall below 40 cfs. The potential for fish kills far downstream near the irrigation diversions would be the same under the applicant's proposal, as current conditions. Under Forest Service condition 17, flow releases to the bypassed reach would be 4 cfs rather than 0 cfs during extreme low-flow conditions. This amount of flow would likely be lost to the aquifer in the losing section of the bypassed reach, resulting in a reduction of 4 cfs to Spearfish Creek below the powerhouse. A loss of 4 cfs during extreme low-flow conditions, particularly in downstream reaches where water levels are already low due to irrigation withdrawals, could contribute to increased water temperatures and an increased risk of fish kills compared to current conditions and the applicant's proposal.

Flooding

At our January 13, 2009, scoping meeting, we received comments from Jerry Boyer who lives adjacent to Spearfish Creek in the city of Spearfish, downstream of the powerhouse. Mr. Boyer says his home was flooded in December 2008 when ice formed in Spearfish Creek causing the creek to overflow its banks. Mr. Boyer recommends we require the applicant to release 20 cfs from Maurice dam into the project's bypassed reach during times of ice build-up, to help prevent downstream flooding.

Our Analysis

Mr. Boyer's home was built in 1963, after project operations began, and is located within the Spearfish Creek floodplain. There is little information in the record indicating the frequency and magnitude of flooding at Mr. Boyer's property (or elsewhere in the city of Spearfish) but a newspaper article cites neighbors as saying this was the first flooding incident since at least 1976 (Steen, 2009).

The flooding experienced at Mr. Boyer's residence could have been the result of anchor ice forming on the bottom of Spearfish Creek. Anchor ice typically forms in fast-flowing rivers during extreme periods of cold weather. As temperatures drop below freezing for extended periods of time, water at the surface of a turbulent creek is cooled below freezing; however, the velocity of the water does not permit the formation of a solid ice pack at the surface. Rather, the turbulence brings the very cold water to the bottom of the stream, where the velocity slows down near the substrate. If the velocity of the water along the bottom of the stream is low enough, ice crystals can deposit on the stream substrate, forming ice on the substrate. As the area along the

---

[26] Its analysis concluded that minimum flow releases should be suspended when flows measured at USGS gage 06431500 (Spearfish Creek at Spearfish) diminish to 40 cfs or less during the irrigation season.

stream bottom is filled with ice, water levels in the stream rise which can flood adjacent land (Malenchak et al., 2006; Hirayama et al., 2007).

We are not certain that releasing a 20-cfs flow through Maurice dam would result in reducing flood hazards downstream of the powerhouse. The variable nature of extreme cold events sufficient to cause the flooding seen in December 2008, makes quantitative study and/or modeling of the effects of flow on icing extremely difficult. It is unknown, for example, if water lost to underlying aquifers in the losing section of the bypassed reach during extreme winter conditions would occur at rates similar to those observed by Hortness and Driscoll (1998) during the spring and summer months. Releasing 20 cfs to the bypassed reach at these times could result in the freezing of water in cracks, fissures, and sinkholes, which could reduce infiltration rates and allow most of this streamflow to pass downstream. Further, releasing 20 cfs could cause anchor ice to form in the bypassed reach which could shift flooding to other properties adjacent to Spearfish Creek. There are at least nine residences and/or lodges in the 200-foot-wide corridor (100 feet from either bank) along the bypassed reach, and many more in the 300-foot-wide corridor (Lawrence County, 2009).

Flow Losses within the Project Diversion Works

On September 29, 2008, and July 13, 2009, Richard Fort of ACTion for the Environment estimated flow losses within the project between Maurice dam and the powerhouse. In their September 29, 2008 letter, ACTion for the Environment estimated that the average water loss within the project was 9 cfs, based on the difference between average daily flow statistics for the 61-year period of record (POR) for USGS gage 06431500 (Spearfish Creek at Spearfish), and the 16-year POR for USGS gage 06430900 (Spearfish Creek upstream of Spearfish). In its July 13, 2009 filing, ACTion for the Environment supplemented its previously filed comments with an estimated flow loss in the aqueduct of 19.5 cfs for the POR of June 22, 2009 to July 7, 2009. ACTion for the Environment recommends that the applicant, at a minimum, seal the aqueduct and/or take other actions to reduce the amount of leakage in the project's aqueduct.

Our Analysis

Mean and median flow losses within the project diversion works for the months of October through March (water years 1989 to 1996) were estimated by Hortness and Driscoll (1998) to be 2.1 cfs and 1.8 cfs, respectively. Mean monthly flow losses were estimated by subtracting mean monthly flows at the two gages [USGS gage 06431500 (Spearfish Creek at Spearfish) and USGS gage 06430900 (Spearfish Creek upstream of Spearfish)]. Flow losses were not estimated for April through September because flow in Spearfish Creek upstream of Maurice dam sometimes exceeds the project's 120-cfs hydraulic capacity during this period. Flows in excess of the project's hydraulic

capacity spill over the dam into the bypassed reach, and may be absorbed into the losing reach of Spearfish Creek.

The approach and assumptions used by ACTion for the Environment to estimate the 9-cfs average flow loss differs in several key ways from those used by Hortness and Driscoll (1998): (1) ACTion for the Environment calculated flow losses based on daily differences in gage data, while Hortness and Driscoll used mean monthly data to estimate losses; (2) ACTion for the Environment used flow data from months where an unknown amount of spill occurred, while Hortness and Driscoll estimated project losses using data from months without spill; and (3) ACTion for the Environment used the difference in USGS average daily flow statistics at the two gages over two different periods (61-year POR for USGS gage 06431500 and the 16-year POR for USGS gage 06430900), while Hortness and Driscoll used a consistent POR (1989 to 1996) for both gages during their analysis.

Staff support the Hortness and Driscoll method for determining project losses because: (1) differences between monthly average flows at the two gaging stations reduce short-term anomalies present in the daily flow record between gages (i.e. lag time between gages, changes in the intake flow volume, changes in storage in the project flowline, and other factors related to project operations); (2) including months where unknown amounts of spill over the dam into the bypassed reach can cause large uncertainties in estimated losses in the flowline; and (3) using different PORs for upstream and downstream estimates can bias results because differences in historical flow data may be present based on changes in water use, weather patterns, or other conditions that would not be consistent over both time periods.

Staff updated Hortness and Driscoll's estimated losses in the project using the same methodology but with a longer POR (for water years 1989 to 2009 instead of 1989 to 1996). Staff estimated an average flow loss in the project of 1.9 cfs which is similar to the 2.1 cfs obtained by Hortness and Driscoll, as opposed to the 9 cfs reported by ACTion for the Environment.

Additionally, in their July 13, 2009 filing, ACTion for the Environment based their 19.5-cfs loss estimates on provisional USGS data from gage 06431500 for the POR of June 22, 2009 to July 7, 2009. The data obtained from these gages was revised and approved by USGS after ACTion for the Environment submitted their comments (USGS, 2010).

Fish Entrainment

The applicant proposes to remove fish from the forebay every 5 years and upon request by South Dakota DGF&P after large flow events. All removed fish would be returned to Spearfish Creek upstream of the Maurice dam. A fish salvage operation conducted by South Dakota DGF&P in 2007 removed approximately 250 trout from this location.

Our Analysis

Some fish residing in the reach upstream of Maurice dam are entrained into the project's aqueduct and forebay, especially during high flow events. These fish may be unable to return to the stream due to high water velocities, and are effectively removed from the population. Collecting fish from the forebay every 5 years and relocating them to Spearfish Creek upstream of Maurice dam would reduce fish losses to entrainment or fish being trapped in the forebay. Additionally, salvaging these fish could be beneficial because they could contribute to the recreational fishery and may increase the size of the spawning population.

Fish Passage

The applicant does not propose fish passage facilities; however, the Forest Service recommends fish passage facilities to "improve stream connectivity and the free movement of resident fish past Maurice dam."

Our Analysis

Under existing conditions, Maurice dam creates a permanent barrier to upstream migration of fish and fragments resident trout habitat including habitat used by a self-sustaining population of rainbow trout, brown trout, and brook trout both upstream and downstream of Maurice dam. Although rainbow trout are only observed infrequently in the reach from Maurice dam downstream to Bridal Veil Falls, habitat conditions and observations of rainbow trout upstream and downstream suggest that rainbow trout abundance would likely increase in this subreach if minimum flows were released from Maurice dam.

The Forest Service did not provide or recommend a design for any upstream fish passage structures; however, we assume that this facility could be incorporated into the design of the flow release structure that would be constructed under the applicant's proposal. For this analysis, we assumed that fish passage would be provided by incorporating three step pools into an automated overflow weir at the bypass flow release point. This design would require additional construction and costs above what would be required by a simple flow release structure, and we have included these costs in section 4.3, *Cost of Environmental Measures*.

If fish passage were provided under the applicant's flow proposal, fishway operations could occur during all times, except during periods when extreme low-flow conditions occur. During these periods, minimum flow releases and the channel immediately downstream of Maurice dam would become dry for several hundred feet (DTA, 2008a) such that fish could not swim upstream to the fishway. However, because spawning generally occurs during the non-irrigation season (spring for rainbow trout and fall for brown trout and brook trout), most of the time, sufficient flow releases would be available for fishway operation during the trout spawning seasons under the applicant's flow proposal. Under the flows specified in the Forest Service's condition 17, fishway operation could occur year-round, including during periods of extreme low-flow conditions.

Providing fish passage at the dam in association with instream flow releases could improve connectivity for resident fish. Resident fish in the reach from Maurice dam downstream to the municipal/irrigation diversion (about 3.3 miles) could possibly be able to access more habitat upstream of the dam. However, the record of information shows that existing trout populations in their respective reaches have sufficient access to habitats for all life stages.

3.3.2.3 Cumulative Effects

Actions within the geographic scope (defined in section 3.2.1) that may affect or have affected water quantity, the fishery, and fish habitat in combination with the Spearfish project include: other surface water diversions from Spearfish Creek, groundwater withdrawal from wells near the creek, urbanization and agricultural development, forest and rangeland management practices, mining, road building, recreation, and angling.

Surface water diversions and groundwater withdrawal have reduced streamflows and spring inputs to Spearfish Creek, contributing to shallower flow depths and warmer water temperatures during the irrigation season. Urbanization and agricultural development have confined Spearfish Creek in places, have altered storm hydrology, and have contributed to stormwater runoff and irrigation return flows of lesser water quality. Dispersed recreation including angling has likely increased local sediment input and modified riparian vegetation. Recreational angling also contributes to increased stress and direct mortality of trout. Construction and operation of the Spearfish Project has affected fish habitat by inundating some riverine habitat upstream of Maurice dam, reducing streamflows in the bypassed reach, and has blocked fish residing downstream of Maurice dam from accessing spawning habitat located in tributaries upstream of the project. These project effects on fish habitat and the entrainment of fish into the project's forebay may have contributed to a cumulative reduction in trout populations, in combination with other actions in the basin.

Under the measures proposed by the applicant, aquatic habitat conditions would improve in the bypassed reach through increased minimum flows. Under the Forest Service's conditions, fish passage could increase trout populations and minimum flows would improve aquatic habitat in the bypassed reach; however, minimum flow releases to the bypassed reach during extreme low-flow conditions could increase water temperatures and the risk of fish kills in downstream sections of Spearfish Creek.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

Upland habitats within the Spearfish Project area include evergreen forest, mixed hardwood/evergreen forest, hardwood forest, and agricultural land. Evergreen forest, found at the upper elevations of the Spearfish Project area, consists of ponderosa pine, white spruce, and paper birch. The sparse herbaceous layer in this forest is dominated by canyon juniper and native grasses. As depicted in figure E.1-1 of the final license application, the majority of the project area is dominated by evergreen forest. This vegetation type is dominant surrounding Maurice dam and all project facilities.

Mixed hardwood/evergreen forest is found at the middle elevations of the Spearfish Project area and is made up of ponderosa pine, peachleaf willow, white spruce, cottonwood, American elm, paper birch, and boxelder. The shrub layer is made up of peachleaf willow, coyote willow, and red-osier dogwood. The herbaceous and vine layers are made up of snowberry, horsetail, butter and eggs, true forget-me-not, common tansy, and goldenrod.

Hardwood forest is found at lower elevations of the Spearfish Project area, and at the mouth of the canyon along the riparian corridor. The canopy and midstory of this forest type is made up of burr oak, green ash, American elm, peachleaf willow, cottonwood, hickory, and boxelder. The shrub layer is made up of peachleaf willow, hawthorne, and red-osier dogwood. The herbaceous and vine layers are composed of common tansy, Virginia creeper, and wild grape.

Agricultural land is found at the lower elevations and mostly outside the boundaries of the city of Spearfish. A small strip of riparian vegetation (hardwood forest) may persist in cropland areas, but the remaining cleared land is used in crop production. The pasture areas are mostly made up of native and non-native pasture grasses, common tansy and true forget-me-not in wetter areas along the creek margin. However, sparse woody vegetation is found in the form of mature trees and shrub areas that are inaccessible to cattle. This vegetation is made up of boxelder, peachleaf willow, green ash, American elm, and coyote willow.

The applicant conducted wetland surveys in 2008 (DTA, 2008b). The results of these surveys indicate that the majority of wetlands in the project area are fringe wetlands associated with the stream banks of Spearfish Creek and are mostly composed of herbaceous vegetation such as true forget-me-not, horsetail, and Nebraska sedge. The surveys also identified a small amount of wetland habitat in the reach downstream of the project area. These wetland areas consist of a combination of forested (12.6 acres), scrub/shrub (3.8 acres), and emergent wetland types (4.5 acres). There are also forested/shrub-scrub wetlands that occur as island wetlands found within the Spearfish Creek channel. Vegetation on these islands is made up of peachleaf willow, American elm, green ash, red-osier dogwood, boxelder, true forget-me-not, horsetail, and Nebraska sedge.

The losing section of the bypassed reach, located between the city of Spearfish's municipal water intake and the project powerhouse, has little or no vegetation growth, and shows evidence of flooding events and scouring.

The Black Hills National Forest lists 16 noxious weed species occurring within the forest boundary (Forest Service, 2008). These species include Canada thistle, St. John's wort, sulphur cinquefoil, leafy spurge, diffuse knapweed, yellow toadflax, dalmation toadflax, spotted knapweed, saltcedar, common tansy, common mullein, whitetop, henbane, hound's tongue, musk thistle, and oxeye daisy. Common tansy and St. John's wort occur near the Spearfish Canyon Portal trailhead located between Maurice dam and the city of Spearfish (Forest Service, 2008). The extent to which invasive species are present within the Spearfish Project boundary is not known.

Wildlife

The mosaic of evergreen, hardwood and mixed forests, agricultural areas, and wetlands present in the project area provide habitat for a wide variety of common wildlife species. Common mammals in the project area include red squirrel, coyote, North American porcupine, bobcat, mule and white-tailed deer, red fox, striped skunk, eastern chipmunk, tree squirrel, fringed-tailed myotis, pocket gopher, and meadow jumping mouse. Common birds include a variety of warblers, dark-eyed junco, black–capped chickadee, brown creeper, American redstart, western wood-pewee, turkey, American robin, bald eagle, chipping sparrow, Cooper's hawk, and ovenbird. Common reptile and amphibian species include woodhouse's toad, bullsnake, and prairie rattlesnake. A more detailed discussion of common wildlife species and their preferred habitat types are presented in section E1.2.1 of the license application.

Sensitive Species

The Black Hills National Forest District Ranger and the South Dakota DGF&P Natural Heritage Program identified Forest Service Region 2 sensitive species, Black Hills National Forest species of local concern, and state-listed species with the potential

to occur in the Spearfish Project area. These species are listed in table 8. FWS indicated that there are no federally listed threatened or endangered species or designated critical habitat in the project area.

Table 8. Forest Service Region 2 sensitive species, species of local concern, and state-listed species (Source: city of Spearfish, 2008).

Common Name	Scientific Name	Federal Status	State Status	Forest Service Rank	Presence in Project Area
Mammals					
Fringed myotis	*Myotis thysanodes*	NL	NL	R2SS	Potential roosting habitat in upper Spearfish Canyon, potential foraging habitat along Spearfish Creek
Townsend's big-eared bat	*Corynorhinus townsendii*	NL	NL	R2SS	Potential roosting habitat in upper Spearfish Canyon, potential foraging habitat along Spearfish Creek
American marten	*Martes americana*	NL	NL	R2SS	Potential to occur in upland forests, not likely to occur along Spearfish Creek
Bear Lodge meadow jumping mouse	*Zapus hudsonius campestrias*	NL	NL	R2SS	Potential habitat associated with perennial sections of Spearfish Creek
Birds					
American dipper	*Cinclus mexicanus*	NL	T	SOLC	Known to occur along Spearfish Creek
Bald eagle	*Haliaeetus leucocephalus*	NL	T	R2SS	Known to forage near Maurice dam, transient along Spearfish Creek

Common Name	Scientific Name	Federal Status	State Status	Forest Service Rank	Presence in Project Area
Osprey	*Pandion haliaetus*	NL	T	R2SS	Known to forage near Maurice dam, transient along Spearfish Creek
Black-backed woodpecker	*Picoides arcticus*	NL	NL	R2SS	Potential to occur in upland forests, not likely to occur along Spearfish Creek
Grasshopper sparrow	*Ammodramus savannarum*	NL	NL	R2SS	Potential to occur in upland grasslands near project area, not likely to occur along Spearfish Creek
Amphibians and Reptiles					
Northern leopard frog	*Rana pipiens*	NL	NL	R2SS	Potential breeding and foraging habitat along Spearfish Creek
Black Hills red-belly snake	*Storeria occipitomaculata pahaspae*	NL	T	R2SS	Potential foraging habitat along Spearfish Creek
Invertebrates					
Cooper's mountain snail	*Oreohelix strigosa cooperi*	NL	NL	R2SS	Known to occur in Spearfish Creek
Atlantis fritillary	*Speyeria atlantis pahasapa*	NL	NL	SOLC	No preferred habitat present in project area
Callused vertigo	*Vertigo arthuri*	NL	NL	SOLC	Known to occur in lower Spearfish Canyon
Frigid ambersnail	*Catinella gelida*	NL	NL	SOLC	Known to occur in lower Spearfish Canyon

Common Name	Scientific Name	Federal Status	State Status	Forest Service Rank	Presence in Project Area
Plants					
Lesser yellow lady's slipper	*Cypridpedium parviflorum*	NL	NL	R2SS	Known to occur in upland areas within several hundred feet of Spearfish Creek
Large roundleaf orchid	*Platanthera orbiculata*	NL	NL	R2SS	Potential to occur in upland forests, not likely to occur along Spearfish Creek
Bloodroot	*Sanguinaria Canadensis*	NL	NL	R2SS	Potential habitat along Spearfish Creek
Northern hollyfern	*Polystichum lonchitis*	NL	NL	SOLC	Potential to occur in upland forests, not likely to occur along Spearfish Creek
Shining willow	*Salix lucida*	NL	NL	SOLC	Known to occur along Spearfish Creek

Notes: NL – not listed
R2SS – Forest Service Region 2 sensitive species
SOLC – species of local concern
T – threatened

The American marten, black-backed woodpecker, grasshopper sparrow, Atlantis fritillary, large roundleaf orchid, and northern hollyfern all occupy upland habitats that would be unaffected by the project. Specific habitat requirements for sensitive species potentially affected by the proposed project are discussed below.

Mammals

The fringed-tailed myotis prefers habitats ranging from dry shrub to pine woodlands at moderate elevations. This bat species roosts in caves, mines, and natural crevices and occurs only in the Black Hills of South Dakota and Wyoming, and northwestern Nebraska. The Forest Service is conserving and enhancing habitat for this species through cave, mine, and snag management. Suitable roosting and hibernacula

habitats may be present in the project area, while riparian habitats associated with Spearfish Creek may provide important foraging areas.

Townsend's big-eared bats are associated with areas containing caves and roosting habitat. Generally, this species is found in dry uplands throughout the west, but also occurs in mesic (i.e., moderately moist) coniferous and deciduous forest habitats. Suitable roosting and hibernacula habitats for Townsend's big-eared bat might be present in the project area.

The Bear Lodge meadow jumping mouse requires high quality, relatively undisturbed riparian habitats and is dependent upon the existence of perennial water sources, shrubs, adjacent forested land, and other habitat components including downed woody debris, dense forbs, and grasses. Historically, this species was collected along Spearfish Creek. Recent reports indicate a low abundance of the Bear Lodge meadow jumping mouse. Suitable habitats are present along Spearfish Creek.

Birds

The American dipper is found in fast moving, clean mountain creeks throughout the American west, feeding on benthic macroinvertebrates. Nesting typically occurs on raised sites overlooking water, on rocks in streams, on cliff ledges, and under waterfalls and bridges. Dome shaped nests are constructed of moss, grass, or leaves. In 2008, American dippers were observed in the bypassed reach of the Spearfish Project area and nested at the Maurice dam/intake. An American dipper pair nesting at the intake was unsuccessful in fledging any young, likely because the chicks were swept up into the intake tunnel after leaving the nest (Lovett, 2008)

There is potential forage habitat for the bald eagle and osprey within the Spearfish Creek vicinity. However, both species prefer big and medium-sized rivers, lakes or ponds, all of which are absent in the project area. Therefore, both bald eagle and osprey are expected to be only transient visitors to the project area.

Reptiles and Amphibians

The northern leopard frog is a species in review for proposed listing as a federal threatened or endangered species, but it currently has no federal status. The Forest Service Rocky Mountain Region lists this species as a sensitive species. The northern leopard frog breeds in a variety of aquatic habitats, including slow-moving or still water along streams and rivers, and may find suitable breeding and foraging habitat within the project area. Sub-adult northern leopard frogs migrate to feeding sites along the borders of larger, more permanent bodies of water, and recently metamorphosed frogs will move up and down drainages and across land in an effort to locate new breeding areas. The northern leopard frog feeds on small plants and macroinvertebrates as a tadpole, and insects, earthworms, and occasionally small mammals as an adult. Wetland and

riparian areas along Spearfish Creek may provide suitable habitat for all life stages of the northern leopard frog. Although there have been no surveys for this species, recent studies in the Black Hills National Forest region found northern leopard frogs.

The Black Hills red-belly snake prefers wet meadows, woodlands, and forest-meadow edge habitats. This species finds food and shelter in the ground litter of moist habitats that support slugs, snails, earthworms, and insect larvae. The Black Hills red-belly snake is the westernmost subspecies of the red-belly snake and is found only within the Black Hills. Potential suitable habitat exists in the project area, particularly where there is abundant dead and down woody debris.

Invertebrates

Cooper's mountain snails are found on calcareous soils and limestone, as calcium in the soil is important for this species' formation and growth. This species, which is endemic to the Black Hills of South Dakota and Wyoming, primarily feeds on partially decayed leaves and degraded herbaceous vegetation. Live, recently dead, and long dead specimens were found in the bypassed reach of the project area in 1991, 1993, and 1999. The upper project area contains suitable habitat for this species, but there is no habitat available downstream.

In the Black Hills, the callused vertigo is found in wet, relatively undisturbed forests with deep litter, generally on shaded north-facing slopes, often at the slope base or extending slightly into the adjacent floodplain. Globally, the abundance of this species is declining. This species occurs in lower Spearfish Canyon.

The frigid ambersnail is found in open ponderosa pine forest, often with a secondary deciduous tree and shrub component. This species also occurs in lower Spearfish Canyon.

Plants

Shining willow rarely occurs in the Black Hills National Forest; is commonly associated with streambanks, shores, wet meadows, and seeps; and is considered a facultative wetland plant. Only four occurrences of this species are documented in the Black Hills National Forest, and the specific microsite conditions associated with this species are limited within the broader, more general riparian conditions occurring in the Black Hills National Forest. However, suitable habitats are present along Spearfish Creek and this species was documented within 200 feet of Spearfish Creek.

Bloodroot prefers rich, mesic (moderately moist) to somewhat dry deciduous forests and coves with a tall, multi-storied canopy of deciduous tree species; a rich understory of mostly perennial herbs; and a thick layer of decaying leaves above moist, well-drained, nutrient rich soils. In the Black Hills, this species occupies floodplains,

forested terraces, drainage bottoms, and north facing footslopes in open, rich hardwood plant communities. As of 2003, 22 occurrences of bloodroot have been found in the northern and northeastern portions of the Black Hills National Forest, and suitable habitats are present along Spearfish Creek.

The yellow lady's slipper and shining willow have both been found within 200 feet of Spearfish Creek, and suitable habitats for these species and bloodroot are found along Spearfish Creek.

3.3.3.2 Environmental Effects

Minimum Flows

Based on a field survey conducted by the applicant (DTA, 2008b), a small amount of wetland habitat occurs in the reach downstream of the project powerhouse. These wetland areas consist of a combination of forested, scrub/shrub, and emergent wetland types. The majority of the wetland areas are fringe wetlands located along the margins of the creek, which are mostly made up of herbaceous vegetation such as true forget-me-not, horsetail, and Nebraska sedge. Under current operations, the extent and composition of these wetlands and of riparian vegetation along the bypassed reach are affected by the diversion of the entire flow of Spearfish Creek by the project for most of the year.

Under existing conditions, most of the upper portion of the bypassed reach has surface flow year-round due to consistent inflows from springs along the first 3.3 miles of the reach, and most of the downstream 4.0-mile-long losing section of the bypassed reach is dewatered for most of the year. During the Delphi study, the applicant and the Delphi study team evaluated changes in habitat parameters in the gaining and losing sections of the bypassed reach, and in the creek downstream of the powerhouse over a range of flows released from Maurice dam.

Our Analysis

Wetlands and Riparian Vegetation

The results of the Delphi study (DTA, 2008a) indicate that flow releases at Maurice dam would cause the wetted length and width of stream in the bypassed reach to increase, without causing a significant decrease in the wetted width of Spearfish Creek downstream of the powerhouse. As described in section 3.3.2, *Aquatic Resources*, based on parameters measured over a range of flows observed during the Delphi study, we estimated stream widths, depths, and wetted channel lengths at each of the flows proposed by the applicant and specified by the Forest Service (table 7). At flow releases of 3, 4, and 6 cfs, the wetted channel in the losing section of the bypassed reach would increase by an estimated 590, 1,025, and 2,250 feet, respectively. The

estimated average wetted width in the losing section of the bypassed reach would increase by 13.2, 15.0, and 18.0 feet at the same flow releases. In Spearfish Creek downstream of the powerhouse, the estimated average wetted width would remain unchanged at about 27 feet under the above flow releases (table 7).

Any minimum flows that are released at Maurice dam would enhance riparian resources in the bypassed reach by increasing the abundance and distribution of riparian plant species. Some of the benefits realized by the applicant's proposed flow regime, however, could be reduced when flows are reduced during the irrigation season, and would be eliminated under extreme low-flow conditions, when flow releases are suspended for extended periods. For example, flow data provided in table 6 indicates that a series of dry years in the late 1980s and early 1990s would have resulted in the suspension of minimum flow releases for between 11 and 19 weeks each year in at least 5 consecutive years under the applicant's proposal. Extended dry periods of this magnitude would likely cause desiccation and mortality of many riparian plant species, which would require a number of years to become re-established. The year-round flow releases specified in Forest Service condition 17, which would be maintained at a minimum flow of at least 4 cfs during extreme low-flow conditions, would be more effective in promoting the establishment and maintenance of riparian species in the bypassed reach.

Releasing minimum flows into the bypassed reach would cause some reduction in flows in Spearfish Creek downstream of the powerhouse, due to flows being absorbed into underlying aquifers in the losing section of the bypassed reach. Because the effects on stream wetted width are negligible as discussed earlier, any effects on riparian resources would likewise be minimal.

Wildlife

Proposed minimum flows to the bypassed reach would improve the growth of riparian vegetation and the production of aquatic invertebrates, increasing the amount of available food and habitat for wildlife, especially wildlife associated with riparian areas.

Under the applicant's proposal, flows would be reduced from 6 to 3 cfs during the irrigation season (May 1 through September 30) and eliminated completely under extreme low-flow conditions. The irrigation season would overlap with the breeding/rearing season of special status species like the northern leopard frog, American dipper, Bear Lodge meadow jumping mouse, Cooper's mountain snail, Black Hills red-belly snake, Townsend's big-eared bat, fringed myotis, frigid ambersnail, and callused vertigo. Compared to existing conditions, the addition of a 3-cfs minimum flow during this period would benefit these species by increasing available habitat and food supplies associated with aquatic invertebrates.

Under Forest Service condition 17, flows would only be reduced during the irrigation season when extreme low-flow conditions occur (from 6 to 4 cfs). Under all other conditions, minimum flows would remain at 6 cfs. Minimum flows provided under the Forest Service condition would also benefit the above species compared to existing conditions and would provide a greater benefit compared to the applicant's proposal because the Forest Service's flows would maintain a more stable aquatic ecosystem year-round, providing greater benefit to wildlife species within the bypassed reach. This year-round base flow would benefit many plant and wildlife species in the area and increase suitable habitat for sensitive species. Also, as discussed above, providing minimum flows under both the applicant's and the Forest Service's proposal would not cause a significant decrease in the wetted width of Spearfish Creek downstream of the powerhouse and therefore, would likely have minimal effects on riparian-dependent wildlife.

American Dipper Nesting

Diverting flow from the 7.3-mile bypassed reach has reduced foraging habitat for American dipper by reducing the amount of streambed that is wetted and capable of producing aquatic invertebrates. American dippers are known to nest above the Maurice dam where Spearfish Creek provides abundant habitat for foraging. However, dippers nesting near project facilities have been reported to experience decreased reproductive success due to limited foraging habitat and fledgling mortality associated with the diversion of water into the project's intake.

The Forest Service notes that the American dipper population at Spearfish Creek is likely limited by the number and distribution of suitable nesting sites. The Forest Service indicates that there are a number of bridges that span Spearfish Creek in the reach downstream of the power plant that would be suitable sites for the placement of dipper nest boxes. In accordance with Forest Plan Objective 221 to conserve or enhance habitat for R2SS sensitive species and species of local concern, the Forest Service recommends the installation of nest boxes at suitable sites within the project area to benefit Spearfish Canyon's American dipper population.

Our Analysis

Other studies have shown that dipper populations increase in response to the introduction of nest boxes. A 5-year study on American dipper reproductive success in Oregon found that the addition of artificial nest structures, including cliff platforms, nest boxes, and hollowed logs, doubled the breeding population of American dippers along a 6-mile stretch of stream. American dippers readily used all the artificial nest sites that were constructed (Loegering and Anthony, 2006). Similar results have been obtained in California, with the population of dippers in a stretch of Sagehen Creek doubling after the introduction of nest boxes (Hawthorne, 1979). In 1997, after South Dakota DGF&P placed nest boxes along Spearfish Creek in Spearfish Canyon, dipper populations

increased in number, reaching an all-time recorded high in 2001 (Forest Service, 2002a).

Suitable locations for artificial nest structures exist in and near the Spearfish Canyon project area, both upstream of Maurice dam and within the bypassed reach. The Forest Service's recommendation to install nest boxes would likely enhance the reproductive success of American dippers within Spearfish Canyon. We expect that installing nest boxes, in conjunction with minimum flow-related improvements in nesting and foraging habitat, would enhance the population of American dippers using Spearfish Canyon.

3.3.4 Recreation, Land Use, and Aesthetics

3.3.4.1 Affected Environment

Recreational Resources

The Spearfish Project is located in a popular recreation region of the Black Hills and Badlands in western South Dakota. Recreation is a staple of the surrounding area, in part, because of a regional east to west pattern of recreational travel from the Black Hills to Yellowstone National Park. The recreational attractions of the Mount Rushmore Memorial, Deadwood gaming, Devil's Tower, Black Hills, and Spearfish Canyon are major draws for the area. Two popular scenic byways accommodate a large number of travelers and recreational enthusiasts throughout the year. The Needles Scenic Byway, serving Mt. Rushmore, accommodates approximately 2 million travelers annually, while the Spearfish Canyon Scenic Byway accommodates more than 1 million travelers per year.

The Black Hills National Forest encompasses about 13,000 acres of wilderness and about 1,300 miles of streams. Recreational opportunities and facilities within the National Forest include about 450 miles of trails, 32 picnic areas, 30 campgrounds with 682 individual sites, 11 reservoirs and associated swimming beaches, marinas and boat launches, and two scenic byways including the Spearfish Canyon Scenic Byway. The Black Hills National Forest offers opportunities for a wide variety of recreational activities, including backpacking, hiking, cycling, educational programs, gold panning, horseback riding, swimming, boating, fishing, skiing, snowmobiling, and big game and turkey hunting. All-terrain vehicles and motorcycles are allowed on most logging trails. Most hiking trails allow mountain bikes, but prohibit motorized vehicles.

Spearfish Canyon provides many outdoor recreation opportunities, including sightseeing, fishing, picnicking, rock climbing, camping, wildlife viewing, bicycling, jogging, walking, hunting, and cross-country skiing. Hiking is a popular recreational activity in the canyon, and there are currently six marked trails, primarily located south of the project in the Savoy area. Camping is available at three Forest Service

campgrounds within Spearfish Canyon—Timon, Hanna, and Rod and Gun Campgrounds, all located within 4 miles of the scenic byway (see figure 4). Bird and wildlife watching is a recreational activity growing in popularity throughout Spearfish Canyon due to the area's unique biodiversity and ecologically distinct habitats. Rock climbing is a growing recreational sport within Spearfish Canyon, offering more than 300 world-class limestone routes. Ice climbing during the winter months is also growing in popularity due to the moderately difficulty ice routes available in Spearfish Canyon. Hunting, mostly for deer and turkey, is permitted in Spearfish Canyon; however, opportunities are limited because of state restrictions on shooting from a public roadway and within certain distances of housing. Hunting limitations are also imposed because of the variable slopes of the canyon terrain (Spearfish Canyon Foundation, 2009).

The Spearfish Canyon Scenic Byway extends about 22 miles through the canyon along Route 14A from Exit 10 off Interstate 90 in the city of Spearfish, connecting to the mouth of the canyon at the Spearfish Canyon Country Club and upward ending at Cheyenne Crossing at the intersection of Highway 85. The Byway parallels the project's dam, intake, and bypassed reach. This road was designated a National Forest Scenic Byway and a Scenic Byway by the State in 1989. The Byway provides six official pull-outs, but a total of 23 sites are used along the highway (see figure 4). The majority of the highway is maintained by the South Dakota Department of Transportation, except for the portion that passes through and is maintained by the city of Spearfish. The Spearfish Canyon Scenic Byway accommodates a designated 4-foot-wide shoulder on both sides of the roadway from Spearfish to Savoy for biking and jogging activities. The route is acclaimed by "Bicycling Magazine" as one of the nation's top 50 scenic bike paths.

Recreational facilities within the city of Spearfish are managed by the City and include 13 City Parks with tennis courts, ball fields, a golf course, football/soccer fields, bike paths, and walking paths. The 15-acre Spearfish City Park is located along Spearfish Creek, adjacent to the D.C. Booth Historic National Fish Hatchery and the city of Spearfish Campground. Amenities at Spearfish City Park include a band shell, basketball courts, benches, bicycling/walking paths, fishing access, picnic shelters (with a total shelter capacity of 320 people), picnic tables, playground equipment, primitive grills, restrooms, sand volleyball and tennis courts, and water fountains. The D.C. Booth Historic National Fish Hatchery, operated by FWS, is located in the city of Spearfish. The hatchery was established in 1896 and is one of the oldest operating fish hatcheries in the country. The D.C. Booth Historic National Fish Hatchery offers museum tours, underwater fish viewing, fish feeding, fish ponds, a picnic/playground area, bird watching, photography, nature trails, and a gift shop.

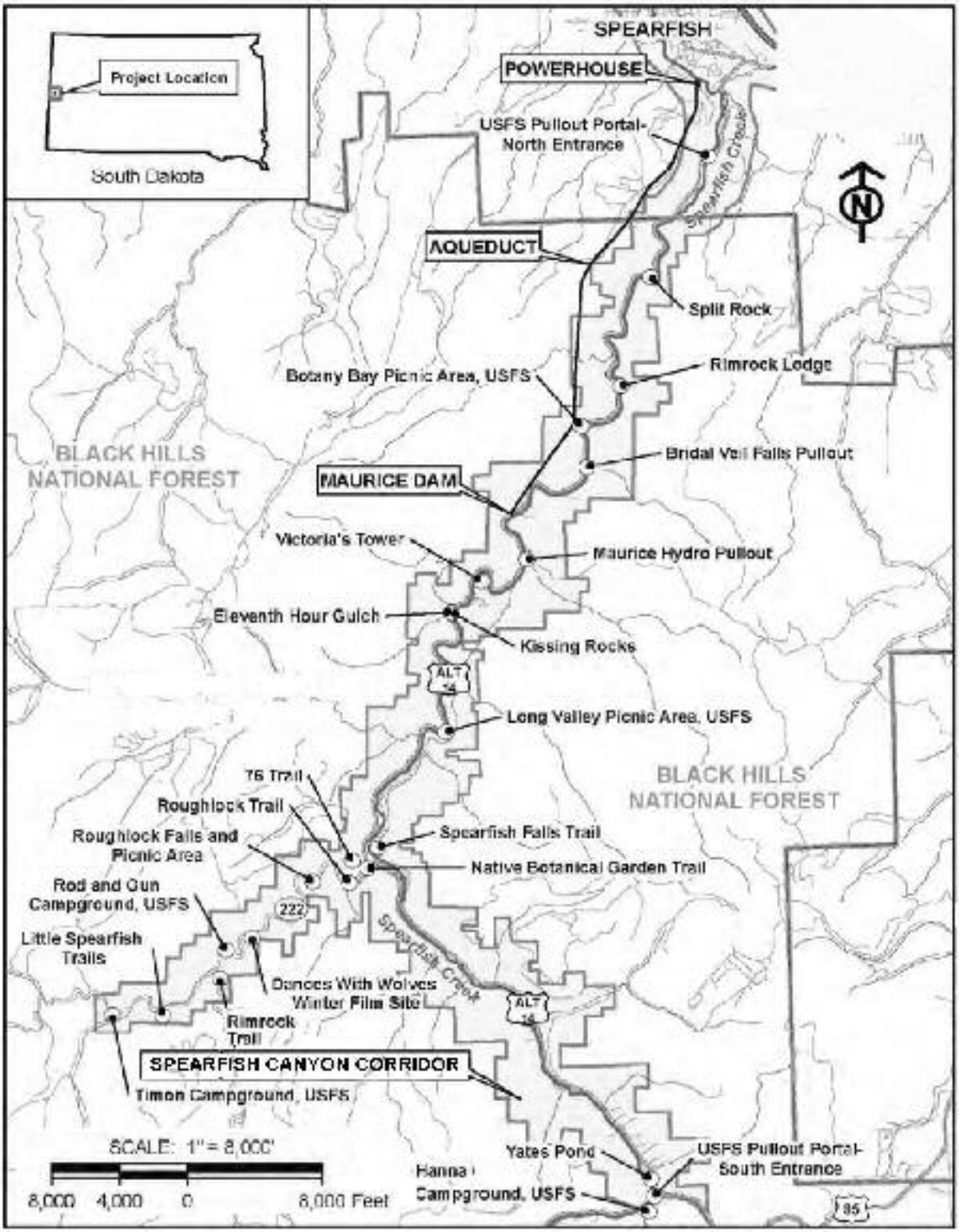

Figure 4. Spearfish Canyon recreation sites, shaded area represents the canyon corridor (Source: city of Spearfish, 2008).

Belle Fourche Reservoir

Downstream of the project is the Belle Fourche reservoir. The Belle Fourche reservoir is owned and operated by the U.S. Bureau of Reclamation and provides the benefit of irrigation, flood control, and recreation. The reservoir has approximately 8,040 water surface acres, 6,694 land acres, and 58 miles of shoreline. The primary purpose of the Belle Fourche reservoir is to store water for irrigation. While the average elevation fluctuation of the reservoir during the irrigation season is approximately 20 feet, based on water years 1953 through 2009, fluctuations of up to 40.3 feet have been recorded. This large variability in reservoir elevations results from several factors: precipitation from rain and snowfall, temperature, evaporation, stream flows, spring runoff, irrigator water use, and other causes. An accurate profile of the effect of each factor on the elevation of the reservoir is complicated by the fact that many of these factors have a confounding effect on each other (high temperatures lead to increased snowmelt, or increased precipitation leads to higher inflow from streams (U.S. Bureau of Reclamation, 2009).

The main recreational activity at Belle Fourche reservoir is fishing, with limited boating opportunities. Other activities include camping, picnicking, and hunting. South Dakota DGF&P manages the reservoir's fishery and maintains the project's access roads, bathroom facilities, and two boat ramps.

Angling Opportunities

Fly-fishing is popular along Spearfish Creek. In general, there is good public access to the creek, except for downstream of the I-90 crossing, where access is privately owned. Fish species pursued by anglers include rainbow, brook, and brown trout. The majority of Spearfish Creek and its tributaries, including waters in the project vicinity and downstream, are managed under standard regulations with a daily limit of five trout (in any combination), with one allowed 14 inches or longer.

Upstream of Maurice dam to Cheyenne Crossing, the beauty of the canyon, along with multiple access points from Highway 14A, makes this section of Spearfish Creek attractive to anglers. The project's reservoir formed by Maurice dam is visible from the road and receives fairly constant fishing pressure. South Dakota DGF&P surveyed the upper portion of Spearfish Creek, upstream of Maurice dam, for angler use in the summer of 2006, along with three other popular Black Hills trout streams. Survey results indicated that the catch rate (1 to 2 fish per hour) and the overall angler satisfaction (86 to 91 percent) were very good compared with the other three streams surveyed. Most of the fish caught from Spearfish Creek were outside of the catch and release section. Of the nearly 6,000 fish caught, more than 1,500 were rainbow trout with a catch rate of 0.48 per hour. Within the catch and release section, the rainbow trout catch rate was much higher at 1.0 fish per hour.

A 1-mile reach of Spearfish Creek immediately upstream of the project from Maurice dam to the decommissioned Homestake Hydro No. 2 building is currently managed with catch and release regulations for rainbow trout. Other trout species may be harvested according to standard regulations. This reach of Spearfish Creek is unique in that it contains the only naturally-reproducing rainbow trout population in the South Dakota Black Hills capable of maintaining a wild Class I rainbow trout fishery (> 25 fish > 200 mm per surface acre) (see also section 3.3.2, *Aquatic Resources*).

In the bypassed reach upstream from the project tailrace, fishing pressure is very light in the first 4 miles, except for one large pool formed by the city of Spearfish's municipal/irrigation diversion structure that is visible from Highway 14A, which receives occasional fishing pressure. Within the gaining section of the bypassed reach, several publicly-accessible angling opportunities exist along the Spearfish Canyon Scenic Byway. One opportunity exists 1.2 miles downstream of the project's dam at Bridal Veil Falls, where a pull-out exists to view the falls and there is foot access to Spearfish Creek. A second opportunity exists 1.5 miles downstream of the project's dam at the Botany Bay picnic area, managed by the Black Hills National Forest, which includes picnic tables and a toilet facility, and provides access to Spearfish Creek. Other informal pull-outs exist downstream of the project's dam, along the gaining section of the bypassed reach, which provide access to Spearfish Creek.

Most of the creek from the project's tailrace to I-90 (approximately 3 miles) is easily accessible to the public through municipal parks, trails, and bridges. Easy access, combined with good trout production, make this section of Spearfish Creek a popular fishery.

Statewide Comprehensive Outdoor Recreation Plan

The most recent South Dakota Statewide Comprehensive Outdoor Recreation Plan (SCORP) was completed in 2002 and serves as the state's official policy plan for outdoor recreation and land conservation (South Dakota DGF&P, 2002). The SCORP provides information regarding the following components: (1) an updated inventory of outdoor recreation providers and facilities that are managed and maintained; (2) an assessment of outdoor recreation activities; (3) an overview of South Dakota and its people; (4) a public participation survey; (5) a guide of how the state will use its Land and Water Conservation Fund apportionment; and (6) an updated wetlands addendum. The SCORP does not contain recommendations or assessments that are specific to the Spearfish Project. The project lies within SCORP planning region 6, which has the highest concentration of hiking, cross-country skiing, mountain biking, and horseback riding trails in the state.

The SCORP recognizes fishing as one of the top ranked outdoor recreational activities within the state, with 54 percent of adult South Dakotans being active anglers based on a survey conducted by South Dakota DGF&P. Relevant SCORP goals for future recreation management include developing and maintaining outdoor recreation facilities in ways that enhance the quality of water, plants, wildlife, soil, air, noise, and scenery; considering the protection of unique natural areas that are threatened by development or degradation and that have recreation potential; and providing facilities and services that interpret the significance of outdoor resources.

Land Use and Aesthetic Resources

The Spearfish Project spans from Maurice dam and reservoir, located within the Black Hills National Forest, to the powerhouse located within the city of Spearfish. The project is located entirely within Lawrence County, South Dakota, primarily within Spearfish Canyon, and includes 57.26 acres of Forest Service lands within the Black Hills National Forest.

Land use within Lawrence County includes three major categories—Parks and Forest (63 percent), Agriculture (32 percent), and Urban/Suburban (5 percent). Due to fairly steep topography in Spearfish Canyon and the project's location partially within the Black Hills National Forest, the most common land use designation within the proposed project boundary is undeveloped forest land. In the city of Spearfish, beginning immediately downstream of the project powerhouse tailrace for a distance of about 3 miles, Spearfish Creek runs through municipal parks and recreation areas interspersed with moderate to low density residential development. Municipal parkland and trails have helped to protect riparian habitat and have made Spearfish Creek more accessible to the public.

The scenic value of Spearfish Canyon is described by the Forest Service as unparalleled east of the Rocky Mountains and west of the Appalachians with the canyon's deep canyon walls, flowing waterfalls, and panoramic vistas. The canyon walls are beautified by various geologic formations including the red siltstones and streaky white gypsum of the Spearfish Formation. Not only do the rich colors of the canyon walls add aesthetic value to Spearfish Canyon, but the surrounding mountains also add to the unique vistas. The city of Spearfish is often referred to as the "Queen City" as it is surrounded by three prominent mountain peaks—Lookout Mountain, Spearfish Mountain, and Crow Peak.

Spearfish Creek enhances the aesthetic values of Spearfish Canyon. Spearfish Creek flows continuously up to the project's diversion and intake, where all the flows up to the project's 120-cfs hydraulic capacity are diverted for generation. For several hundred feet downstream of the dam, the creek bed is dewatered up to the point where the stream is wetted by accretion flows from springs and runoff. The wetted portion of

the creek extends downstream to just below the city of Spearfish's municipal/irrigation water supply diversion. This 3.3-mile section of the bypassed reach is considered the gaining section of the bypassed reach. Within the gaining section, Bridal Veil Falls, one of three premiere waterfalls in Spearfish Canyon, flows directly into Spearfish Creek. This site is one of the most popular pull-outs along the Spearfish Scenic Byway.

Downstream of the city of Spearfish's municipal/irrigation water supply diversion, the stream flows into underground aquifers, and the streambed remains dewatered for about 4 miles. This section of the bypassed reach is considered the losing section of the bypassed reach. Downstream of the project's tailrace, Spearfish Creek is once again wetted, providing aesthetic views for the city of Spearfish.

Regional Management Plans

Black Hills National Forest Land and Resource Management Plan

Portions of the project are located within the Black Hills National Forest and are designated by the Land and Resource Management Plan (LRMP) as Black Hills Management Area 4.2A within Spearfish Canyon. This area is designated under the recreation opportunity spectrum class as Roaded Natural.[27] Recreation management goals for the Black Hills Management Area 4.2A include allowing recreational use with an emphasis on interpretation and education when it does not threaten the biological or scenic values for which the Scenic Byway was designated, and protecting the area from actual or potential damage due to public use (Forest Service, 2006).

In terms of scenery management, the scenic integrity objectives for Black Hills Management Area 4.2A are primarily designated as High (55 percent), followed by Moderate (32 percent), and Low (13 percent). Areas designated as High scenic integrity are landscapes where the valued landscape character "appears" intact. Deviations from the appearance may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident. For the Moderate classification, scenic integrity refers to landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed (Forest Service, 2006).

---

[27] For the Roaded Natural classification, the area is characterized by a predominantly natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment and interaction between users may be low to moderate. Resource modifications and use practices may be evident but harmonize with the natural environment, and conventional motorized use is provided for in construction standards and the design of facilities.

In 1992, the Forest Service completed a land exchange with the Homestake Mining Company in which the Forest Service acquired 12,000 acres within the Black Hills National Forest, including 1,200 acres in Spearfish Canyon. Land preservation through land exchange in Spearfish Canyon is a primary goal of the Forest Service. The land acquired within Spearfish Canyon consisted primarily of mining claims along Spearfish Creek. Generally, land extending 25 feet on each side of the creek within developed areas became National Forest land. However, some private lots extend to the creek as a result of a provision that was incorporated into the agreement to ensure public access to the creek. Another land exchange was completed in 1996, at which time 585 acres at the lower end of Spearfish Canyon were added to the National Forest (Forest Service, 2006).

Spearfish Canyon Corridor Management Plan

The purpose of the Spearfish Corridor Management Plan is to provide goals and objectives and general management strategies for agencies and groups working toward a common goal in the protection of the resources of Spearfish Canyon. General goals identified in the plan include: returning water flow in Spearfish Creek to its natural full flow as opportunities allow; encouraging zoning to prevent high density residential housing and commercial development; encouraging opportunities to transfer undeveloped private lands to public ownership; maintaining a balance between development and open spaces; allowing no surface disturbance from mining within the scenic byway corridor; resolving conflicts between motorized and non-motorized uses; discouraging trail development that may affect private lands and homes; preserving the unique biodiversity of Spearfish Canyon; maintaining natural landscapes on public land and the natural conditions of the canyon and riparian areas; encouraging the Forest Service to continue its non-development policy on public lands; encouraging the continuation of the Forest Service's LRMP; interpreting and providing signage of scenic and historic attributes; and maintaining current visitor facilities, but not expanding infrastructure other than those already approved or granted under previous rights (Forest Service, 1999).

Spearfish Canyon Landscape Assessment

The Spearfish Canyon Landscape Assessment was prepared by the Forest Service to evaluate management goals for the National Forest within the canyon and recommend ways to meet these goals. The Spearfish Canyon Landscape Assessment states that top priorities for the Spearfish Canyon include: vegetation management to maintain a diverse and healthy forest and to reduce noxious weeds; fuels management to reduce the potential for wildfire damage; water management to sustain adequate stream flow and water quality; and recreation management to reduce conflicts between visitors, residents, wildlife, fish, and plants (Forest Service, 2002b).

Lawrence County Comprehensive Plan

Under the Lawrence County Comprehensive Plan, land within the proposed project boundary is zoned as Park Forest Land and Commercial Light Industrial Land. Park Forest land is zoned to provide the county with an area to be preserved for its natural beauty, resources, and open character. Certain structures, such as historical monuments or buildings, are permitted, and the density of residential use is limited. Commercial Light Industrial Land is intended to provide areas for a mix of commercial and light industrial use, as well as strictly industrial development (Lawrence County Commission, 2005).

Under the Lawrence County Comprehensive Plan, the Spearfish Project is located both within the South County area, consisting of the area south of the Black Hills National Forest boundary, and the North County area, consisting of the area north of the National Forest boundary. The Spearfish Canyon Preservation and Recreational Development areas are included within the South County area. The Comprehensive Plan stresses the preservation and enhancement of existing rural, forested, and mountainous areas in the South County area, and the preservation of access to both public and private lands is encouraged. The accommodation of development of recreational areas is another strong recommendation for the South County area (Lawrence County Commission, 2005). Preservation of agricultural uses and the right to farm and ranch is stressed in the comprehensive plan for the North County, including the preservation of existing game production areas.

Residential development is expected to increase in the future in the upper and lower valley area, as well as to the west in the hills above the city of Spearfish. Commercial and industrial development is also expected to increase because the City is located along the I-90 corridor making it attractive to future development. The City is expected to continue developing its tourism industry, as Spearfish Canyon continues to attract thousands of visitors yearly. The Comprehensive Plan promotes development solely within Spearfish urban growth areas and promotes commercial land uses along arterial corridors, except for special cases in which developing land for commercial or industrial needs would benefit Lawrence County as a whole.

3.3.4.2 Environmental Effects

Effects of Project Operation and Flows

The applicant proposes to release a minimum flow of 3 cfs from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flow releases under extreme low-flow conditions to be defined by South

Dakota DENR.[28] Forest Service condition 17 specifies a year-round minimum flow release of 6 cfs at Maurice dam with a provision for reducing minimum flow releases during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions (see also section 3.3.2, *Aquatic Resources*).

The Forest Service states that the magnitude, duration, and frequency of any changes in flow released at Maurice dam into the bypassed reach would have a substantial bearing on how well a flow scenario meets the Black Hills National Forest Plan and other laws, regulations, and policies.

Our Analysis

Under existing conditions, all flows up to the project's 120-cfs hydraulic capacity are diverted from Spearfish Creek at Maurice dam, bypassing 7.3 miles of stream channel. This results in the first several hundred feet of the stream channel downstream of the dam and the lower 4 miles of the bypassed reach being dewatered for most of the year. Most of the upper 3.3 miles of the bypassed reach has perennial surface flow ranging from 2 to 20 cfs, originating from limited surface runoff and from spring contributions.

Under the applicant's proposal, a minimum flow of 6 cfs would be released into the bypassed reach during the non-irrigation season (October 1 through April 30). This release would wet 2,250 feet of the reach that is dewatered under existing conditions, and would enhance angling opportunities and recreation within Spearfish Creek. During the irrigation season (May 1 through September 30), the applicant proposes to release 3 cfs, except during extreme low-flow conditions, when no flow releases would occur. The 3-cfs release would wet 590 feet of stream channel that is dewatered under existing conditions. However, this enhancement would not occur when flow releases are suspended during extreme low-flow conditions, which occurs approximately 1 out of every 2 years (see section 3.3.2, *Aquatic Resources*).

The Forest Service's proposed flow of 6 cfs during the non-irrigation season is identical to the applicant's proposal, and would provide a similar level of enhancement to angling opportunities and recreation within Spearfish Creek. However, the Forest Service's proposal of 6 cfs during the irrigation season (instead of the applicant's proposed 3 cfs) and provision to lower minimum flows to 4 cfs during extreme low-flow conditions (instead of the applicant's proposal to suspend minimum flows entirely)

---

[28] As discussed in section 3.3.2, *Aquatic Resources*, South Dakota DENR has preliminarily determined that minimum flows should be suspended when a flow of 40 cfs or less occurs at USGS gage 06431500 (Spearfish Creek at Spearfish) during the May 1 through September 30 irrigation season.

would provide a greater level of enhancement to angling opportunities and recreation during the irrigation season than the applicant's proposal.

As discussed in section 3.3.2, *Aquatic Resources*, the flows proposed by both the applicant and the Forest Service would enhance aquatic habitat in the bypassed reach compared to existing conditions. Enhancing aquatic habitat has the potential to increase fish abundance which could improve fishing success and angling opportunities in this section of Spearfish Creek.

However, both the applicant's and the Forest Service's minimum flow proposals would result in some decrease in flows downstream of the project because minimum flows would be absorbed into underlying aquifers in the losing section of the bypassed reach. This loss of flows would be most critical during extreme low-flow conditions which periodically occur during the summer irrigation season. Because the applicant proposes to suspend minimum flows during extreme low-flow conditions, only the Forest Service's proposal would result in a loss of flows (up to 4 cfs) downstream of the project under extreme low-flow conditions. Therefore, only the Forest Service's proposal has the potential to increase water temperatures and the risk of fish kills in Spearfish Creek downstream of the powerhouse during extreme low-flow conditions, compared to existing conditions. Any fish kills that would occur during the summer irrigation season in dry years would be likely to adversely affect angling opportunities and recreation downstream of the project.

Although the applicant did not assess the effects of different flow releases on stream aesthetics, it is likely that any increases in the wetted stream length would provide an aesthetic benefit, and that higher volumes of surface flow would improve aesthetic attributes by increasing wetted width and turbulence. Flows proposed by the applicant would increase the length of wetted stream channel by 2,250 feet during the non-irrigation season and 590 feet about 1 out of every 2 years during the irrigation season (no increase in wetted length would occur during the irrigation season in dry years). Aesthetic values of the reach would improve with the presence of water intermittently in this section of Spearfish Creek. Flows specified by the Forest Service would increase the length of wetted stream channel by a minimum of 1,025 feet at all times, and by 2,250 feet most of the time, providing a more sustained improvement in aesthetic values within this section of Spearfish Creek.

As stated above, the applicant's and the Forest Service's flow proposals would result in some decrease in flows downstream of the project due to increased losses of flow into the aquifer in the bypassed reach, except when minimum flow releases are suspended under the applicant's proposal. These reductions in flows are not expected to have a substantial effect on aesthetic resources downstream of the project's powerhouse.

Project Area Recreational Resources

The existing project does not have any recreation facilities and the applicant does not propose any new facilities in its license application. No entities recommended new recreation facilities in comments on the license application.

Our Analysis

Existing recreational opportunities associated with the project are primarily related to recreational fishing, mostly upstream of Maurice dam and downstream of the project tailrace. The project's existing reservoir is a small diversion pool of less than one-half acre, but receives sustained fishing pressure from anglers. As discussed in section 3.3.2, *Aquatic Resources* and above, providing minimum flows to the project's bypassed reach would enhance trout habitat and increase the length of wetted stream channel, which would also be available for angling. As discussed above, under the applicant's proposal no increase in the length of the wetted stream channel would occur under extreme low-flow conditions, while the flows specified by the Forest Service would increase the length of wetted stream channel available for angling by a minimum of 1,025 feet at all times, and 2,250 most of the time, providing a greater enhancement of angling opportunities within the bypassed reach.

Currently, the majority of Spearfish Creek in the project area is publically accessible through Black Hills National Forest trails and access areas, and municipal parks, trails, and bridges. No entities indicated the need for additional recreation facilities or access associated with the project during the public scoping and comment period. Because there are no proposals for new recreation facilities at the project, there would be no changes to recreation resources except for increased angling opportunities in the bypassed reach under both the applicant and the Forest Services' proposals. This increase in angling opportunities in the bypassed reach would be somewhat offset by an increased risk of fish kills downstream of the project under the Forest Service's proposal, because 4 cfs would be released into the bypassed reach even during extreme low-flow conditions.

As discussed in section 3.3.2 *Aquatic Resources*, both the Forest Service's condition 17 and the applicant's proposal would reduce water levels in the Belle Fourche reservoir, particularity at the end of the irrigation season, in September, when the largest anticipated effect would occur. Forest Service condition 17 would reduce water levels by about one foot and the applicant's proposal would reduce water levels by less than one foot.

A reduction in water level of one foot or less at the end of the irrigation season would not be expected to affect the fishery in the Belle Fourche reservoir. The Belle

Fourche reservoir contains approximately 60,803[29] acre-feet of water in September (U.S. Bureau of Reclamation, 2010). A minor reduction in water levels created by the Forest Service and the applicant's proposals are unlikely to have any negative impacts on any of the life stages of the resident fish in the reservoir.

Although we do not have any specific information that indicates whether the two boat ramps at Belle Fourche would be affected by an additional one foot (or less) reduction in surface elevation, we expect that the boat ramps would remain useable because Belle Fourche currently experiences a wide range of water level fluctuations throughout any given year.

Consistency with Regional Management Plans

Assessment of consistency with regional management plans is related to potential land use, aesthetic, and recreation effects associated with the proposed project on the established goals and objectives in the regional management plans as described in section 3.3.4.1, *Affected Environment, Recreation Resources*. The proposed measures discussed above, that are likely to affect these management plan goals, are primarily related to the potential aesthetic effects of project features and proposed new minimum flows in Spearfish Creek and associated effects on aesthetics and recreational opportunities.

Our Analysis

The applicant does not propose any changes to project facilities (except to install a system for releasing minimum flows at Maurice dam). So, the proposed project would not alter the existing land use and aesthetic character of the area. Further, the proposed project would not alter the form, line, color, texture, or pattern of the landscape as compared to existing conditions, and therefore would have no adverse effects on any of the LRMP scenic integrity objective management goals of the project area, including the most restrictive, high scenic integrity objective.

Providing new minimum flows, as proposed by the applicant and as specified by Forest Service condition 17, would be consistent with objectives in the regional management plans to enhance the scenic qualities of the project area and enhance recreational angling opportunities. As discussed in section 3.3.2, *Aquatic Resources*, providing new minimum flows would likely result in enhanced aquatic habitat, fisheries resources, angling opportunities, and aesthetics in the project's bypassed reach. These benefits would maintain and enhance the natural aesthetic character of the area

---

[29] Average end-of-month storage in Belle Fourche Reservoir for September from years 1952-2009.

compared to existing conditions, which would be consistent with the LRMP objectives of Roaded Natural recreation opportunity spectrum objectives. In addition, these benefits would be consistent with, and would help to meet the objectives specified in the Spearfish Canyon Corridor Management Plan of returning water flow in Spearfish Creek (Forest Service, 1999) and the Spearfish Canyon Landscape Assessment of providing water management to sustain adequate stream flow (Forest Service, 2002b). The proposed project would also be consistent with management objectives specified in the South Dakota SCORP to maintain outdoor recreational opportunities in ways that enhance the quality of scenery and unique natural areas, and with the Lawrence County Comprehensive Plan for the preservation and enhancement of existing rural, forested, and mountainous areas, including the preservation of access to both public and private lands (Lawrence County Commission, 2005).

3.3.4.3 Cumulative Effects

New minimum flows in the project's bypassed reach, particularly as specified by the Forest Service, would enhance aquatic habitat compared to existing conditions and has the potential to increase fish abundance which could improve fishing success and angling opportunities in this section of Spearfish Creek. New minimum flows would also improve aesthetic attributes in the bypassed reach by increasing wetted length, width, and turbulence. These enhancements would result in cumulative beneficial effects to recreation and aesthetics in the vicinity of the project.

However, new minimum flows under both the applicant's and the Forest Service's proposals, would result in some decrease in flows downstream of the project because minimum flows would be absorbed into underlying aquifers in the losing section of the bypassed reach. This loss of flows, in combination with irrigation withdrawals, particularly during extreme low-flow conditions which periodically occur during the summer irrigation season, could increase water temperatures and the risk of fish kills downstream of the project, particularly under the Forest Service's proposal. A loss of flows downstream of the project would also cause minor reductions in water levels in the Belle Fourche reservoir. The above effects would likely have minor potential cumulative adverse effects on recreational angling opportunities in the downstream reaches and may contribute to a cumulative reduction in recreational angling opportunities, in combination with other actions in the basin, such as water withdrawal for irrigation.

3.3.5 Cultural Resources

3.3.5.1 Affected Environment

Area of Potential Effects

The APE for this project encompasses all land within the proposed project boundary plus any additional land or locations where project operations or project-related activities could affect historic properties.

Historical Background

The Black Hills is a forested mountain region surrounded by plains. Archaeologists do not yet have sufficient information to understand how prehistoric Great Plains peoples may have used the Black Hills. Survey data suggest that from around 10,000 Before Present (B.P.), Native populations intermittently inhabited the Black Hills during distinct cultural periods, depending on the climate and availability of large food sources (e.g., bison) on the Plains. The Black Hills may thus have served in part as a refuge during times of climatic extremes, when the plains were less hospitable. It remains unknown whether any cultures specifically adapted to the mountains continuously inhabited the area.

Beginning around 1600 Anno Domini (A.D.), European explorers and traders introduced the horse and the gun to the Plains, along with a variety of trade goods. In that period, the Crow, Plains Apache, Ponca, Comanche, Kiowa, and Kiowa-Apache occupied the Black Hills, but by 1750 the area was dominated by Lakota, Arapaho, and Cheyenne. In the following century, the California gold rush and construction of the transcontinental railroad brought Euro-American settlers into the northern Plains and the Black Hills, leading to inevitable pressures on the Native inhabitants. Although the federal government set the western half of South Dakota off as a reservation for the Lakota in 1868, the discovery of gold in the Black Hills within the next decade set off a series of wars as the Lakota fought a growing number of treaty violations. Despite their defeat of federal armies under Crook and Custer, the Lakota were ultimately forced to cede the Black Hills and Powder River country to the U.S. government in 1877.

The Black Hills gold rush brought American settlement and industry to Spearfish Canyon, as miners, loggers, homesteaders, and ranchers flocked to the area. The town of Spearfish was surveyed in 1876, and the town's first store and post office opened the following year (city of Spearfish, 2009). The same year, mining magnate George Hearst, with two other large California investors, purchased the 4-acre Homestake claim near the town of Lead. Subsequent acquisitions and consolidations by the Homestake Mining Company resulted in the largest gold mining operation in North America (Wolff, 2009). In the first decade of the twentieth century, Homestake built two hydroelectric stations in the Spearfish Valley to generate electric power for the mines

and associated processing operations. The Spearfish Project (originally designated Spearfish No. 1) was built on Spearfish Creek between 1909 and 1911.

Historic Properties in the APE

As a result of archaeological investigations that have taken place over the years in the area of Spearfish Canyon, two Euro-American archaeological sites (39LA1303 [a town site] and 39LA1323 [a non-farm ruin]) have been identified that may be located in the APE. Neither site has been evaluated to determine eligibility for the National Register.

In March 2009, the South Dakota SHPO provided its opinion that the Spearfish project facilities are eligible for inclusion in the National Register.[30] This finding was based on the project's historical associations with the Homestake Mining Company and architectural and engineering values expressed in these early twentieth century project facilities.

The Spearfish Project lies within a much larger area of ancestral Tribal lands important to the Sioux and other Plains tribes. The Tribes therefore have a historic and cultural interest in the natural and cultural resources located within the project. No traditional cultural properties have been recorded in the APE. However, during the licensing process, both the Oglala and Standing Rock Sioux expressed interest in the area's culturally significant plants and any locations associated with Native cultural traditions.

3.3.5.2 Environmental Effects

Our Analysis

We agree with the South Dakota SHPO that the facilities of the Spearfish Project are eligible for inclusion in the National Register due to their important associations with the Homestake Mining Company and the gold mining industry of the Black Hills and due to architectural and engineering values that have remained noticeably intact since the project was built (1909–1911). Although formal National Register determinations have not been completed for any of the specific project structures, few elements within the Spearfish Project have been replaced since the project's original construction. Thus, all project elements are considered eligible for the National Register. Among elements associated with the facility, this would include the dam and

---

[30] *See* Appendix C, *Consultation Correspondence*, in the HPMP, filed April 10, 2009.

intake, aqueduct, penstock, surge tanks, powerhouse, and appurtenant historic period equipment.

Effects on cultural resources within the APE can result from project-related activities such as modifications to historic project facilities, recreational or resource enhancements, or ground-disturbing activities. Effects also can result from other forces such as wind and water erosion, recreational use (project and non-project related), and vandalism. The type and level of effects on cultural resources can vary widely, depending upon the setting, size, and visibility of the resource, as well as whether there is public knowledge about the location of the resources.

However, issuing a license for the Spearfish Project could have a beneficial effect on historic properties because eligible facilities and historic resources would come under the protection afforded by section 106 of the NHPA. In consultation with the South Dakota SHPO, the applicant has prepared an HPMP describing the principles and procedures the applicant would follow to manage and protect historic properties over the term of any new license.[31] Under the HPMP, the applicant would consult with the South Dakota SHPO for any action involving historic project facilities that does not come under the agreed-upon categorical exclusions. The applicant would also commission professional archaeological investigations to determine the National Register eligibility of sites 39LA1303 and 39LA1323,[32] and would consult with the South Dakota SHPO and Forest Service regarding site eligibility, potential effects, and future treatment. The applicant in its HPMP also proposes to consult with the South Dakota SHPO, Tribes, and Forest Service prior to undertaking any ground-disturbing action in the project area and to complete any work to identify, evaluate, and treat historic properties determined necessary as a result of those consultations.

Pursuant to the NHPA and to protect historic properties, we would craft and execute a PA to implement the HPMP as a condition of any license for this project. The PA would be executed among FERC, South Dakota SHPO, and the Advisory Council on Historic Preservation, with the applicant, Oglala Sioux Tribe, Standing Rock Sioux Tribe, and Forest Service invited to sign the PA as concurring parties. With execution and implementation of the PA and the HPMP, we anticipate that any adverse effects on cultural resources from operation of the Spearfish Project would be appropriately resolved.

---

[31] The applicant filed its HPMP with the Commission as a non-public document on April 10, 2009.

[32] Although the HPMP identifies site 39LA1232 for eligibility determinations, other material submitted with the applicant's application suggests that this is a typographical error, and that the correct site number is 39LA1323.

3.3.6 Socioeconomics

3.3.6.1 Affected Environment

The Spearfish Project is located entirely within Lawrence County, South Dakota. The project powerhouse is located within the city of Spearfish. Due to the nature of the fairly steep topography of Spearfish Canyon and its location partially within the Black Hills National Forest, the most common land use within the project boundary is undeveloped forest land.

The city of Spearfish is the most populated city within Lawrence County, with a 2000 U.S. Census population of 8,606 people. Table 9 presents population and other demographic data for the city of Spearfish, Lawrence County, and South Dakota from the U.S. Census Bureau.

Table 9. Population characteristics of the city of Spearfish, Lawrence County, and South Dakota, 2000 (Source: U.S. Census Bureau, 2009).

	Population, 2000	**Population Estimate, 2008**	**Persons in Labor Force, 2000**	**Median Family Income, 2000**	**Families Below Poverty Level, 2000 (percent)**
City of Spearfish	8,606	NA	4,635	$40,257	9.8
Lawrence County	21,802	23,524	11,548	$40,501	9.5
South Dakota	754,844	804,194	394,945	$43,237	9.3

Notes: NA – not available

The U.S. Census Bureau reports that in 2000 there were approximately 27.3 persons per square mile in Lawrence County, which has a land area of 800 square miles. The population of Lawrence County continues to rise slowly, with an estimated population increase of 7.9 percent from 2000 to 2008 (U.S. Census Bureau, 2009a). During the same period, the population of the state was estimated to grow by 6.5 percent (U.S. Census Bureau, 2009b). According to the 2000 census, median family incomes in the city of Spearfish and Lawrence County are slightly lower than the state average, and the percentage of families living under the poverty level is slightly higher (U.S. Census Bureau, 2009c,d,e).

The 2000 Census reports that the sector with the greatest employment in Lawrence County and in the city of Spearfish was education, health, and social services, employing 22.8 percent of the workforce in Lawrence County and 26.7 percent of the workforce in the city of Spearfish. The arts, entertainment, recreation, accommodation,

and food services industry was the second largest employer, with 21 percent of the workforce in Lawrence County and 17.6 percent of the workforce in the city of Spearfish. The retail trade industry was the third largest employer, with 12.5 percent of the workforce in Lawrence County and 15.8 percent of the workforce in the city of Spearfish. The Census also reports that 9.0 percent of the workforce in Lawrence County in 2000 was employed in agriculture, forestry, fishing and hunting, or mining (U.S. Census Bureau, 2009f).

Spearfish Creek provides many benefits to the local economy by creating electricity at the project, providing municipal water for the residents of Spearfish, providing irrigation water to agricultural interests in the Spearfish Creek basin, and providing irrigation water to agricultural interests further downstream including the Belle Fourche Irrigation District. Water from the creek also supports a trout fishery that is popular with anglers and attracts other visitors drawn by the recreational opportunities provided by the creek, the Spearfish Canyon Scenic Byway, and the city of Spearfish. No estimate is available concerning the relative economic value of the above benefits.

Agriculture is an important part of the economy of the state of South Dakota. In 2007, the South Dakota farm economy produced cash receipts of $6.1 billion. Crops generated $3.0 billion, or 50.1% of total cash receipts, and livestock generated $2.7 billion, or 44.7% of cash receipts (South Dakota Bureau of Finance and Management, 2010). In 2002, Lawrence County had 239 farms with 140,703 acres of land in farms. The average farm size was 589 acres, crop sales totaled $994,000, livestock sales totaled $8,997,000, and the average value of agricultural products sold per farm was $41,804 (Department of Agriculture, 2010). The distribution of agricultural land in Lawrence County is shown in figure 5.

There are ten water rights issued by the state of South Dakota for irrigation diversions from Spearfish Creek between the project's powerhouse and the confluence of Spearfish Creek with the Redwater River (figure 6). Irrigation withdrawals are also made from the Redwater River, the largest being the Redwater Irrigation District, and from the Belle Fourche Project. As noted in section 3.3.2.1, *Affected Environment, Water Quantity*, Spearfish Creek contributes approximately 36 percent of the flow in the Redwater River, and up to 22 percent of the flow in the Belle Fourche River, which provides flow to the Belle Fourche reservoir.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

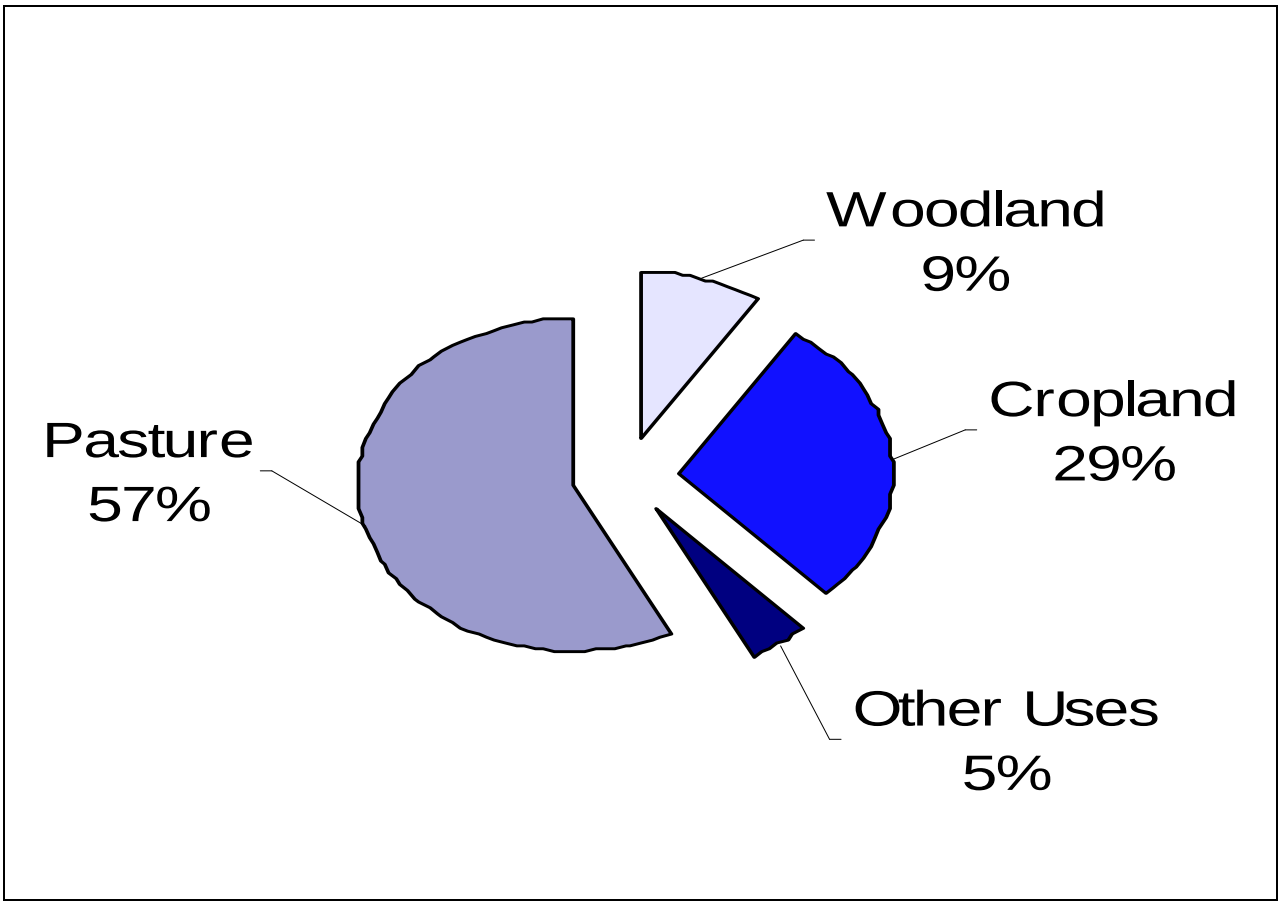

Figure 5. Distribution of agricultural land in Lawrence County, South Dakota (Source: U.S. Department of Agriculture, 2002).

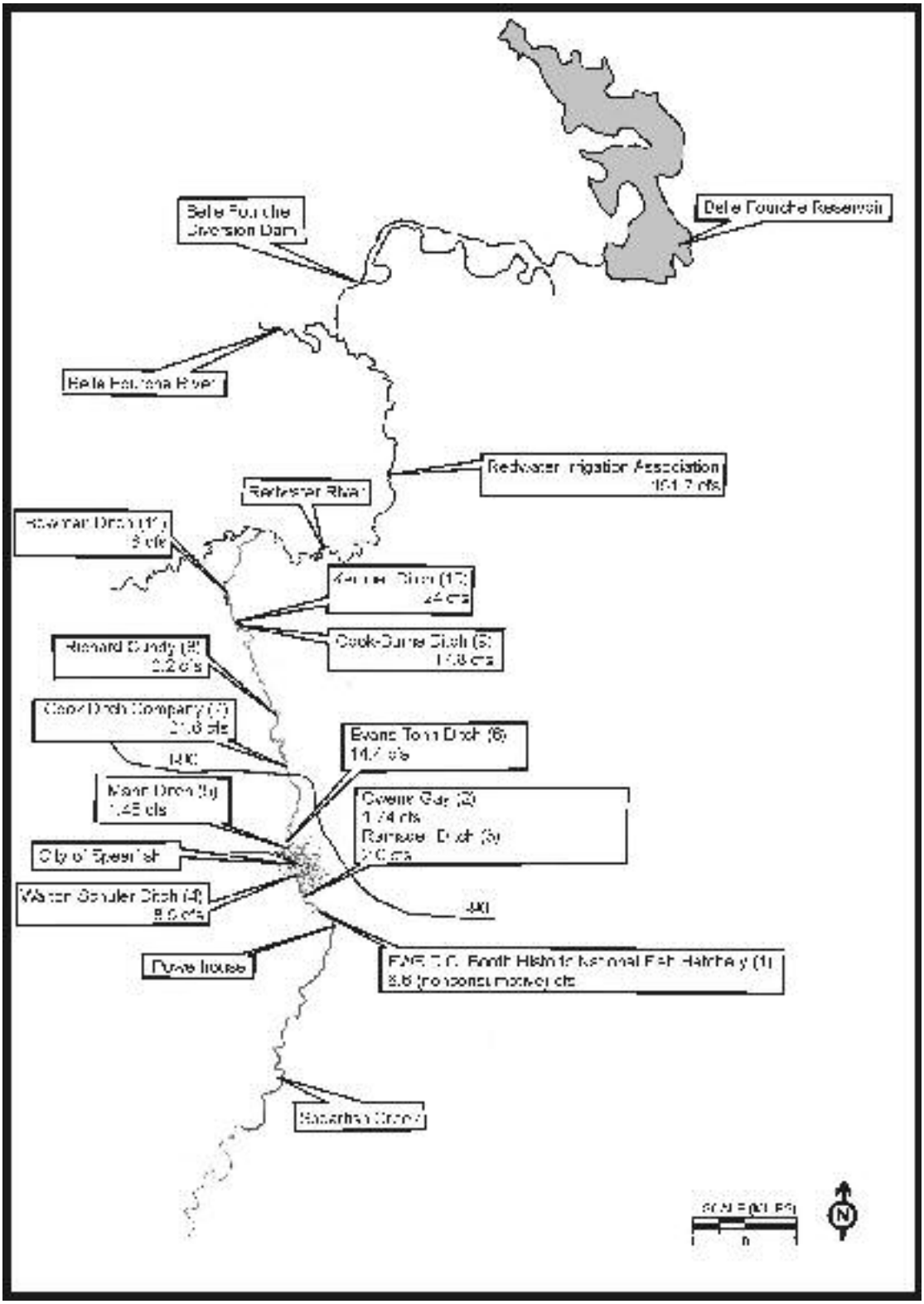

Figure 6. Location of active water rights on Spearfish Creek between the Spearfish powerhouse and Spearfish Creek's confluence with the Redwater River (Source: city of Spearfish, as modified by staff).

Due to withdrawals made to support irrigation at the diversions on Spearfish Creek, the volume of flow in Spearfish Creek typically decreases as it flows downstream from June through September (figure 7). Therefore, the further downstream a water user is, the more likely they are to be affected by reduced flows in Spearfish Creek. Irrigators who commented on the applicant's proposed minimum flows were generally more favorable if their point of withdrawal from Spearfish Creek was located upstream of Cook Ditch. Irrigators were generally less favorable of minimum flows if their point of withdrawal was located downstream of Cook Ditch. No irrigators filed comments supporting the Forest Service's minimum flows specified in condition 17.

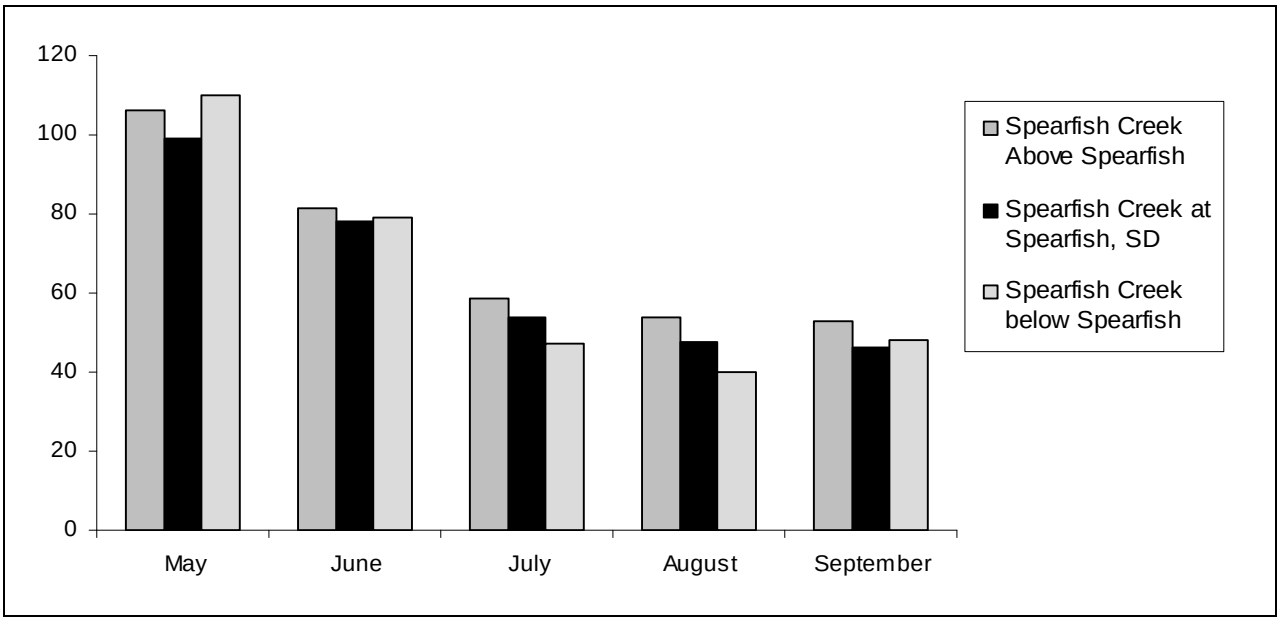

Figure 7. Average monthly flow in Spearfish Creek from 1988–1998 during the irrigation season (Source: USGS, 2009).

3.3.6.2 Environmental Effects

The applicant proposes to release a minimum flow of 3 cfs from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions to be defined by South Dakota DENR. Forest Service condition 17 specifies a year-round minimum flow of 6 cfs at Maurice dam with a provision for reducing minimum flows during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions.

Our Analysis

Affected Resources in the Bypassed Reach

As described in section 3.3.2.2, *Environmental Effects, Minimum Flows*, the applicant proposes to provide new minimum flows that would increase the wetted stream length and available trout habitat compared to existing conditions. Under Forest Service condition 17, the length of wetted stream and the amount of trout habitat in the bypassed reach would be increased even further than the applicant's proposal.

Detailed information concerning the economic value of the Spearfish Canyon fishery is not available; however, increasing available trout habitat could increase trout abundance, which would be likely to improve fishing success and angling opportunities in this section of Spearfish Creek compared to existing conditions. Improved fishing opportunities could increase angler use and increase spending by anglers coming to the Spearfish Canyon area. The minimum flows as specified by the Forest Service in condition 17 would result in the greatest increase in trout habitat and, therefore, would be likely to further enhance fishing opportunities and angler use.

Although the applicant did not assess the effects of different flow releases on stream aesthetics, it is likely that any increases in wetted stream length would provide an aesthetic benefit, and that higher volumes of surface flow would improve aesthetic attributes by increasing wetted width and turbulence. As a result, the minimum flows proposed by the applicant would likely enhance aesthetics, except when flows are discontinued during extreme low flow conditions. The minimum flows specified by the Forest Service in condition 17 would increase the length of wetted stream channel at all times, providing a more sustained improvement in aesthetic values within this section of Spearfish Creek. Improved aesthetics in the bypassed reach would draw more visitors to this portion of Spearfish Canyon, which would likely bring positive socioeconomic benefits.

Affected Resources Downstream of the Project

As described in section 3.3.2.2, *Environmental Effects, Minimum Flows*, adult trout habitat in reaches downstream of the powerhouse may decrease slightly as a result of minimum flows proposed by the applicant or specified by Forest Service condition 17. A 6-cfs minimum flow release at Maurice dam would decrease the average depth in the reach downstream of the powerhouse by approximately 0.04 foot and would reduce the average wetted perimeter by approximately 0.5 foot. Because these are relatively minor changes in physical habitat, we do not expect fish populations in Spearfish Creek downstream of the powerhouse to be adversely affected by these changes.

However, trout populations downstream of the project have experienced periodic fish kills due to high water temperatures exacerbated by irrigation withdrawals during

extreme low-flow conditions. Because all of the flow that is released into the bypassed reach under these conditions would pass into the aquifer, minimum flow releases under these conditions may reduce the flow in Spearfish Creek downstream of the project, and contribute to the frequency and/or severity of conditions that can lead to fish kills in downstream reaches.

Under the applicant's proposal, there would be little risk of increased water temperatures and associated fish kills because the applicant proposes to suspend minimum flows entirely during extreme low-flow conditions. However, Forest Service condition 17 would require the applicant to continue providing a 4 cfs minimum flow even during extreme low-flow conditions, which periodically occur during the summer irrigation season. As discussed, in section 3.3.2.2, *Environmental Effects, Minimum Flows*, continuing to provide minimum flows under these circumstances, could increase the risk of higher water temperatures and fish kills downstream of the project. Any fish kills that occur could adversely affect angling opportunities and recreation downstream of the project. These effects, in turn, could adversely affect tourism and spending.

Finally, although both the applicant's and the Forest Service's minimum flows would result in some net loss of water in Spearfish Creek downstream of the project, these losses are not expected to have a substantial effect on aesthetic resources in downstream reaches of the creek, as discussed in section 3.3.2.2., *Environmental Effects, Minimum Flows.*

Effects on Irrigators

We received comments from six irrigators who withdrawal water at diversions on Spearfish Creek and two irrigators representing interests below the confluence of Spearfish Creek with the Redwater River. The following irrigators filed comments supporting the applicant's proposal for releasing minimum flows: (1) Jerry Frank, president of the Ramsdell Irrigation Association; (2) Doug Hayes, president of the Walton-Schuler Ditch; and (3) John Roggenbuck, Chairman of the Board of the Evans-Tonn Ditch Company.[33]

Irrigators who oppose any minimum flows to the project's bypassed reach or who oppose any changes to the project's current operation (which would preclude new minimum flows) include: (1) Jim Jennings, on behalf of Kemper Ditch users and the

[33] *See* letter from Jerry Frank filed February 13, 2009, comments from Doug Hays and John Roggenbuck at FERC's scoping meeting held January 13, 2009, and letters from John Roggenbuck filed July 22, and September 24, 2009.

Cook-Burns Ditch; (2) Harvey Paulson, president of the Redwater Irrigators Association; and (3) Clint Pitts, manager of the Belle Fourche Irrigation District.[34]

Finally, irrigators who filed other comments on the issue of proposed minimum flows include: (1) Michael McGuigan, president of the Cook Ditch Irrigators who commended the applicant on its proposed project but stated, "There are times during drought that there is not enough water flow to maintain our own water right, thus affecting the fishery directly below our head gate" and (2) Guido Della-Vecchia, representing the Owens-Gay Ditch, who made general statements in favor of irrigator's wise use of water.[35]

As noted in section 3.3.2.2, *Environmental Effects, Minimum Flows*, Spearfish Creek contributes approximately 36 percent of the flow in the Redwater River. The intake for the Redwater Irrigation Ditch is approximately 13.4 miles downstream of the confluence of the Spearfish Creek with the Redwater River. There are approximately 5,300 acres of farmland under irrigation from this ditch. In his comments, Mr. Paulson with the Redwater Irrigators Association stated that, "normally we can't even draw enough water out of Redwater that our water right permit actually allows us to do, because the flow is insufficient."[36] The Redwater Irrigation Association holds a water right of 151.7 cfs; however, under low flow conditions, the association must bypass flows for downstream domestic use, livestock water, and senior water rights (SD DENR, 2006).

As noted in section 3.3.2.2, *Environmental Effects, Minimum Flows*, Spearfish Creek contributes approximately 22 percent of the flow in the Belle Fourche River, which provides water to the Belle Fourche reservoir, part of the Belle Fourche Irrigation Project. Mr. Pitts, with the Belle Fourche Irrigation District, stated, "There are several farmers up here that operate on a couple hundred acre-feet of water a year, and 365 days at 1 cfs is 620, 630 acre-feet of water. So realistically, you're taking water away from three farmers by bypassing minimum flows. That's our obvious, big concern."

Irrigators between the Project and the Belle Fourche Reservoir

Irrigators who divert water from Spearfish Creek or the Redwater River between the project and the Belle Fourche reservoir would experience seasonal losses from

---

[34] *See* letter from Jim Jennings filed January 23, 2009, and comments from Harvey Paulson and Clint Pitts at FERC's scoping meeting held January 14, 2009.

[35] *See* letter from Michael McGuigan filed February 13, 2009, and comments from Guido Della-Vecchia at FERC's scoping meeting held January 13, 2009.

[36] *See* comments provided at FERC's scoping meeting held January 14, 2009.

minimum flows released into the project's bypassed reach, compared to existing conditions. As noted in section 3.3.2.2, *Environmental Effects, Minimum Flows,* the applicant's proposed minimum flows would result in a maximum potential annual loss, excluding spring flows, of from 0 to 910 acre-feet of water.[37] Minimum flows specified in Forest Service condition 17 would result in a potential annual loss of between 1,241 and 1,820 acre-feet of water.[38]

As an example, using historic flow conditions from 1988 to 2009, the average annual loss under the applicant's proposal would have been 734 acre-feet of water, or 3.8 percent of the flow in Spearfish Creek, as measured at the Spearfish gage (USGS gage 06431500, Spearfish Creek at Spearfish). Using the same historical conditions, the average annual loss from Forest Service condition 17 would have been 1,717 acre-feet, or 9.4 percent of the flow at this location.

While methods are in place to allocate limited flows during the irrigation season, in 1990, for example, when the average flow was 44 cfs at the Spearfish gage, the combination of low flows and irrigation withdrawals led to a cessation of flows in Spearfish Creek below the Cook Ditch (South Dakota Department of Water and Natural Resources, 1990). As noted in table 6 in section 3.3.2.2, *Environmental Effects, Minimum Flows,* during the irrigation season of 1990, under the city of Spearfish's proposal, minimum flows would have been suspended for 92 days of the 153-day irrigation season. Under Forest Service condition 17, flows would have been reduced from 6 cfs to 4 cfs for 91 days. Cessation of minimum flow releases under the applicant's proposed action would reduce losses of stream flow into the aquifer during the periods when downstream irrigators would be most vulnerable, while the Forest Service's specified condition would reduce the amount of flow available to downstream irrigators by requiring a minimum flow release of 4 cfs during extreme low-flow conditions.

While there are many influences on agricultural production, a net loss of water downstream of the project would adversely affect irrigators during the May 1 through September 30 irrigation season, when water use is greatest. These effects would occur under both the applicant's and the Forest Service's minimum flows but would be most pronounced under the Forest Service's condition 17, because a 4-cfs minimum flow

---

[37] This range represents a minimum loss of 0 acre-feet if minimum flows are suspended for the entire irrigation season, and 910 acre-feet if minimum flows are not suspended at any time over the irrigation season.

[38] This range represents a minimum loss of 1,241 acre-feet under a 4 cfs minimum flow release, and 1,821 acre-feet under a 6 cfs minimum flow release during the irrigation season.

would be released instead of suspending minimum flows entirely as proposed by the applicant.

Irrigators below Belle Fourche Reservoir

Input from the Belle Fourche River replenishes the Belle Fourche reservoir, which is drawn down during the May to September irrigation season. Minimum flows to the bypassed reach during both the irrigation and the non-irrigation seasons are expected to have a cumulative negative effect on the amount of water available to the Belle Fourche Project for irrigation. As described in section 3.3.2.2, *Environmental Effects, Minimum Flows,* excluding any increased contribution from spring flows associated with groundwater recharge, the mean annual flow in Spearfish Creek could be reduced by 2,523 to 3,433 acre-feet of water under the applicant's proposal and 3,753 to 4,344 acre-feet of water under Forest Service condition 17, including releases that are made into the bypassed reach both within and outside of the irrigation season. Assuming that the amount of water that is withdrawn from irrigation diversions between the Spearfish project and the inlet canal to the Belle Fourche reservoir is similar to what has been diverted in the past, the loss resulting from the applicant's proposal is equivalent to a reduction in the mean annual inflow to the Belle Fourche reservoir of 2.2 to 3.0 percent, as measured at the inlet canal upstream of Belle Fourche reservoir (USGS gage 06434505). Under Forest Service condition 17, the reduction in mean annual inflow is expected to be 3.3 to 3.8 percent of the inflow to the Belle Fourche reservoir.

Under the assumption that the average irrigation release of 115,123 acre-feet annually from the Belle Fourche reservoir was equally distributed among all 57,068 acres under irrigation, the average water allocation would be 24.2 inches per acre. This does not take into account losses in the canals, laterals, and drains due to seepage or evaporation, which could significantly decrease the actual average amount of water delivered per acre.[39] Assuming that all diverted flows were lost to the Belle Fourche Project, and assuming that these losses were equally distributed among all 57,068 irrigated acres, the expected total annual loss would range from 0.53 to 0.72 inches per acre under the applicant's proposal and 0.80 to 0.91 inches per irrigated acre under Forest Service condition 17.

Increased contribution from spring flows may help to offset some of these losses both in Spearfish Creek and in the Belle Fourche reservoir, but we do not have

---

[39] The South Dakota DENR (2004) estimated that during water year 1995–1996, only 32 percent of the water discharged through the irrigation canals was used by crops. The remaining water was lost to canal seepage, operational waste, or flowed off crop lands into the drainage system or nearby streams.

sufficient information to estimate this effect. While both the applicant's proposal and the Forest Service condition 17 may decrease the amount of water downstream that may replenish the Belle Fourche reservoir, the applicant's proposal would be expected to have a smaller potential annual impact on the total annual amount of water available for irrigators who use the Belle Fourche Irrigation Project than the minimum flows specified by Forest Service condition 17.

3.3.6.3 Cumulative Effects

As noted in section 3.3.4.3, *Cumulative Effects*, concerning recreation and aesthetics, providing minimum flows to the bypassed reach would enhance aesthetic resources and fish habitat, and may increase trout populations and angling opportunities in this part of Spearfish Canyon. In concert with on-going socioeconomic activities in the area, these benefits could, in turn, lead to small positive socioeconomic benefits.

However, a net loss of water in Spearfish Creek downstream of the powerhouse, together with any other flow losses, could adversely affect downstream water users, including irrigators. Further, releasing minimum flows into the project's bypassed reach during extreme low-flow conditions as specified by the Forest Service could increase water temperatures and the risk of fish kills downstream of the project. Any adverse effects to the fishery could adversely affect angling opportunities and recreation along Spearfish Creek in downstream reaches.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to be operated as it has been operated in the past, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Spearfish Project's use of Spearfish Creek for hydropower purposes to see what effect various environmental measures would have on the project's costs and power benefits. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[40] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e. for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 10 summarizes the assumptions and economic information we use in our analysis. This information was provided by the city of Spearfish in its license application, or estimated by staff. We find that the values provided by the applicant are reasonable for the purposes of our analysis. Cost items common to all alternatives include: insurance costs, net investment (the total investment in power plant facilities remaining to be depreciated), estimated future capital investment required to maintain and extend the life of plant equipment and facilities, licensing costs, and normal operation and maintenance cost.

---

[40] See Mead Corporation, Publishing Paper Division, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Table 10. Parameters for the economic analysis of the Spearfish Hydroelectric Project.

Parameter	Value	Source
Period of analysis (years)	30	Staff
Term of financing (years)	20	Staff
Insurance	0.25%	Staff
Net investment, $[a]	$190,000	City of Spearfish[a]
Cost to prepare license application	$500,000	City of Spearfish
Operation and maintenance, $/year	$448,000	City of Spearfish response filed January 6, 2009
Energy rate, ($/MWh)	$48.76	License application
Interest rate (%)	6%	Staff
Authorized installed capacity (MW)	4.0	License application
Annual generation (MWh)	18,084	City of Spearfish response filed January 6, 2009

[a] Net investment is the depreciated project investment allocated to power purposes. As stated in the official transcript from the January 13, 2009 public scoping meeting, the applicant paid $250,000 for the project in 2004. We depreciated the purchase price to 2009 dollars using straight-line depreciation over 20 years.

4.2 COMPARISON OF ALTERNATIVES

Table 11 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this EA: no-action, the applicant's proposal, the staff alternative, and the staff alternative with mandatory conditions.

4.2.1 No-action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project would have an installed capacity of 4 MW, and generate an average of 18,084 MWh of electricity annually. The average annual cost of alternative power would be $881,770, or about $48.8/MWh. The average annual project cost would be $499,850, or about $27.6/MWh. Overall, the project would produce power at a cost which is $381,920 ($21.1/MWh) less than the cost of alternative power.

Table 11. Summary of the annual cost of alternative power and annual project cost for four alternatives for the Spearfish Hydroelectric Project (Source: staff).

	No Action	**City of Spearfish Proposal**	**Staff Alternative**	**Staff Alternative with Mandatory Conditions**
Installed capacity (MW)	4.0	4.0	4.0	4.0
Annual generation (MWh)	18,084	16,819	16,819	16,363
Annual cost of alternative power ($/MWh)	$881,770 48.76	$820,090 48.76	$820,090 48.76	$797,860 48.76
Annual project cost ($/MWh)	$499,850 27.64	$509,050 30.27	$513,260 30.52	$513,260 31.37
Difference between the cost of alternative power and project cost ($/MWh)	$381,920 21.12	$311,040 18.49	$306,840 18.24	$284,600 17.39

4.2.2 Applicant's Proposal

The city of Spearfish proposes to continue operating the project in a similar manner as it is operated now, except with new minimum flows in the project's bypassed reach and implementation of several environmental measures. No modifications to project generating capacity are proposed. As proposed by the city of Spearfish, the project would generate annually an average of 16,819 MWh of electricity. The average annual cost of alternative power would be $820,090, or about $48.8/MWh. The average annual project cost would be $509,050, or about $30.3/MWh. Overall, the project would produce power at a cost which is $311,040 ($18.5/MWh) less than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes all of the applicant's proposed environmental measures except for the proposed one-year minimum flow progress report. The staff alternative also includes all of the Forest Service's preliminary 4(e) conditions except for one condition (condition 17) that specifies higher minimum flows, and includes one of the Forest Service's section 10(a) recommendations for installing nest boxes for the

American dipper. Finally, the staff alternative includes one staff-recommended measure that would require the applicant to prepare a plan for installing, maintaining, and operating a minimum flow release structure and a continuous recording gage. Table 12 shows the staff recommended additions, deletions, and modifications to the city of Spearfish's proposed environmental protection and enhancement measures and the estimated cost of each measure.

Based on a total installed capacity of 4 MW and an average annual generation of 16,819 MWh, the Spearfish Project would have an average annual cost of alternative power of $820,090, or about $48.8/MWh. The average annual project cost would be $513,260, or about $30.5/MWh. Overall, the project would produce power at a cost which is $306,840 ($18.2/MWh) less than the cost of alternative power.

4.2.4 Staff Alternative with Mandatory Conditions

This alternative is similar to the staff alternative with the exception of increased minimum flows. This alternative would have an average annual generation of 16,363 MWh, and an annual cost of alternative power of $797,860, or about $48.8/MWh. The average annual project cost would be $513,260, or about $31.4/MWh. Overall, the project would produce power at a cost which is $284,600 ($17.4/MWh) less than the cost of alternative power. This alternative would cost $26,440 more than the project proposed by the city of Spearfish, and $22,240 more than the staff alternative.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 12 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 12 Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Spearfish Hydroelectric Project (Source: city of Spearfish, 2008, and staff).

Enhancement/Mitigation Measures	Entities	Capital (2009$)	Annual (2009$)	Total Annual Cost (2009$)	Notes
1. Release a minimum flow of 3 cfs from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions	City of Spearfish, Staff	$0	$61,680 (1,265 MWh of lost energy)	$61,680	**a**
2. Design and install a system for releasing minimum flows at Maurice dam	City of Spearfish, Staff	$75,000	$2,000	$7,640	**b**
3. Prepare a one-year minimum flow progress report, in consultation with the resource agencies, that would assess the effects of the applicant's proposed minimum flows	City of Spearfish	$9,620	$0	$720	**c**
4. Enter into an agreement with the South Dakota DGF&P to periodically electroshock, remove, and relocate fish that are entrained into the project's forebay	City of Spearfish, Staff	$0	$840	$840	**d**
5. Prepare and file an erosion control plan prior to any ground-disturbing activities	Forest Service, Staff	$3,000	$0	$230	**c**

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Enhancement/Mitigation Measures	Entities	Capital (2009$)	Annual (2009$)	Total Annual Cost (2009$)	Notes
6. Prepare and implement a noxious weed management plan	Forest Service, Staff	$3,000	$1,000	$1,230	**c**
7. Prepare and implement a plan to protect threatened, endangered, and sensitive species prior to any activity that could affect these species	Forest Service, Staff	$0	$0	$0	**e**
8. Release a year-round minimum flow of 6 cfs at Maurice dam with a provision for reducing minimum flows during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions	Forest Service	$0	$83,920 (1,721 MWh of lost energy)	$83,920	**f**
9. Incremental cost over applicant's proposal to design, construct, and maintain a structure to measure and release minimum flows at Maurice dam with continuous recording capability	Forest Service, Staff	$25,000	$500	$2,380	**b, g**
10. Modify Maurice dam to allow free movement of resident fish past the dam	Forest Service	$75,000	$1,000	$6,640	**c, h**
11. Install nest boxes for the American dipper at suitable sites	Forest Service, Staff	$3,000	$500	$730	**c**

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Enhancement/Mitigation Measures	Entities	Capital (2009$)	Annual (2009$)	Total Annual Cost (2009$)	Notes
12. Prepare a plan for installing, maintaining, and operating the minimum flow release structure and continuous recording gage.	Staff	$5,000	$0	$380	**c**
13. Release 20 cfs into the project's bypassed reach during times of ice build-up to reduce flood hazard downstream of the powerhouse	Jerry Boyer	$4,060	$0	$310	**c**

[a] Lost energy provided by the applicant in its January 6, 2009, response to FERC additional information request (AIR).

[b] Cost of release structure provided by the applicant in its January 6, 2009, AIR response.

[c] Cost estimated by staff.

[d] Staff estimated a cost of $5,000 in years 5, 10, 15, 20, and 25.

[e] Because no potential adverse effects on listed, proposed, or sensitive species are anticipated from the applicant's proposal or any of action alternatives at this time, we did not include any cost for this measure in this analysis.

[f] Lost energy estimated by staff based on energy loss estimates provided by the applicant in its January 6, 2009, AIR response.

[g] Cost of gaging station and reporting estimated by staff.

[h] This represents the incremental cost of incorporating fish passage into the design of the flow release structure. This cost is based on constructing three step pools at the bypass flow release point and using an automated overflow weir to regulate flows into the upper step pool to facilitate upstream fish passage.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of the applicant's proposal, the staff alternative, the staff alternative with mandatory conditions, and the no-action alternative.

We estimate the annual generation of the project under the four alternatives identified above. Our analysis shows that the annual generation would be 16,819 MWh for the proposed action and the staff alternative; 16,363 MWh for the staff alternative with mandatory conditions; and 18,084 MWh for the no-action alternative.

We summarize the environmental effects of the different alternatives below.

Geology and Soils—There are no known ongoing soil erosion control problems at the project, and the applicant does not propose any major new construction activities. However, the applicant does propose to construct a system for releasing minimum flows at Maurice dam, and Forest Service condition 18 specifies that the flow release structure include a system for monitoring minimum flow releases. Under the staff alternative and staff alternative with mandatory conditions, the applicant would develop and implement an erosion control plan. This plan would ensure the protection of aquatic fish and wildlife species and would help minimize any degradation to aquatic habitat during ground-disturbing activities.

Aquatic Resources—Under the applicant's proposal, staff alternative, and staff alternative with mandatory conditions, minimum flow releases would enhance aquatic habitat in the bypassed reach compared to existing conditions. However, the staff alternative with mandatory conditions would enhance aquatic habitat more, because 6 cfs would be released year-round (the applicant proposes to release 3 cfs during the irrigation season) and because at least 4 cfs would be released under extreme low-flow conditions (the applicant proposes to suspend minimum flows entirely under extreme low-flow conditions).

However, releasing minimum flows into the project's bypassed reach under the applicant's proposal and two action alternatives, instead of routing this water through the project's underground aqueduct as currently occurs, would result in a net loss of water in Spearfish Creek downstream of the powerhouse compared to existing conditions. This would happen because minimum flows released into the bypassed reach would be absorbed into underlying aquifers in the losing section of the bypassed reach. Under the staff alternative with mandatory conditions, the Forest Service's minimum flow releases would result in higher losses in Spearfish Creek downstream of the project than would occur under lesser minimum flow releases specified in the applicant's proposal and staff alternative. A net loss of water in Spearfish Creek

downstream of the project, particularly during extreme low-flow conditions, could adversely affect aquatic habitat in downstream reaches of Spearfish Creek. The Forest Service's condition to release minimum flows during extreme low-flow conditions could increase downstream water temperatures and the risk of fish kills below the project.

The staff alternative and staff alternative with mandatory conditions includes two measures that would benefit aquatic resources: a plan to protect threatened, endangered, and sensitive species (including aquatic species) and development of a soil erosion control plan prior to any ground-disturbing activities. The staff alternative, in addition, includes a plan for installing, maintaining, and operating a minimum flow release structure and continuous recording gage. These additional measures would help protect aquatic resources from any project-related ground-disturbing activities and would help ensure that the applicant complies with any minimum flow conditions.

Terrestrial Resources—Minimum flows under the applicant's proposal and under the two action alternatives, would benefit riparian vegetation in the project's bypassed reach compared to existing conditions. However, minimum flows under the staff alternative with mandatory conditions would enhance riparian vegetation more because 6 cfs would be released year-round and because 4 cfs would be released under extreme low-flow conditions, compared to the applicant's proposal and the staff alternative.

The staff alternative, and the staff alternative with mandatory conditions, includes three additional measures: (1) a plan to protect threatened, endangered, and sensitive species (including terrestrial species); (2) a noxious weed management plan; and (3) installation of nest boxes for the American dipper. These additional measures would help protect sensitive terrestrial species, control noxious weeds, and enhance breeding for the American dipper compared to existing conditions and the applicant's proposal.

Recreation, Land Use, and Aesthetics—Minimum flows under the applicant's proposal and under both action alternatives, would improve angling opportunities and aesthetics in the project's bypassed reach compared to existing conditions. However, the Forest Service's specified minimum flows under the staff alternative with mandatory conditions would enhance these resources more because higher minimum flows under this alternative would provide more aquatic habitat that could increase trout populations and would improve the appearance of the bypassed reach compared to the applicant's proposal.

However, releasing minimum flows into the project's bypassed reach during extreme low-flow conditions, as specified by the Forest Service under the staff alternative with mandatory conditions, could increase water temperatures and the risk of fish kills downstream of the project. Any adverse effects to the fishery could adversely

affect angling opportunities and recreation along Spearfish Creek downstream of the powerhouse.

Cultural Resources—Under the applicant's proposal and both action alternatives, historic properties would be managed pursuant to the terms of an HPMP the applicant developed in consultation with the South Dakota SHPO. The HPMP would be formally implemented through execution of a PA pursuant to section 106 of the NHPA among the Commission, South Dakota SHPO, and the Advisory Council on Historic Preservation, if the Advisory Council on Historic Preservation chooses to participate.

Socioeconomics—Minimum flows under the applicant's proposal and both action alternatives, would improve angling opportunities and aesthetics in the bypassed reach which could draw more visitors to the area. The Forest Service's minimum flows under the staff alternative with mandatory conditions, would improve angling opportunities and aesthetics in the bypassed reach even more than the applicant's proposal and the staff alternative.

As discussed above, releasing minimum flows into the project's bypassed reach under the applicant's proposal and both action alternatives, instead of routing this water through the project's underground aqueduct as currently occurs, would result in a net loss of water in Spearfish Creek downstream of the powerhouse compared to existing conditions. The staff alternative with mandatory conditions would release higher minimum flows than the applicant's proposal and the staff alternative, and therefore, would result in higher losses in Spearfish Creek downstream of the project. A net loss of water in Spearfish Creek downstream of the project under the applicant's proposal and the staff alternative, and higher net losses under the staff alternative with mandatory conditions could adversely affect downstream water users, including irrigators.

Under the no-action alternative, environmental conditions at the project would remain the same and there would be no enhancement of environmental resources at the project.

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the

Spearfish Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we selected the staff alternative as the preferred option. We recommend this option because: (1) issuance of a hydropower license by the Commission would allow the applicant to operate the project as an economically beneficial and dependable source of electrical energy for its customers; (2) the 4.0 MW of electric energy generated from a renewable resource may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable resources and reducing atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance fish and wildlife resources, and would provide improved aesthetic conditions and recreation opportunities at the project, which is located near the Spearfish Canyon Scenic Byway.

In the following section, we make recommendations as to which environmental measures proposed by the applicant or recommended by agencies and other entities should be included in any license issued for the project. In addition to the applicant's proposed environmental measures, we recommend additional staff-recommended environmental measures to be included in any license issued for the project. We also discuss which measures we do not recommend including in the license.

Measures Proposed by the Applicant and Recommended by Staff

Based on our environmental analysis of the applicant's proposal discussed in section 3 and the costs discussed in section 4, we recommend including the following environmental measures proposed by the applicant in any license issued for the project.

- Release a minimum flow of 3 cfs from Maurice dam into the bypassed reach of Spearfish Creek during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions.[41]

- Design and install a system for releasing minimum flows at Maurice dam, which may include a bypass pipe and other equipment.

---

[41] We concur with South Dakota DENR that extreme low-flow conditions should be defined as a flow of 40 cfs or less in Spearfish Creek at USGS gage 06431500 (Spearfish Creek at Spearfish) during the May 1 through September 30 irrigation season.

- Enter into an agreement with the South Dakota DGF&P to periodically electroshock, remove, and relocate fish that are entrained into the forebay. This action would be taken every 5 years, and after high flow events upon request by South Dakota DGF&P.

Additional Measures Recommended by Staff

- Forest Service condition 7—Prepare and implement an erosion control plan prior to any ground-disturbing activities.

- Forest Service condition 15—Prepare and implement a noxious weed management plan.

- Forest Service condition 16—Prepare and implement a plan to protect threatened, endangered, and sensitive species prior to any activity that could affect these species.

- Forest Service condition 18—Install, maintain, and operate a minimum flow release structure and measurement device at Maurice dam with continuous recording capability.

- Forest Service 10(a) recommendation 2—Install nest boxes for the American dipper at suitable sites in the project area.

- Develop a plan for installing, maintaining, and operating the minimum flow release structure proposed by the applicant and continuous recording gage specified in Forest Service condition 18. This plan should also include methods for reporting flow release data to the resource agencies and the Commission.

Measures Not Recommended by Staff

- The applicant's proposal to prepare a one-year minimum flow progress report, in consultation with the resource agencies, which would assess the effects of the applicant's proposed minimum flows on aquatic resources.

- Forest Service condition 17—Release a year-round minimum flow of 6 cfs at Maurice dam with a provision for reducing minimum flows during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions.

- Forest Service 10(a) recommendation 1—Install fish passage facilities to "improve stream connectivity and the free movement of resident fish past Maurice dam."

Staff's Evaluation of the Measures Considered

Our recommended alternative is based on the applicant's proposal with certain staff-recommended changes listed above. We discuss our rationale for the measures we are recommending or not recommending below.

Minimum Flows

The primary issues associated with licensing this project are the costs and benefits of providing minimum flows to the project's bypassed reach and the effects of minimum flow losses (through aquifer recharge) on downstream aquatic resources and downstream water users, including irrigators. Currently, the project diverts all flow in Spearfish Creek up to the project's 120-cfs hydraulic capacity, eliminating or reducing flow in the bypassed reach.

Under the staff alternative, which includes the applicant's proposed minimum flows, the applicant would release 3 cfs from Maurice dam into the project's bypassed reach during the irrigation season (May 1 through September 30) and 6 cfs during the non-irrigation season, with a provision for suspending minimum flows under extreme low-flow conditions. The applicant's proposed minimum flows of 3 and 6 cfs would increase the wetted length of Spearfish Creek in the bypassed reach by about 590 and 2,250 linear feet, which is an increase of 1.5 and 5.8 percent, respectively. As discussed in section 3, proposed minimum flows would enhance aquatic habitat, riparian habitat, angling opportunities, and aesthetics in the bypassed reach compared to existing conditions.

Although the applicant's proposed minimum flows would benefit resources in the project's bypassed reach, these minimum flows would also result in a net loss of water in Spearfish Creek downstream of the project. This would happen because minimum flows released into the bypassed reach, which currently flow through the project's underground aqueduct, would be absorbed into underlying aquifers in the losing section of the bypassed reach. Under the applicant's proposed minimum flows of 3 and 6 cfs, a maximum of 2,523 to 3,433 acre-feet would be lost which represents 6.3 to 8.5 percent of the mean annual flow of Spearfish Creek downstream of the powerhouse (USGS gage 06431500) and 2.2 to 3.0 percent of the mean annual inflow to the Belle Fourche reservoir (USGS gage 06434505). Releasing minimum flows into the bypassed reach instead of using this water to generate power would also reduce the project's annual generation by about 1,265 MWh, which would cost an estimated $61,680 annually.

Under the staff alternative with mandatory conditions, which includes Forest Service condition 17, the applicant would release a year-round minimum flow of 6 cfs at Maurice dam with a provision for reducing minimum flows during the irrigation season (May 1 through September 30) to 4 cfs under extreme low-flow conditions. A

minimum flow of 4 and 6 cfs would increase the wetted length of Spearfish Creek in the bypassed reach by about 1,025 and 2,250 linear feet, which is an increase of 2.7 and 5.8 percent, respectively. The staff alternative with mandatory conditions would enhance the same resources as the staff alternative, but these enhancements would be greater, because 6 cfs would be released year-round (instead of 3 cfs during the irrigation season), and because at least 4 cfs would be released under extreme low-flow conditions (instead of suspending minimum flows entirely).

However, the staff alternative with mandatory conditions would result in higher net losses in Spearfish Creek downstream of the project. Under this alternative with seasonal minimum flows of 4 and 6 cfs, a maximum of 3,753 to 4,344 acre-feet would be lost to groundwater recharge, which represents 9.3 to 10.8 percent of the mean annual flow of Spearfish Creek downstream of the powerhouse (USGS gage 06431500) and 3.3 to 3.8 percent of the mean annual inflow to the Belle Fourche reservoir (USGS gage 06434505). As discussed in section 3, these higher net losses could increase the risk of higher water temperatures and fish kills on Spearfish Creek downstream of the project, especially during extreme low-flow conditions (because the applicant would continue to provide 4 cfs rather than suspending minimum flows entirely). Higher net losses would also have a greater effect to downstream water users, including irrigators, and would reduce the project's annual generation by about 1,721 MWh, which would cost an estimated $83,920 annually.

In consideration of the above costs and benefits of providing minimum flows to the project's bypassed reach under the applicant's proposal and under the staff alternative with mandatory conditions, which includes Forest Service condition 17, we find that on balance, providing a minimum flow that provides some enhancement to habitat conditions in the project's bypassed reach while at the same time protecting the downstream fishery and water users (by reducing minimum flows during the irrigation season and suspending minimum flows entirely during extreme low-flow conditions), would provide for the best comprehensive use of the waters of Spearfish Creek for all beneficial public uses. We, therefore, recommend the applicant's proposed minimum flows as part of the staff alternative.

Minimum Flow Release Structure and Monitoring

Currently, there is no way of releasing minimum flows at Maurice dam in a reliable manner. To solve this problem, the applicant proposes to design and install a system for releasing minimum flows at the dam. We agree that a system for releasing minimum flows is needed and estimate that this proposal would have an annualized cost of $7,640.

Forest Service condition 18 also specifies a system for releasing minimum flows at the dam with the added requirement of installing a continuous recording gage.

Because of the flow gains and losses that occur between Maurice dam and the nearest existing gage downstream of the project (USGS gage 06431500, Spearfish Creek at Spearfish), this nearest existing gage would not provide an effective method for documenting compliance with any minimum flow requirements. A gage located at Maurice dam with continuous measuring capacity, as specified by Forest Service condition 18, would provide the needed flow release data. We estimate that a continuous recording gage would have an annualized cost of $2,380 (the combined annualized cost of the gage and system for releasing minimum flows would be $10,010). We conclude that this gage is necessary and would be worth the additional cost.

Because the applicant did not provide detailed plans for installing, maintaining, and operating the minimum flow release structure and because we need the details of how the continuous recording gage would be installed and operated (to ensure that the gage provides all needed flow data), we recommend that the applicant develop a plan for implementing these measures. This plan would ensure that the flow release structure and recording gage are properly designed, that appropriate environmental safeguards are implemented during installation of these facilities, and that minimum flow release data are collected and reported in a way that documents compliance with any minimum flow requirements. The annualized cost of developing this plan would be $380; this cost would be worth the plan's benefits.

Finally, along with its proposed minimum flows, the applicant proposes to develop a one-year minimum flow progress report, in consultation with the resource agencies, to assess the effects of the minimum flow releases. Because the effects of the applicant's proposed minimum flows on aquatic habitat are well known from data collected during the applicant's Delphi study, we conclude that the applicant's proposed progress report would provide little, if any, benefit and therefore, would not justify the annualized cost of $720 needed to implement this measure. Therefore, we do not adopt this proposed measure.

Erosion Control

Forest Service condition 7 specifies that the applicant prepare and implement an erosion control plan at least 60 days prior to any ground-disturbing activity. Preparing an erosion control plan prior to commencing activities that could increase erosion or sedimentation (e.g., construction of a minimum flow release structure and continuous recording gage at Maurice dam) would help prevent any adverse effects to aquatic habitat and terrestrial and aesthetic resources. We estimate that preparing and implementing an erosion control plan would have an annualized cost of $230. We conclude that the benefits of the measure warrant its costs.

Fish Entrainment and Passage

Fish that enter the project's intake structure at Maurice dam travel through the 4.5-mile-long underground aqueduct that leads to the project's forebay pond. These fish are likely unable to return to Spearfish Creek due to high water velocities in the underground aqueduct, and therefore, are effectively removed from the upstream population. To address this issue, the applicant proposes to, through an agreement with South Dakota DGF&P, provide for the removal of fish from the forebay every 5 years and upon request by South Dakota DGF&P after high flow events. The applicant would electroshock, remove, and relocate fish from the forebay and release these fish upstream of Maurice dam. We estimate that the annualized cost of implementing this measure would be $840. Because this measure would help protect and maintain the self-reproducing population of rainbow trout that exists upstream of Maurice dam, we conclude that the benefits of this measure are worth the cost, and we have included this measure in the staff alternative.

Forest Service section 10(a) recommendation 1 provides that the applicant install fish passage facilities at Maurice dam to "improve stream connectivity and free movement of resident fish past Maurice dam." We estimate that there would be no cost to providing downstream passage because downstream passage can occur during high flow periods with the existing facilities; however, the annualized cost of providing upstream passage would be $6,640. Our analysis in section 3 indicates that the populations of trout upstream and downstream of the dam are self-sustaining. Further, the data on record show that trout populations in the bypassed reach contain all life stages and that the bypassed reach contains the specific habitats each life stage requires. Therefore, we find that the lack of any benefit of providing upstream fish passage would not justify the annualized cost of $6,640. For this reason, we have not included this recommendation in the staff alternative.

Rare and Sensitive Species

Forest Service section 10(a) recommendation 2 provides that the applicant install nest boxes for the American dipper at suitable sites in the project area. The Forest Service notes that the American dipper has nested in the vicinity of Maurice dam upstream of the intake for several years but has not successfully fledged any young. Installing nest boxes could encourage American dipper to nest in more suitable locations and could potentially increase the successful reproduction of this bird, which is a state-listed threatened species and a Forest Service species of local concern. Our analysis in section 3 identifies several examples where nest boxes have successfully increased breeding populations of American dipper at other locations. Also, installing nest boxes in conjunction with increased foraging habitat provided by staff-recommended minimum flows could increase nesting success as well. We estimate that the annualized cost of this measure would be $730. We conclude that the benefits of this measure warrant its cost.

Forest Service condition 16 specifies that the applicant prepare and implement a plan to protect threatened, endangered, and sensitive species at least 60 days prior to any activity that could affect these species. Such a plan would help to identify potential adverse effects on sensitive species associated with construction and any routine maintenance activities. Although the extent and frequency of any such future activities cannot be predicted at this time, the cost to prepare the plan would be nominal. We find that the plan would be an effective way to identify, avoid, and mitigate potential adverse effects. Therefore, we conclude that the benefits of the plan would be worth its costs. We recommend that this measure be included in any license issued for the project.

Noxious Weeds

Forest Service condition 15 specifies that the applicant prepare and implement a noxious weed management plan. Noxious weeds can affect the functional value of riparian and wildlife habitat and can outcompete native plants, including sensitive species. Implementing a noxious weed management plan would help control the spread and abundance of invasive and nuisance species, benefitting native vegetation, wildlife, and sensitive plant species. We estimate that this measure would have an annualized cost of $1,230. We conclude that the benefits of the measure warrant its costs.

Flood Control

Mr. Jerry Boyer, a property owner who lives adjacent to Spearfish Creek downstream of the powerhouse, requested in comments at the January 13, 2009, scoping meeting that any license issued to the applicant require it to release 20 cfs into the project's bypassed reach during times of ice build-up to reduce flood hazards. Extreme cold temperatures during December 2008 caused ice to accumulate in Spearfish Creek which then overflowed its banks, flooding Mr. Boyer's property. Our analysis in section 3 indicates that Mr. Boyer's property has been flooded on only this one occasion in the last 30 years.

In section 4, we estimate that the annualized cost to release 20 cfs into the bypassed reach during times of ice build-up would be $310. As discussed in section 3, the variable nature of extreme cold events makes quantitative study and/or modeling of the effects of flow on icing extremely difficult. Releasing water into the bypassed reach during extreme cold events could result in the freezing of water in cracks, fissures, and sinkholes within the Madison formation (below the streambed), which could reduce infiltration rates and allow most of this streamflow to pass downstream anyway, eliminating any flood control benefit. Further, the freezing of water in the cracks, fissures, and sinkholes could also result in ice jams within the bypassed reach upstream of Mr. Boyer's property, which could shift any flooding problem upstream to other properties adjacent to the bypassed reach. For these reasons, we conclude that the lack of any benefits of releasing a 20-cfs flow for the purpose of controlling downstream

flooding, do not justify the annualized cost of $310 and the potential flooding costs to other adjacent property owners as noted above.

Flow Losses in Project Works

In letters filed September 29, 2008, and July 13, 2009, Richard Fort of ACTion for the Environment expressed his concern about water losses in the project's aqueduct and woodstave pipeline due to leakage. ACTion for the Environment estimates an annual average loss of 9 cfs, based on a comparison of average historical daily flows upstream and downstream of the project, and a minimum loss of 19.5 cfs from June 22 to July 7, 2009, based on provisional flow data from that period. ACTion for the Environment cites these losses as part of its recommendation that the project be shut-down. ACTion for the Environment also recommends that if the project continues to operate, the applicant should take action to reduce the amount of water that is lost in the project works due to leakage.

Our analysis in section 3 indicates that ACTion for the Environment's estimates include a number of assumptions that are likely inaccurate, including uncertainties in the amount of flow spilled over Maurice dam during the periods analyzed, and an inconsistent period of record for data comparison. Our analysis in section 3 indicates that leakage in the project flowline is around 2 cfs, which is consistent with a previous estimate made by the USGS. This amount of leakage is relatively small given the length and age of the aqueduct and pipeline, and we consider it unlikely that leakage could be reduced substantially below these levels. Although the precise cost of implementing measures to seal the flowline could not be determined without dewatering and inspecting the aqueduct, we estimate that the costs would be substantial given that the flowline is buried and not easily accessed. Because the leakage is small relative to the 120-cfs hydraulic capacity of the flowline, we conclude that the benefit of repairing the flowline would not justify the considerable effort and likely considerable cost required to make any repairs. As a result, we do not recommend that the applicant take action to reduce leakage in the project.

5.3 UNAVOIDABLE ADVERSE EFFECTS

Continued project operation would continue to reduce flows in the project's bypassed reach which adversely affects aquatic resources in this section of Spearfish Creek, although staff-recommended minimum flows would reduce these effects. Fish would continue to be entrained into the project's forebay with some possible mortality, although staff-recommended measures to electroshock, remove, and relocate fish would help minimize these effects.

5.4 SUMMARY OF SECTION 10(j) RECOMMENDATIONS AND 4(e) CONDITIONS

5.4.1 Fish and Wildlife Agency Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

No recommendations pursuant to section 10(j) were filed by the fish and wildlife resource agencies in response to the Commission's notice requesting terms, conditions, and recommendations.

5.4.2 Land Management Agency's Section 4(e) Conditions

In section 2.2.4, *Modifications to Applicant's Proposal—Mandatory Conditions*, we list the preliminary 4(e) conditions submitted by the Forest Service, and note that section 4(e) of the FPA provides that any license issued by the Commission "for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation." Thus, any 4(e) condition that meets the requirements of the law must be included in any license issued by the Commission, regardless of whether we include the condition in our staff alternative.

Of the Forest Service's 18 preliminary conditions, we consider 13 of the conditions (conditions 1 through 6 and 8 through 14) to be administrative or legal in nature and not specific measures requiring detailed analysis in this draft EA. We, therefore, do not analyze these conditions in this draft EA. Table 13 summarizes our conclusions with respect to the remaining five preliminary 4(e) conditions. Four of the five preliminary conditions are included in the staff alternative.

Table 13. Forest Service preliminary section 4(e) conditions for the Spearfish Hydroelectric Project (Source: staff).

Condition	Annualized Cost	Adopted?
7—Prepare and implement an erosion control plan	$230	Yes
15—Prepare and implement a noxious weed management plan	$1,230	Yes
16—Prepare and implement a plan to protect threatened, endangered, and sensitive species prior to any activity that could affect these species	$0	Yes
17—Minimum flow release at Maurice dam	$83,920	No
18—Install, maintain, and operate a minimum flow release structure and measurement device at Maurice dam with continuous recording capability	$10,010	Yes

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C.§803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed two comprehensive plans that are applicable to the Spearfish Project, located in South Dakota.[42] No inconsistencies were found.

[42] The two comprehensive plans were: (1) Forest Service. 2006. Black Hills National Forest Land and Resource Management Plan. Department of Agriculture, Custer, South Dakota. March 2006 and (2) South Dakota Department of Game, Fish and Parks. 2002. South Dakota Statewide Comprehensive Outdoor Recreation Plan (SCORP). Pierre, South Dakota. 2002.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

6.0 FINDING OF NO SIGNIFICANT IMPACT

Continuing to operate the Spearfish Project with our recommended measures would not require any significant changes to project structures or operation. Our recommended measures would maintain the project's existing run-of-river operation and would enhance aquatic resources in the project's bypassed reach with some reduction in water available to downstream users, including irrigators that obtain water from diversions downstream of the project. Other enhancement measures would remove fish entrained into the project's forebay; control soil erosion and noxious weeds; protect threatened, endangered, and sensitive species; and enhance habitat for the American dipper.

On the basis of our independent analysis, we find that the issuance of a license for the Spearfish Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LITERATURE CITED

Carter, J.M., D.G. Driscoll, G.R. Hamade, and G.J. Jarrell. 2001. Hydrologic budgets for the Madison and Minnelusa aquifers, Black Hills of South Dakota and Wyoming, water years 1987–96. U.S. Geological Survey Water-Resources Investigations Report 01–4119. 53 pp.

City of Spearfish. 2009. Welcome to the city of Spearfish. Available at http://www.cityofspearfish.com. Accessed August 19, 2009. City of Spearfish, Spearfish, SD.

City of Spearfish. 2008. City of Spearfish Hydroelectric Project, FERC Project No. 12775, application for an original license, major waterpower project under 5 MW—existing dam. Volumes I though III. City of Spearfish, South Dakota, September 2008.

Department of Agriculture, 2002. Census of Agriculture County Profile for Lawrence, South Dakota. http://www.agcensus.usda.gov. Accessed January 26, 2010.

DTA (Devine, Tarbell and Associates). 2008a. Analysis of Spearfish Creek instream flows using the Delphi team study approach, Spearfish Hydroelectric Project. Prepared for the city of Spearfish, Spearfish, SD. 213 pp.

DTA. 2008b. Wetland and floodplain reconnaissance survey report, Spearfish Hydroelectric Project. Prepared for the city of Spearfish, Spearfish, SD. 13 pp.

Ferrari, R.L. 2006. Belle Fourche reservoir 2006 sedimentation survey. U.S. Department of the Interior, U.S. Bureau of Reclamation, Technical Service Center, Denver, CO.

Forest Service (U.S. Department of Agriculture, Forest Service). 2008. Invasive species action plan—Black Hills National Forest. Available at: http://www.fs.fed.us/bhnf/projects/weeds/invasive_species_action_plan.pdf Accessed August 13, 2009. May 2008.

Forest Service. 2006. Black Hills National Forest land and resource management plan. U.S. Department of Agriculture, Forest Service, Custer, SD. March 2006.

Forest Service. 2002a. Conservation assessment for the American dipper in the Black Hills National Forest, South Dakota and Wyoming. U.S. Department of Agriculture, Forest Service. December 2002.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Forest Service. 2002b. Spearfish Canyon landscape assessment. U.S. Department of Agriculture, Forest Service, Northern Hills Ranger District, Black Hills National Forest, SD. September 2002.

Forest Service. 1999. The Spearfish Canyon corridor management plan. U.S. Department of Agriculture, Forest Service, Black Hills Ranger District, Spearfish, SD. August 24, 1999.

Hawthorne, V.M. 1979. Use of nest boxes by dippers on Sagehen creek, California. Western Birds 10:215-216.

Hirayama, K., K. Terada, M. Sato, K. Hirayama, M. Sasamoto, and M. Yamazaki. 2007. Field measurements of anchor and frazil ice. Published by the 9th Workshop on River Ice, September 24–26, Fredericton, New Brunswick.

Hortness, J.E. and D.G. Driscoll. 1998. Streamflow losses in the Black Hills of western South Dakota. U.S. Geological Survey Scientific Investigations Report 98-4116. 99 pages.

Lawrence County. 2009. Lawrence County Equalization Office GIS mapping web page. Available at: www2.lawrence.sd.us:45500/webGIS/GIShome.html. Accessed February 6, 2009. Lawrence County, SD.

Lawrence County Commission. 2005. Lawrence County comprehensive plan. Revision 2005. Lawrence County, SD.

Loegering, J.P. and R.G. Anthony. 2006. Nest-site selection and productivity of American dippers in the Oregon coast range. The Wilson Journal of Ornithology 118:281–294.

Lovett, K. 2008. American dipper (*Cinclus mexicanus*) 2008 nest monitoring Spearfish Creek watershed and Whitewood Creek in the Black Hills of South Dakota. Prepared for the South Dakota Department of Game, Fish and Parks, Pierre, SD.

Malenchak, J., M. Morris, H. T. Shen, and J. Doering. 2006. Modeling anchor ice growth at Sundance Rapids. Proceedings of the 18th IAHR International Symposium.

Putnam, L.D. and A.J. Long. 2007. Characterization of ground-water flow and water quality for the Madison and Minnelusa aquifers in northern Lawrence County, South Dakota. U.S. Geological Survey Scientific Investigation Report 2007-5001. 61 pages.

South Dakota Bureau of Finance and Management, 2010. South Dakota Economy (updated 05/12/2009). http://www.state.sd.us/bfm/economy.htm. Accessed January 26, 2010.

South Dakota DENR (South Dakota Department of Environment and Natural Resources). 2006. The 2006 South Dakota integrated report surface water quality assessment. South Dakota Department of Environment and Natural Resources, Pierre, SD.

South Dakota DGF&P (South Dakota Department of Game, Fish and Parks). 2008. Spearfish Creek Watershed electrofishing data. Included as attachment in South Dakota DENR Spearfish Creek Use Attainability Analysis. http://denr.sd.gov/documents/SpearfishCreek.pdf Accessed October 5, 2009.

South Dakota DGF&P (South Dakota Department of Game, Fish and Parks). 2007. Spearfish Creek Watershed electrofishing surveys—Internal SDGFP draft data summary document. Available at: http://www.sdgfp.info/wildlife/fishing/WesternLakes/SpearfishCreek07.pdf. South Dakota Department of Game, Fish and Parks, Rapid City, SD. October 2007.

South Dakota DGF&P. 2006. Electrofishing survey history of Spearfish Creek downstream of Savoy to the Redwater confluence, 1981–2005. Internal SDGFP draft data summary document. South Dakota Department of Game, Fish and Parks, Rapid City, SD. March 2006.

South Dakota DGF&P. 2002. South Dakota statewide comprehensive outdoor recreation plan (SCORP). Pierre, SD.

South Dakota Department of Water and Natural Resources. 1990. Letter issued to Leo Cassidy et al., regarding diversions from Spearfish Creek. Filed with the Commission as supporting documentation with South Dakota Water Right 1387-1.

Spearfish Canyon Foundation. 2009. Spearfish Canyon Foundation website, http://www.spearfishcanyon.com/index1.htm. Accessed July 22, 2009.

Steen, J. Spearfish flood victims question lack of help. Rapid City Journal, Rapid City, SD. January 9, 2009.

U.S. Bureau of Reclamation. 2010a. Belle Fourche Project. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=Belle+Fourche+Project. Accessed April 25, 2010.

U.S. Bureau of Reclamation. 2010b. Hydromet: RES070 Monthly Values for Period of Record. Available at: http://www.usbr.gov/pn/hydromet. Accessed January 21, 2010.

U.S. Bureau of Reclamation. 2009. Hydromet: RES070 Monthly Values for Period of Record. Available at: http://www.usbr.gov/pn/hydromet. Accessed October 9, 2009.

U.S. Census Bureau. 2009a. Lawrence County QuickFacts web page. Available at: http://quickfacts.census.gov/qfd/states/46/46081.html. Accessed September 1, 2009.

U.S. Census Bureau . 2009b. South Dakota QuickFacts web page. Available at: http://quickfacts.census.gov/qfd/states/46000.html. Accessed September 1, 2009.

U.S. Census Bureau . 2009c. Spearfish city, South Dakota: Fact sheet – American factfinder. Available at: http://factfinder.census.gov/servlet/SAFFFacts?_event=ChangeGeoContext&geo_id=16000US4660020&_geoContext=01000US%7C04000US46%7C05000US46081&_street=&_county=spearfish&_cityTown=spearfish&_state=04000US46&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=010&_submenuId=factsheet_1&ds_name=DEC_2000_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=. Accessed September 1, 2009.

U.S. Census Bureau . 2009d. Lawrence County, South Dakota: Fact sheet – American factfinder. Available at: http://factfinder.census.gov/servlet/ACSSAFFFacts?_event=&geo_id=05000US46081&_geoContext=01000US%7C04000US46%7C05000US46081&_street=&_county=lawrence&_cityTown=lawrence&_state=04000US46&_zip=&_lang=en&_sse=on&ActiveGeoDiv=&_useEV=&pctxt=fph&pgsl=050&_submenuId=factsheet_1&ds_name=DEC_2000_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=. Accessed September 1, 2009.

U.S. Census Bureau . 2009e. South Dakota: Fact sheet – American factfinder. Available at: http://factfinder.census.gov/servlet/SAFFFacts?_event=&geo_id=04000US46&_geoContext=01000US%7C04000US46&_street=&_county=&_cityTown=&_state=04000US46&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=040&_submenuId=factsheet_1&ds_name=ACS_2007_3YR_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=. Accessed September 1, 2009.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

U.S. Census Bureau . 2009f. Lawrence County, South Dakota – DP-3. Profile of selected economic characteristics web page. Available at: http://factfinder.census.gov/servlet/QTTable?_bm=y&-qr_name=DEC_2000_SF3_U_DP3&-ds_name=DEC_2000_SF3_U&-_lang=en&-_sse=on&-geo_id=05000US46081. Accessed September 1, 2009.

USGS (U.S. Geological Survey). 2009. USGS National Water Information System, water data for the nation web page. Available at: http://waterdata.usgs.gov/nwis. Accessed September 8, 2009.

USGS (U.S. Geological Survey). 2009. USGS National Water Information System, water data for the nation web page. Available at: http://waterdata.usgs.gov/nwis. Accessed April 22, 2010.

Wolff, D. 2009. Gold mining in the Black Hills, Visitor Magazine. Available at: http://www.blackhillsvisitor.com.main. August 19, 2009.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

8.0 LIST OF PREPARERS

Federal Energy Regulatory Commission

Steven Hocking—Task Monitor, Terrestrial Resources (B.S., Natural Resource Management)

Joseph Adamson—Recreation, Land Use, and Aesthetics (Outdoor Recreation Planner; B.S., Forestry and Wildlife; M.A., Science Education)

Ryan Hansen—Aquatic Resources (Fisheries Biologist; M.S., Environmental Science and Public Policy)

Jennifer Harper—Need for Power, Developmental Resources, and Water Quantity (Engineer; Ph.D., Environmental Health Engineering; MSCE, Civil Engineering)

Frank Winchell—Cultural Resources (Archeologist; B.A., M.A., Ph.D., Anthropology)

Louis Berger Group

Fred Winchell—Deputy Project Manager (Fisheries Biologist; M.S., Fisheries Biology)

Marty Bowers—Cultural Resources (Principal Architectural Historian; M.A., American History)

Ellen Hall—Socioeconomic Resources (Environmental Planner/Resource Economist; Ph.D., Resource Economics; M.Ag., Agricultural Economics; B.A., History/Economics)

James Hamski—Developmental Analysis (Hydrologist; B.S., Environmental Science)

Kenneth Hodge—Need for Power and Developmental Analysis (Senior Engineer; B.S., Civil Engineering)

Coreen Johnson—Editorial Review (Technical Editor; B.A., English/Education)

Karen Klosowski—Recreation and Land Use/Aesthetics (Senior Recreation and Land Use Specialist; M.L.A., Landscape Architecture; M.U.R.P., Regional Planning; B.S., Parks and Recreation)

Kiersten Lippman—Terrestrial Resources (Wildlife Biologist; M.S., Zoology; B.S., Biology)

Tyler Rychener—Terrestrial Resources, Threatened and Endangered Species (Environmental Scientist/GIS; M.S., Plant Biology; B.S., Biology)

Patricia Weslowski—Senior Review (Preservation Planner; Masters of Public Administration)

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Subcontractor Staff

Stillwater Sciences

Dirk Pedersen—Aquatic Resources (Aquatic Ecologist, B.S., Fisheries Science)

Jay Stallman—Water Resources (Geologist/Geomorphologist, M.S., Geology)

20100513-3057 FERC PDF (Unofficial) 05/13/2010

APPENDIX A

U.S. Forest Service Preliminary Terms and Conditions for the Spearfish Hydroelectric Project

Condition No. 1—Requirement to Obtain a U.S. Forest Service Special Use Authorization

The Licensee shall obtain a special use authorization from the U.S. Forest Service for the occupancy and use of National Forest System (NFS) lands. The Licensee shall obtain the executed authorization before beginning ground-disturbing activities on NFS lands or within six months of License issuance if no construction or reconstruction was proposed in the application for License.

The Licensee may commence ground-disturbing activities authorized by the License and special use authorization no sooner than 60 days following the date the Licensee files the Forest Service special use authorization with the Commission, unless the Commission prescribes a different commencement schedule.

Condition No. 2—U.S. Forest Service Approval of Final Design

Before any construction of the Project occurs on NFS lands, the Licensee shall obtain the prior written approval of the U.S. Forest Service for all final design plans for Project components that the U.S. Forest Service deems as affecting or potentially affecting NFS resources. The Licensee shall follow the schedules and procedures for design review and approval specified in the U.S. Forest Service construction temporary special use authorization. As part of such prior written approval, the U.S. Forest Service may require adjustments in final plans and facility locations to preclude or mitigate impacts and to assure that the Project is compatible with on-the-ground conditions. Should such necessary adjustments be deemed by the U.S. Forest Service, the Commission, or the Licensee to be a substantial change, the Licensee shall follow procedures of Article 2 of the License. Any changes to the License made for any reason, pursuant to Article 2 or Article 3, shall be made subject to any new terms and conditions of the Secretary of Agriculture made pursuant to section 4(e) of the Federal Power Act.

Condition No. 3—Approval of Changes after Initial Construction

Notwithstanding any License authorization to make changes to the Project, the Licensee shall get written approval from the U.S. Forest Service prior to making any changes in the location of any constructed Project features or facilities, or in the uses of Project lands and waters, or any departure from the requirements of any approved exhibits filed with the Commission. Following receipt of such approval from the U.S. Forest Service, and at least 60 days prior to initiating any such changes or departure, the Licensee shall

file a report with the Commission describing the changes, the reasons for the changes, and showing the approval of the U.S. Forest Service for such changes. The Licensee shall file an exact copy of this report with the U.S. Forest Service at the same time it is filed with the Commission. This article does not relieve the Licensee from the amendment or other requirements of Article 2 or Article 3 of this License.

Condition No. 4—Consultation

Each year during the 60 days preceding the anniversary date of the License, the Licensee shall consult with the U.S. Forest Service with regard to measures needed to ensure protection and development of the natural resource values of the Project area. Within 60 days following such consultation, the Licensee shall file with the Commission evidence of the consultation with any recommendations made by the U.S. Forest Service. The Commission reserves the right, after notice and opportunity for hearing, to require changes in the Project and its operation that may be necessary to accomplish natural resource protection.

Condition No. 5—Surrender of License or Transfer of Ownership

Prior to any surrender of this License, the Licensee shall restore NFS lands to a condition satisfactory to the U.S. Forest Service. At least one year in advance of the proposed application for License surrender, the Licensee shall file with the Commission a restoration plan approved by the U.S. Forest Service. The restoration plan shall identify improvements to be removed, restoration measures, and time frames for implementation and estimated restoration costs. In addition, the Licensee shall pay for an independent audit to assist the U.S. Forest Service in determining whether the Licensee has the financial ability to fund the surrender and restoration work specified in the plan. As a condition of any transfer of the License or sale of the Project, the Licensee shall require the proposed transferee to demonstrate, in a manner satisfactory to the U.S. Forest Service, that it has the financial ability to provide for the costs of surrender and restoration of the Project.

Condition No. 6—Modification of U.S. Forest Service Conditions

The U.S. Forest Service reserves the right to modify these conditions, if necessary, to incorporate changes necessitated by new laws and regulations directing changes in management of the area, additional information provided by studies which have not been completed to date, by findings in the Project of new noxious terrestrial or aquatic biota, and to address new listings of Threatened, Endangered, and other Special Status Species in the Project.

Condition No. 7—Erosion Control Measures Plan

At least 60 days prior to any ground disturbing activity, the Licensee shall file with the Commission an Erosion Control Measures Plan that is approved by the U.S. Forest Service. The plan shall be based on actual site conditions (geological, soil, and groundwater) and shall include:

- Descriptions of the actual site conditions
- Detailed descriptions, design drawings and specific topographic locations of all control measures
- Measures to divert runoff away from disturbed land surfaces
- Measures to collect and filter runoff over disturbed land surfaces
- Measures to revegetate disturbed areas outside of the roadbed
- Seed mixtures and application rates of seed mixes and fertilizers
- A monitoring and maintenance schedule.

The U.S. Forest Service may require changes to the plan to ensure adequate protection of the environmental, scenic, and cultural values of the Project area. This plan must identify requirements for construction, operation, and maintenance measures to meet U.S. Forest Service erosion control objectives and standards. Upon approval, the Licensee shall implement the Plan.

In the event of the need for emergency repairs and use of areas other than Licensed access roads arises, the Licensee shall notify the U.S. Forest Service of its actions as soon as possible, but not more than 48 hours, after such actions have been taken. Licensee shall follow the protocol established for any ground disturbing activities as per an approved grading and restoration plan. Whether or not the U.S. Forest Service is notified or provides consultation, the Licensee shall remain solely responsible for all abatement measures performed.

Condition No. 8—Maintenance of Improvements

The Licensee shall maintain all its improvements and premises on NFS lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the U.S. Forest Service. The Licensee shall comply with all applicable Federal, State, and local laws and regulations, including but not limited to, the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., the Resources Conservation and Recovery Act, 42 U.S.C. 6901 et seq., the Comprehensive Environmental Response, Control, and Liability Act, 42 U.S.C. 9601 et seq., and other relevant environmental laws, as well as public health and safety laws and other laws relating to the siting, construction, operation, and maintenance of any facility, improvement, or equipment.

Condition No. 9—Signs

The Licensee shall consult with the U.S. Forest Service prior to erecting signs related to safety issues on NFS lands covered by the License. Prior to the Licensee erecting any other signs or advertising devices on NFS lands covered by the License, the Licensee must obtain the approval of the U.S. Forest Service as to location, design, size, color, and message. The Licensee shall be responsible for maintaining all Licensee-erected signs to neat and presentable standards.

Condition No. 10—Safety during Project Construction Plan

At least 60 days prior to any ground disturbing activity related to new project construction on or affecting NFS lands, the Licensee shall file with the Commission a Safety During Construction Plan approved by the U.S. Forest Service that identifies potential hazard areas and measures necessary to protect public safety. Areas to consider include construction activities near public roads, trails, and recreation areas and facilities. The Licensee shall perform daily (or on a schedule otherwise agreed to by the U.S. Forest Service in writing) inspections of Licensee's construction operations on NFS lands while construction is in progress.

The Licensee shall document these inspections (informal writing sufficient) and shall deliver such documentation to the U.S. Forest Service on a schedule agreed to by the U.S. Forest Service. The inspections must specifically include fire plan compliance, public safety, and environmental protection. The Licensee shall act immediately to correct any items found to need correction.

Condition No. 11—Indemnification, Risks and Hazards, and Damage to Lands, Property, and Interests of the United States

The Licensee shall indemnify, defend, and hold the United States harmless for any costs, damages, claims, liabilities, and judgments arising from past, present, and future acts or omissions of the Licensee in connection with the use and/or occupancy authorized by this License. This indemnification and hold harmless provision applies solely to any negligent acts and omissions of the Licensee or the Licensee’s heirs, assigns, agents, employees, affiliates, subsidiaries, fiduciaries, contractors, or lessees in connection with the use and/or occupancy authorized by this License which result in: (1) violations of any laws and regulations which are now or which may in the future become applicable, and including, but not limited to environmental laws, such as the Comprehensive Environmental Response Compensation and Liability Act, Resource Conservation and Recovery Act, Oil Pollution Act, Clean Water Act, Clean Air Act; (2) judgments, claims, demands, penalties, or fees assessed against the United States; (3) costs, expenses, and damages incurred by the United States; or (4) the release or threatened release of any solid waste, hazardous substances, pollutant, contaminant, or

oil in any form in the environment. The provisions of this condition do not apply to any damages, judgments, claims, or demands arising out of the negligence, recklessness, or willful misconduct of the United States or other third parties or to damages, judgments, claims, or demands arising out of any activity initially occurring outside the Project boundary or outside NFS lands. The Licensee's liability hereunder shall be limited to reasonable damages, costs, claims, and judgments.

The Licensee is responsible for periodically inspecting (in accordance with good utility practice) its Project site, right-of-way, and immediate adjoining area for dangerous trees, hanging limbs, and other evidence of hazardous conditions. Licensee shall abate those conditions, except those caused by third parties not related to the occupancy and use authorized by the License, after securing permission from the U.S. Forest Service, except in an emergency where there is an imminent risk of death or injury to the public or facilities, in which case the Licensee shall notify the U.S. Forest Service of the action as soon as possible.

The extent of the Licensee's liability for fire and other damages to NFS lands shall be determined in accordance with standard L-Form Articles 22 and 24 of this License and the liability standard shall be determined in Federal Court by using applicable South Dakota State Law.

Condition No. 12—Road Use by Government

The United States shall have unrestricted use of any road constructed within the Project area for all purposes deemed necessary and desirable in connection with the protection, administration, management, and utilization of NFS lands or resources and shall have the right to extend rights and privileges of use of such road to states and local subdivisions thereof, as well as to other users, including members of the public, except contractors, agents, and employees of the Licensee; provided that the agency having jurisdiction shall control such use as to not unreasonably interfere with the safety or security uses, or cause the Licensee to bear a share of the costs of maintenance greater than the Licensee's use of the road.

Condition No. 13—Road Use

The Licensee shall confine all Project vehicles, including but not limited to, administrative and transportation vehicles, and construction and inspection equipment, to roads or specifically designed access routes. The U.S. Forest Service reserves the right to close any and all such routes where damage is occurring to the soil or vegetation, or, if requested by Licensee, to require reconstruction/construction by the Licensee to the extent needed to accommodate the Licensee's use.

Condition No. 14—Access

The U.S. Forest Service reserves the right to use or permit others to use any part of the licensed area on NFS lands for any purpose, provided such use does not interfere with the rights and privileges authorized by this License or the Federal Power Act.

Condition No. 15—Invasive Plant, Noxious Weed and Aquatic Nuisance Species Management Plan

Within six months from the date of the issuance of a new License for the Project, the Licensee shall file with the Commission an Invasive Plant, Noxious Weed and Aquatic Nuisance Species Management Plan that is approved by the U.S. Forest Service. This Plan is intended to reduce the infestation and spread of invasive plants, noxious weeds and aquatic nuisance species. At a minimum the Plan shall include the following requirements to be implemented by the Licensee:

- Identify methods for prevention and control of noxious weeds within the Project area. Treatment of existing infestations of highest priority weeds shall be initiated immediately upon approval of the plan by the Commission.
- Clean all construction equipment thoroughly before entering areas addressed by the Plan to reasonably ensure that seeds of invasive plants and noxious weeds are not introduced.
- Restrict travel to established roads and trails when possible, and avoid entering areas with existing populations of invasive plants or noxious weeds. If entering such areas is required, conduct work in uninfested areas first when possible.
- Minimize ground disturbance during Project operations and maintenance (O&M). When ground disturbance is required, dispose of any resulting spoils on-site, grading to match local contours and reseeding with a mix of native species approved by the U.S. Forest Service. If fill is required for O&M activities, use fill collected onsite whenever possible, and reseed the disturbed area as described above. All seeding should be conducted immediately following disturbance. Seeding needs to be done in conjunction with proper seedbed preparation such as harrowing or tilling the soil surface.
- Use certified weed-free straw or rice straw for all construction, erosion control, or restoration needs.
- Develop a monitoring program to evaluate the effectiveness of re-vegetation, vegetation control, and invasive plant and noxious weed control measures. Provide specific methods for monitoring and evaluation. At a minimum, surveys shall be conducted every three years.
- Develop procedures for identification of additional measures that the Licensee shall implement if monitoring reveals that re-vegetation and vegetation control is not successful or does not meet intended objectives.

- Equipment used for all activities conducted within the stream channel or reservoir, such as but not limited to stream flow measurement or the collection and transport of fish, shall be disinfected, cleaned or adequately dried to eliminate the potential introduction or spread of aquatic nuisance species, if this equipment has been used outside of the Spearfish Creek drainage.

Condition No. 16—Protection of Threatened, Endangered, Proposed for Listing, Sensitive Species and Species of Local Concern Plan

At least 60 days prior to any activity that may affect a federally listed or proposed species and their critical habitat, or U.S. Forest Service sensitive species or Species of Local Concern and their habitat on NFS lands, the Licensee shall file with the Commission a Threatened, Endangered, Proposed for Listing, Sensitive Species, and Species of Local Concern Plan that is approved by the U.S. Forest Service in consultation with appropriate Federal and State agencies. This Plan shall describe how the Licensee shall coordinate, consult, and prepare a biological assessment and evaluation evaluating the potential impact that any action may have on listed, proposed, sensitive species, or Species of Local Concern and their habitat. The Licensee shall implement all mitigation measures and Reasonable and Prudent Alternatives required in any Biological Opinion rendered by the U.S. Fish and Wildlife Service or other regulatory agency.

At a minimum the Plan shall:

- Develop procedures to avoid/minimize adverse effects to listed species and other Special Status Species
- Ensure that Project-related activities shall meet restrictions included in site management plans for listed species and other Special Status Species
- Develop implementation and effectiveness monitoring of measures taken or employed to reduce effects to listed species and other Special Status Species
- Update the Plan as new information is obtained in consultation with the agencies and submitting the updated Plan to the Commission for approval
- Identify required elements contained within a biological assessment and evaluation

Condition No. 17—Flow Release at Maurice Dam

The Licensee shall release a year-round continuous minimum flow of 6 cfs at Maurice dam into the bypassed reach of Spearfish Creek. Flow releases from Maurice dam may be reduced to 4 cfs in dry years, defined by a seven (7) day average stream flow of less than 40 cfs from Monday through Sunday measured at USGS stream gage 06431500 beginning on or after May 1 of the current calendar year; the bypass flow is adjusted

the following Monday. The bypass release at Maurice dam shall be restored to 6 cfs on October 1 of that calendar year.

The minimum-flow release at Maurice dam into the bypassed reach of Spearfish Creek may be temporarily modified, for a period not to exceed 24 hours, if required by equipment malfunction or operating emergencies reasonably beyond the control of the Licensee. If the streamflow is so modified, the Licensee shall provide notice to the Commission and the U.S. Forest Service describing the reasons and duration for the modification as soon as possible, but no later than 10 calendar days after such incident.

Condition No. 18—Guaranteed Priority Flow Bypass Device and Flow Gaging

In order to ensure that the instream flows required in Condition 17 are released, the Licensee shall construct, operate, and maintain a guaranteed priority bypass structure, approved by the U.S. Forest Service, to release flows at Maurice dam into the bypassed reach of Spearfish Creek. At least 60 days prior to beginning construction of the flow release structure, the Licensee shall file for Commission approval, functional design drawings and an implementation schedule for the guaranteed priority bypass flow release structure.

The Licensee, after consulting with the South Dakota Department of Environment and Natural Resources, the U.S. Forest Service, the South Dakota Department of Game, Fish and Parks and the U.S. Geological Survey, shall develop plans to install, maintain and operate a stream flow measurement device with continuous recording capability at Maurice dam to demonstrate compliance with the requirements of the Maurice dam flow release condition. The Licensee shall file with the Commission, at least 60 days prior to the installation of the water measurement device, plans approved by the U.S. Forest Service for the stream flow measurement device.

20100513-3057 FERC PDF (Unofficial) 05/13/2010

Document Content(s)

P-12775-001SPEARFISHNOADEA.DOC.....1-139