December 11, 2012

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St. N.E.
Washington, DC 20426

Subject: **Spokane River Project, FERC Project No. 2545**
License Article No. 404 "Spokane River Ramping Rate Evaluation Report"

Dear Secretary Bose:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) to operate the Spokane River Hydroelectric Project. Appendix A of the License, the Idaho 401 Water Quality Certification, included a four-inch per-hour down ramping rate for the Post Falls Hydroelectric Development (HED). Avista began implementing the down ramping rate upon issuance of the new License.

License Article 404 (Article) required Avista to complete the enclosed "Ramping Rate Evaluation Report" (Report) to document: 1) the effects of the ramping rates and any potential stranding on rainbow trout fry in the Spokane River downstream of the Post Falls HED; 2) any agency recommendations for more restrictive ramping rates based on the outcome of the Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study (Study); and 3) the associated costs to implement more restrictive ramping rates, if any are recommended by the consulting agencies.

In order to fulfill the Article, Avista first developed and implemented the Study, which was designed to determine the effects of the four-inch per-hour down ramping rate and any potential stranding of rainbow trout fry during the spring/summer rearing period. Avista consulted with the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service, and the Idaho Department of Fish and Game throughout the Study process. Upon completion of the Study, Avista sought comments and recommendations from the three agencies about the four-inch per-hour ramping rate. None of the three agencies commented that changes to the current four-inch per-hour down ramping rate were necessary; however, WDFW provided editorial comments, which we incorporated into the Study.

Given the Study, results indicate the four-inch per-hour down ramping rate is protective of rainbow trout fry and because none of the three agencies recommended any changes to the ramping rate Avista did not develop costs to implement more restrictive ramping rates.

Avista then submitted the enclosed Report, which includes the revised Study in Appendix A, with WDFW's editorial comments incorporated into it, to the three agencies for comments. None of the agencies recommended changes to the Report or to the current four-inch per-hour down ramping rate. As such, and upon FERC's approval, Avista will continue operating the Post Falls HED in accordance with the four-inch per-hour down ramping rate, as currently required by the License and the Idaho 401 Water Quality Certification.

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

800.227.9187
www.avistautilities.com

With this, Avista is submitting the enclosed Spokane River Ramping Rate Evaluation Report to FERC for approval. If you have any questions, please feel free to contact me by telephone at (509) 495-4998 or Tim Vore at (509) 495-8612.

Sincerely,

Elvin "Speed" Fitzhugh
Spokane River License Manager

Enclosure

cc: Jim Fredericks, IDFG
Graham Simon, WDFW
Bob Steed, IDEQ
Rick Donaldson, USFWS
Tim Vore, Avista

AVISTA CORPORATION

RAMPING RATE EVALUATION REPORT

LICENSE ARTICLE 404

Spokane River Hydroelectric Project
FERC Project No. 2545

Prepared By:
Avista Corporation

December 11, 2012

Introduction and Background

On June 18, 2009, the Federal Energy Regulatory Commission (FERC) issued a new license for Avista Corporation's Spokane River Hydroelectric Project, FERC Project No. 2545 (Project). The new FERC license (License) became effective on June 1, 2009. Appendix A of the License, the Idaho 401 Water Quality Certification, required that Avista limit the Post Falls Hydroelectric Development (HED) down-ramping rate to a maximum of four-inches per hour. Avista began implementing the down-ramping rate upon issuance of the new License.

In addition to the Idaho 401Water Quality Certification's down-ramping rate requirement, Article 404 of the License required Avista to conduct an assessment of the potential effects of the down-ramping rate on emerged Rainbow trout fry in the Spokane River downstream of the HED. Article 404 is included below for reference.

> **Article 404. – *Ramping Rate Evaluation*:** *No later than December 31 of the first complete year of project operation following license issuance, the licensee shall file for Commission approval, a ramping rate evaluation report. The report shall include:*
>
> *(1) the results of a Rainbow trout fry stranding study, developed and implemented after consultation with Idaho Fish and Game, Washington Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service, that documents the effects of the ramping rates contained in Appendix A, Condition VI.A, and any potential stranding on rainbow trout fry during the first complete spring/summer rearing period following license issuance;*
>
> *(2) any recommendations from the consulted entities for more restrictive ramping rates based on the outcome of the rainbow trout fry stranding study; and*
>
> *(3) the associated costs to implement more restrictive ramping rates, including the potential costs of reduced power generation and any construction costs needed to modify the Post Falls HED to provide more restrictive ramping rates if recommended by the consulted entities.*
>
> *The licensee shall include with the report, documentation of consultation; copies of comments and recommendations on the completed report after it has been prepared and provided to the consulted entities, and specific descriptions of how the consulted entities' comments are accommodated by the report. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.*
>
> *The Commission reserves the right to require changes to project operations or facilities based on the results or recommendations in the report.*

Avista began to implement the ramping rate evaluation and rainbow trout fry stranding study during the spring of 2010; however, at that time the Spokane River basin was experiencing low flow conditions due to the lack of snow throughout the river basin. Avista consulted with the U.S. Fish and Wildlife Service (USFWS), Idaho Department of Fish and Game (IDFG), and the Washington Department of Fish and Wildlife (WDFW) to determine how best to proceed. The parties concluded that the stranding study and down-ramping evaluation should be postponed until flow conditions would allow the study to be properly conducted. Avista then sought an extension to conduct the Rainbow trout fry stranding study and to extend the completion date for the ramping rate evaluation to December 31, 2011, which FERC granted on July 2, 2010.

Based on FERC's July 2, 2010 extension, Avista planned to implement the study during 2011; however, the Spokane River's 2011 runoff season was extremely high and unseasonably longer than normal. This prevented Avista from being able to control the amount of water being released from the HED and to control the down-ramping rates during the spring spawning and fry emergence season. Avista again worked with the three agencies and sought an additional one-year extension to conduct the Rainbow trout fry stranding study and complete the ramping rate evaluation by December 31, 2012. FERC granted the extension on July 5, 2011.

After two years of high and low river flows, Avista was able to conduct the "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (McMillen 2012) (Study) to document the effects, and any potential Rainbow trout fry stranding caused by the four-inch per hour down-ramping rate, which is required by the License and the Idaho 401 Water Quality Certification. The Study is included as Appendix A of this report.

Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study

Avista consulted with the WDFW, IDFG, and the USFWS to develop the methodology and as it implemented the Study, as required by License Article 404.

In order to complete the Study, Avista implemented a series of down-ramping events in 2011 and 2012 during flows when wild Rainbow trout fry were present in the near-shore varial zone, and when river flows were less than 20,000 cubic feet per second (cfs), the flows in which Avista can

control the discharge from the HED. Four specific study sites were identified in areas of known and expected Rainbow trout spawning and where rainbow fry were most likely to occupy. Modeling was used to determine stage changes at the study sites, based on flow reductions at the HED, and to establish a range of flows when down-ramping exposed habitat areas that could potentially strand Rainbow trout fry. Field surveys were then conducted during several HED down-ramping events to identify whether or not stranding of Rainbow trout fry occurred.

Habitat modeling at the four study sites determined that a tiered range of flows exists between 20,000 cfs and 2,000 cfs, when the greatest amount of habitat is exposed during flow reduction and when the HED actually has the ability to influence flows. Based on the habitat modeling, the greatest amount of habitat would be dewatered between 16,000 cfs and 4,500 cfs. The Study also evaluated specific down-ramping flow ranges that encompass most of the discharges that yielded the largest areas of dewatered habitat and that created the greatest potential for stranding.

Modeling and site specific measurements found that a four-inch per hour down ramp at the HED resulted in less than a four-inch decrease in water levels at the downstream study sites, where Rainbow trout fry were most susceptible to stranding. This attenuated flow is mainly due to channel morphology, as well as the travel time required for flow changes to affect habitat a few miles downstream. Additionally, the Study found that down-ramping changes are gradual and take at least an hour to occur in the downstream habitats. Based on these observations, the attenuated flow and the gradual change in water elevation provide adequate time for Rainbow trout fry to navigate to river connected water, and thus avoid being stranded. Entrapment pools were not common during the down-ramping studies on the Spokane River; however, the only Rainbow trout fry observed to be stranded was found in one of these pools at the Island Complex study site.

In conclusion, the Study found the effects of the HED's four-inch per hour down-ramping rate are attenuated, with smaller and more gradual changes in stage, by the time flows reach the important downstream habitat. Additionally, the numerous Rainbow trout fry present during the Study and in the shoreline areas at the study sites were able to successfully avoid being stranded during down-ramping events. Analyzing all the available data and the Study findings indicate

that the License condition, with a no greater than four-inch per hour down-ramping rate at the Post Falls HED, is protective of Rainbow trout fry.

Agency Recommendations Based on the Study

In accordance with Article 404, Avista sought recommendations from the USFWS, IDFG, and the WDFW pertaining to a more restrictive ramping rate based on the outcome of the Study. Documentation of Avista's September 7, 2012 request for comments and the associated agency recommendations and/or comments are included in Appendix B of this report.

Based on the outcome of the Study, the USFWS and IDFG concurred that the four-inch per hour down-ramping rate is effective and adequate at protecting Rainbow trout fry in the Spokane River. The WDFW did not recommend changes to the four-inch per hour ramping rate; however, it did provide editorial comments on the Study, which we addressed in Appendix B of this report and revised the Study accordingly. None of the revisions substantively altered the Study or changed any of the findings that the four-inch per hour ramping rate is protective of Rainbow trout fry in the Spokane River.

Costs to Implement More Restrictive Ramping Rates

None of the three agencies recommended more restrictive ramping rates than the four-inch per hour ramping rate that is currently required by the License and the Idaho 401 Water Quality Certification based on the Study. As such, Avista did not provide projected costs to implement a more restrictive ramping rate in this "Ramping Rate Evaluation Report" (Report), which was submitted to the agencies for an additional 30-day consultation period.

Agency Comments on the Report

The WDFW, USFWS, and IDFG had no further comments besides those that they provided for the Study. Documentation of Avista's request for comments and the associated agency comments on the Report are also included in Appendix B.

Avista's Recommendation

Based on the Study results and all of the agencies' comments and recommendations on both the Study and the Report, Avista plans to continue operating the Post Falls HED in accordance with the License and Idaho 401 Water Quality Certification required four- inch per hour down-ramping rate.

References

FERC. 2009. Order Issuing New License and Approving Annual Charges For Use Of Reservation Lands. FERC Project No. 2545-091. Federal Energy Regulatory Commission, Washington DC.

McMillen, 2012. Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Report. McMillen, LLC. Boise, Idaho.

APPENDIX A

RAMPING RATE EVALUATION AND RAINBOW TROUT FRY STRANDING STUDY REPORT (STUDY)

Spokane River Hydroelectric Project

FERC No. 2545

Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report

Prepared For: Avista Corporation

Prepared By: McMillen, LLC

McMillen, LLC

October 12, 2012

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SECTION 1
INTRODUCTION

1.0 Introduction

The Post Falls Hydroelectric Development (HED) was constructed in 1906 and is part of the Spokane River Hydroelectric Project, licensed (License) by the Federal Energy Regulatory Commission (FERC) as Project No. 2545. It includes three dams (North Channel, Middle Channel and South Channel, with natural islands connected by the three structures), spillways along the top of the North and South Channel dams, and a powerhouse integral to the Middle Channel dam. Operation of the Post Falls HED varies year to year due to water in-flows, weather conditions, and energy demands. As a part of the relicensing effort to investigate fishery resources in the Post Falls Reach of the Spokane River Project, several wild rainbow trout were collected for genetic analysis. Small (2007) determined that the wild rainbow trout in the Spokane River are Columbia Redband trout (*Oncorhynchus mykiss gairdneri*), a distinct subspecies indigenous to the Columbia River and its tributaries.

The Spokane River Project relicensing work groups expressed concern about the potential effect on the fishery resource from sudden changes in decreasing discharges and stage at the Post Falls HED (i.e., down-ramping). Avista and Parametrix Inc. (2004) developed an assessment in close coordination with the Washington Department of Fish and Wildlife (WDFW) and Idaho Department of fish and Game (IDFG) to address this concern. The Avista and Parametrix assessment presented considerable information and included the following:

- The flashy nature of the Spokane River creates considerable variation in flow and stage naturally;
- Down-ramping at Post Falls has the greatest potential to effect early life history stages during late spring and early summer, when the Post Falls HED can reduce Spokane River flows in order to control water levels upstream at Lake Coeur d'Alene. This control of lake water levels potentially occurs when early life history stages of wild Rainbow trout fry inhabit near-shore habitats in the varial zone;
- Down-ramping is attenuated by the time flow changes reach downstream habitat, and
- A maximum 4 inch down-ramp at Post Falls is appropriate and protective of the resource.

The assessment showed that the HED's operations have the potential to affect important Rainbow trout spawning and rearing areas in the approximately 10-mile-long, free-flowing reach of the Spokane River downstream of the Post Falls HED. In addition, juvenile salmonids and other fish that inhabit the shallow shoreline areas may be susceptible to decreasing flows from the Post Falls HED. Information derived from instream flow work (nhc and HDI 2004) and Rainbow trout spawning and emergence studies (Avista 2004; Parametrix 2003) identified areas susceptible to water level changes and that the potential for fry stranding is greatest in the gradual-sloping gravel areas proximal to the highest density of spawning redds. Four sites, identified as the Island Complex (Island), Starr Road Bar (Starr), Murray Road (Murray), and Harvard Road (Harvard) were selected as the most appropriate areas to evaluate down-ramping and the potential for stranding.

This information was reviewed by federal and state resource agencies with US Fish and Wildlife Service (USFWS) and IDFG recommending a Post Falls HED ramping rate of no more than a 4-in-per-hour drop in downstream water levels as measured at the USGS Gauge (No. 12419000)

near Post Falls, ID. The Idaho Department of Environmental Quality (IDEQ) reviewed the information and included the 4-in down-ramping rate in their Clean Water Act Section 401 Water Quality Certification for the Post Falls HED. This certification, with the down-ramping restriction, was incorporated into the new FERC License for the Spokane River Project as Appendix A, Section VI.

The Spokane River Project received a new FERC license on June 18, 2009, which included new down-ramping limits for the Post Falls HED. In order to protect fishery resources, notably wild Rainbow trout, Avista must maintain discharges corresponding to no more than a 4-inch reduction per hour in downstream water levels (i.e., stage) as measured at the USGS gage located near Post Falls, Idaho. Article 404 of the License also required an assessment of the potential effects of this down-ramp condition on newly-emerged Rainbow trout fry in the Spokane River downstream of the Post Falls HED. Article 404 of the new License reads as follows:

> **Article 404. – *Ramping Rate Evaluation*:** *No later than December 31 of the first complete year of project operation following license issuance, the licensee shall file for Commission approval, a ramping rate evaluation report. The report shall include:*
>
> *(1) the results of a Rainbow trout fry stranding study, developed and implemented after consultation with Idaho Fish and Game, Washington Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service, that documents the effects of the ramping rates contained in Appendix A, Condition VI.A, and any potential stranding on rainbow trout fry during the first complete spring/summer rearing period following license issuance;*
>
> *(2) any recommendations from the consulted entities for more restrictive ramping rates based on the outcome of the rainbow trout fry stranding study; and*
>
> *(3) the associated costs to implement more restrictive ramping rates, including the potential costs of reduced power generation and any construction costs needed to modify the Post Falls HED to provide more restrictive ramping rates if recommended by the consulted entities.*
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>
> *The Commission reserves the right to require changes to project operations or facilities based on the results or recommendations in the report.*

Lake Coeur d'Alene Avista set out to implement the Ramping Rate Evaluation in the spring of 2010; however, the Spokane River basin experienced very low snow accumulation that year, with local SNOTEL readings below 50% of the long-term average in March. Consultation with the USFWS, IDFG, and WDFW concluded that the stranding survey and down-ramping evaluation should be postponed in 2010 due to these natural, dry water year conditions; it was re-scheduled for 2011. The opposite condition occurred in 2011, when the Spokane River basin had much higher than normal spring run-off, which again forced a delay in the down-ramping and stranding

survey. Avista requested an extension to complete the evaluation by December 31, 2012; this extension was granted by FERC on July 5, 2011.

Avista consulted with the WDFW, IDFG, and the USFWS to develop a Spokane River Ramping Rate Evaluation Study (Avista 2010). This report provides the results of a comprehensive down-ramping and stranding evaluation conducted in June, 2012 to meet the study objectives. This report also includes preliminary down-ramping and stranding assessments completed in late June and July of 2011, as well as a supplemental down-ramping and stranding assessment completed in early July of 2012.

1.1 Study Purpose and Objectives

The purpose of the Post Falls HED Ramping Rate Evaluation was to analyze the potential impacts, if any, of a facility 4-inch-per-hour down-ramping rate, as measured at the Post Falls USGS gage, on emerged Rainbow trout fry downstream.

The primary objectives of the study were to:

- Identify the primary Rainbow trout fry rearing locations in the free-flowing section of the Spokane River downstream of the Post Falls HED.
- Describe the extent of existing flow fluctuations in terms of rate and frequency of stage change (ramping) in the free-flowing section of the Spokane River from the Post Falls HED downstream to the Sullivan Road Bridge.
- Describe the potential for the required down-ramping rate (4 inches per hour) to strand fish, specifically newly-emerged Rainbow trout fry.
- Conduct concurrent observations of fish stranding incidence and fish condition during actual down-ramping events.
- Analyze all data and determine the viability of the current 4-inch per hour down-ramping requirement.

1.2 Existing Information

Results of previous study work conducted during the Spokane River Project relicensing provided the information to address the first objective. An assessment conducted by Avista and Parametrix in 2003 documented areas in the free-flowing portion of the Spokane River below the Post Falls HED with the highest incidence of rainbow trout spawning (Parametrix 2003). In 2003, 232 redds were observed at spawning areas in the upper river reach below the HED (approximately RM 84-101.7). Of the 232 redds identified, 117 (50%) occurred within the three established spawning reference areas listed below, and 88% occurred between RM 92.1 and RM 95.1 (which encompasses the three reference areas). The Harvard Road area had the highest redd count (76), including 52 redds in the established reference area, and 24 redds in adjacent habitat. The next highest redd concentration (51 redds) was observed at the Harvard Road site, followed by 43 redds in the Island Complex reference area, and 22 redds in the Starr Road Bar reference site (Parametrix 2003). Tables 1 and 2 document spawning locations and redd concentrations from the 2003 study.

Table 1. Spawning Locations of Rainbow Trout in the Upper Reach of the Spokane River Downstream of Post Falls HED (from Parametrix 2003)

Spawning Location	River Mile	Fish	Redds
McGuire Road access	100.7	0	5
Corbin Park	99.8	0	3
Island Complex (reference area)	94.8-95.1	12	43
Starr Road Barr (reference area)	94.7	40-50*	22
Starr Road Shoreline	94.7	0	12
Harvard Road (reference area)	92.6	40-50*	76
Harvard Road River Bend	92.1	0	51
Sullivan Road (Left Bank)	87.2	3	2
Sullivan Road (Right Bank)	87.1	4	5
Centennial Trail Bridge	84.0	6	13

*Estimated number of fish

Table 2. 2003 Rainbow Trout Spawning Survey Data (Parametrix 2003)

Reference Area	Parametrix Counts (May 23)	Avista Counts (May 13)
Island Complex	43	46
Starr Road Barr	22	31
Harvard Road	52	44
Total	**117**	**121**

The 2003 study also examined emergence timing in the free-flowing area below the Post Falls HED. Rainbow trout spawned around the first week of April, and fry were first observed in the upper river study reach on May 23 and 24. Newly-emerged fry were detected at both the Island Complex and Starr Road Bar locations on May 23 (Parametrix 2003). This previous work was used to identify the Rainbow trout fry emergence and rearing locations and determine study areas.

The second objective of this study was to describe flow fluctuations in the Spokane River. Changes in river flow are a normal and natural occurrence in all river systems. The effects of Post Falls HED down-ramping are attenuated by the time flows reach the important habitats downstream in Washington. A ramping rate evaluation produced by Avista and Parametrix in 2004 provided an analysis to document the discharge fluctuation necessary at the Post Falls HED to produce a 4-inch drop in stage at Starr Road, one of the primary spawning and rearing sites for Rainbow trout in the upper Spokane River. An instream flow analysis provided survey and discharge information in the upper Spokane River (nhc & HDI 2004). From September, 2006 to September, 2009, however, the Washington Department of Ecology (Ecology), as part of the Spokane River basin cleanup plan, removed large amounts of sediment from primary Rainbow trout spawning locations on the upper Spokane River and replenished the sites with new gravels. These restoration efforts modified the topography of these areas. This study included gathering information and surveying habitat areas to confirm the existing topography and to address the remaining study objectives.

1.3 Study Area

The study area includes the Post Falls HED and the approximately 10-mile-long, free-flowing reach of the upper Spokane River between the Post Falls HED and Sullivan Road in Washington (Figure 1). Upon review of past studies related to spawning and rearing in the upper Spokane

River, four study sites were selected within this area due to their documented and anticipated utilization by Rainbow trout. These four study sites are shown in Figures 1 – 5 include:

- Harvard Road
- Murray Road
- Starr Road
- Island Complex

The Murray Road site had not been identified as an existing spawning area for Rainbow trout, but was included as a study site. The site is within the river reach where most spawning occurs; recent gravel replenishments and the engineering by Ecology to enhance this site met the described habitat conditions for Rainbow trout fry rearing.

Figure 1. Spokane River Ramping Rate Evaluation Study Area

Figure 2. Approximate Study Site and Index Area Locations at Harvard Road

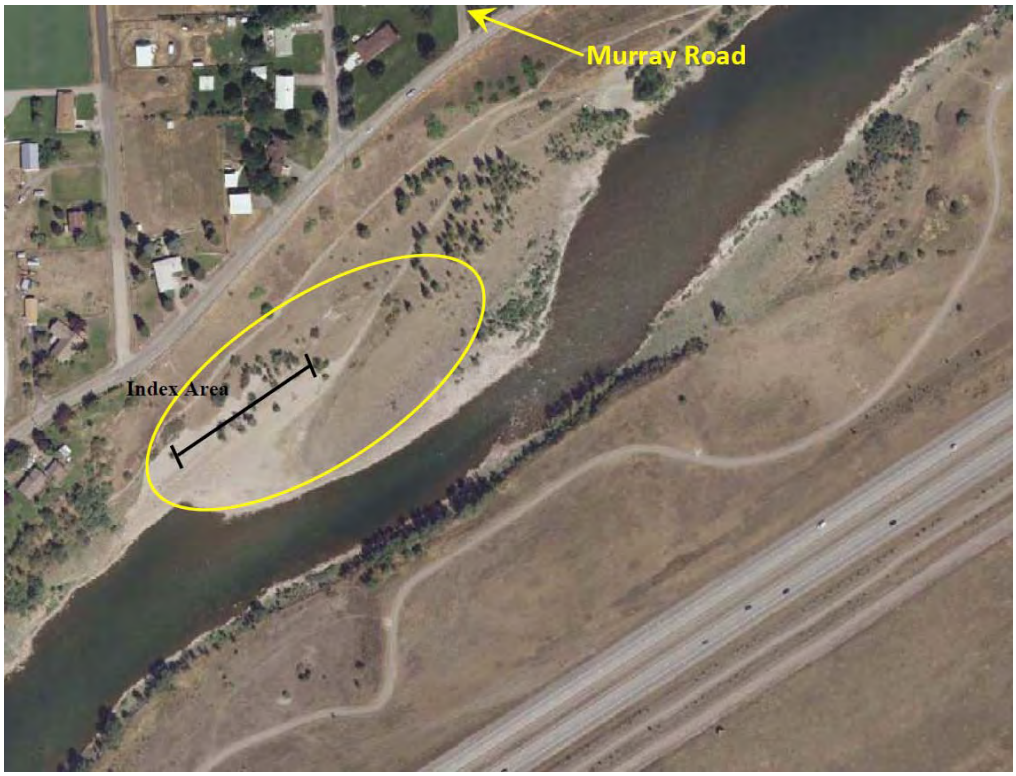

Figure 3. Approximate Study Site and Index Area Locations at Murray Road

Figure 4. Approximate study site and index area locations at Starr Road

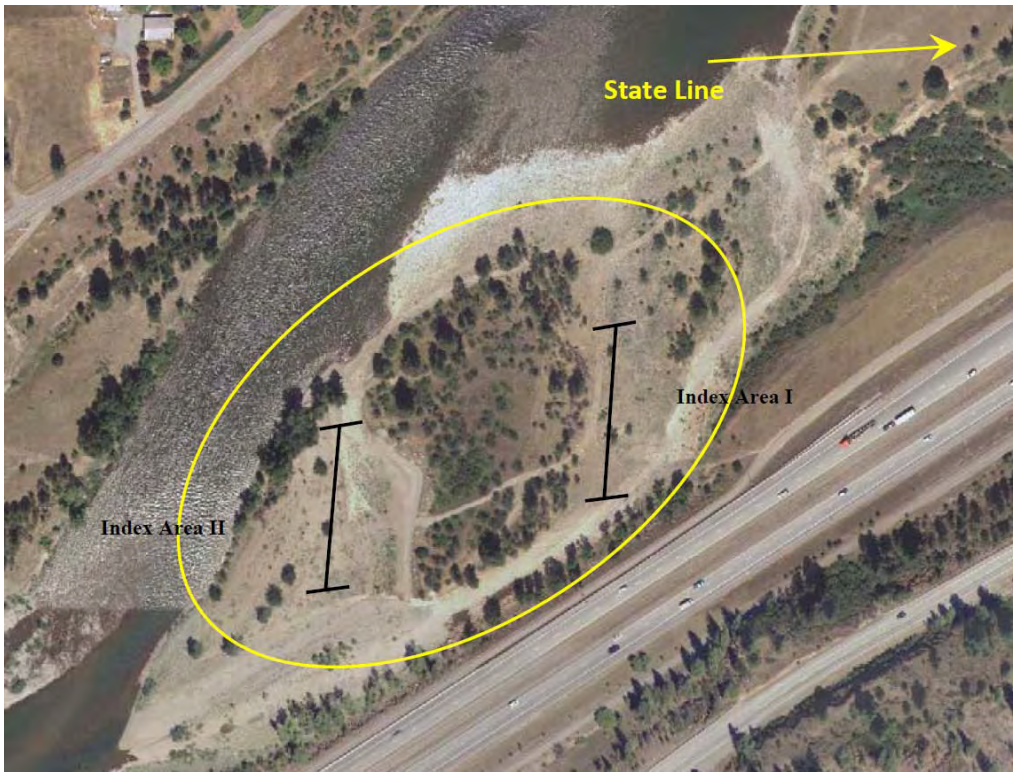

Figure 5. Approximate study site and index area locations at the Island Complex

SECTION 2
METHODS

2.0 Introduction

Methods for this study were developed and approved by WDFW, IDFG, and the USFWS to address the study objectives:

- Assess ramping potential at Post Falls HED - Determine area that is exposed at each of the four study sites with a 4-inch drop in stage at the Post Falls USGS gauge.
- Assess stranding - Determine the number of Rainbow trout fry observed to be stranded at the measured stranding events, if any.

Methods included the development of stage/discharge relationships at the Post Falls USGS gauge (No. 12419000) at the selected sites. This involved the use of modeling techniques, and the production of elevation contour maps using Light Detection and Ranging (LiDAR) and survey data, for input into a GIS layer. Avista used Ecology's existing elevation and LiDAR-based bathymetric data, where applicable, to establish stage vs. discharge relationships at the sites of interest. At other sites, additional survey data was obtained.

2.1 Assess Ramping Potential

Analysis of the potential to strand fish was a two-step process, involving a determination of the stage-discharge relationship at each site, as well as an observation of stranded fish during the down-ramping study. These steps are described below.

2.1.1 Determination of Stage/Discharge Relationships

Assessing ramping potential at the Post Falls HED required analyzing the stage/discharge relationship at the Post Falls USGS gauge, and determining the stage/discharge relationships at the four study sites with those changes in flow and stage at the Post Falls USGS gauge. Once these relationships were known, inundation areas could be calculated for the study sites (i.e., to determine the amount of habitat that would be exposed by a 4-inch drop in stage).

2.1.1.1 Post Falls USGS Gauge Flows and Stage

McMillen staff used the existing stage/discharge relationship at the Post Falls USGS gauge (No. 12419000) to determine any initial and secondary flow levels resulting in a 4-inch stage decrease. Flows were examined from a high of 20,000 cubic feet per second (cfs) to a low of 2,000 cfs. An upper flow of 20,000 cfs was selected because Avista's operating license includes criteria to achieve and maintain a Lake Coeur d'Alene elevation at or near 2,128.0 ft. as soon as practicable each year. To achieve this requirement, Avista must begin controlling discharge from the Post Falls HED when flows drop to approximately 19,000 cfs or below (which corresponds to a Lake Coeur d'Alene level near 2,128.5 ft, as determined by the Avista Project free-flow curves). The lower flow of 2,000 cfs flow was selected determined by the habitat area topography and the flow that potentially can occur during the fry emergence and nearshore occupation.

McMillan calculated the Post Falls gauge flow at every 0.01 ft from gauge height 17.20 ft (20,000 cfs) to gauge height 7.65 ft (2,000 cfs). For each of these stage measurements, 4 inches (0.33 ft)

was subtracted, to determine the change in flow given a 4-in change in stage. There is very little inflow to the Spokane River between the Post Falls gauge and the four study sites; therefore, the flow at the gauge upstream was assumed to be the flow at each of the four study sites.

2.1.1.2 Study Sites Flows and Stage

Avista used a combination of LiDAR and/or water surface elevation (WSE) surveying in order to determine the specific stage/discharge relationships at the four study sites. Ecology used LiDAR, with 2 ft contours, to map these sites. Independent of relicensing studies, these sites were part of a Spokane River Basin restoration effort. Part of these habitat improvements included the replenishment of spawning gravels at these study sites between 2006 and 2009. In most instances, gravel replenishment was completed prior to LiDAR survey flights; therefore, Avista could utilize these LiDAR-generated contour data. The Harvard site, however, was flown with LiDAR before the gravel was replaced, so the contours that were generated were no longer accurate. At all four sites, and particularly at the Harvard site, ground-based survey techniques supplemented LiDAR data and confirmed the existing topography and elevation.

At the four study sites, Avista surveyed elevational contours using known, established benchmarks. At a range of known flows (as measured at the Post Falls gauge), Avista surveyed the WSE where it intersected the shore (i.e., water's edge). All surveying by Avista was conducted by a licensed survey technician. A total station, along with a differential GPS (dGPS) was used during all surveys. The elevations were plotted on overhead maps, using a Geographic Information System (GIS).

For each of the study sites, Avista calculated a stage/discharge relationship using submodule HYDSIM in the River Habitat Simulation (RHABSIM by T.R. Payne and Associates, Arcata, CA). Unless otherwise specified, stage was calculated for every flow from 2,000 - 20,000 cfs.

2.1.2 Calculation of Inundation Areas

Once contours were delineated over a range of flows, McMillen calculated the area at each habitat site associated with a given measured (or surveyed) flow. McMillen used a linear interpolation between measured and surveyed flow measurements to calculate exposed areas at increments of 0.01 ft in elevational change. These data were used to estimate the area (in ft^2) at each site potentially exposed by a change in stage of 4 in, as measured at the Post Falls USGS gauge, and to identify those flows where the greatest amount of habitat would be exposed.

2.2 Stranding Analysis

2.2.1 Identification of Exposed Areas during Potential Stranding Event

The use of site-specific stage/discharge relationships superimposed over existing ground topography allowed Avista to focus on those areas, and discharge flows, where the greatest impacts would most likely occur. In addition, a temporary staff gauge was established at each of the four study sites to ensure accurate recording of local stage changes *in situ*.

Avista monitored spawning and emergence activity at the four sites in 2011; additional surveys were conducted in 2012 and during nine potential stranding events over the course of three days. These studies were conducted:

1) When fry emerged and were susceptible to stranding, and
2) At those decreases in stage that exposed the largest amount of habitat and had the greatest potential to strand fish.

Avista notified IDFG, WDFW and USFWS when an anticipated, qualifying down-ramping event was expected to occur, and mobilized the biologists and equipment needed to conduct the study as soon as possible. Water's edge at the beginning of each event was flagged to denote the upper WSE, and was also flagged after each flow and stage reduction at the Post Falls HED to denote the down-ramping WSE. At each down-ramping event, Avista did the following:

- Recorded the stage (as measured by the temporary staff gage established at each site), date, and time. *[Note: flow was determined at a later date when comparing Project and USGS flow data]*.
- Flagged the water surface at shore's edge prior to each down-ramping event.
- Measured the horizontal distance of the streambank which was exposed by the event.
- Photographed from pre-set photo points to document the level of habitat exposure that occurred with each down-ramping event.

2.2.2 Fish Capture Methods

Avista visually surveyed the newly-exposed habitat during and immediately following each down-ramping event. Due to the nature of the substrate (fines, gravel and small cobble), neither seining nor electofishing was required. All fish found stranded were transferred to aerated, acclimatized holding water, and released nearby into a connected portion of the Spokane River.

In addition to looking for stranded fish, Avista was careful to observe water areas for the presence of fry in the varial zone near shore habitats before, during, and after each down-ramping event.

SECTION 3
RESULTS

3.0 Stream Channel Exposure during Potential Stranding Events

3.1 Stage/Discharge Relationships

Since the 2006 to 2009 gravel replenishment, Ecology has been periodically collecting additional stage and flow data to develop new stage vs. discharge relationships at all the sites. Table 3 documents the ongoing data collection that was conducted by the WDOE at the four study sites. Avista supplemented these data with additional stage/discharge surveys in 2011 (Table 4).

Avista analyzed Ecology data from the Starr Road and Murray Road sites to develop stage/discharge relationships for these habitat areas. Flows modeled ranged from approximately 2,000 cfs to 20,000 cfs. Where site-specific data did not exist (i.e., the Island Complex and Harvard Road sites), Avista collected additional data to develop similar relationships. Additional surveying also took place at the Starr Road and Murray Road sites to verify that no changes to the topography had occurred (since Ecology's gravel replenishment efforts) that would invalidate the stage/discharge relationships.

After these data had been collected and the stage/discharge relationships verified, Avista overlaid the changes in stage associated with changes in flow onto LIDAR maps (discussed in further detail below) and quantified the amount of exposed habitat that is associated with a 4-in drop in stage, as measured at the USGS gauge near Post Falls, ID. During this modeling exercise, ft^2 of habitat exposed at each site over a range of flows were quantified and tabulated.

Avista and Parametrix (2004) identified that susceptibility to stranding would be greatest in gravel substrates with gently sloping banks where salmonid fry are abundant. From this work, it was also determined that the larger the habitat area affected by a 4 in change in stage, the greater the risk for stranding Rainbow trout fry.

Table 3. Post-Construction Surveys Conducted by Ecology at the Four Study Sites

Harvard Road		Murray Road		Starr Road		Island Complex	
Date Surveyed	Flow (cfs)	Date Surveyed	Flow (cfs)	Date Surveyed	Flow (cfs)	Date Surveyed	Flow (cfs)
No Post-Construction Surveying Conducted by WDOE		09/27/2007	1,200	09/27/2007	1,200	05/23/2008	40,600
		10/01/2007	1,900	10/01/2007	1,900	-	-
		11/26/2007	3,170	11/26/2007	3,170	-	-
		03/07/2008	4,600	03/07/2008	4,600	-	-
		03/17/2008	6,800	03/17/2008	6,800	-	-
		04/16/2008	9,500	04/16/2008	9,500	-	-
		05/01/2008	13,200	05/01/2008	13,200	-	-
		05/07/2008	17,000	05/23/2008	40,600	-	-
		05/13/2008	21,300	-	-	-	-
		05/19/2008	28,000	-	-	-	-

Table 4. Additional surveying conducted by Avista at the four study sites

Date	Flow	Harvard	Murray	Starr	Island
12/09/2009	3,030 cfs	•	•	•	•
02/03/2010	2,450 cfs	•		•	•
04/07/2010	6,470 cfs	•	•	•	•
05/06/2010	16,400 cfs	•		•	•
05/11/2010	8,600 cfs	•		•	•
04/26/2011	13,900 cfs	•			
05/13/2011	20,200 cfs	•			
05/17/2011	29,000 cfs	•			

Table 5 summarizes the range of flows for which habitat measurements were available. Because there were no existing bathymetry data that could be used at the Island Complex and Harvard Road sites, the lower limit of habitat analysis was 2,450 cfs (the lowest flow that was measured by Avista). Similarly, the Harvard Site could not be extrapolated at flows above 29,000 cfs, the highest surveyed flow. Between the existing Ecology data and the Avista surveys, measurements were taken at flow volumes between 2,450 cfs and 40,000 cfs *[Note: although measurements of stage were taken at flows as high as 40,600 cfs, only those flows that could be influenced by the Post Falls HED were modeled - 2,000 cfs - 20,000 cfs]*.

Table 5. Range of Flows for Habitat Assessments at the Four Study Sites

Site	Range of Flows (cfs)
Starr Road	1,210 - 40,600
Murray Road	1,210 - 40,600
Harvard Road	2,450 - 29,000
Island Complex	2,450 - 40,600

3.1.2 Habitat Availability at Study Sites

McMillen calculated the total amount of habitat at each study site, beginning with the lowest baseline flow that had elevational data (e.g., 1,210 cfs for the Murray and Starr sites, and 2,450 cfs for the Harvard and Island sites) (Table 6). These estimates of area (ft^2) form the basis for calculations of area exposed with a qualifying down-ramping event (4-in drop in stage, as measured at the Post Falls USGS gage). *[Using the Murray site as an example, 26,768 ft^2 of habitat exists between flows of 1,210 cfs - baseline - and 3,030 cfs. There are 7,086 ft^2 of habitat between the measured flows of 2,450 cfs and 3,030 cfs (26,768-19,682)]*. Figures 6 through 9 show the amount of habitat that exists at the range of measured flows for all four study sites.

Table 6. Cumulative Habitat (ft^2) at the Four Study Sites on the Spokane River

Flow (cfs)	Harvard	Murray	Starr	Island
1,210	N/A	0	0	N/A
2,450	0	19,682	14,188	0
3,030	4,575	26,768	17,190	2,091
6,470	14,261	68,108	43,634	78,149
8,600	21,554	109,033	66,590	151,596
13,900	26,814	162,434	108,032	190,037
16,400	33,421	184,060	124,629	206,729
20,200	36,967	285,400	143,280	211,715

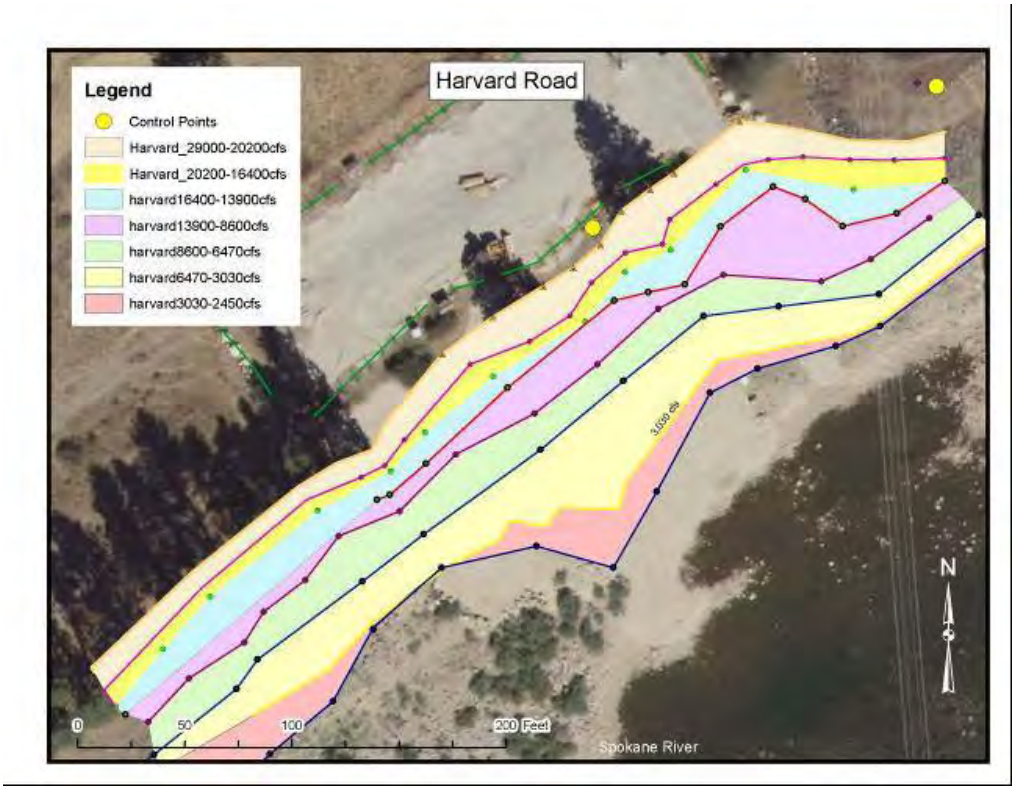

Figure 6. Harvard Road Site Habitat Versus Flow

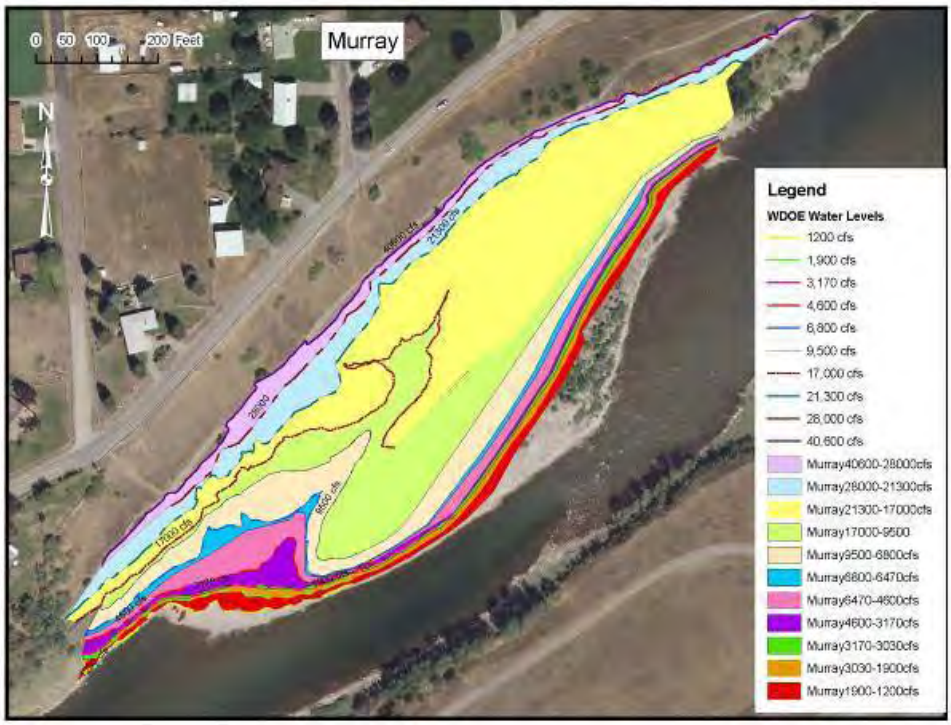

Figure 7. Murray Road Site Habitat Versus Flow

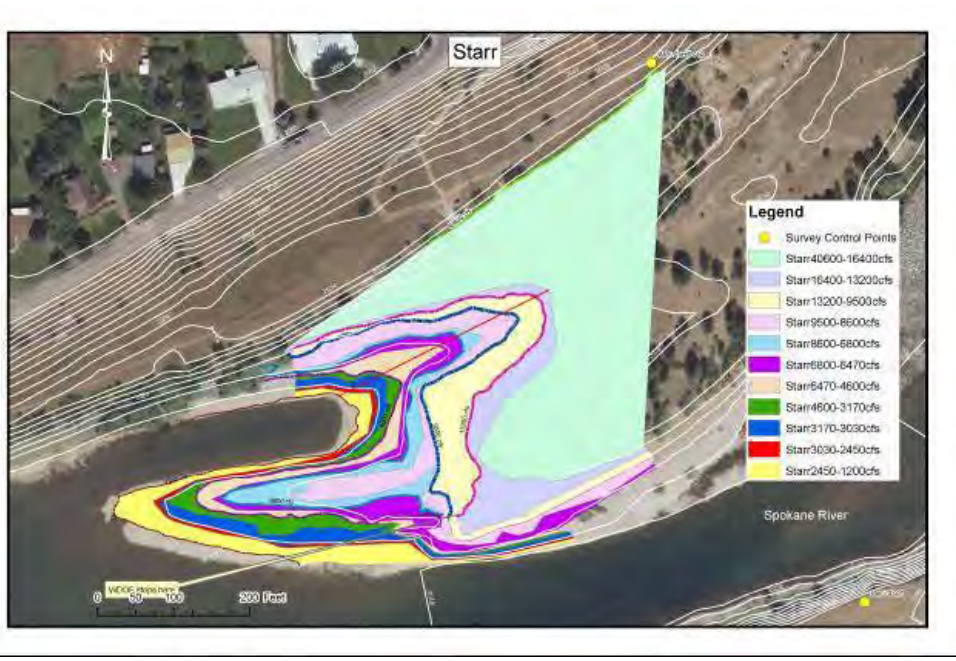

Figure 8. Starr Road Site Habitat Versus Flow

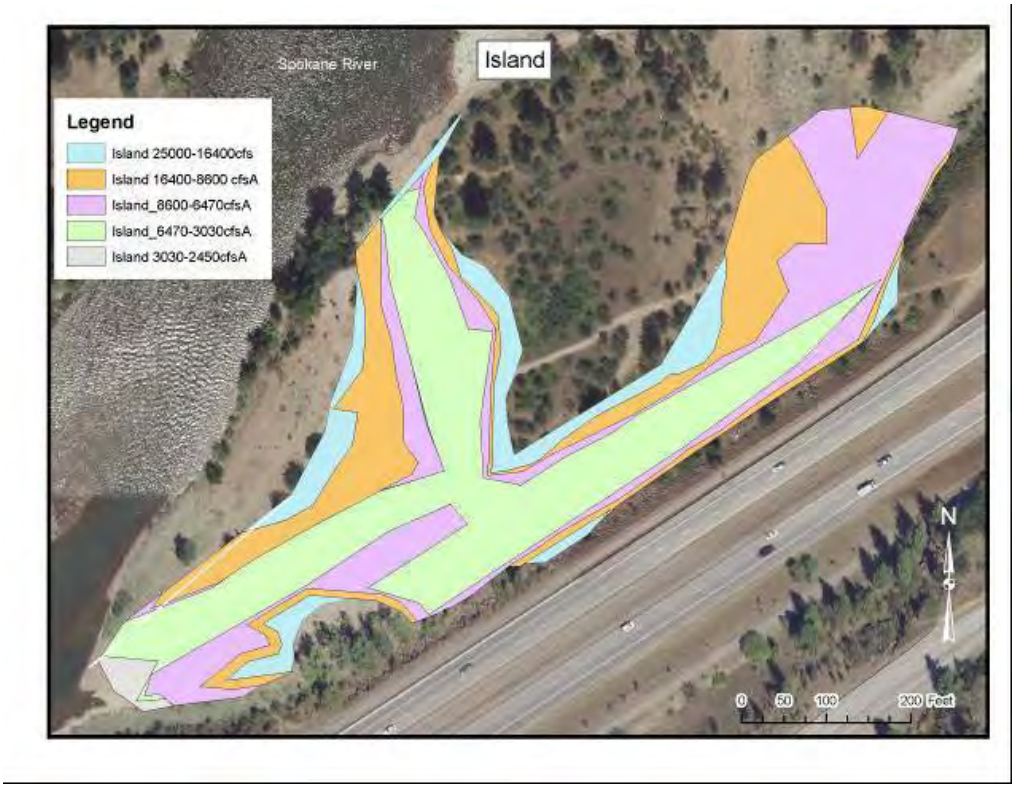

Figure 9. Island Complex Site Habitat Versus Flow

McMillen then calculated the change in habitat at each of the four sites, given a qualifying down-ramping event (4-in drop in stage as measured at the Post Falls USGS gauge). The amount of habitat exposed at each site was then summed to examine those flow changes that had the largest amount of exposed habitat (Figure 10) and together with previous work provided the following:

1) A time-frame of interest from mid-May through June, when newly-emerged rainbow trout fry were are expected to occupy near shore habitats.
2) Tiered flow ranges most critical to assess for potential down-ramping impacts:
   a. 8,600 cfs – 6,000 cfs (Tier 1)
   b. 16,000 cfs – 8,600 cfs and/or 6,000 cfs – 4,500 (Tier 2)
   c. 20,000 cfs – 16,000 cfs, and/or 4,500 cfs – 3,000 cfs (Tier 3).

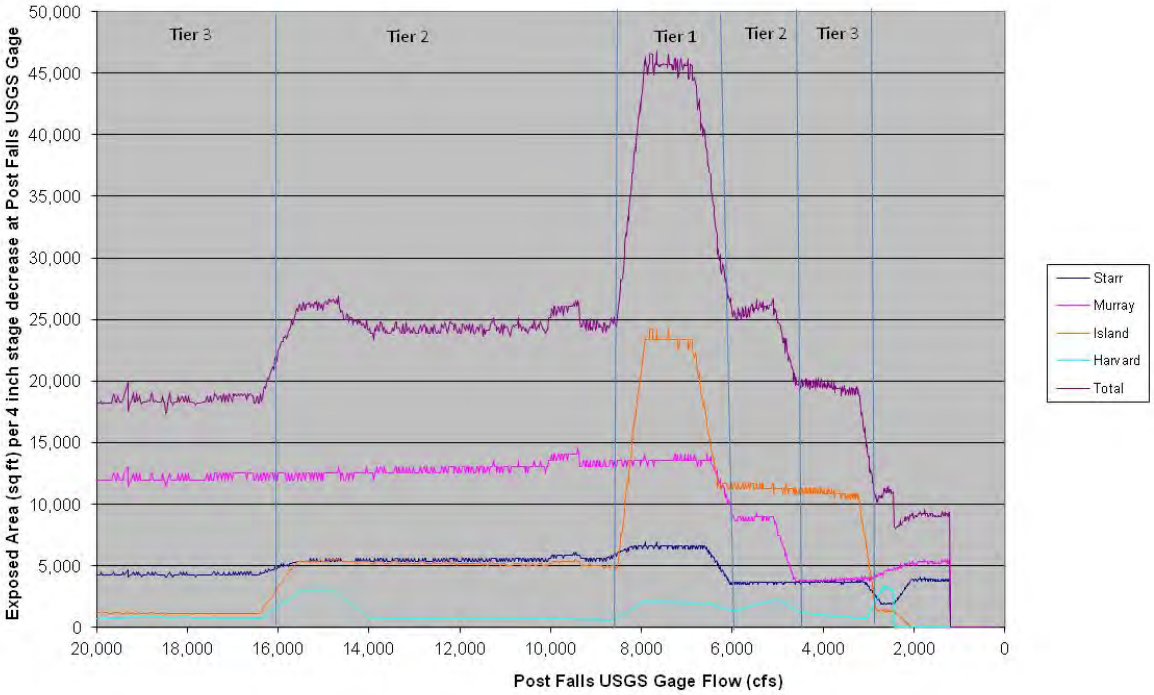

Figure 10. Changes in Exposed Near-Shore Habitat with a 4 inch Change in Stage as Flows Decrease in the Spokane River Below Post Falls HED

As measured by the amount of exposed habitat, the highest risk of potential stranding occurs when flows drop from 8,600 cfs - 6,000 cfs (an approximate 25,000 - 45,000 ft^2 total of exposed habitat at the four study sites/4 in drop in stage) corresponding to 4 in stage drops at USGS gage near Post Falls. The second tier of exposed habitat occurs as flows decrease from 6,000 cfs - 4,500 cfs (25,000 ft^2 /4 in drop in stage) and again from 16,000 cfs – 8,600 cfs A third tier exists at flows ranging from 4,500 cfs – 3,000 cfs and 20,000 cfs - 16,000 cfs (20,000 ft^2 or less/4 in drop in stage).

3.2 Fish Stranding and Habitat Assessment

Because of a much higher than normal runoff during spring of 2011, Avista did not begin to control flow at the project (i.e., flows below 20,000 cfs) during the period when most of the Rainbow trout fry had emerged, and Avista was unable to complete the stranding analysis as planned in 2011. Excessive water flows continued into July of 2011. Avista consulted with the agencies of these conditions and FERC granted an extension of time to complete the assessment on July 5, 2011. Avista completed a comprehensive down-ramping investigation in spring and early summer, 2012, and the results are presented in this report.

3.2.1 2012 Evaluation

Photos depicting the 2012 evaluation are found in Appendix A.

Habitat Assessment

June 23 – 26 Assessment

The April 2012 stream flow forecast for the Spokane River Basin was 119% of average, as provided by the Northwest River Forecast Center; it was also predicting a near normal runoff pattern in the Spokane River Basin. Avista continued to track flow predictions and Rainbow trout fry emergence during the spring of 2012. From these flow predictions, the opportune time for assessment was expected to occur from approximately June 6 through June 12, 2012. Rainbow trout emergence was monitored twice weekly at the survey sites, beginning on May 15. The monitoring of the study sites confirmed fry emergence on June 1, 2012, with many more fry observed on June 4, 2012. Avista organized field crews and prepared for study plan implementation to begin on June 5. In an email dated May 9, Avista informed WDFW, IDFG, USFWS, and Ecology of the potential survey to be conducted starting on June 5, and invited their participation. On June 5, however, excessive precipitation forced a delay in the evaluation and the agencies were notified that Avista was postponing the evaluation until June 14. Avista was staged and ready to conduct the evaluation on the morning of June 14, when once again excessive rain caused the inflow to Lake Coeur d'Alene to substantially increase and Spokane River flows to exceed 21,000 cfs. Therefore, the study was again postponed until flows were under Project control.

Declining water elevations in Lake Coeur d'Alene and Spokane River flow made it possible to conduct the down-ramping and stranding evaluation on June 23 – 26, 2012. Avista began to control water elevations on Lake Coeur d'Alene and Spokane River flow. On June 23, transect lines were established at each of the four sites and one down-ramping event was performed. Down-ramping occurred at several events throughout each day on June 24 and 25, when a survey crew of 4 individuals assessed the water level changes and the area exposed for potential stranding. On June 26, another significant rainfall increased Spokane River flows and forced an end to the down-ramping operations. A total of nine down-ramping events, bracketing flows from 14,000 cfs down to 8,100 cfs, occurred during this time period (see Table 8).

Study Plot Dimensions

Index areas were established at each of the four study sites, representing typical habitat in the down-ramping zones of each site (Figures 2-5; Table 7). The index area at the Murray site was established to include habitat with the presence of cover (trees, rocks and other features) and gently-sloping gravels consistent with the habitat assessment and considered the most likely habitat which Rainbow fry would occupy. The Island Complex was divided into two sections (Index Areas I and II) to include side channels where Rainbow fry were expected to occupy. The index area in the Harvard and Starr sites were established consistent with these criteria.

Table 7. Plot Dimensions and Index Areas for Spokane River Ramping Rate Study

Site	Index Area		Total	% Total
	Linear (ft)	Area Exposed (ft^2)	Area Exposed (ft^2)	
Island Complex - 1	167.6	8,503.6	52,534.5	31.7%
Island Complex - 2	265.0	8,171.0	(both sites)	-
Starr	723.6	29,812.1	46,449.0	64.2%
Murray	225.0	9,223.6	61,595.0	15.0%
Harvard	256.6	4,298.1	6,628.0	64.8%

Down-Ramping Events and Hydrology

A total of 9 (nine) down-ramping events occurred from June 23 – 26, 2012. As water levels were assessed, flags were placed in transect lines to identify the waterline before, and then after each event. An example of the transect setup within an index area is provided in Figure 11.

Figure 11. Flags Denoting Changes in Stage from Down-Ramping Events at the Starr Site

Starting flows in the Spokane River were 14,000 (stage of 14.82 ft as measured at the Post Falls USGS gage) on June 23, and ended June 26, with a flow of 8,170 cfs (stage of 12.03 ft), for an overall drop in flow of 5,830 cfs and 2.79 ft in stage. Average drop in stage for these nine events was .31 ft (3.7 inches) per event, with an average change in flow of 648 cfs. Table 8 summarizes the down-ramping events from July 23-26, 2012. Down-ramping, measured as inches per event, generally decreased in a downstream direction, with mean stage decreases ranging from 3.37 in –

2.38 in moving downstream from Post Falls (Table 9). Figures 12 and 13 depict changes in flow and stage for the June 23-26 period, as measured at the Post Falls USGS gauge.

Table 8. Summary of Adjustments to Spokane River Flow from Post Falls Hydroelectric Project, June 23 – 26, 2012

		Begin		End		Stage Change		
Date	Time	Flow	Stage	Flow	Stage	Ft	In	Event
June 23, 2012	13:00	14,000	14.82			-	-	
	13:30	14,000	14.82	13,700	14.69	0.13	1.6	1
June 24, 2012	07:30	13,700	14.69	13,200	14.47	0.22	2.6	2
	10:10	13,200	14.47	12,900	14.33	0.14	1.7	3
	12:15	12,900	14.33	12,300	14.06	0.27	3.2	4
	21:22	12,300	14.06	11,500	13.69	0.37	4.4	5
June 25, 2012	08:45	11,500	13.69	11,100	13.50	0.19	2.3	6
	10:40	11,100	13.50	10,200	13.06	0.44	5.3	7
	11:30	10,200	13.06	9,550	12.76	0.30	3.6	8
	14:10	9,550	12.76	8,150	12.02	0.74	8.9	9

Table 9. Summary of Water Surface Elevations at Index Sites with Adjustments to Discharge at the Post Falls Hydroelectric Project, June 23 - 26, 2012

				Stage (ft)				
Date	Event	Time	Flow (cfs)	Post Falls	Island	Starr	Murray	Harvard
June 23		13:00	14,000	14.82	2,025.26	2,023.77	2,019.52	2,003.76
	1	13:30	13,700	14.69	2,025.14	2,023.69	2,019.43	2,003.66
June 24	2	7:30	13,200	14.47	2,024.93	2,023.55	2,019.27	2,003.50
	3	10:10	12,900	14.33	2,024.81	2,023.47	2,019.18	2,003.40
	4	12:15	12,300	14.06	2,024.56	2,023.30	2,018.98	2,003.21
	5	21:22	11,500	13.69	2,024.22	2,023.06	2,018.71	2,002.95
June 25	6	8:45	11,100	13.50	2,024.05	2,022.94	2,018.57	2,002.83
	7	10:40	10,200	13.06	2,023.66	2,022.66	2,018.25	2,002.53
	8	11:30	9,550	12.76	2,023.37	2,022.45	2,018.00	2,002.32
	9	14:10	8,150	12.02	2,022.72	2,021.98	2,017.44	2,001.86
		15:20	8,210	12.05	2,022.75	2,022.00	2,017.44	2,001.86
June 26		7:30	8,170	12.03	2,022.73	2,021.98	2,017.45	2,001.87
Change			5,830	2.79	2.53	1.79	2.07	1.89
Mean (ft)				0.31	0.28	0.20	0.23	0.21
Mean (in)				3.72	3.37	2.38	2.76	2.52

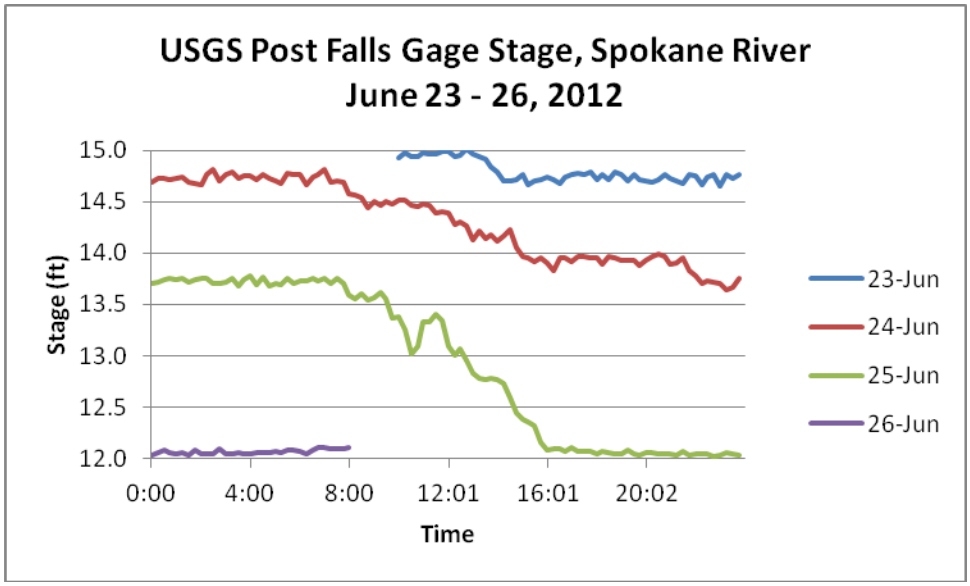

Figure 12. Stage Height at the Post Falls USGS Gage, June 23 – 26, 2012

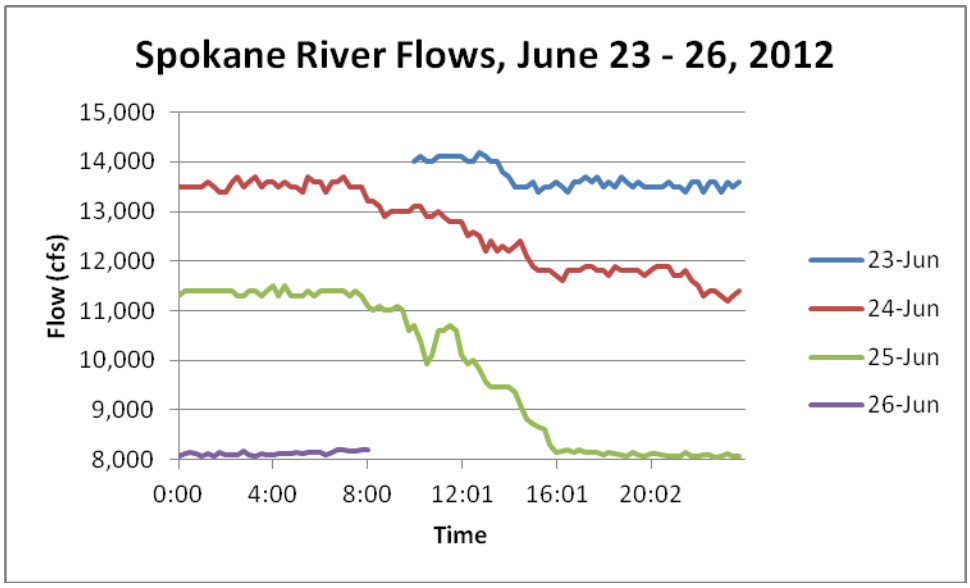

Figure 13. Flows at the Post Falls USGS Gage, June 23 – 26, 2012

Tables 10 through 14 provide a summary of those metrics evaluated at the four index sites. Overall, there were nine different down-ramping events. At the Island Complex sites, however, there was no distinct break in flow and stage between Down-Ramping Events 5 and 6; as a result, the measurements taken after Down-ramping Event 6 show the cumulative change from both of these drawdown events.

Table 10. Summary of Down-Ramping Events, Island Complex No. 1

Station	Start	Down-Ramping Event (distance to tape - ft)[1/]								
-	-	1	2	3	4	5	6	7	8	9
15.0	N/A	2.08	0.75	8.67	2.67	N/A	5.92	1.58	2.58	1.50
48.7	43.05	4.58	4.71	5.58	4.00	N/A	11.33	4.33	6.71	3.83
78.9	39.20	3.50	8.63	12.02	4.00	N/A	23.88	7.88	8.83	6.71
154.5	30.40	4.00	2.29	3.92	3.08	N/A	37.50	4.63	17.17	4.04
167.6	33.55	0.75	0.50	5.67	5.25	N/A	14.96	2.33	0.50	0.83
PP2[2/]		3.25	1	3.5	1.42	N/A	4.46	7.17	2.42	3.50
Stage	37.25	37.05	36.88	36.58	36.35	N/A	35.73	35.40	35.15	34.88
Time	13:29	16:00	9:09	13:53	16:07	N/A	11:03	14:08	15:42	17:19
Flow	14000	13,700	13,200	12,900	12,300	11,500	11,100	10,200	9,550	8,150
Date	06/23/12	06/23/12	06/24/12	06/24/12	06/24/12		06/25/12	06/25/12	06/25/12	06/25/12
Fry	0	0	0	0	0	N/A	0	0	0	0
Mean drawdown:		2.98	3.38	7.17	3.80	N/A	18.72	4.15	7.16	3.38
Length:		167.60	167.60	167.60	167.60	N/A	167.60	167.60	167.60	167.60
Area:		500	566	1,202	637	N/A	3,137	696	1,200	567
Total horizontal shoreline exposed (ft):										50.74
Total area exposed at index site (ft^2):										8,504
Total habitat modeled at Island Complex No. 1 (ft^2):										52,535
Percent sampled of total at site:										16.2%
[1/] Incremental distance from initial measurement or the previous down-ramping event										
[2/] Photo Point 2; located on opposite bank of Island Complex No. 1										

Table 11. Summary of Down-Ramping Events, Island Complex No. 2

Station	Start	Down-Ramping Event (distance to tape - ft) [2/]								
-	-	1	2	3	4	5	6	7	8	9
0.00	6.92	0.71	0.27	0.67	0.50	N/A	0.75	0.17	0.50	0.33
12.30	8.50	0.42	0.29	0.42	0.33	N/A	0.58	0.21	0.38	0.33
52.80	12.00	0.60	0.58	1.17	1.33	N/A	2.63	0.67	0.79	0.96
91.00	20.00	1.08	0.79	4.58	1.88	N/A	5.29	3.17	0.58	1.17
97.50	21.00	1.85	1.83	2.25	2.75	N/A	5.29	2.13	1.67	1.83
150.00	23.10	2.63	5.08	2.67	1.92	N/A	9.71	2.42	1.33	6.54
167.50	19.00	3.40	1.83	16.42	23.50	N/A	6.67	2.58	0.88	5.88
172.00	9.20	1.00	0.33	3.92	0.00	N/A	0.00	0.00	0.00	0.00
190.00	10.60	2.33	3.67	32.00	0.00	N/A	0.00	0.00	0.00	0.00
191.00	5.70	5.08	0.63	28.60	3.25	N/A	5.38	9.17	3.00	1.00
210.50	17.20	1.13	4.54	2.38	1.67	N/A	3.88	2.83	2.25	16.17
226.10	19.65	0.85	4.58	2.05	1.42	N/A	6.33	9.92	18.00	6.42
265.00	17.45	5.81	1.50	13.83	2.38	N/A	27.86	2.17	13.00	3.38
Stage	52.85	52.71	52.6	52.41	52.25	N/A	51.86	51.68	51.5	51.3
Time	13:38	15:40	9:09	13:57	16:11	N/A	11:07	14:14	15:41	17:35
Flow	14,000	13,700	13,200	12,900	12,300	11,500	11,100	10,200	9,550	8,150
Date	06/23/12	06/23/12	06/24/12	06/24/12	06/24/12	06/25/12	06/25/12	06/25/12	06/25/12	06/25/12
Fry	0	0	1	0	0	N/A	0	0	0	0
Mean drawdown:		2.07	2.00	8.53	3.15		5.72	2.72	3.26	3.38
Length:		265.00	265.00	265.00	265.00		265.00	265.00	265.00	265.00
Area:		548.26	528.73	2,261.50	834.07		1,515.80	721.96	863.80	896.92
Mean horizontal shoreline exposed (ft):										30.83
Total area exposed at index site (ft^2):										8,171
Total habitat modeled at Island Complex No. 2 (ft^2):										52,535
Percent sampled of total at site:										15.55%
[1/] Incremental distance from initial measurement or the previous down-ramping event										

Table 12. Summary of down-ramping events, Starr Road site

Station	Start	Down-Ramping Event (distance to tape - ft) [1/]								
-	-	1	2	3	4	5	6	7	8	9
51.00	25.30	2.33	18.46	13.21						
101.00	27.40	3.75	3.67	6.88	3.08	4.00	3.33			
140.70	13.70	5.40	1.50	4.79	2.42	7.00	2.83	7.25	8.92	8.67
182.40	18.00	2.29	1.71	5.04	5.08	5.38	2.13	4.13	3.50	2.33
228.70	9.50	2.67	1.75	2.33	2.17	6.38	1.42	4.83	3.96	2.00
271.70	9.45	1.44	1.38	2.83	1.92	3.21	1.13	5.17	3.33	2.83
323.45	3.95	1.96	1.75	3.08	1.79	6.21	3.08	13.42	4.13	2.42
355.40	10.92	1.33	1.33	4.29	5.17	3.00	2.42	8.33	4.63	2.42
382.10	12.25	1.50	1.96	4.25	2.00	3.25	3.46	5.17	3.00	2.17
92.00	-7.95	7.95	1.08	20.17	6.92	12.17	7.75	23.00	14.25	5.83
130.80	0.25	3.08	2.79	5.00	14.83	16.96	3.50			
189.00	27.80	5.25	13.83	15.17	4.58	8.33	1.67	8.75	5.50	1.75
229.30	57.40	3.88	5.67	26.67	3.58	7.75	1.50	4.58	6.21	2.42
255.70	50.80	3.48	1.50	25.83	15.75	10.96	1.88	5.00	5.33	3.92
301.60	29.90	1.29	1.21	20.18	13.67	11.96	1.25	3.13	2.42	1.42
Delta that appeared at lower flows										
190.00							8.13	6.75	3.42	3.50
230.00							5.08	17.04	8.00	1.67
Stage	43.29	43.13	42.98	42.73	42.55	42.2	42.11	41.73	41.47	41.32
Time	11:49	16:52	10:00	14:48	16:46	10:38	12:02	14:38	16:25	17:52
Flow	14,000	13,700	13,200	12,900	12,300	11,500	11,100	10,200	9,550	8,150
Date	06/23/12	06/23/12	06/24/12	06/24/12	06/24/12	06/25/12	06/25/12	06/25/12	06/25/12	06/25/12
Fry	0	0	0	0	0	0	0	0	0	0
Mean drawdown:		3.17	3.97	10.65	5.93	7.61	3.16	8.32	5.47	3.10
Length:		683.70	683.70	683.70	582.70	582.70	491.00	486.00	486.00	486.00
Area:		2,169.42	2,715.81	7,280.11	3,452.84	4,434.42	1,551.00	4,045.66	2,658.54	1,504.29
Mean horizontal shoreline exposed (ft):										51.38
Total area exposed at index site (ft^2):										29,812
Total habitat modeled at Starr Road (ft^2):										46,449
Percent sampled of total at site:										64.18%
[1/] Incremental distance from initial measurement or the previous down-ramping event										

Table 13. Summary of Down-Ramping Events, Murray Road Site

Station	Start	Down-Ramping Event (distance to tape - ft) [1/]								
-	-	1	2	3	4	5	6	7	8	9
9.8	12.50	2.10	8.17	13.67	1.38	4.38	13.83	6.54	8.08	1.92
58.2	10.92	1.67	2.13	2.92	3.88	7.46	4.25	11.38	16.13	7.48
107.0	7.83	1.38	1.83	4.83	3.71	2.33	1.83	5.67	10.08	1.29
158.0	11.58	3.75	2.67	4.17	3.83	3.67	3.83	7.67	5.58	1.25
220.7	13.50	1.58	1.92	3.50	2.25	2.58	4.63	6.29	4.92	1.13
225.0	11.75	1.92	1.50	4.67	2.92	3.92	2.92	6.08	5.29	1.25
Stage	33.05	32.90	32.73	32.45	32.25	32.00	31.81	31.35	31.00	30.84
Time	12:13	17:48	10:30	15:14	17:09	9:58	12:30	15:06	16:45	18:12
Flow	14,000	13,700	13,200	12,900	12,300	11,500	11,100	10,200	9,550	8,150
Date	6/23/12	6/23/12	6/24/12	6/24/12	6/24/12	6/25/12	6/25/12	6/25/12	6/25/12	6/25/12
Fry	0	0	0	0	0	0	0	0	0	0
Mean drawdown:		2.07	3.03	5.63	2.99	4.06	5.22	7.27	8.35	2.39
Length:		225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00	225.00
Area:		464.84	682.81	1,265.63	673.44	912.50	1,173.44	1,635.94	1,878.13	536.88
Mean horizontal shoreline exposed (ft):										40.99
Total area exposed at index site (ft^2):										9,224
Total habitat modeled at Murray Road (ft^2):										61,595
Percent sampled of total at site:										15.00%
[1/] Incremental distance from initial measurement or the previous down-ramping event										

Table 14. Summary of Down-Ramping Events, Harvard Road Site

Station	Start	Down-Ramping Event (distance to tape - ft) [1/]								
-	-	1	2	3	4	5	6	7	8	9
5.6	30.80	0.83	1.08	1.71	1.42	1.58	1.67	3.42	3.58	2.83
51.5	17.40	1.25	1.58	3.54	2.50	3.33	2.75	5.58	2.67	2.21
89.3	23.70	1.50	0.67	1.58	1.17	1.17	1.42	2.88	2.83	2.46
136.4	16.80	1.42	1.54	0.25	2.67	2.33	2.83	1.79	1.63	0.75
137.3	17.30	2.50	1.83	3.33	1.88	1.33	1.08	1.63	1.58	0.83
173.8	118.40	0.92	0.38	1.42	1.00	1.25	1.33	1.83	1.25	1.50
216.5	12.65	1.08	0.58	1.88	1.04	1.42	1.46	4.54	2.38	1.83
256.6	11.10	1.17	1.00	2.54	1.67	1.42	2.21	4.00	1.75	0.75
Stage	93.24	93.09	92.95	92.68	92.47	92.24	92.03	91.66	91.35	91.2
Time	12:39	18:14	10:39	15:03	17:07	9:58	12:27	15:04	16:45	18:10
Flow	14,000	13,700	13,200	12,900	12,300	11,500	11,100	10,200	9,550	8,150
Date	6/23/12	6/23/12	6/24/12	6/24/12	6/24/12	6/25/12	6/25/12	6/25/12	6/25/12	6/25/12
Fry	0	0	0	0	0	0	0	0	0	0
Mean drawdown:		1.33	1.08	2.03	1.67	1.73	1.84	3.21	2.21	1.65
Length:		256.60	256.60	256.60	256.60	256.60	256.60	256.60	256.60	256.60
Area:		342.13	277.98	521.22	427.67	443.70	473.11	823.26	566.66	422.32
Mean horizontal shoreline exposed (ft):										16.75
Total area exposed at index site (ft^2):										4,298
Total habitat modeled at Harvard Road (ft^2):										6,628
Percent sampled of total at site:										64.85%
[1/] Incremental distance from initial measurement or the previous down-ramping event										

Mean horizontal distance of exposed varial zone ranged from a low of 16.75 ft at the Harvard Road site, to over 51 ft as measured at the Starr Road site. The Harvard Road site had a more steeply-sloped bank, which resulted in less horizontal distance of shoreline being exposed when compared to the other sites.

Table 15 provides the mean change in stage at the index sites from a 4-in drop in surface elevation at the Post Falls USGS gage. Stage change at all downstream index sites was less than the 4 in drop in stage at Post Falls. This is due to the increased channel width of the Spokane River at the downstream sites. The sites are several miles downstream of the Post Falls USGS gage and it takes an hour or more, depending on flow, for changes to occur at the downstream sites. In addition, stage changes at the study sites were gradual.

Table 15. Mean Change in Stage at Index Sites with 4 Inch Drop as Measured at the Post Falls Gage

	Average Change in Stage (inches)			
Flow (cfs)	**Island**	**Starr**	**Murray**	**Harvard**
20,000 - 16,000	3.92	2.54	2.81	2.59
16,000 - 12,000	3.78	2.56	2.91	2.98
12,000 - 8,000	3.64	2.63	3.08	2.60
8,000 - 4,000	3.28	2.62	3.19	3.30
4,000 - 2,000	3.06*	2.80	3.68	1.97*
*For flows from 4,000 cfs – 2,450 cfs for Harvard and Island Complex sites.				

Stranding Assessment

June 23 – 26

Beginning May 15, Avista staff surveyed the Starr, Murray, and Harvard Road sites for Rainbow trout fry emergence. High waters precluded surveying the Island Complex sites; however, the shoreline area immediately adjacent to the index sites was observed for the presence of fry. Fry were observed at each of the four sites on June 1, with many more fry observed at all sites on June 4. Rainbow trout fry were observed in the nearshore areas throughout the period leading up to, and during the assessment dates.

Rainbow trout fry were observed in the near-shore area of all study sites and index areas during all down-ramping events during the June 23 – 26 period. Of particular note were several hundred fry observed near shore at the Starr Road site for every down-ramping event. None of these fish, however, was observed to be stranded. Rainbow trout fry were mobile and moved readily throughout the nearshore habitats. As water levels gradually decreased, fry would follow water levels into deeper areas.

Each study site and index area was visited during each down-ramping event over the 4-day period. Two teams of two biologists each would visit separate index sites to more efficiently cover the survey area during, and/or immediately after water surface elevation was found to decline. The newly exposed habitat was carefully approached and walked over the entire index area length to see if any rainbow trout fry or other species had become stranded. Previous investigations on stranding and trapping indicated that on finer substrates fish are not likely to hide but can be exposed to predators and can quickly be removed (Anglin et al. 2006). Anglin et al. also showed that fish can hide within interstices of larger substrate classes (e.g. cobble, boulder) or hide in isolated pools. During this study care was taken when approaching the nearshore areas to not disturb the site. Birds (robins, starlings, etc.) were noted, but were not observed to be preying on fry. Substrate composition at the index sites was primarily gravels, so hiding was not expected. As the newly exposed habitat was assessed, however, some of the gravels and larger substrates were turned to see if any fry or other species had become hidden or buried in the substrate. Pools or vegetative cover were not common at the sites, but when encountered, were carefully approached and observed during the survey.

One wild Rainbow trout fry was found entrapped (i.e., stranded in an isolated pool, separated from the main river with a minimum wetted surface area of one square meter, that result from

streamflow reductions) (Anglin et al. 2006) during Down-Ramping Event 2 at Island Complex Index Area 2. This fry was found in a small pool that was isolated when flows dropped from 13,700 cfs to 13,200 cfs (Figure 14). This fish was removed from the pool and released into the central channel at the complex. This was the only stranded Rainbow trout fry observed during the entire June 23 – 26 period. A few non-salmonid fry were also observed in this pool.

Figure 14. Isolated Pool at Island Complex 2 with One Stranded Rainbow Trout Fry

3.2.2 Preliminary and Supplemental Assessments

Avista was able to complete a preliminary habitat and stranding assessment in 2011 and a supplemental assessment was also completed in July of 2012. These assessments followed a similar methodology as the 2012 evaluation to assess the newly dewatered habitat associated with down-ramping events at the established study sites. These assessments were performed to gain additional information and observation over a wider range of flows and run-off conditions. The preliminary assessment performed in 2011 also helped establish survey technique and index area dimensions. Following are the results of these assessments.

2011 Preliminary Habitat Assessment

Avista examined the results of two down-ramping events in 2011: one on June 29 - 30, and again on July 15. Avista began to close spill gates at the Post Falls Dam on the evening of June 27, 2011. On June 29, 2011 the Harvard, Murray, and Starr Road sites were assessed for habitat dewatering. The Island Complex site was not accessible due to high water flows and was not assessed. Flags were installed at water edge at different times during the survey period to capture the amount of newly exposed habitat from water elevation changes. Two sets of flags were installed at the Harvard and Murray Road sites and 3 sets of pins were installed at Starr Road (examples of the measurements see Photos 1, 2 and 3 in Appendix B). Flags are identified in an

upstream to downstream manner (A, B). USGS gage data show flows ranged from 15,800 cfs at 0900 on June 29 to 14,900 cfs at 0930 on June 30, 2011. Table 16 provides the results of the habitat assessment.

Table 16. June 29 – 30, 2011 Assessment: Change in Horizontal Length with Reduction in Stage at Harvard, Starr, and Murray Road sites. Decrease in Flow from 15,800 cfs to 14,900 cfs

Habitat	Pin 1 (Time June 29)	Length (in)	Pin 2 (time)	Length (in)	Pin 3 (Time)	Length (in)	Pin 4 (Time June 30)
Harvard Rd							
Pin A	10:00	10.0	12:30	17	15:30	10	09:00
Pin B	10:02	9.5	12:31	12	15:31	12	09:01
Starr Rd							
Pin A	10:30	12.0	11:30	20	14:42	21	09:20
Pin B	10:33	0	11:31	10	14:44	28	09:21
Pin C	10:35	13.0	11:33	17.5	14:45	51.5	09:23
Murray Rd							
Pin A	10:15	11.0	11:45	16	15:00	8	09:45
Pin B	10:16	6.0	11:46	12	15:02	20	09:47

A second assessment was conducted on July 15, 2011, with results found in Table 17. This assessment included all four habitat sites from flows that ranged from 7,300 cfs to 6,840 cfs as measured at the USGS gage near Post Falls. Local stage height at the survey sites was not measured in 2011.

2011 Preliminary Stranding Assessment

The newly exposed shoreline was walked during each visit to observe for possible fish stranding. No stranding of any fish species was observed in the newly-exposed habitat during this survey. Rainbow trout fry were observed in the near shore areas at all three study sites assessed. Several different species of fish were observed in the near shore areas including crayfish (*Pacifastacus leniusculus)*, Smallmouth bass (*Micropterus dolomieu*), Tench (*Tinca tinca*), Rainbow trout fry, Pumpkinseed (*Lepomis gibbosis*), and numerous other fry believed to be sucker (*Catostomus spp.*).

A second assessment was conducted on July 15, 2011(Table 17). No stranding of any fish species was observed in the newly exposed habitat during this survey at any of the four sites. The potential stranding, however, of several fry, believed to be suckers, were observed in a nearly isolated pool at the Starr Road site during the 12:22 pm survey (picture Appendix B). *[Note: Avista has further researched identification of these fry and cannot confirm if they are sucker species]*. No rainbow trout fry were observed in the near shore areas during this second assessment.

Table 17. July 15, 2011 Assessment: Changes in Horizontal Length with Reduction in Stage at all Four Index Sites - Flows Ranged from 7,300 to 6,840 cfs

Habitat	Pin 1 (Time)	Length (in)	Pin 2 (time)	Length (in)	Pin 3 (Time)
Harvard Rd					
Pin A	07:51	13.0	12:01	-	-
Pin B	07:51	11.0	12:00	-	-
Starr Rd					
Pin A	07:30	0.0	09:13	12.0	12:26
Pin B	07:30	35.0	09:14	19.0	12:22
Pin C	07:31	17.0	09:15	11.0	12:18
Murray Rd					
Pin A	08:01	23.0	12:44	-	-
Pin B	08:02	16.5	12:42	-	-
Island Complex					
Pin A	07:15	19	09:54	0.0	11:30
Pin B	07:01	43	10:03	0.0	11:35
Pin C	07:04	13	11:33	0.0	11:35

2012 Supplemental Habitat Assessment:

One additional down-ramping event was evaluated on July 2, 2012 by Avista staff. This assessment was performed between 06:30 when the Post Falls gage height was 11.74 ft, with a corresponding discharge of 7,550 cfs, and 09:30, when the Post Falls stage of 11.45 ft and a flow of 7,060 cfs. Total change in discharge and stage was 490 cfs and 3.48 in, respectively. Avista conducted a down-ramping event and measured the corresponding results at the four study sites downstream (Table 18). Average change in stage at the four sites was 1.90 in, ranging from 1.20 in to 3.00 in. Photographs of the habitat site are available in Appendix C.

2012 Supplemental Stranding Assessment:

Emerged Rainbow trout fry were observed in the near-shore areas at all four sites during the supplemental assessment. No Rainbow trout fry were found stranded during the down-ramping event on the morning of July 2, 2012.

Table 18. Summary of July 2, 2012 Supplemental Down-Ramping Assessment

	Flows			Stage			Exposed (ft)	
Site	Begin	End	Change	Begin (ft)	End (ft)	Change (in)	Bank (ft)	Area (ft2)
Post Falls	7,550	7,060	490	11.74	11.45	3.48	N /A	N /A
Island No. 1	7,550	7,060	490	45.53	45.43	1.20	1.11	186
Island No. 2	7,550	7,060	490	50.97	50.86	1.32	1.45	384
Starr Road	7,550	7,060	490	41.07	40.90	2.04	3.25	1,580
Murray Road	7,550	7,060	490	30.60	30.35	3.00	2.78	625
Harvard Road	7,550	7,060	490	N/A	N/A	1.92*	2.19	563
*Staff gage had been removed. Estimated from stage-discharge relationship at Harvard Road site								

SECTION 4
DISCUSSION

4.0 Discussion

The 4-in per hour down-ramp requirement was included in the License (Appendix A, Section VI) to improve the protection of fishery resources from previous license conditions. The FERC Final Environmental Impact Statement (FEIS 2007) discussed that the Spokane River is unique in that down-ramping typically occurs infrequently throughout the year, usually only once during a season. Avista operates the Post Falls HED in a free-flow condition through spring until inflows to Lake Coeur d'Alene decline and result in decreasing outflows to the Spokane River. The Post Falls HED then begins to control discharge flows, not only according to the Upper Spokane River Rainbow Trout Spawning and Fry Emergence Monitoring and Protection Plan, but also to achieve normal full pool elevation at Lake Coeur d'Alene as early as practicable each year as required by the FERC License Condition Appendix A, I.

The License also includes Article 404, which was to conduct this ramping rate evaluation. Therefore, a series of down-ramping events were scheduled and implemented by Avista during the 2011 and 2012 periods when wild Rainbow trout fry were observed in the near-shore varial zone, and when Avista controlled water discharge of the project (i.e., flows of less than 20,000 cfs). This down-ramping assessment was developed in consultation with the natural resource agencies and remained consistent with the approved study plan.

Habitat modeling at the four study sites determined that a tiered range of flows existed between 20,000 cfs and 2,000 cfs, when the greatest amount of habitat is exposed during flow reduction and when the Post Falls HED has ability to influence flow (Section 3.1.2). From the habitat modeling, the most habitat was dewatered between a general flow range of 16,000 cfs to 4,500 cfs. Over the two year (2011 and 2012) period, down-ramping flows were evaluated in the following ranges:

- 15,800 cfs – 14,900 cfs (2011)
- 14,000 cfs – 8,170 cfs (2012)
- 7,550 cfs – 7,060 cfs (2012)
- 7,300 cfs – 6,840 cfs (2011)

These flow ranges encompass a majority of discharges shown to yield the largest areas of dewatered habitat, which create the greatest potential for stranding.

The modeling and study site measurements of the study also found that a 4 in drop in stage at the Post Falls HED results in less than a 4 in decrease in water levels at downstream survey sites, where rainbow trout fry were most susceptible to stranding (see Table 15). This attenuated flow is mainly due to channel morphology as well as the travel time required for flow changes to affect habitat a few miles downstream. Additionally, this study found that down-ramp changes are gradual and occur over an hour in downstream habitats. This finding helps confirm the previous assessment that flow and stage changes are moderated by the time they reach the sites. The

attenuated flow and the gradual change in water elevation appear to provide adequate time for Rainbow trout fry and other species to navigate to river connected water.

In 2011, no Rainbow trout fry were observed to be stranded; in 2012, only one Rainbow trout fry was observed to be stranded during 9 down-ramping events over a three-day period. An additional stranding assessment conducted on July 2, also found no Rainbow trout fry being stranded. The results of this stranding evaluation found that the numerous Rainbow trout fry occupying the nearshore areas were able to avoid stranding during Project-related down-ramp occurrences.

Other investigations of stranding and entrapment, notably in the Hanford Reach, indicate that, *"Fish stranded on substrates … are inherently difficult to find (i.e., detectability is low, even when fish are present). On larger substrates fish tend to migrate downwards as the water recedes, requiring excavation of the site to locate dead fish. On finer substrates, fish are exposed to predators and are often quickly removed"* (Anglin et al. 2006). Anglin et al. (2006) also indicated that a large portion of the fish were subject to entrapment, which was defined as isolated pools, separated from the main river with a minimum wetted surface area of one square meter, that result from streamflow reductions. This study utilized four biologists working in teams visiting each habitat site either during or immediately after dewatering. The gravel habitat did not appear to provide hiding habitat for fry, and most were observed following the water levels during down-ramping. Also, during the stranding assessments substrate was turned and found no hiding of Rainbow trout fry. Birds were present in the areas but no predation on fry was observed.

Entrapment pools were not common during the down-ramping studies on the Spokane River; however, the only Rainbow trout fry observed to be stranded was found in one of these pools at the Island complex. As noted earlier, Avista observed Rainbow trout fry in the varial zone at all sites, but these fry avoided shoals that were becoming exposed. Substrates consisted primarily of fines and armored, consolidated gravels and cobbles; however, cobbles at the Harvard site were unconsolidated, increasing the risk of fish migrating downward and not being observed. Although Avista did periodically overturn substrates on the exposed banks (with no observations of fish) and predation was not noted at the sites, some fish mortalities most likely did occur and our stranding estimates may be low.

Changes in river flow are a normal and natural occurrence in all river systems, and the Spokane River is known to have considerable changes in flow over short periods of time that occur naturally . This evaluation focused on the potential effects of the License down-ramping condition on habitat and any potential stranding on Rainbow trout fry. Study sites were established in areas of known and expected rainbow trout spawning and where rainbow fry were most likely to occupy. Modeling developed stage changes at the study sites with flow reductions at Post Falls HED, and established a range of flows when down-ramping exposed habitat area that could potentially strand Rainbow trout fry. Field surveys were then conducted during several Project related down-ramping events to identify if any stranding of Rainbow trout fry occurred.

This comprehensive evaluation found the effects of Post Falls HED down-ramping are attenuated by the time flows reach the important habitats downstream at the study sites. A down-ramp of 4 in at the Post Falls gage has a smaller change in stage and is more gradual at the study sites. Additionally, the numerous Rainbow trout fry present in the shoreline areas of the study site seem to be able to successfully navigate away from potential stranding during down-ramping events. Analyzing all the available data and the findings of this evaluation indicate the License condition, with a no greater than 4 inch per hour down-ramping rate at the Post Falls HED, is viable in protecting Rainbow trout fry in the Spokane River, which serves as the primary objective of the study.

SECTION 5
LITERATURE CITED

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APPENDIX A

2012 SURVEY PHOTOGRAPHS

JUNE 23 – 26, 2012

Photo 1. Rainbow Trout Fry captured in varial zone.

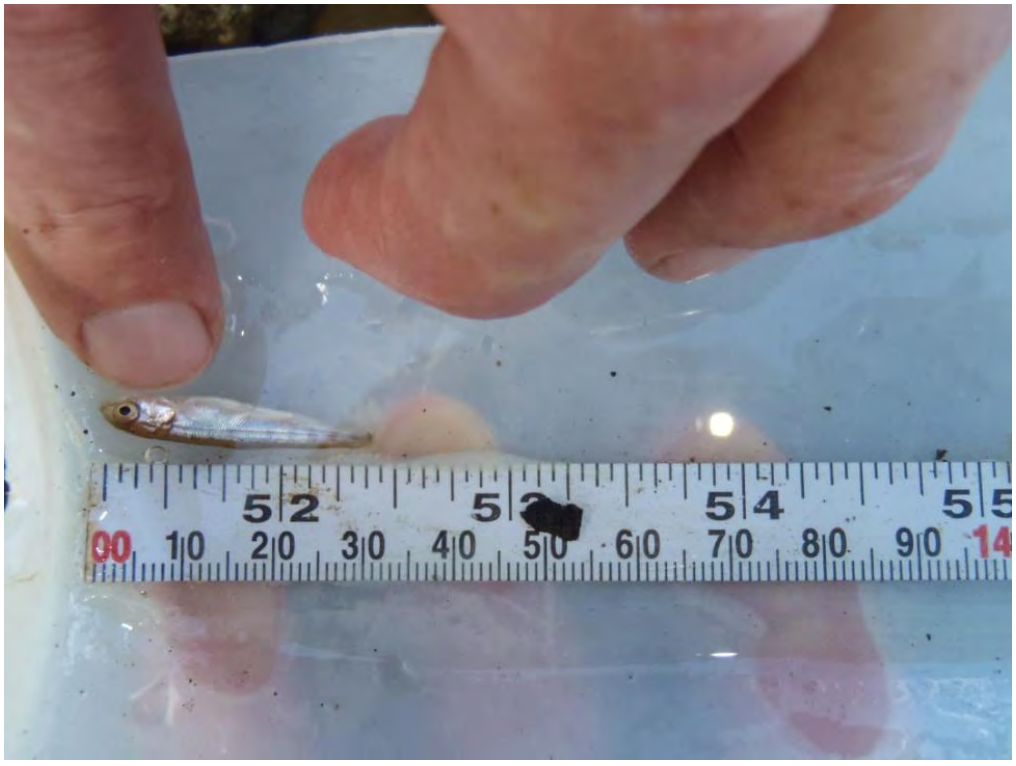


Photo 2. Rainbow Trout Fry found in entrapment pool

Photo 3. Typical substrate at Island Complex (1)

Photo 4. Island Complex (1).

Photo 5. Island Complex (2)

Photo 6. Starr Road Site: isthmus exposed at lower flows.

Photo 7: Lower Star Road site.

Photo 8. Upper Starr Road site.

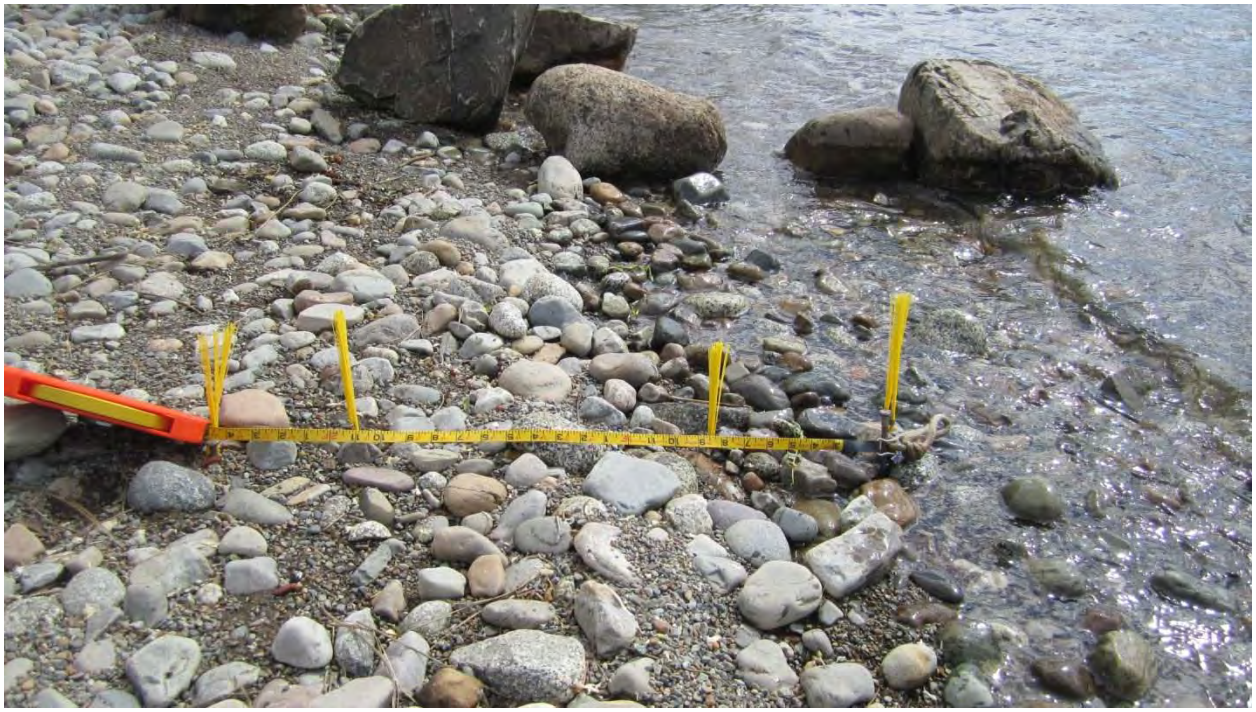
Photo 9. Murray Road site.

Photo 10. Harvard Road site.

APPENDIX B

2011 SUPPLEMENTAL SURVEY PHOTOGRAPHS

June 2011 Assessment



Pins A Murray Road

Pins A Harvard Road

Pins B Harvard Road

Pins A Starr Road

Non-salmonid Fry (considered to be Sucker Fry (spp)

Rainbow Trout Fry

July 2011 Assessment

Pins A Islands Complex

Pins B Islands Complex

Pins C Islands Complex

Islands Complex Lower Side Channel Looking Downstream from Pins C

Pins B Starr Road

Pins A Murray Road

Murray Road Habitat

APPENDIX C

2012 SUPPLEMENTAL SURVEY PHOTOGRAPHS

Photo 1. Murray Road

Photo 2: Harvard Road

Photo 3: Starr Road: isthmus

Photo 4: Islands Complex (1)

Photo 5: Islands Complex (2)

Photo 6: Islands Complex (2)

Photo 7: Lower Starr Road site

Photo 8: Harvard Road site

APPENDIX B

PART I
CONSULTATION RECORD ON RAMPING RATE EVALUATION REPORT (REPORT)

PART II
CONSULTATION RECORD ON RAMPING RATE EVALUATION AND RAINBOW TROUT FRY STRANDING STUDY (STUDY)

PART I
CONSULTATION RECORD ON RAMPING RATE EVALUATION REPORT (REPORT)

Avista's Letter to IDFG - Request for Comments on the Report

November 8, 2012

Jim Fredericks
Regional Fishery Manager, Panhandle Region
Idaho Department of Fish and Game
2885 W. Kathleen Avenue
Coeur d'Alene, Idaho 83815

Subject: Spokane River Project, FERC Project No. 2545, License Article No. 404 "Ramping Rate Evaluation Report"

Dear Mr. Fredericks:

On September 7, 2012 Avista requested comments and recommendations from the Idaho Department of Fish and Game (IDFG), the U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) pertaining to the "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study). The Study, which was conducted in accordance with Article 404 of our Spokane River Project License (License), assessed potential Rainbow trout fry stranding in the Spokane River associated with the four-inch per hour down-ramping rate at our Post Falls Hydroelectric Development (HED), is included in the enclosed Ramping Rate Evaluation Report (Report).

The purpose of the Report is to determine if any of the three agencies believed, based on the results of the Study, that more restrictive ramping rates are necessary to protect newly emergent Rainbow trout fry downstream of the Post Falls HED. None of the agencies that Avista consulted with recommended more restrictive ramping rates. Instead, IDFG believed the four-inch per hour ramping rate was adequate and the USFWS believed it was effective at protecting Rainbow trout fry in the Spokane River. The WDFW provided editorial comments on the Study, which has been revised accordingly. The revisions to the Study that addressed WDFW's comments did not substantially alter it or change the findings, which indicate the four-inch per hour ramping rate is protective of Rainbow trout fry. The consultation record with all three agencies is included in Appendix B of the Report.

The Report was also to include agency recommendations, if they had any, for more restrictive ramping rates, based on the outcome of the Study. If more restrictive rates were recommended, Avista was to provide the associated costs for reduced power generation and for construction costs needed to comply with the more restrictive ramping rates. Since none of the agencies recommended more restrictive rates, Avista has not included potential costs for reduced power generation or for construction in the Report.

Avista is required to submit the Report to FERC prior to December 31st of this year; however, we must first submit it to you for a 30-day review and comment period. With this, please provide me with any comments that you may have pertaining to the Report by December 10, 2012.

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

800.227.9187
www.avistautilities.com

If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

Enclosure

cc: Rick Donaldson, USFWS (without enclosure)
Graham Simon, WDFW (without enclosure)
Bob Steed, IDEQ (without enclosure)
Speed Fitzhugh, Avista (without enclosure)

IDFG's Comments on the Report

Vore, Tim

From: Fredericks,Jim [jim.fredericks@idfg.idaho.gov]
Sent: Monday, November 19, 2012 3:55 PM
To: Vore, Tim
Cc: Goloborodko, Yelena; Fitzhugh, Speed (Elvin); Robert.Steed@deq.idaho.gov
Subject: RE: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Review and Comment

Tim,
I received the Ramping Rate Evaluation Report and cover letter. I have reviewed the report and have no comments.

Thank you,

Jim Fredericks
Regional Fishery Manager, Panhandle Region
Idaho Department of Fish and Game
2885 W. Kathleen Ave.
Coeur d'Alene ID 83815
(208) 769-1414
jim.fredericks@idfg.idaho.gov

From: Vore, Tim [mailto:tim.vore@avistacorp.com]
Sent: Friday, November 09, 2012 9:46 AM
To: Fredericks,Jim
Cc: Goloborodko, Yelena; Fitzhugh, Speed (Elvin); Robert.Steed@deq.idaho.gov
Subject: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Review and Comment

Good morning Mr. Fredericks,

Please see the attached cover letter and "Spokane River Ramping Rate Evaluation Report." We would appreciate any comments you may have by December 10, 2012.

If you have any questions, please contact me at (509) 495-8612.

Thank you,
Tim Vore | Avista Corp.
PO Box 3727 MSC-1, Spokane, WA 99220
509.495.8612 | tim.vore@avistacorp.com

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Avista's Letter to USFWS - Request for Comments on the Report

November 8, 2012

Rick Donaldson
Northern Idaho Field Office
U.S. Fish and Wildlife Service
11103 E. Montgomery Drive
Spokane Valley, WA 99206

Subject: **Spokane River Project, FERC Project No. 2545, License Article No. 404 "Ramping Rate Evaluation Report"**

Dear Mr. Donaldson:

On September 7, 2012 Avista requested comments and recommendations from the Idaho Department of Fish and Game (IDFG), the U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) pertaining to the "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study). The Study, which was conducted in accordance with Article 404 of our Spokane River Project License (License), assessed potential Rainbow trout fry stranding in the Spokane River associated with the four-inch per hour down-ramping rate at our Post Falls Hydroelectric Development (HED), is included in the enclosed Ramping Rate Evaluation Report (Report).

The purpose of the Report is to determine if any of the three agencies believed, based on the results of the Study, that more restrictive ramping rates are necessary to protect newly emergent Rainbow trout fry downstream of the Post Falls HED. None of the agencies that Avista consulted with recommended more restrictive ramping rates. Instead, IDFG believed the four-inch per hour ramping rate was adequate and the USFWS believed it was effective at protecting Rainbow trout fry in the Spokane River. The WDFW provided editorial comments on the Study, which has been revised accordingly. The revisions to the Study that addressed WDFW's comments did not substantially alter it or change the findings, which indicate the four-inch per hour ramping rate is protective of Rainbow trout fry. The consultation record with all three agencies is included in Appendix B of the Report.

The Report was also to include agency recommendations, if they had any, for more restrictive ramping rates, based on the outcome of the Study. If more restrictive rates were recommended, Avista was to provide the associated costs for reduced power generation and for construction costs needed to comply with the more restrictive ramping rates. Since none of the agencies recommended more restrictive rates, Avista has not included potential costs for reduced power generation or for construction in the Report.

Avista is required to submit the Report to FERC prior to December 31st of this year; however, we must first submit it to you for a 30-day review and comment period. With this, please provide me with any comments that you may have pertaining to the Report by December 10, 2012.

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800.227.9187
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If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

Enclosure

cc: Jim Fredericks, IDFG
Graham Simon, WDFW (without enclosure)
Bob Steed, IDEQ (without enclosure)
Speed Fitzhugh, Avista (without enclosure)

USFWS's Comments on the Report

Subject: FW: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Reviewand Comment

From: Donaldson, Rick [mailto:rick_donaldson@fws.gov]
Sent: Thursday, December 06, 2012 3:20 PM
To: Vore, Tim
Cc: Russ MacRae; Erin BrittonKuttel; Jim Fredericks; graham.simon@dfw.wa.gov
Subject: Re: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Reviewand Comment

Hi Tim,

This concerns the U.S. Fish and Wildlife Service's response to Avista's *Ramping Rate Evaluation Report* (Report), License Article 404, for the Spokane Hydroelectric Project, dated November 8, 2012. We have no further comment on the Report beyond what we provided in our e-mail to you on October 4, 2012. This response has been coordinated with Erin Britton Kuttel of our Eastern Washington Field Office.

Thank you for the opportunity to comment on the Report.

Rick

On Fri, Nov 9, 2012 at 9:49 AM, <tim.vore@avistacorp.com> wrote:

Good morning Mr. Donaldson,

Please see the attached cover letter and "Spokane River Ramping Rate Evaluation Report." We would appreciate any comments you may have by December 10, 2012.

If you have any questions, please contact me at (509) 495-8612.

Thank you,

Tim Vore | Avista Corp.
PO Box 3727 MSC-1, Spokane, WA 99220
509.495.8612 | tim.vore@avistacorp.com

(See attached file: Ramping Rate Letter to USFWS 11-8-12.pdf)(See attached file: Ramping Rate Evaluation Report 11-8-12.pdf)

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Avista's Letter to WDFW - Request for Comments on the Report

November 8, 2012

Graham Simon
Renewable Energy Habitat Biologist
Washington Department of Fish and Wildlife
3860 Chelan Hwy N.
Wenatchee, WA 98801

Subject: **Spokane River Project, FERC Project No. 2545, License Article No. 404 "Ramping Rate Evaluation Report"**

Dear Mr. Simon:

On September 7, 2012 Avista requested comments and recommendations from the Idaho Department of Fish and Game (IDFG), the U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) pertaining to the "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study). The Study, which was conducted in accordance with Article 404 of our Spokane River Project License (License), assessed potential Rainbow trout fry stranding in the Spokane River associated with the four-inch per hour down-ramping rate at our Post Falls Hydroelectric Development (HED), is included in the enclosed Ramping Rate Evaluation Report (Report).

The purpose of the Report is to determine if any of the three agencies believed, based on the results of the Study, that more restrictive ramping rates are necessary to protect newly emergent Rainbow trout fry downstream of the Post Falls HED. None of the agencies that Avista consulted with recommended more restrictive ramping rates. Instead, IDFG believed the four-inch per hour ramping rate was adequate and the USFWS believed it was effective at protecting Rainbow trout fry in the Spokane River. The WDFW provided editorial comments on the Study, which has been revised accordingly. The revisions to the Study that addressed WDFW's comments did not substantially alter it or change the findings, which indicate the four-inch per hour ramping rate is protective of Rainbow trout fry. The consultation record with all three agencies is included in Appendix B of the Report.

The Report was also to include agency recommendations, if they had any, for more restrictive ramping rates, based on the outcome of the Study. If more restrictive rates were recommended, Avista was to provide the associated costs for reduced power generation and for construction costs needed to comply with the more restrictive ramping rates. Since none of the agencies recommended more restrictive rates, Avista has not included potential costs for reduced power generation or for construction in the Report.

Avista is required to submit the Report to FERC prior to December 31st of this year; however, we must first submit it to you for a 30-day review and comment period. With this, please provide me with any comments that you may have pertaining to the Report by December 10, 2012.

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

800.227.9187
www.avistautilities.com

If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

Enclosure

cc: Jim Fredericks, IDFG
Rick Donaldson, USFWS (without enclosure)
Bob Steed, IDEQ (without enclosure)
Speed Fitzhugh, Avista (without enclosure)

WDFW's Comments on the Report

Vore, Tim

From: Simon, Graham A (DFW) [Graham.Simon@dfw.wa.gov]
Sent: Monday, December 10, 2012 12:50 PM
To: Vore, Tim
Cc: Goloborodko, Yelena; Donaldson, Rick; Russ MacRae; Erin BrittonKuttel; Jim Fredericks
Subject: RE: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Review and Comment

Tim – I wanted to send you a quick response to the email below requesting comments on the Ramping Rate Evaluation Report. WDFW has no additional comments besides what we provided in our October 7, 2012 letter

Thanks for letting WDFW provide comments on the report and if you have any additional questions please feel free to give me a call

Regards,

Graham Simon
Renewable Energy Habitat Biologist
3860 Chelan Hwy N.
Wenatchee, WA 98801
(509) 662-0503 Desk
(509) 670-0742 Cell
(509) 662-0492 Fax
graham.simon@dfw.wa.gov

From: Vore, Tim [mailto:tim.vore@avistacorp.com]
Sent: Friday, November 09, 2012 9:46 AM
To: Simon, Graham A (DFW)
Cc: Goloborodko, Yelena; Fitzhugh, Speed (Elvin)
Subject: Avista Submittal of Spokane River Ramping Rate Evaluation Report for Review and Comment

Good morning Mr. Simon,

Please see the attached cover letter and "Spokane River Ramping Rate Evaluation Report." We would appreciate any comments you may have by December 10, 2012.

If you have any questions, please contact me at (509) 495-8612.

Thank you,

Tim Vore | Avista Corp.
PO Box 3727 MSC-1, Spokane, WA 99220
509.495.8612 | tim.vore@avistacorp.com

1

PART II
CONSULTATION RECORD ON RAMPING RATE EVALUATION AND RAINBOW TROUT FRY STRANDING STUDY (STUDY)

Avista's Letter to IDFG - Request for Comments and Recommendations on the Study

AVISTA

September 7, 2012

Jim Fredericks
Regional Fishery Manager, Panhandle Region
Idaho Department of Fish and Game
2885 W. Kathleen Avenue
Coeur d'Alene, Idaho 83815

Subject: **Spokane River Project, FERC Project No. 2545, License Article No. 404 "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report"**

Dear Mr. Fredericks:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) to operate the Spokane River Hydroelectric Project. Appendix A of the License included a four-inch-per-hour down ramping rate for the Post Falls Hydroelectric Development (HED). Avista began implementing the down ramping rate upon issuance of the new License.

License Article 404 requires Avista to complete a Ramping Rate Evaluation Report to document: 1) the effects of the ramping rates and any potential stranding on rainbow trout fry in the Spokane River downstream of the Post Falls HED; 2) any agency recommendations for more restrictive ramping rates based on the outcome of the enclosed "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study); and 3) the associated costs to implement more restrictive ramping rates, if any are recommended by the consulting agencies.

In order to fulfill the License Article, Avista recently completed the enclosed Study developed and implemented after consultation with the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), and the Idaho Department of Fish and Game (IDFG). Based on the outcome of this Study, which indicates that the current four-inch-per-hour down ramping rate is protective of rainbow trout fry in the Spokane River, Avista does not believe any changes to the current ramping rate are necessary.

With this, please provide any comments or recommendations, based on the results of the Study, by October 7, 2012. Once we receive your comments or recommendations, we will include them in the Ramping Rate Evaluation Report that we are required to submit to FERC by December 31st of this year.

If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

800.227.9187
www.avistautilities.com

IDFG's Comments and Recommendations on the Study

From: Fredericks,Jim [mailto:jim.fredericks@idfg.idaho.gov]
Sent: Monday, October 15, 2012 4:22 PM
To: Vore, Tim
Cc: Robert.Steed@deq.idaho.gov
Subject: RE: Avista's Submittal of the Ramping Rate Evaluation Report

Hi Tim,
Sorry I wasn't able to respond by last week. I've been away for a couple of weeks. IDFG has also reviewed the Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report and concur that the 4 inch per hour down ramping rate at the Post Fall HED is adequate. We have no comments or additional recommendations.

Jim Fredericks
Regional Fishery Manager, Panhandle Region
Idaho Department of Fish and Game
2885 W. Kathleen Ave.
Coeur d'Alene ID 83815
(208) 769-1414
jim.fredericks@idfg.idaho.gov

Avista's Responses to IDFG Comments and Recommendations on the Study

Avista agrees with IDFG that the current License and Idaho 401 Water Quality Certification required four- inch per hour down-ramping rate is adequate.

Avista's Letter to USFWS - Request for Comments and Recommendations on the Study

AVISTA

September 7, 2012

Rick Donaldson
Northern Idaho Field Office
U.S. Fish and Wildlife Service
11103 E. Montgomery Drive
Spokane Valley, WA 99206

Subject: **Spokane River Project, FERC Project No. 2545, License Article No. 404 "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report"**

Dear Mr. Donaldson:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) to operate the Spokane River Hydroelectric Project. Appendix A of the License included a four-inch-per-hour down ramping rate for the Post Falls Hydroelectric Development (HED). Avista began implementing the down ramping rate upon issuance of the new License.

License Article 404 requires Avista to complete a Ramping Rate Evaluation Report to document: 1) the effects of the ramping rates and any potential stranding on rainbow trout fry in the Spokane River downstream of the Post Falls HED; 2) any agency recommendations for more restrictive ramping rates based on the outcome of the enclosed "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study); and 3) the associated costs to implement more restrictive ramping rates, if any are recommended by the consulting agencies.

In order to fulfill the License Article, Avista recently completed the enclosed Study developed and implemented after consultation with the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), and the Idaho Department of Fish and Game (IDFG). Based on the outcome of this Study, which indicates that the current four-inch-per-hour down ramping rate is protective of rainbow trout fry in the Spokane River, Avista does not believe any changes to the current ramping rate are necessary.

With this, please provide any comments or recommendations, based on the results of the Study, by October 7, 2012. Once we receive your comments or recommendations, we will include them in the Ramping Rate Evaluation Report that we are required to submit to FERC by December 31st of this year.

If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

800.227.9187
www.avistautilities.com

USFWS's Comments and Recommendations on the Study

From: Erin_BrittonKuttel@fws.gov
Sent: Thursday, October 04, 2012 8:56 AM
To: Vore, Tim
Subject: RE: Avista's Submittal of the Ramping Rate Evaluation Report

Tim,

We have reviewed the Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report. Based on the study, it appears that a 4 inch per hour down ramping rate at the Post Fall HED is effective at protecting rainbow trout fry in the Spokan River. As such, we have no comments or additional recommendations to provide. Our response has been coordinated with Rick Donaldson of the Northern Idaho Field Office of the Fish and Wildlife Service.

Please feel free to give me a call if you have any questions.

Erin Britton Kuttel
Fish and Wildlife Biologist
U.S. Fish & Wildlife Service
11103 E. Montgomery Drive
Spokane Valley, WA 99206
Erin_BrittonKuttel@fws.gov
509.893.8029 (Phone)
509.891.6748 (Fax)

Avista's Responses to USFWS Comments and Recommendations on the Study

Avista agrees with the USFWS that the current License and Idaho 401 Water Quality Certification required four- inch per hour down-ramping rate is effective at protecting Rainbow trout fry in the Spokane River.

Avista's Letter to WDFW - Request for Comments and Recommendations on the Study

AVISTA

September 7, 2012

Graham Simon
Renewable Energy Habitat Biologist
Washington Department of Fish and Wildlife
3860 Chelan Hwy N.
Wenatchee, WA 98801

Subject: **Spokane River Project, FERC Project No. 2545, License Article No. 404 "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report"**

Dear Mr. Simon:

On June 18, 2009 the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) to operate the Spokane River Hydroelectric Project. Appendix A of the License included a four-inch-per-hour down ramping rate for the Post Falls Hydroelectric Development (HED). Avista began implementing the down ramping rate upon issuance of the new License.

License Article 404 requires Avista to complete a Ramping Rate Evaluation Report to document: 1) the effects of the ramping rates and any potential stranding on rainbow trout fry in the Spokane River downstream of the Post Falls HED; 2) any agency recommendations for more restrictive ramping rates based on the outcome of the enclosed "Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report" (Study); and 3) the associated costs to implement more restrictive ramping rates, if any are recommended by the consulting agencies.

In order to fulfill the License Article, Avista recently completed the enclosed Study developed and implemented after consultation with the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), and the Idaho Department of Fish and Game (IDFG). Based on the outcome of this Study, which indicates that the current four-inch-per-hour down ramping rate is protective of rainbow trout fry in the Spokane River, Avista does not believe any changes to the current ramping rate are necessary.

With this, please provide any comments or recommendations, based on the results of the Study, by October 7, 2012. Once we receive your comments or recommendations, we will include them in the Ramping Rate Evaluation Report that we are required to submit to FERC by December 31st of this year.

If you have any questions, please feel free to contact me by telephone at (509) 495-8612 or by email at tim.vore@avistacorp.com.

Sincerely,

Tim Vore

Tim Vore
Environmental Specialist

1411 East Mission Avenue
PO Box 3727
Spokane, Washington 99220-3727

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www.avistautilities.com

WDFW's Comments and Recommendations on the Study

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Mailing Address: 600 Capitol Way N · Olympia, WA 98501-1091 · (360) 902-2200, TTY (800) 833-6388
Office Location: Wenatchee District Office · 3860 Chelan Hwy North · Wenatchee, WA 98801

October 5, 2012

Yelena Goloborodko
Spokane River Administrative Assistant
Avista Corporation
P.O. Box 3727 MSC-1
Spokane, WA 99220-3727

Subject: **COMMENTS:** Draft Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report (FERC No. 2545)

Dear Ms Goloborodko:

The Washington Department of Fish and Wildlife (WDFW) appreciates the opportunity to review, comment and provide recommendations for the Draft Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report.

1. Page 16 – 3.1.2

   Comments: The text on this page appears to refer to Figure 10. Figure 10 could be labeled to more clearly explain what is shown. The y-axis is labeled "Exposed Area (sq ft)" but this appears to be exposed area per 4-inch drop in flow beginning at whatever flow is indicated on the x-axis. The text is not clear because the intervals listed (8,600-6,000 cfs, 6,000-4,500 cfs, 16,000-8,600 cfs, 4,500-3,000 cfs, and 20,000-16,000 cfs) probably do not all correspond to 4 inch stage declines, even though the text seems to indicate that they are.

2. Page 17 – 3.2.1

   Comments: The last sentence in the second paragraph reads: "A total of nine down-ramping events, bracketing flows from 14,000 cfs down to 8,100 cfs, occurred during this time period." These should be shown in a table listing starting and ending flows for each of these nine events. This appears in Table 8.

3. Page 19 – Table 8

   Comments: This table is unclear as to whether down-ramp was continuous or discontinuous. As mentioned above, each down-ramp event should be listed with a starting and ending flow and stage, with the change in both ft and inches. After converting the data to inches it appears that event seven on June 25, 2012 exceeded the 4 in/hr criterion.

4. Page 21 – Table 10

Comments: What is PP2? Distances to tape on a row must be increments as they do not continually increase. Please state this in the report.

5. Page 22 – Table 11

   Comments: After reviewing this table it appears that only one fry was found stranded at the lowest ramping rate which was event two. Is this correct?

6. Page 28 – 3.2.2

   Comments: Most of the fish species stranded in the study were non-native, but sucker fry (native) appear to have been numerous. If suckers should become species of interest in the future, this stranding should be considered.

7. Page 31 – 4.0

   Comments: The next to last paragraph appears to contradict an earlier statement that down-ramping occurs only in the spring. This needs to be clarified

Summary

WDFW have provided recommendations to address our concerns with the Spokane River Ramping Rate Evaluation and Rainbow Trout Fry Stranding Study Report. WDFW recommends our comments be addressed in an updated report prior to final approval. We appreciate the opportunity to provide comments on the report. Please contact me at (509) 662-0503 or by email graham.simon@dfw.wa.gov if you have questions.

Sincerely,

Graham Simon
Renewable Energy Habitat Biologist

Cc John Whalen
Hal Beecher
Randal Osborne
Doug Robison

Avista's Responses to WDFW Comments and Recommendations on the Study

WDFW Comment 1: *Page 16 – 3.1.2*

The text on this page appears to refer to Figure 10. Figure 10 could be labeled to more clearly explain what is shown. The y-axis is labeled "Exposed Area (sq ft)" but this appears to be exposed area per 4-inch drop in flow beginning at whatever flow is indicated on the x-axis. The text is not clear because the intervals listed (8,600-6,000 cfs, 6,000-4,500 cfs, 16,000-8,600 cfs, 4,500-3,000 cfs, and 20,000-16,000 cfs) probably do not all correspond to 4 inch stage declines, even though the text seems to indicate that they are.

Avista Response to Comment 1:

The text has been re-written to clarify that the intervals are a tiered range of flows that reflect the amount of habitat that becomes exposed with a four- inch drop in stage, as measured at the Post Falls USGS gage. The table has been revised to clarify the graphics.

WDFW Comment 2: *Page 17 – 3.2.1*

The last sentence in the second paragraph reads:"A total of nine downramping events, bracketing flows from 14,000 cfs down to 8,100 cfs, occurred during this time period."This should be shown in a table listing starting and ending flows for each of these nine events. This appears in Table 8.

Avista Response to Comment 2:

The text and Table 8 have been revised accordingly; for example, the flow at 13:00 was 14,000 cfs and after Down-ramp Event 1, the flow was 13,700 cfs.

WDFW Comment 3: *Page 19 – Table 8*

This table is unclear as to whether down-ramp was continuous or discontinuous. As mentioned above, each down-ramp event should be listed with a starting and ending flow and stage, with the change in both ft and inches. After converting the data to inches it appears that event seven on June 25, 2012 exceeded the 4 in/hr criterion.

Avista Response to Comment 3:

The measurements were discontinuous, meaning that flows were maintained at one level, and then dropped to the next downramping flow. Table 8 has been clarified to explain the starting and ending stages and flows for the down-ramping events. Inches were also be added to the table for clarification. Downramping event seven did exceed the four-inches per hour down ramping rate; however, even with the slight increase in the stage drop, no stranded fish were observed.

WDFW Comment 4: *Page 21 – Table 10*

What is PP2? Distances to tape on a row must be increments as they do not continually increase. Please state this in the report.

Avista Response to Comment 4:

PP2 is an abbreviation for Photo Point No. 2. We revised the report and added a foot note to the table for clarification. The measurements shown in the table were incremental changes; mean cumulative change from the beginning of Down-ramping Event 1 to the end of Down-ramping Event 9 is presented as "mean horizontal shoreline exposed" at the lower, right-hand corner of the tables. We revised the text to reflect this.

WDFW Comment 5: *Page 22 – Table 11*

After reviewing this table it appears that only one fry was found stranded at the lowest ramping rate which was event two. Is this correct?

Avista Response to Comment 5:

Yes, this is correct.

WDFW Comment 6: *Page 28 – 3.2.2*

Most of the fish species stranded in the study were non-native, but sucker fry (native) appear to have been numerous. If suckers should become species of interest in the future, this stranding should be considered.

Avista Response to Comment 6:

The objective of the FERC License required study was to describe the potential stranding of newly emerged Rainbow trout fry while implementing a four-inch per hour down ramping rate at the Post Falls HED. As stated on page 26 of the Study, several hundred fry were observed near shore; however, none of these fish were stranded. During the stranding assessment a few non-salmonid fry were reported stranded in a pool (page 27 of the Study), however the fisheries biologists who conducted the study could not confirm whether or not they were suckers. Additionally, no fish were observed stranded during the preliminary or supplemental assessments, as indicated on pages 28 and 29 of the Study.

WDFW Comment 7: *Page 31 – 4.0*

The next to last paragraph appears to contradict an earlier statement that down-ramping occurs only in the spring. This needs to be clarified.

Avista Response to Comment 7:

The next to the last paragraph was revised by adding "that occurs naturally" to the end of the first sentence. The study was designed to evaluate the potential for HED related down-ramping events that effect newly emerged Rainbow trout fry while they inhabit the near shore areas during the spring and early summer. Emergence of Rainbow trout fry typically occurs around the last week of May and the first week of June, with the fry inhabiting the near shore areas until early July. The preliminary assessment conducted in 2011 found that Rainbow trout fry had left the near shore areas prior to the July 15th assessment (page 28 of the Study). The report has been clarified to explain these points.

Avista Response to WDFW Summary:

Avista appreciates WDFW's recommendations and comments and has revised the Study report accordingly. None of the revisions substantively altered the report or changed any of the findings that the four-inch per hour ramping rate is protective of Rainbow trout fry in the Spokane River.