135 FERC ¶ 62,210
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PPL Montana, LLC P-1869-052

ORDER APPROVING FISH PASSAGE EVALUATION PLAN

(Issued June 9, 2011)

1. On October 18, 2010, PPL Montana, LLC, licensee for the Thompson Falls Project, filed its Fish Passage Evaluation Plan (plan), pursuant to the Federal Energy Regulatory Commission's (Commission) Order Approving Construction and Operation of Fish Passage Facilities (passage order)[1] and term and condition 1g of the U.S. Fish and Wildlife Service's (FWS) Biological Opinion.[2] The Thompson Falls Project is located on the Clark Fork River in Sanders County, Montana.

BACKGROUND

2. The Commission's passage order requires the licensee to follow the FWS' terms and conditions numbers 1 through 7 in order to be exempt from the take prohibitions of Section 9 of the Endangered Species Act (ESA). In part, term and condition 1g of the FWS' Biological Opinion requires that the licensee prepare, in consultation with the Technical Advisory Committee (TAC),[3] an action plan for Phase 2 of the evaluation period (2010 through 2020)[4] to evaluate efficiency of the upstream passage facility. The goal of the plan will be to assess how effective the ladder is at passing bull trout, the potential length of any delay, the amount of fallback, and the optimal operational

[1] 126 FERC ¶ 62,105 (February 12, 2009).

[2] Filed with the Commission on November 4, 2008.

[3] The TAC consists of members from PPL Montana, U.S. Forest Service, Montana Fish Wildlife and Parks, Montana Department of Environmental Quality, and Confederated Salish and Kootenai Tribes.

[4] Implementation of fish passage at Thompson Falls will occur in three systematic phased steps, in which Phase 2 consists of fishway post-construction monitoring and evaluation, including an assessment and enhancement of up- and downstream fish passage and an examination of other bull trout limiting factors in the Project action area.

procedures to achieve the highest efficiency. The plan should also include establishment of a routine feedback loop, which will be used to fine tune operations and combined with a variety of experimental and evaluative studies (at the discretion of the TAC, a surrogate species such as rainbow trout may be used to facilitate certain evaluations). At a minimum, for the remaining term of the license (through 2025), the licensee will support a sampling method to annually estimate the total numbers of all species passing through the ladder, and adequately characterize the timing of such movements.

LICENSEE'S PLAN

Data Collection

3. The licensee states that the upper ladder of the Thompson Falls fishway is equipped with a trap-sample loop. This allows the fish ladder to be configured to allow fish to pass freely upstream or redirects fish into an off-ladder holding pool where they can be locked into a sampling area for biological data collection and tagging. The licensee proposes to route all fish into the sampling loop for the first year of operation, and possibly longer; the ladder could be opened to allow free passage if agreed to by the TAC and Montana Fish Wildlife and Parks (MFWP). The licensee states that after biological data are collected, fish will either be routed to pool 48 of the ladder (where they may then volitionally pass into the Thompson Falls Reservoir), returned to the tailrace, or transported upstream of Thompson Falls Dam.

4. The licensee proposes to collect data regarding overall upstream fish passage, including counts of fish, species identification, fish lengths and weights, and the timing of movement and passage by species. However, the licensee states that there may be situations where collecting biological data for each individual fish may not be feasible; the timing and circumstances of these extreme conditions will be documented, and, when possible, the licensee proposes to instead collect data on batches of fish. The licensee states that it will put a priority on collecting data on individual bull trout and on salmonids in general.

5. The licensee proposes to maintain biological data, fish tagging and marking information, and daily ladder operations records in a database. The licensee believes that it will have its own staff available to monitor fish ladder operations and oversee data collection in cooperation with MFWP. The licensee states that it may propose operational changes based on the results of the data collected, and may modify data collection procedures and biological parameters collected based on annual experience and results in order to improve the evaluation effort.

6. Pursuant to FWS' Biological Opinion term and condition 1e, the licensee states that it will obtain fin clips for genetic testing from bull trout that ascend the fish ladder.

Additionally, term and condition 1e requires development of a tagging system for all bull trout and other fisheries investigation activities. Subsequently, the licensee has developed a protocol for marking and/or tagging salmonid and non-salmonid species that are captured after ascending the fish ladder or captured up- or downstream of the Thompson Falls Dam, so that the licensee will be able to monitor the effectiveness of the ladder (in particular, bull trout passage effectiveness) and its upstream passage efficiency, estimate the potential length of delay, determine the incidence of fallback, and monitor fish movements. The licensee proposes using passive integrated transponder (PIT) tags, radio tags, and/or visible implant elastomer (VIE) tags.

7. The licensee has proposed to tag all captured bull trout with a PIT tag, which will enable the licensee to monitor movement and growth of the bull trout. The licensee states that PIT tag data will be collected through an automated system at the ladder, with antennas placed in multiple pools at both the ladder entrance and upstream exit. The licensee states that other salmonids, which may serve as surrogates to bull trout during Phase 2 evaluation period, could also receive PIT tags; the use of surrogate species will be determined though consultation with the TAC on an annual basis. Fish will be fully scanned to pre-existing PIT tags at all possible tagging locations. The licensee states that it may use radio telemetry to monitor fish movement patterns and behavior, following standardized protocols to surgically insert radio tags into the fish's peritoneal cavity. The licensee proposes tagging non-salmonids with a VIE tag inserted behind the left eye (or in another suitable location depending on the species); the VIE tag will be color-coded by year. Any modifications to the tagging and marking procedures will be done in consultation with the TAC.

Seasonal Operations

8. The licensee states that the fish ladder operation window will vary seasonally and will not be operated in the winter due to climate conditions and safety concerns. The licensee proposes to close the ladder for a period of time if monitoring is not feasible; depending on the duration of the shut down, the licensee states that it may either dewater the ladder, make in inaccessible for fish, or leave it open to allow fish passage. The licensee states that it will generally try to begin ladder operations in February, but that this depends on ice conditions and safety concerns. Once spring operations begin, the licensee proposes checking the ladder at least twice daily through 2011 (or at least until the operations and fish movements are well understood). The licensee states that the frequency of monitoring may be seasonally adjusted, and will continue operations until upstream fish passage is made ineffective or the ladder becomes inoperable (due to high flows associated with spring run-off, which typically occurs between mid-May to early July). The licensee proposes to commence ladder operations when spring flows decline. In the summer, the licensee states that more frequent monitoring may be necessary to reduce heat stress for fish held in the ladder (guidelines based on temperature and fish

movements will be developed in 2011). The licensee states that it will consider fish movement patterns and behavior, as well as safety considerations, for determining ladder operations and monitoring protocols in the fall.

Ladder Operational Procedure Studies

9. The licensee states that it will have the ability to operate prefabricated aluminum weirs between fish ladder pools 1 and 44 in either weir or orifice mode, and that it will assess which mode of operation is most effective for bull trout passage. In the 2011 season, the licensee states that it will perform testing to determine the procedure and effort necessary to alternate between modes and develop modifications to study plan if needed (alternating between modes may require dewatering the fishway). The licensee proposes to initially assess the effectiveness of the modes in 2011 (switching between modes on a weekly basis and collecting passage, biological, and operational data) and refine the most effective of the modes through 2012 to optimize passage. After completion of the study and refinement, the licensee states that it will consult with the TAC to determine whether further testing is needed. As soon as practicable, the licensee states that it will prepare and implement a permanent flow operation plan.

10. The licensee states that the attraction flow to attract fish in the spillway tailrace is composed of a lower discharge flow passing from pool to pool in the ladder combined with discharge from the auxiliary water system, and may also be influenced by the high-velocity attraction jet spill gates, and radial gates. The licensee proposes to evaluate passage efficiency through manipulation of the attraction flows and will monitor fish response using radio telemetry. The licensee proposes performing this work in two phases, where phase 1 (2011-2013) will be used to test and manipulate variable attraction flows and enhance operation, and phase 2 (2014-2017) will consist of a study to identify set periods of time to test variable attractant flows (further studies will be determined based on the results of the phase 2 data and consultation with the TAC). The methodology proposed entails testing various operating modes and attraction flow configurations over a period of multiple years, and may be impacted by variations in streamflow and runoff patterns. To minimize potential impacts of testing on bull trout due to ineffective configurations that block passage, the licensee proposes to temporarily or intermittently institute remedial implementation of known safe and effective passage procedures.

11. The licensee states that it will perform attraction flow tests using both operating modes (weir and orifice) and variable attractant flows, assessing the combinations of operating mode and flow on passage efficiency by using radio telemetry to monitor fish movement and behavior. To assess fish behavior and movement in response to attraction flows, in 2011 the licensee proposes to use bull trout captured at Cabinet Gorge or Noxon Rapids Dam and genetically assigned to Region 4 (which is upstream of Thompson Falls

Dam), and during 2012-2013 the licensee proposes to use selected salmonids captured downstream of the Thompson Falls Dam. The licensee reports that prior to 2014 it will determine study design modifications based on data collected from 2011-2013, and it will continue using radio telemetry to evaluate the effects of attractant flow through 2017; further studies will be based on results collected from 2014-2017.

Length of Delay Studies

12. The licensee proposes to use radio telemetry to gather information regarding bull trout and salmonid movement, timing, and behavior in order to understand and identify the factors that affect the timing of fish passage at Thompson Falls. The licensee proposes a three year study (2011 through 2013) and, at the end of this period, the licensee will determine the need for additional studies or modifications to the existing study in consultation with the TAC. The licensee proposes to PIT tag and possibly radio tag those bull trout captured downstream of Cabinet Gorge and Noxon Rapids dams and genetically assigned to Region 4. As conditions permit and in coordination with Avista, the licensee proposes to release bull trout in the Noxon Reservoir starting in 2011, and tracking bull trout movements between Noxon Reservoir and Thompson Falls Dam in coordination with Avista and MFWP. The licensee states that it may also study the movements of other salmonids tagged downstream of Thompson Falls Dam. Specific information the licensee proposes to collect from assessing the movement patterns and timing are the length of time for migration (from Noxon Reservoir to the Thompson Falls Dam tailrace, from the tailrace to the ladder, and from the entrance to the top of the ladder), upstream migration timing, and migration/movement behavior and patterns.

13. The licensee proposes to assess the behavior of bull trout and other salmonids in the fish ladder and states that it will take the appropriate steps to streamline it. The licensee states that it will seek to understand and document how operation configurations, lighting patterns, flow patters, or other factors contribute to safe, timely, and efficient passage through the ladder by observing fish behavior (via visual inspection, underwater cameras, and/or PIT tag monitoring). The licensee also proposes to modify or improve any ladder pools that appear to cause delays, remedy any patterns that lead to excessive jumping behavior, and monitor bull trout behavior in the trap box in order to minimize any harmful actions.

14. The licensee proposes to monitor fallback for fish ascending the ladder and entering the Thompson Falls reservoir for the duration of the Phase 2 evaluation period (2011 through 2020). The licensee proposes to use PIT and/or radio tags to monitor for fallback by bull trout and other salmonids; non-salmonids may be monitored for fall back based on VIE tags. The licensee states that it will use the data collected in the fallback study to evaluate the need to transport bull trout upstream of Thompson Falls Dam by vehicle (the determination for transport will be made in consultation with the TAC).

Reporting

15. The licensee states that the data collected and activities performed during the Phase 2 evaluation period (2011 through 2020) will be analyzed and summarized in annual reports (as specified in the FWS terms and condition 7a) and in the 5- and 10-year comprehensive reports (as specified in the FWS terms and conditions 7b and 1h, respectively). Filing deadlines for these reports are specified in the passage order as April 1 each year for the annual reports, December 31, 2015 for the 5-year report, and December 31, 2020 for the 10-year report.

AGENCY CONSULTATION

16. The licensee's fish passage evaluation plan was developed in consultation with MFWP, Montana Department of Environmental Quality, the Confederated Salish and Kootenai Tribes, and the FWS. The FWS approved the plan on October 12, 2010.

DISCUSSION

17. The licensee's plan describes the strategies the licensee will employ to evaluate the effectiveness of the Thompson Falls fish ladder. The plan describes the scientific studies that will be conducted over the next ten years (2011 through 2020) to assess the ability of bull trout and other fish to locate the ladder entrance and ascend the ladder; this data will be used to help the licensee fine-tune ladder operation to optimize fish passage. The licensee states that it will provide data from the studies, the estimated number of fish passing through the ladder, and a work plan for the coming year, which will be filed with the Commission in annual reports pursuant to the passage order.

18. The licensee's plan meets the requirements of the Commission's fish passage order and term and condition 1g of FWS' Biological Opinion, and should be approved.

The Director orders:

(A) The Fish Passage Evaluation Plan filed on October 18, 2010, by PPL Montana, licensee for the Thompson Falls Project, is approved.

(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2010). The filing of a request for rehearing does not

operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

PPL Montana, 45 Basin Creek Road, Butte, Montana 59701

PPL MONTANA, LLC

PPLM-Thompson Falls -2667

bcc: File
FERC Ease
e-mail: GDC/JHJ/JCC/CAH

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street
Washington, D.C. 20426

October 14, 2010

RE: Filing Thompson Falls (Project No. 1869) Fish Passage Evaluation Plan

Dear Secretary Bose:

On February 12, 2009 the Commission issued an Order Approving Construction and Operation of Fish Passage Facilities for the Thompson Falls Hydroelectric Project. Herein attached is the Thompson Falls Fish Passage Evaluation Plan (Phase 2 Action Plan, 2011-2020) required by this Order and United States Fish and Wildlife Service (USFWS) Biological Opinion Terms and Conditions #1g. PPL Montana developed this Plan in consultation with Montana Fish, Wildlife, and Parks; Montana Department of Environmental Quality; the Confederated Salish and Kootenai Tribes; and the USFWS. Signature of approval for this Plan from the USFWS is included on the following page.

Sincerely,

Jon Jourdonnais
Manager Hydro Licensing and Compliance

Enclosure

cc: Andy Welch, MDEQ
Wade Fredenberg, USFWS
Tim Bodurtha, USFWS
Mark Wilson, USFWS
Jon Hanson, MFWP
Ladd Knotek, MFWP
Craig Barfoot, CSKT
Brent Mabbott, PPLM
Frank Pickett, PPLM
Gordon Criswell, PPLM
Dave Kinnard, PPLM
Ginger Gillin, GEI
Kristi Webb, MMI

By signature below, the USFWS approves this Thompson Falls Passage Evaluation Plan (Phase 2 Action Plan, 2011-2020) filing with the Commission.

R. Mark Wilson

Name

Field Supervisor

USFWS Position

October 12, 2010

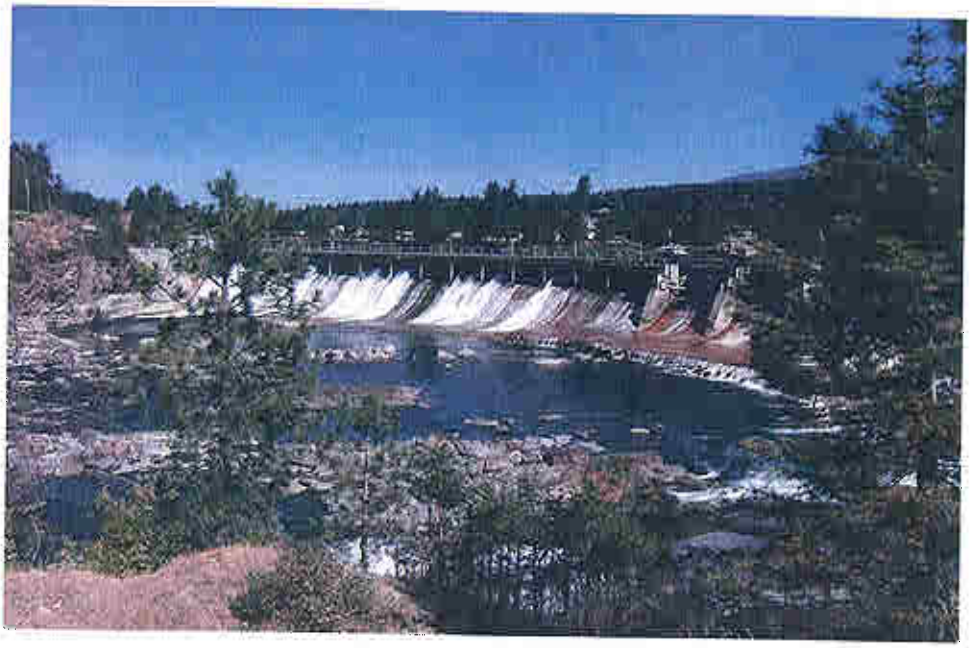
Date

PPL MONTANA

Thompson Falls Hydropower Project
FERC Project Number 1869

Fish Passage Evaluation Plan
Phase 2 Action Plan, 2011-2020
October 2010

Public



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1.0 Introduction

1.1 Project Background

PPL Montana is owner and operator of Thompson Falls Dam (No. 1869), located on the Clark Fork River near Thompson Falls, Montana. The current Federal Energy Regulatory Commission (FERC or Commission) License was issued in 1979 and will expire December 31, 2025.

In 1998, the bull trout (*Salvelinus confluentus*) was federally listed under the Endangered Species Act (ESA) as a threatened species (Federal Register, 1998) and critical habitat was designated in 2005, though the project area was largely excluded (Federal Register, 2005). In October 2010, that critical habitat designation was revised, primarily to include Federal lands and other waters that were previously excluded from the designation (Federal Register, 2010). The Clark Fork River at the project site as well as Thompson Falls Reservoir and portions of important spawning and rearing tributaries bordered by Federal (USFS) lands are now designated as critical habitat for bull trout. Because bull trout are present within the Project area, a draft Biological Evaluation was prepared for the Thompson Falls Project and submitted to the United States Fish and Wildlife Service (USFWS or Service) and the Commission in 2003.

After 5 years of study and consultation with resource management agencies and the Confederated Salish and Kootenai Tribes (CSKT), PPL Montana filed a new Biological Evaluation discussing the effects of the Thompson Falls Project on bull trout and proposed conservation measures with the Commission on April 7, 2008. PPL Montana's Biological Evaluation identified several factors directly related to Project operation that negatively impact bull trout in the Clark Fork River. Blockage of upstream migration and access to spawning habitat caused by the Thompson Falls Dam were identified as major concerns. Consequently, PPL Montana proposed to install a full-height fishway at the Thompson Falls Project and filed 90-percent drawings for the structure on April 7, 2008. The filing also contained a Memorandum of Understanding (MOU) signed by PPL Montana, the CSKT, Montana Fish, Wildlife and Parks (MFWP), and the USFWS (MOU, 2008).[1]

The Commission concluded that the Thompson Falls Project is adversely affecting bull trout and the proposed conservation measures will reduce, but not totally eliminate, the Project's adverse effects on bull trout. The 2008 Biological Evaluation was adopted as the Commission's final Biological Assessment and submitted to the USFWS on May 1, 2008.

On November 4, 2008 the USFWS filed with the Commission a Biological Opinion and associated incidental take statement, which includes reasonable and prudent measures and Terms and Conditions to minimize incidental take of bull trout. The USFWS concluded in its Biological Opinion that the Thompson Falls Project is currently adversely affecting bull trout and PPL

[1] The MOU provides Terms and Conditions regarding the collaboration between the Licensee and the USFWS, MFWP, and CSKT, and the implementation of minimization measures for bull trout.

Montana's proposed conservation measures will reduce, but not totally eliminate, adverse impacts of the Thompson Falls Project.

On February 12, 2009 the Commission issued an Order Approving Construction and Operation of Fish Passage Facilities for the Thompson Falls Hydroelectric Project. This order included the reasonable and prudent measures, Terms and Conditions, and conservation recommendations from the USFWS's Biological Opinion. Construction of the upstream fish passage facility at Thompson Falls Dam commenced in 2009 and was completed in fall 2010. The passage facility was tested in August and September 2010 and is scheduled to be operational in 2011.

1.2 Compliance with the FERC Order

The February 12, 2009 Commission Order requires PPL Montana to file a Passage Evaluation Plan (Phase 2 Action Plan, 2011-2020), referenced in Terms and Conditions #1g of the USFWS's Biological Opinion for upstream passage:

> g. In consultation with the TAC, PPL Montana will prepare by January 1, 2011, for Service approval, an action plan for Phase 2 of the evaluation period (2010 through 2020) to evaluate efficiency of the upstream passage facility. The goal will be to assess how effective the ladder is at passing bull trout, the potential length of any delay, the amount of fallback, and the optimal operational procedures to achieve the highest efficiency. During this Phase 2 evaluation period (2010 through 2020) a routine feedback loop will be established and used, as agreed to by the Service, to fine tune operations and will be combined with a variety of experimental and evaluative studies. It may be necessary to conduct research on surrogate species (e.g., rainbow trout) at the discretion of the TAC, in order to facilitate certain of these evaluations. At a minimum, for the remaining term of the license (through 2025), PPL Montana will support a sampling method to annually estimate the total numbers of all species passing through the ladder and adequately characterize the timing of such movements.

The FERC Order requires that the Passage Evaluation Plan be developed with the Thompson Falls Technical Advisory Committee (TAC) and approved by the USFWS. PPL Montana met with the Thompson Falls TAC subcommittee, including representatives from USFWS and MFWP, on September 9, 2010. The TAC subcommittee developed and agreed to the following elements of the Passage Evaluation Plan scheduled to be implemented from 2011 through 2020.

This document, the Passage Evaluation Plan (Phase 2 Action Plan, 2011-2020), outlines PPL Montana's strategy for evaluating the effectiveness of the Thompson Falls Fish Ladder. It describes a suite of scientific studies to be conducted to assess the ability of bull trout and other fish to locate the ladder entrance and ascend the ladder. These studies will also provide data to allow PPL Montana to fine-tune the operation of the ladder to optimize fish passage.

Since construction of the fish ladder was completed in 2010, the first full year of operation and biological evaluation will commence in 2011 and will continue through 2020. The Phase 2

evaluation period (2011-2020) is defined in the Biological Opinion as the *Fishway Post-Construction Monitoring and Evaluation* period.

In addition to the scientific studies that this document addresses, PPL Montana has developed a Fishway Operations Manual (SOP) for the fish passage facility. The SOP covers the structural, mechanical, and physical details of the fish passage facility and serves as a user's manual for operations and maintenance of the facility. The SOP will be submitted to FERC by December 31, 2010 as specified in the USFWS Biological Opinion Terms and Conditions #1c.

2.0 Objectives

The objectives of this Passage Evaluation Plan, as specified in the USFWS Biological Opinion Terms and Conditions #1g, include the following:.

- Assess the effectiveness the upstream fish ladder to pass bull trout.
- Determine the optimal operational procedures to achieve the highest efficiency for upstream bull trout passage.
- Assess the potential length of delay for upstream bull trout passage and devise strategies to minimize that delay.
- Assess the amount of fallback.

This Passage Evaluation Plan outlines a series of studies to be conducted over the next 10 years (2011-2020) to meet the objectives. As required by the USFWS Biological Opinion Terms and Conditions #7a, an Annual Report will be prepared which includes the estimated number of fish (by species and date) passing through the ladder and the results of the previous year's fish passage studies. The Annual Report will also contain a work plan for the coming year. This Annual Report will be prepared in consultation with the TAC and approved by the USFWS. Through this annual TAC collaboration and review process, the Thompson Falls Fish Ladder operation will be fine-tuned to improve upstream fish passage.

3.0 Fish Passage Studies

3.1 Assess the Effectiveness of the Ladder

As specified in the USFWS Biological Opinion, PPL Montana must provide annual estimates, by species, of fish passing through the upstream fish ladder at Thompson Falls Dam. PPL Montana must also characterize the timing of those movements, ongoing through the term of the facility's FERC license (2025).

The Thompson Falls Fish Ladder has a trap-sample loop in the upper ladder which allows fish to be routed into an off-ladder holding pool. Fish can then be locked into a sampling area for data collection. The ladder can be configured to either route fish into the sampling loop, or opened to allow free passage of fish. Biological data will be recorded and the appropriate tagging and marking of fish will be conducted at the sampling area. The biological data, including the tagging and marking information will be maintained in a database along with details of the fish ladder operations. These data will be analyzed and summarized for each Annual Report and included in the more comprehensive 5-year (2011-2015) report and 10-year (2011-2020) report for the Phase 2 evaluation period. Modifications to operations may occur based on the results of the data.

During the first year or longer of the ladder operation, all fish will be routed into the sampling loop. In later years, if agreed by the TAC and approved by MFWP, the ladder may be opened to allow free passage of fish during some periods.

The data collected at the work station will be used to summarize overall upstream fish passage, including enumeration of fish using the facility; the species using the facility; range, average size, and weight of species using the facility; and the timing of movement and passage by each species. In cooperation with MFWP, PPL Montana will have staff available to monitor fish ladder operations and oversee daily, seasonal, and annual data collection.

3.1.1 Fish Ladder Data Collection

Biological data will be collected for fish ascending the fish ladder through the Phase 2 evaluation period (2011-2020). Biological data collected will include, at a minimum, the species identification, length, and weight. There may be some situations where collecting biological data for each individual fish is not feasible during extreme conditions, including excessive numbers of fish present, high water temperatures, or other extreme weather events. The timing and circumstances of these extreme conditions will be documented. Whenever possible, data will be collected on fish in batches if data collection on individual fish is not possible. For example, the total number of pounds of non-game fish may be recorded rather than the individual length and weight of each fish. At a minimum, daily estimates will be recorded. A priority will be placed on recording data on individual bull trout, and also on salmonids in general.

After data are collected on each fish, the fish will either be routed to Pool 48 (from there they can volitionally pass into the Thompson Falls Reservoir); returned to the tailrace; or transported.

PPL Montana and personnel handling fish at the fish passage facility or handling fish during studies associated with the evaluation of fish passage will follow State of Montana collection permit guidelines.

Based on annual experience and results, modifications to data collection procedures and biological parameters collected may occur during this period to improve evaluation of upstream fish passage.

Data regarding daily operations at the fish ladder will also be collected in conjunction with biological data. Variables for operations are specified in the SOP.

3.1.1.1 Genetic Testing

The USFWS Biological Opinion (Terms and Conditions #1e) requires PPL Montana to:

> During the Phase 2 evaluation period (2010 through 2020)...provide adequate funding for testing to determine the likely natal tributary of origin of all adult bull trout which ascend the fishway and enter the sample loop, as well as those otherwise captured at the base of Thompson Falls Dam.

Genetic testing of bull trout will be conducted for bull trout that ascend the fish ladder and for bull trout that are otherwise captured at the base of the Thompson Falls Dam. Genetic testing is performed on fin clips. The fin clip is stored in an individually labeled container and sent to a USFWS-approved laboratory for analysis. Data gathered from the genetic analysis will also be entered into a database and summarized in the Annual Report submitted to FERC by April 1 each year.

3.1.1.2 Tagging and Marking Fish

The USFWS Biological Opinion (Terms and Conditions #1e) also requires PPL Montana to:

> ...institute a permanent fish tagging system for all bull trout handled during monitoring and for other fisheries investigation activities in the Project area.

PPL Montana has established a protocol for marking and/or tagging salmonid and non-salmonid species that are captured after ascending the fish ladder, captured downstream of the Thompson Falls Dam, or captured upstream of the Thompson Falls Dam. Marking and tagging data will be collected and used to monitor effectiveness of the ladder to pass bull trout, potential length of delay (timing and behavior of fish movement), fallback, upstream fish passage efficiency, and movement/migration.

All bull trout will be tagged with a passive integrated transponder (PIT) tag. PIT tags will be used to monitor the movement and growth of bull trout and potentially other salmonids. PPL

Montana will be using the TX1411SST (12.50mm x 2.07mm, 134.2 kHz ISO, 0.1020g) PIT tag from Biomark, Inc. PPL Montana will insert the PIT tag in the dorsal sinus cavity anterior to the dorsal fin. It is possible that fish previously tagged for other studies will have PIT tags inserted in different locations. Therefore, fish will be fully scanned for PIT tags at all possible tagging locations.

PIT tags may also be inserted in other salmonids, to serve as surrogates to bull trout during the Phase 2 evaluation period. The use of PIT tags in other salmonids will be determined through consultation with the TAC on an annual basis and described in the Annual Report submitted to FERC.

At the ladder, PIT tag data will be collected through an automated system. Antennas will be in place in multiple pools at both the entrance to the ladder and at the top of the ladder. A receiver will automatically record PIT tag identification numbers via antenna. The installed antennas can detect a TX1411SST PIT tag at a distance of 20 inches from the antenna surface with consistent detection at 18 inches. The automated PIT tag recording system at the ladder will run whenever the ladder is in operation. During the winter the automated PIT tag recording system will be turned off. The automated system will allow detection of tagged fish when they enter the ladder and then again when they reach the top of the ladder. In this way the length of time required for fish to ascend the ladder can be determined. In addition, fallback through the ladder can also be detected.

Radio telemetry may be used to monitor fish movement patterns and behavior. Depending on the study and objectives, fish may be radio tagged downstream of Thompson Falls Dam, at the fish ladder, or upstream of Thompson Falls Dam. Radio tags will be surgically inserted into the peritoneal cavity using standardized protocols developed during fish passage planning studies from 2004 to 2007.

Non-salmonids ascending the ladder will receive, when feasible, a visible implant elastomer (VIE) tag behind the left eye or in other more suitable locations, dependent on species. The VIE tag will be color-coded by year. The VIE tag will be used to evaluate fallback of non-salmonids.

Salmonid and non-salmonid tagging and marking procedures may be modified through the duration of the Phase 2 evaluation, as data is gathered and analyzed to better assess fish ladder passage efficiency or to respond new questions or objectives. Modifications to tagging and marking procedures will be done in consultation with the TAC.

3.1.2 Seasonal Ladder Operations

The fish ladder operation window will vary seasonally (spring, summer, fall) and it will not be in operation during the winter, due to climate conditions (ice) limiting operability and increasing safety concerns. During the winter, fish movement is expected to be minimal. During trapping operations, the fish ladder will be monitored daily. When monitoring is not feasible for a period of time, the ladder may be closed. Depending on the duration that monitoring is not feasible, the ladder may be dewatered, made inaccessible for fish, or left open to allow fish to enter and pass.

3.1.2.1 Spring Operations

Spring operations will generally start in February, but will be dependent upon ice conditions due to operational safety concerns. Once spring operations commence, the ladder will be checked at a minimum twice daily through 2011 or at least until the operations and fish movement are well understood. The frequency of monitoring may be seasonally adjusted depending on fish movement and other operational considerations (e.g. flows, weather, etc.).

Spring operations will continue until it is determined upstream fish passage is ineffective or the ladder becomes inoperable due to high flows, which is anticipated to be when river flows greater than 45,000 cubic feet per second (cfs) or approximately 20,000 cfs spill over the Main Dam. High flows are associated with spring run-off and typically occur between the middle of May and early July. The annual peak flow generally occurs around June 1 (plus or minus a couple weeks).

From past studies, it was concluded that fish tend not to approach the ladder area at these higher spring flows. Therefore, ladder operations will likely be shut down (ladder is either dewatered or configured to prevent fish entry) during this time. However, there will be personnel periodically checking the ladder to verify no fish are present. Ladder operations will resume when spring flows decline to a level that allows fish to approach and find the ladder entrance.

3.1.2.2 Summer Operations

Summer operations will likely require more frequent monitoring to reduce the potential stress on fish held in the ladder as a result of rising water temperature. Frequency of monitoring will be determined based on fish movements and water temperatures. Guidelines in this regard will be developed in 2011, based on experience and observations.

3.1.2.3 Fall Operations

Fall operations will be similar to spring conditions. Previous studies in the Project area indicate that fish movement is reduced and may cease when water temperatures decline to approximately 5 degrees Celsius or lower. Fish movement patterns and behavior, as well as safety considerations will be taken into consideration for determining ladder operations and monitoring protocol during the fall.

3.2 Assess Operational Procedures for Effectiveness

3.2.1 Weir vs. Orifice Study

Prefabricated aluminum weirs between fish ladder pools 1 and 44 can be operated in either notched weir or orifice mode. For this study, PPL Montana will assess which mode is most effective for bull trout passage.

Testing will be required in 2010/2011 to determine the procedure and effort required to alternate between weir and orifice mode. Dependent upon the outcome of these tests, the study plan described in this section may require some modification to accommodate feasibility of

alternating modes and safety concerns. When alternating between weir and orifice mode, the fish ladder may require complete dewatering.

PPL Montana proposes to initially assess effectiveness of the weir versus orifice mode in 2011 and refine the most effective passage mode through 2012. In 2011, PPL Montana proposes to experimentally alternate from weir to orifice mode on a weekly basis, if feasible. Alternating modes on a weekly basis will remove potential seasonal biases in the passage data. Data collection will include the time needed for fish to ascend the ladder, as well as standard biological and operational data. The data analysis will focus on comparing fish passage results for weir versus orifice. The analysis will evaluate the potential difference in overall number of fish passed, fish species, size of fish, possible effects or injuries to fish, and time required for fish to ascend the ladder.

After the first year of data collection, PPL Montana will analyze the data to identify potential design modifications to optimize passage for 2012. After the 2-year study is complete, PPL Montana will evaluate the data and in conjunction with the TAC will determine whether further testing is necessary. If additional testing is needed, PPL Montana will identify potential modifications to the study design. As soon as practicable, PPL Montana will prepare and implement a permanent flow operation plan.

Annual results will be compiled and summarized in the Annual Report. Conclusions and modifications to the study will also be included in the Annual Report submitted to FERC each April. Modifications to the study will be conducted in consultation with the TAC.

3.2.2 Attractant Flow Study

Attraction flow released from the fish ladder (to attract fish in the spillway tailrace) is composed of a lower discharge flow passing from pool to pool in the ladder combined with the auxiliary water system (AWS) discharge. Attractant flow can also be influenced by the high-velocity attraction jet (HVJ), spill gates, and radial gates. Details regarding the operation of the AWS system and other gates controlling flows are presented in the SOP. PPL Montana will evaluate upstream fish passage efficiency through manipulation of the attraction flows and will monitor fish response to varying attraction flows via radio telemetry.

This study consists of two phases: Phase 1 will be implemented between 2011 and 2013; Phase 2 will be implemented between 2014 and 2017. PPL Montana proposes to use up to the first 3 years of ladder operations (2011, 2012, 2013) to test variable attraction flows and enhance operations. The flexibility to experiment with attractant flows in the first 3 years will help operators and biologists develop a more systematic approach and study design for full-time implementation beginning no later than 2014. If early results are straightforward, implementation of the most effective configuration(s) will occur sooner and more frequently to maximize passage.

During the first 3 years (2011-2013) of experimental flows, PPL Montana will endeavor to repeat, to the extent feasible, the same attractant flow conditions when the ladder is configured in weir versus orifice mode. This replication of attractant flows for weirs and orifices reduces the variables for assessing fish behavior and movement associated with attractant flow. The first 3

years of experimental flows will be documented and reported in the Annual Report submitted to FERC. After review of the 2011-2013 attractant flow data, PPL Montana will develop a 4-year (2014-2017) attractant flow study plan to implement in 2014. The focus for the 4-year study will be to identify set periods of time to test variable attractant flows. Any further studies to evaluate attractant flow will be determined following the analysis of the 2014-2017 data and consultation with the TAC.

During manipulations of attractant flow, PPL Montana will evaluate the fish response, including overall number of fish and type of species ascending the ladder and the timing of fish upstream migration. Fish behavior and movement downstream of the Thompson Falls Dam and in the tailrace will be monitored via radio telemetry.

The focus of the radio telemetry portion of this study will be to monitor movement and behavior of bull trout migrating upstream to Thompson Falls Dam, entering the tailrace, and ascending the ladder. PPL Montana will manipulate attractant flow and study behavioral response of fish through radio telemetry. Because the number of bull trout in the system is currently low, other salmonid species may be tagged as surrogates and monitored for movement patterns and behavior.

In 2011, PPL Montana will monitor movement of bull trout that Avista Corporation has captured at Cabinet Gorge or Noxon Rapids Dam and genetically assigned to Region 4. These Region 4 bull trout will be transported to Noxon Reservoir and released, when conditions permit, and their further upstream migration monitored. Information on bull trout movement in the tailrace and to the ladder will be evaluated as part of the attractant flow study.

In 2012 and 2013, PPL Montana will electrofish downstream of the Thompson Falls Dam each spring. Selected salmonids captured during spring electrofishing efforts downstream of the Thompson Falls Dam will be implanted with radio transmitters. Caution will be employed to minimize electrofishing of bull trout, especially during periods when fish are actively migrating upstream and under stress in preparation to spawning. Sampling protocol, including the number of fish tagged, the number of species sampled per year, and location for sampling may vary from year to year. It may be possible for some experiments to use fish trapped from the ladder in order to keep potentially harmful electrofishing effects to a minimum.

Prior to spring 2014, PPL Montana will evaluate the 2011-2013 data and determine (in consultation with the TAC) any study design modifications for the radio telemetry component of this attractant flow study. PPL Montana will continue evaluating affects of attractant flow via radio telemetry of salmonids from 2014 through 2017. Any further studies to evaluate attractant flow using radio telemetry will be determined following the analysis of the 2014-2017 data and consultation with the TAC.

Annual variability in streamflow and runoff patterns may necessitate testing various configurations of weir/orifice structure and attraction flows over a period of multiple years, but any time ineffectiveness of these configurations appear to be blocking passage of adult bull trout (based on observations), remedial implementation of known safe and effective passage

procedures will be temporarily or intermittently instituted so that impacts of the testing to bull trout are minimized.

During the experimental flows (2011-2013) and 4-year study (2014-2017), PPL Montana will focus on the following questions to evaluate affects of attractant flow on fish movement:

- Under what range of discharges do fish move upstream through the narrow (falls) section of river to the tailrace?
- How long does it take fish to migrate past the falls to the tailrace?
- How long does it take fish to locate the ladder entrance once they are in the tailrace?
- What combination of attraction flows is most effective for fish to find the ladder entrance at varying levels of spill?

Data gathered and analyzed for this study will be summarized in the Annual Report submitted to FERC on April 1 each year and in the comprehensive 5-year and 10-year reports. *See* Section 4.0 for reporting details.

3.3 Assess the Length of Delay

One study objective is to evaluate the potential for delay. Currently, there is insufficient literature available to determine a standard passing time for bull trout to migrate from Noxon Reservoir to the Thompson Falls Main Dam tailrace and ascend the ladder. This study will focus on gathering information regarding bull trout and other radio tagged salmonid movement, timing, and behavior. The information collected from this study will assist in understanding and potentially identifying the factors that affect the timing of fish passage at Thompson Falls. This will be a 3-year study starting in 2011 and continuing through 2013. After the data is evaluated, PPL Montana (in consultation with the TAC) will determine the need for additional studies or potential modification to the existing study.

Bull trout captured downstream of Avista's Cabinet Gorge and Noxon Rapids dams that are genetically tested and assigned to Region 4 (upstream of Thompson Falls Dam) will be PIT tagged and may be radio tagged by Avista prior to release. PPL Montana will coordinate with Avista to have the Region 4 bull trout released in the Noxon Reservoir near Vermilion Bay (starting in 2011), whenever conditions permit. In cooperation with Avista and MFWP, PPL Montana will track movement of bull trout between Noxon Reservoir and Thompson Falls Dam.

PPL Montana will assess movement patterns and timing and evaluate:

- Length of time for bull trout to migrate from Noxon Reservoir to Thompson Falls Main Dam tailrace.
- Length of time for bull trout to migrate from Thompson Falls Main Dam tailrace to ladder.
- Length of time for bull trout to ascend ladder (entrance to top).
- Upstream migration timing.
- Migration behavior and pattern once released upstream of Thompson Falls Dam.

In addition to bull trout, PPL Montana may monitor movement patterns, behavior, and timing of other salmonids radio tagged downstream of Thompson Falls Dam. The radio tagged salmonids

will be the same fish captured and tagged for evaluation of attractant flow. PPL Montana will collect data to address the following:

- Length of time for salmonids to migrate from Thompson Falls Main Dam tailrace to ladder.
- Length of time for salmonids to ascend ladder.
- Upstream migration timing.
- Movement patterns and behavior in tailrace.

Data gathered and analyzed for this study will be summarized in the Annual Report submitted to FERC on April 1 each year and in the comprehensive 5-year and 10-year reports. *See* Section 4.0 for reporting details.

3.4 Assess Behavior In Ladder

PPL Montana will also assess behavior of bull trout (and other species) in the ladder and take necessary steps to streamline it to the extent practical. Given the lack of available information on bull trout use of other ladders, it is important to understand and document weir/orifice configurations, lighting patterns, flow patterns, or other factors that contribute to the most safe, timely and efficient passage through the ladder. We do not want to encourage bull trout to take up residency in ladder pools (ostensibly due to desirable combinations of cover or forage), nor do we want to encourage multiple forays up and down the ladder. In addition, ladder pools that appear to become "hangup" locations may need to be modified or improved, including potentially the trap or trap entrance pool. Bull trout behavior in the trap box will also be observed and procedures modified as needed to minimize any harmful actions related to capture, tagging, handling, or release from the trap itself. While observations of behavior will be mostly anecdotal and determined mostly through observation, other combinations of visual inspection, underwater camera use, or mobile PIT Tag monitoring may be used to further elucidate patterns. This information should also be summarized and conveyed in annual reports. In addition, careful examination of any injured fish and close and rapid remediation of any patterns that lead to excessive jumping behavior will occur.

3.5 Assess Fallback

PPL Montana will evaluate fish fallback after ascending the ladder and moving into the Thompson Falls Reservoir on an annual basis for the duration of the Phase 2 evaluation period (2011-2020). Bull trout will be monitored for fallback via PIT tag and in some cases, radio telemetry. Other salmonids that are radio tagged for previously described studies will also be monitored for fallback after ascending the ladder and being passed into the Thompson Falls Reservoir. When feasible, non-salmonids that have ascended the ladder will receive a VIE tag behind the left eye or in another suitable location. The VIE tag will be color-coded by year. The VIE tag will be used to evaluate fallback of non-salmonids.

These data collected via PIT tags, radio-tags, and VIE tags will be used to evaluate fish fallback at Thompson Falls Dam. This information will be analyzed and presented in the Annual Report submitted to FERC on April 1 each year. These data will also be summarized in the

comprehensive 5-year (2011-2015) and 10-year (2011-2020) reports. *See* Section 4.0 for reporting details.

Fallback data will be used to evaluate the need to transport bull trout upstream of Thompson Falls Dam by vehicle.

The USFWS Biological Opinion Terms and Condition #1f requires that:

> ...PPL Montana will make a fish transport vehicle available, and provide staff to transport any adult bull trout that is captured at Thompson Falls Dam and determined by the SOP to require transport to upstream waters.

Initially, bull trout that have ascended the fish ladder at Thompson Falls will be tagged and then returned to Pool 48 of the fish ladder so that they can pass through the dam into Thompson Falls Reservoir. For the initial years of fish ladder operation, we do not plan to transport bull trout upstream via vehicle. USFWS has communicated that the long-term goal for bull trout is to minimize human handling and maximize safe, timely and efficient volitional passage. The Service is preparing more specific guidance in this regard.

The need for future vehicle transport of bull trout will be evaluated based on the fallback data collected and other indicators such as movement patterns of radioed fish once they exit the ladder from Pool 48. The determination of whether transporting bull trout is necessary will be done in consultation with the TAC. In compliance with the USFWS Biological Opinion, PPL Montana will have staff and a vehicle available for transport, if this strategy for bull trout passage is deemed necessary.

3.6 Summary of Phase 2 Studies

A summary of the objectives, studies, and reporting requirements for the Passage Evaluation Plan (2011-2020) is presented in Table 3.5-1.

Table 3.5-1. Summary of the objectives, studies, and reporting requirements for the Passage Evaluation Plan 2011-2020. Annual activities are indicated by an "x." A dash (-) indicates no action will be taken for the year. TBD represents "to be determined."

Objective	Study	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Effectiveness of the Ladder	Annual Fish Passage	x	x	x	x	x	x	x	x	x	x
	Annual Movement Patterns (timing)	x	x	x	x	x	x	x	x	x	x
	Bull Trout Genetic Testing	x	x	x	x	x	x	x	x	x	x
Operational Procedures for Effectiveness	Weir *vs.* Orifice	x	x	Determine if additional study is needed	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Attractant Flow & Radio Telemetry	x (bull trout only)	x (bull trout & salmonids)	x (bull trout & salmonids)	Re-evaluation, Design 4-year Study Plan	x	x	x	TBD	TBD	TBD
Length of Delay	Upstream Movement Patterns, Timing & Behavior (Delay)	x	x	x	x	x	x	x	x	x	x
	In-Ladder Behavior	x	x	x	x	x	x	x	x	x	x
Fallback	Fall Back	x	x	x	x	x	x	x	x	x	x
Reporting Requirements	Annual Reporting (April 1 – FERC Submittal)	x	x	x	x	x	x	x	x	x	x
	5-year Report (Dec 31, 2015 – TAC/USFWS Submittal)	-	-	-	-	x	-	-	-	-	-
	10-year Report (Dec 31, 2020 – TAC/USFWS Submittal)	-	-	-	-	-	-	-	-	-	x

4.0 Evaluation Reporting Requirements

During the Phase 2 evaluation period (2011-2020), PPL Montana will prepare and submit reports summarizing activities. These reports will be completed in accordance with the USFWS Biological Opinion (Terms and Conditions #7a, 7b, and 1h). Reporting requirements will include annual summaries of activities submitted in the Annual Report filed April 1 to FERC each year; a 5-year (2011-2015) comprehensive report submitted to the TAC and USFWS by December 31, 2015; a 10-year (2011-2020) comprehensive report submitted to the TAC and USFWS by December 31, 2020; and a revised Operating Plan for the fish passage facility for 2022-2025 submitted to FERC by December 31, 2021. The following sections outline the requirements for each of the reporting requirements described above.

4.1 Annual Reporting

Annual reporting requirements are specified in the USFWS Biological Opinion Terms and Conditions #7a:

> Annually, by April 1 of each year for the remainder of the license (expires 2025), PPL Montana will prepare and submit to the Service for approval a report of the previous year's activities, fish passage totals, and next year's proposed activities and other fisheries monitoring that may result in intentional as well as incidental take of bull trout. The report will quantify the number of bull trout proposed to be incidentally taken by each activity and summarize the cumulative extent of incidental take from all previous year activities.

PPL Montana will summarize annual activities associated with the evaluation of the fish ladder and include a summary report in the Annual Report submitted to FERC by April 1 each year. The annual summary will include, at a minimum, the following information:

- Total number and timing of fish and species ascending the ladder.
- Total number of fish and species passed to Thompson Falls Reservoir.
- Most active period(s) for fish and various species ascending the ladder.
- Results from the weir versus orifice study and attraction flow studies.
- Total number of fallback.
- Bull trout behavior in the ladder.
- Bull trout genetic sampling and tributary assignment.

4.2 Comprehensive 5-year Report (2011-2015)

The comprehensive 5-year (2011-2015) reporting requirements are specified in the USFWS Biological Opinion Terms and Conditions #7b:

> By December 31, 2015, after the first five years of the Phase 2 evaluation period (as described per TC1g., above), PPL Montana will present to the TAC and the Service a comprehensive written assessment of the first five years of fishway operation. This report is partially for the purpose of assessing the need for major mid-Phase 2 modifications to the facility and its operations as well as for consideration of the need for supporting additional bull trout passage or transport above the dam.

In 2015, PPL Montana will prepare a 5-year comprehensive report for submittal to the TAC and Service by December 31, 2015. The report will include, at a minimum the following information:

- Summary of the annual data, specified in Section 3.1 collected from 2011 through 2015.
- Summary of weir versus orifice study.
- Summary of the attractant flow study.
- Summary of upstream fish movement, behavior, and timing.
- Recommendations for ongoing Standard Operating Procedures for the ladder to maximize safe, timely and efficient passage, especially of bull trout.

4.3 Comprehensive 10-year Report (2011-2020)

The comprehensive 10-year (2011-2020) reporting requirements are specified in the USFWS Biological Opinion Terms and Conditions #1h:

> During the entire Phase 2 evaluation period (2010-2020), the TAC, subject to approval of the Service and with PPL Montana support, will provide adequate oversight of scientific aspects, surveys, studies, and protocols associated with the fish passage aspects of the Project. At the end of the Phase 2 evaluation period (2010-2020), and upon completion and adequate distribution and consideration of a comprehensive ten-year report (due December 31, 2020), PPL Montana will convene a structured scientific review of the project, guided by the TAC. This scientific review will be completed by April 1, 2021 and will develop a set of recommendations to be submitted to the Service for evaluation, modification, and approval; including specific conclusions as to whether the fishway is functioning as intended and whether major operational or structural modifications of the fishway are needed. The review process will culminate, by December 31, 2021, in a revised operating plan for the fishway during the remainder of the existing term of the FERC license (2022 through 2025).

PPL Montana will summarize Phase 2 evaluation activities from 2011 through 2020 in a 10-year comprehensive report that will be submitted to the TAC and the USFWS by December 31, 2020. The TAC will designate a scientific review team to evaluate whether the fish ladder is functioning as intended and/or potential improvements to operations or the structure to increase passage efficiency. The scientific review team will submit their conclusions and recommendations to USFWS for approval. After USFWS evaluation, modification, and approval of the scientific review team's recommendations, PPL Montana will modify the Operating Plan

for the fish ladder accordingly and submit the revised Operating Plan identified for the remainder of the existing license (2022-2025) to FERC by December 31, 2021.

5.0 References

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