

March 8, 2022

**VIA E-FILING**

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

**Subject: Proposed Studies Plan Document and Joint Meeting Notification**  
Pike Island Locks and Dam Hydroelectric Project (FERC No. P-15230)  
New Cumberland Locks and Dam Hydroelectric Project (FERC No. P-15045)

Dear Secretary Bose:

Pike Island Hydropower Corporation & Current Hydro Project 19 LLC, together known as Current Hydro (Licensee or Applicant), is submitting the attached Proposed Studies Plan Document (PSP) for Pike Island Locks and Dam Hydroelectric Project (Pike Island Project) and New Cumberland Locks and Dam Hydroelectric Project (New Cumberland Project) in advance of the proposed Joint Meeting (Meeting) on March 24, 2022, in Wheeling, WV. The Projects are located at the U.S. Army Corps of Engineers (USACE) Pike Island and New Cumberland Locks and Dam. The Projects will require the construction of two new intakes, powerhouses, tailraces, transmission utilidors, and appurtenant facility structures. Current Hydro is pursuing a license from the Federal Energy Regulatory Commission (FERC or Commission) to develop the Projects and gain additional required USACE, West Virginia, and Ohio approvals.

The Commission issued the existing Preliminary Permits for the Projects, effective October 13, 2020, for New Cumberland Project and November 17, 2021, for Pike Island Project. Current Hydro submitted Pre-Application Documents (PAD) on August 1, 2021 for Pike Island Project, and August 11, 2021 for the New Cumberland Project. On October 8, 2021, the Commission approved the use of the Traditional Licensing Process (TLP) New Cumberland Project. On February 3, 2022, the Commission also granted TLP approval for the Pike Island Project. Accordingly, the applicant is pursuing a new license for the Projects pursuant to the Commission's TLP, as described at 18 Code of Federal Regulations (CFR) Part 4.

**Proposed Joint Meeting**

The purpose of this Meeting is to provide an opportunity for project participation for all pertinent agencies, Indian tribes, and members of the public. In advance of that Meeting, Current Hydro is providing the PSP to the distribution list provided in the attached Stakeholder Distribution List to facilitate discussion to ensure all environmental concerns and impacts are adequately addressed in the study plan. Current Hydro will present a detailed overview of our new hydropower proposals, their potential environmental impact and discuss the ecological data available and studies to be conducted.

As part of the FERC licensing process, the Applicant previously solicited comments from resource agencies and stakeholders to prepare a PAD. Current Hydro utilized these comments, past completed studies at the Pike Island and New Cumberland site(s) used in a previous FERC License application by another Applicant, and the study requests and comments in developing the scope of studies that we respectfully suggest, to be conducted in support of licensing. In accordance with 18 CFR §4.38 (b)(3)(ii) of the Commission's regulations, Current Hydro intends to hold an initial Meeting to describe the Project(s) background, concepts, and study methods described in the PSP. Pursuant to 18 CFR §4.38(b)(5), a public site visit of the Project is planned to

begin at 09:00 at Pike Island Locks and Dam public fishing parking lot on the Ohio side of the Ohio River. The tour will then proceed to the West Virginia side of the Ohio River near the USACE New Cumberland Locks and Dam site. During the afternoon meeting at Wheeling City Hall, Current Hydro staff will present information regarding the Commission's TLP, project concepts, and specifics regarding the study process. Final details for the Meeting will be listed at <https://currenthydro.com/calendar>

Current Hydro distributed the Meeting Notification with this PSP on March 8, 2022. The Applicant requests that stakeholders provide any additional comments on the proposed studies by March 24, 2022, for inclusion in the Meeting discussion or pursuant to 18 CFR §4.38(b)(4), no later than (NLT) 60 days after the joint meeting. Please provide written comments NLT May 25, 2022, pursuant to 18 CFR §4.38(b)(5), so that Current Hydro may schedule an additional in-person meeting to address all project impact concerns adequately.

### **Proposed Study Plan**

Current Hydro evaluated all the study requests submitted to date by the stakeholders, focusing on the requests that specifically addressed the criteria outlined in §4.38 (b) of the Commission's TLP regulations, as discussed above. This PSP also provides FERC, regulatory agencies, Indian Tribes, and other stakeholders with the methodology and details of Current Hydro's proposed studies. At this time, Current Hydro is proposing to conduct the following studies as described in detail in the PSP:

1. Project Hydraulics Study;
2. Fish Assemblage Surveys;
3. Fisheries and Fish Entrainment and Impingement Studies;
4. Freshwater Mussel Surveys;
5. Water Quality Study;
6. Aquatic Habitat Study;
7. Terrestrial Habitat and RTE Species Study;
8. Wetlands and Waters Delineation;
9. Recreational Resources; and
10. Cultural Resources.

### **DOCUMENT DISTRIBUTION**

In accordance with 18 CFR §4.38 (b) of the Commission's regulations, we are transmitting this letter to relevant and known resource agencies, Tribes, non-governmental organizations, and stakeholders that we believe may be interested in the Project (see attached Distribution List). Current Hydro is filing the PSP with the Commission electronically and is distributing this letter to the parties outlined on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, this notification and PSP is distributing this letter via email; otherwise, Current Hydro is delivering this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the PSP electronically through FERC's eLibrary system at <https://elibrary.ferc.gov/idmws/search/fercgensearch.asp> under docket number P-15230 and P-15045, or on Current Hydro's website at <https://www.currenthydro.com/pike-island> or <https://www.currenthydro.com/new-cumberland>.

Comments on the PSP, including any additional or revised study requests, must be filed within 60 days of the Meeting, no later than May 25, 2021. Any proposed modifications to this PSP must address the Commission's criteria as presented in 18 CFR §4.38 (b)(5). As necessary, after the comment period closes, Current Hydro

will prepare a Revised Study Plan (RSP) that will address interested parties' comments to the extent practicable.

To assist with meeting planning and logistics, Current Hydro respectfully requests that individuals or organizations who plan to attend the in-person site visit and Meeting to RSVP by sending an email to [roy@currenthydro.com](mailto:roy@currenthydro.com) on or before March 21, 2022. An online virtual meeting invitation will be sent to all listed stakeholders to access to Meeting discussion remotely.

If there are any questions regarding the PSP or the Meeting, please do not hesitate to contact Roy Powers at (914) 805-2522 or at [roy@currenthydro.com](mailto:roy@currenthydro.com).

Sincerely,

A handwritten signature in black ink, appearing to read 'Roy Powers', with a long horizontal flourish extending to the right.

Roy Powers  
Chief Operations Officer  
Current Hydro


**ATTACHMENT A**

**CERTIFICATE OF SERVICE AND DISTRIBUTION LIST**

**CERTIFICATE OF SERVICE**

I hereby certify that Current Hydro, LLC has distributed notice of the Joint Meeting and Proposed Study Plan for the proposed Pike Island and New Cumberland Project to all parties on the attached Distribution List on or about March 08, 2022.

By:



Joel Herm, CEO

Current Hydro LLC

## STAKEHOLDER DISTRIBUTION LIST

### New Cumberland & Pike Island Locks and Dam Hydroelectric Projects Distribution List

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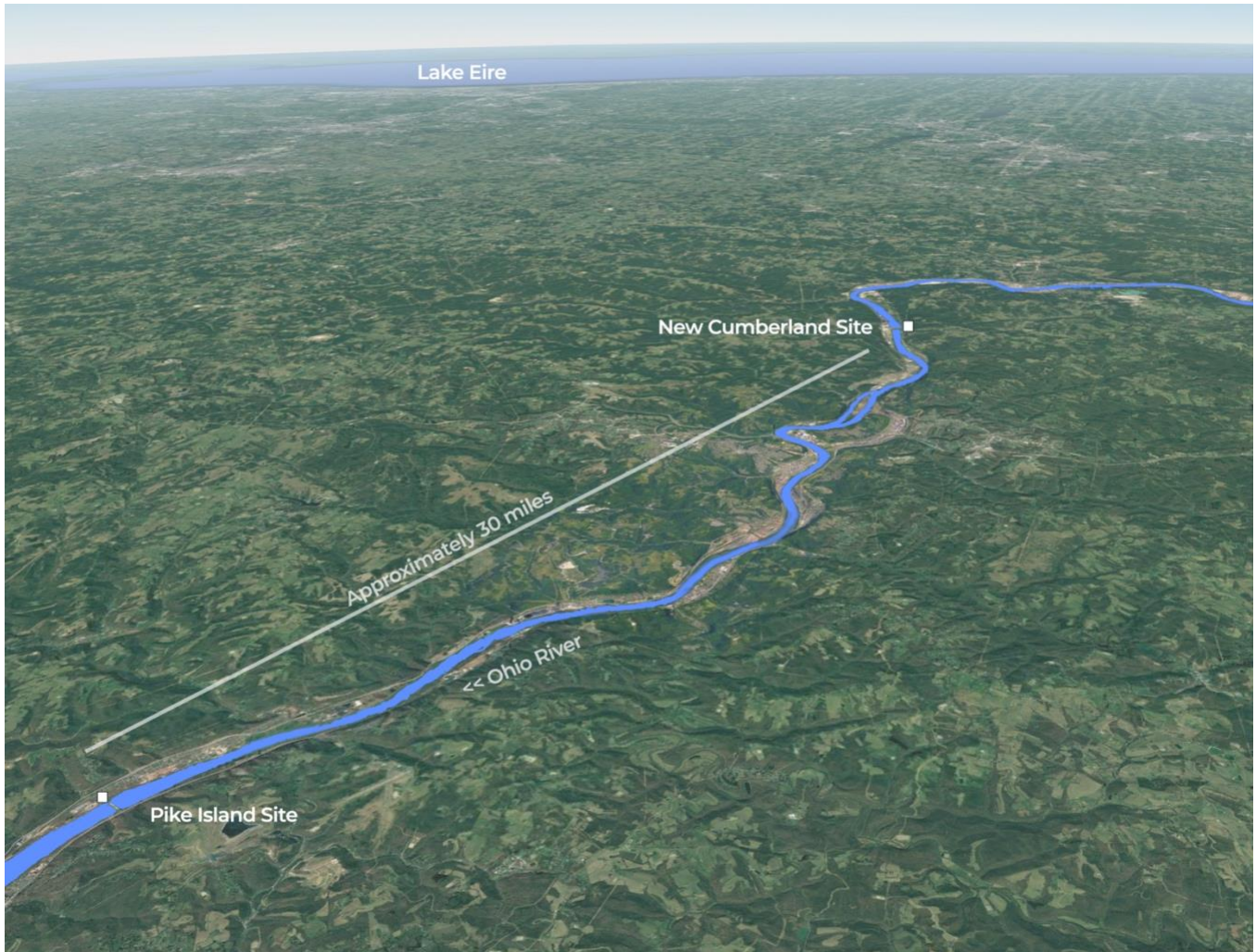
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# Proposed Study Plan

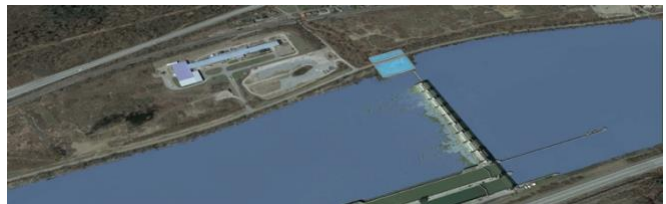
Issued March 8, 2022

Pike Island Hydroelectric Project, FERC P-15230

New Cumberland Hydroelectric Project, FERC P-15045



New Cumberland site



Pike Island site

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## Introduction and Background

### 1.1 Project Background

Pike Island Hydropower Corporation & Current Hydro Project 19 LLC, together known as Current Hydro (Licensee or Applicant), is submitting the Proposed Studies Plan (PSP) for Pike Island Locks and Dam Hydroelectric Project (Pike Island Project) and New Cumberland Locks and Dam Hydroelectric Project (New Cumberland Project). These projects are located on the Ohio River at river mile (RM) 84.1, at the U.S. Army Corps of Engineers (USACE), Pike Island Locks and Dam, at Yorkville, Ohio and Wheeling, West Virginia, and at RM 54.5, USACE New Cumberland Locks and Dam facility at Stratton OH and New Cumberland WV.

The Commission issued the existing Preliminary Permits for the Projects, with an effective date of October 13, 2020, for New Cumberland Project and November 17, 2021, for Pike Island Project. Current Hydro submitted Pre-Application Documents (PAD) on August 1, 2021, for Pike Island Project and August 11, 2021, for New Cumberland Project. On October 8, 2021, New Cumberland Project was granted Commission approved the use of the Traditional Licensing Process (TLP), and on February 3, 2022, Pike Island Project was also approved to utilize the TLP. Accordingly, the Applicant is pursuing a new license for the Projects pursuant to the Commission's TLP, as described at 18 Code of Federal Regulations (CFR) Part 4.

The Projects will require the construction of new intakes, powerhouses, tailraces, transmission utilidor, and appurtenant recreational and other facility structures. Current Hydro is pursuing a license from FERC to develop the Projects and seek other required approvals, including permits from the USACE and the States of West Virginia and Ohio.

### 1.2 Study Plan Overview

The goal of this PSP is to advise all stakeholders of the studies that Current Hydro proposes to conduct in connection with the licensing of these Projects and to afford an additional opportunity for further discussion if these study plans differ from stakeholders' expectations or requirements. This PSP is being distributed to stakeholders concurrent with Federal Energy Regulatory Commission (FERC or Commission) filing and incorporates additional studies and revised methodologies that were developed in response to stakeholder comments on the Applicants PAD, in its previous Agency Consultation, and in other discussions with stakeholders, as further described herein.

Current Hydro is distributing this PSP to resource agencies and stakeholders to provide: (i) a summary of comments and study requests made by various interested stakeholders and (ii) to introduce plans for the studies to be conducted before the Projects' License Application submittals, including the rationale for and the methods and scope of each study. Current Hydro distributed the Joint Meeting Notification with this PSP on March 8, 2022. The Applicant requests that stakeholders provide any additional comments on the proposed studies by March 24, 2022, for inclusion in the meeting discussion or pursuant to 18 CFR §4.38(b)(5), no later than (NLT) 60 days after the joint meeting. Please provide written comments NLT May 25, 2022, so that Current Hydro may schedule an additional in-person meeting to address all project impact concerns adequately.

## 1.3 Agency Consultation

Table 1-2 Study Requests and Comments

Date	Agency / Stakeholder	Agency/ Stakeholder Participants	Other participants	Type of Consultation	Summary of Consultation
1/5/2021	USFWS	Richard McCorkle	Current Hydro	Informal Phone Call	Discussed potential development of two 20 MW projects at Pike Island and New Cumberland Locks and Dams, designed for a low design-flow with high-capacity factor. Discussed concerns the USFWS might have with such a proposal.
1/8/2021	Kleinschmidt	Laura Cowan and Chris Tomichek	Current Hydro	Phone Calls and Email Exchanges	Partnership in licensing efforts and proposed study plan. Continuing engagement since January 2021.
6/23/2021	USFWS	Richard McCorkle, Janet Norman	Current Hydro, Chris Tomichek (Kleinschmidt)	Informal Virtual Meeting	Applicant presented draft of proposed Study Plan (as attached to PAD), specifically discussing mussel survey, the use of eDNA to identify full assemblage in combination with ORSANCO data to estimate relative abundance, water quality study, American Eel, and definition of area of potential effect.
6/24/2021	USFWS	Richard McCorkle	Current Hydro	Informal Phone Call	10-minute discussion of USFWS Qualified Freshwater Mussel Surveyors: <a href="https://www.fws.gov/northeast/pafo/pdf/Mussel_qualified_00082020.pdf">https://www.fws.gov/northeast/pafo/pdf/Mussel_qualified_00082020.pdf</a>
5/7/2021	Norfolk Southern Railroad	Laura Hoag, Jason Wazelle, Scott Plum	Current Hydro	Email Outreach, Virtual Meeting	Since 5/7/21 we had multiple email exchanges about right-of-way, property boundary, and the frequency and type of railroad traffic on that stretch on the WV side of the Ohio River near New Cumberland Locks and Dam.
6/29/2021	Edge Engineering & Science	Casey Swecker		Informal Phone Call	Mr. Swecker is USFWS Qualified Freshwater Mussel Surveyor.  Since 6/29/21: Discussion of a practicable approach to a Mussel Survey and Aquatic Habitat Study in the vicinity of both Projects.
3/11/2021	USACE	Julia Butzler	Joel Herm	Phone Calls and Email Exchanges	Since March 2021 multiple exchanges in regard to USACE As-builts, tech sharing agreement, security clearances for site visits, maps and drawings. Further requests for environmental studies conducted by the Corps.

6/25/2021	Bureau of Indian Affairs	Eastern Regional Office	Jan Borchert	Email Outreach	Informal request for support in identifying Tribal Nations affected by the Projects.
7/20/2021	USFWS	Richard McCorkle	Jan Borchert	Informal Phone Call	10-minute discussion of permitting plan and proposed use of TLP
7/22/2021	Norfolk Southern Railroad	Jason Wazelle, Scott Plum	Jan Borchert	Informal Virtual Meeting	Short description of our Project proposal and associated questions: RR ownership, potential private crossing, and electric cables to pass under RR tracks.
1/13/2022	FERC	John Smith and Janet Hutzel	Current Hydro	Informal Virtual Meeting	The applicant and FERC have been discussing coordination within FERC to manage both New Cumberland & Pike Island.
3/2/2022	Ohio River Valley Water Sanitation Commission (ORSANCO)	Jason Heath, Ryan Argo, Sam Dinkins	Current Hydro and Edge Engineering & Science	Informal Virtual Meeting	Introduced projects to ORSANCO. Discussed existing physical and biological datasets repositied by ORSANCO in vicinity of New Cumberland and Pike Island. Sought guidance on Project-specific studies.

Comments received included study requests, comments on the PAD’s content, past study result information, and requests for specific protection, mitigation, and enhancement measures.

In keeping with the intent of this document, Current Hydro focused primarily on the study request comments; however, all comments were reviewed to ensure that the scope of the Project engineering adequately address all issues, and that Current Hydro is a good environmental partner with the USACE, all agencies, the public and Indian Tribes. Current Hydro addressed all comments thus far and welcomes additional discussion to improve proposed studies to further support a high-quality FERC License Application and protect our valuable resources.

#### 1.4 Studies Proposed to be completed prior to Filing of FERC License Applications

Based upon comments received, Current Hydro will conduct the following ten (10) studies that will be used in its License Application to assess Project effects:

- Project Hydraulics Study
- Fish Assemblage Surveys
- Fisheries and Fish Entrainment and Impingement Studies
- Freshwater Mussel Surveys
- Water Quality Study



- 
- Aquatic Habitat Study
  - Terrestrial Habitat and RTE Species Study
  - Wetlands and Waters Delineation
  - Recreational Resources
  - Cultural Resources

At this stage in the FERC licensing process, studies are conducted to gather data to assess Project effects addressed later in the Draft License Application (DLA) portion of the process. In addition to the Project effects assessments, any proposed protection, mitigation, and enhancement measures determined to be necessary will be addressed in the DLA.

It should be further noted that the Pike Island Project and New Cumberland Project proposed by the current Applicant is very similar in scope, but with lower impact, to the Previously issued FERC Licensed Project at the Pike Island Locks and Dam by the City of Orville and New Cumberland Locks and Dam by the City of New Martinsville. The prior Pike Island Locks and Dam Project FERC License was issued on September 29, 1989, for 50 years and kept active till Surrender to the FERC on February 19, 2010. The prior New Cumberland Locks and Dam Project P-6901 was issued on September 27, 1989, for 50 years and kept active till Surrender to the FERC on September 3, 2009.

Current Hydro is developing hydropower projects with the philosophy and intention of causing minimal impact to hydraulic, ecological, and recreational resources both at the powerhouse and downstream. This is the motivation for designing a powerhouse that uses maximum flows of 90% flow exceedance at these locations and with a powerhouse hydraulic capacity of 13,773 cubic feet per second (cfs) (see appendix A for annual and monthly flow duration curves). Thus, it is expected and intended that the Projects will have minimal effects on Project-area resources and will protect existing uses of the Project-area waters. There may be localized changes in flow velocity and direction due to small proportions of water released from the powerhouse, rather than exclusively over the dam or via spillway gates and lockage operations. These changes will be analyzed in the Project Hydraulics Study and Water Quality Study, but lower hydraulic flow capacity diversion is an important factor when analyzing many other proposed studies described herein.

## 1.5 Study Requests

Current Hydro worked with Interested Parties, Licensing Participants, and subject matter experts to identify areas of potential concern for Project effects to the human and natural environments. Partnering with Edge Engineering & Science and Alden Labs provides Current Hydro with experiential guidance and standard methodology, included herein, to conduct appropriate and thorough investigations. Any resource agency, Indian Tribe, or members of the public may identify additional studies for consideration as specified by CFR 18, § 4.38 (b)(5); any study request must:

- Identify its determination of necessary studies to be performed or the information to be provided by the potential applicant;
- Identify the basis for its determination;
- Discuss its understanding of the resource issues and its goals and objectives for these resources;

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- Explain why each study methodology recommended by it is more appropriate than any other available methodology alternatives, including those identified by the potential applicant pursuant to paragraph (b)(2)(vii) of CFR 18, § 4.38;
    - Detailed descriptions of any proposed studies and the proposed methodologies to be employed
  - Document that the use of each study methodology recommended by it is a generally accepted practice; and
  - Explain how the studies and information requested will be useful to the agency, Indian tribe, or member of the public in furthering its resource goals and objectives that are affected by the proposed project.

Current Hydro addressed all comments thus far and welcomes additional discussion to further improve proposed studies and protect our valuable resources. Please provide written comments NLT May 25, 2022, so that Current Hydro may schedule an additional in-person meeting to address all project impact concerns adequately. Email or mail completed study requests in MS Word or PDF format to:

Roy Powers  
Roy@currenthydro.com  
Current Hydro, LLC  
Post Office Box 224  
Rhinebeck NY, 12572

## 1.6 Studies and Resource Protection Plans Proposed to be Completed After Receipt of FERC License, but Prior to Construction

Current Hydro intends to conduct various studies and prepare several resource protection plans after the FERC License is issued, but before the start of Project construction: Each of these studies or plans are discussed below, along with the rationale for conducting them later in the Project development process.

Current Hydro will propose that each of these studies and plans be required as a condition of its FERC License for the Projects. Current Hydro will request that FERC require that the plans for these studies be developed in consultation with agencies and stakeholders after issuance of the FERC License. Study results will be issued for agency and stakeholder review and comment before filing with FERC. FERC will require that the studies and or plans be completed before authorizing construction to begin. Further, if any of the studies indicate that resource protection or mitigation measures are necessary, such measures will be developed in consultation with affected resource agencies and stakeholders.

A brief description of each study or plan to be prepared after receiving the FERC License is provided below. Additional discussion will be included in the Current Hydro DLA

### Invasive Species Survey and Invasive Species Management Plan

Current Hydro will conduct an Invasive Species Survey in the area of the new powerhouse, transmission line, and substation. This study will be undertaken post-licensing, before commencing construction. The Prior License holder performed a previous Invasive Species analysis of the Proposed Pike Island site and is summarized herein. The new survey will be followed by the development of an Invasive Species Management Plan that will apply to initial Project construction and future activities at the Project.

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## Avian Protection

Current Hydro will develop an Avian Protection Plan for the Project. The Plan will be developed consistent with Avian Power Line Interaction Committee (APLIC) and the United States Fish and Wildlife Service (USFWS) guidelines and will identify protection measures that will be incorporated in the Project design. The Plan will also address measures that will be implemented in the future in association with transmission facility maintenance activities. A previous Avian Study was performed for the prior Pike Island FERC License and is summarized herein.

## Transmission Line Maintenance

Current Hydro will develop a Transmission Line Corridor Management Plan. This plan will detail procedures to be implemented to control vegetation along any newly created transmission line corridors developed as part of the FERC-licensed Project.

## Erosion and Sedimentation Control Plan

During construction, an Erosion and Sedimentation Control Plan will be required by the Commission, the USACE, and the States, under their respective regulatory approval processes. Prior to the start of construction, Current Hydro will develop the plan in consultation with these agencies. The plan will address the relevant erosion and sedimentation control requirements of all agencies in one document. This plan will include all provisions to minimize erosion and sedimentation disturbance during Project construction and stabilize banks post-construction. In addition, a sediment testing and management plan will be included that is compliant with applicable State regulations.

## 1.7 Area of Project Effect and Study Areas

The studies discussed herein will be conducted within the Area of Project Effect (APE). The APE includes an aquatic component and a terrestrial component.

The aquatic APE is the water area upstream and downstream of both existing USACE locks and dam that the new hydropower Projects will potentially impact by changing hydraulic conditions (e.g., water elevations, flow velocities, or flow directions).

The terrestrial APE generally includes lands within the proposed Project Boundary, including transmission line corridors. The terrestrial APE also includes all lands that may be used for construction access, equipment storage areas, etc., and the new Recreational Fishing Access Park.

## 1.8 Study Reporting

Planned biweekly meetings will present the current findings and status of all studies. In general, we expect to issue final study reports concurrent with the DLA for the Projects in September 2022. However, reports for some studies that require late summer and all fieldwork may not be complete when the DLAs are issued. If necessary, Current Hydro will issue supplements to the DLA for such studies and to report results. In any event, agencies will be provided drafts of all study reports for review and comment before the reports are finalized for submission to FERC with the Final License Application.

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# Proposed Studies

## 2.1 Project Hydraulics Study

### Goals and Objectives

Current Hydro is developing hydropower projects at Pike Island and New Cumberland Locks and Dam with the philosophy and intention of causing minimal impact to hydraulic, ecological, and recreational resources both at the powerhouse and downstream. This is the motivation for designing a powerhouse that uses maximum flows of 90% flow exceedance at these locations. The Projects will operate according to USACE operational directives and will leave at least 60% of the Ohio River water going over the spillway for most of the year (see appendix A for annual and monthly flow duration curves). However, the redirection of even a small portion of water through the powerhouse could cause localized changes in velocity and direction of water flow. These changes can potentially alter aquatic habitat, water quality, sediment movement, and access to existing recreational facilities.

A Project Hydraulics Study will be performed to understand the effect powerhouse operations will have on the existing flow regime, study the potential for new sediment transport patterns and scouring, and facilitate the evaluation of the possibility that such alterations might have on habitat and recreation. The specific objectives of this study are to:

- Task 1 - Compile available hydrologic and bathymetric data and collect additional data if needed;
- Task 2 - Develop a two-dimensional hydraulic model of existing flow conditions upstream and downstream of the dam;
- Task 3 - Confirm the upstream and downstream boundaries of the APE;
- Task 4 - Model future flow conditions (velocity, direction, and depth) at high, average, and low flows in the APE using the two-dimensional model;
- Task 5 - Model changes in sediment movement and deposition in the APE using a two-dimensional model; and
- Task 6 - Model pool levels under future flow conditions at high, average, and low flows in the APE.

Data obtained through the modeling conducted under this study will be used as inputs to several other studies to assess resource effects. Specifically, the Project Hydraulic Study will provide the following data for the studies listed below:

- Fish Entrainment and Impingement Studies (Section 2.3) - Flow conditions upstream of the powerhouse.
- Water Quality Study (Section 2.5) - Flow conditions as related to spillway flow.
- Aquatic Habitat Study (Section 2.6) - Areas of changed sediment deposition and bed shear forces.
- Recreational Uses (Section 2.9) - Provide guidance as to the hydraulic conditions affecting the delineation of recreational use areas.

### Resource Management Goals

USACE has authority over the hydraulic and physical operation of hydropower projects operated at USACE-owned facilities and requires them to conform to USACE policy regarding water management,

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which includes both water quality and water control. Current Hydro’s hydropower development at Pike Island Locks and Dam and New Cumberland Locks and Dam must conform to USACE operational goals, which include ensuring that “all applicable state and federal water quality standards are met, water quality degradation of Corps resources is avoided or minimized, and project responsibilities are attained.” (ER-1110-2-8154, Sec 2.1, 2018) The USACE dams in the upper Ohio River, including Pike Island and New Cumberland, are considered “efficient aerators,” and reduced spillage over the dam spillway could result in the reduction of dissolved oxygen (DO) concentration which is critical to maintaining the overall health of the downstream reaches of the river. Likewise, the Corps is responsible for maintaining several water control functions on the Ohio River, including flow regulation, navigation, and recreational access.

Encompassed in the objectives of USACE are the goals of USFWS, Ohio DNR, and West Virginia DNR, as well as various recreation and conservation stakeholders that regulate, manage, and utilize the fisheries on the Ohio River. The Ohio River is home to a large number of fish and mussel species, some of which are federally listed as threatened or endangered. The protection of critical habitat for these species is of special concern for Current Hydro and a responsibility that we take seriously.

### Existing Information

There is a large amount of channel geometry data in existence collected for the purposes of academic studies, river navigation, and operational monitoring, which will be surveyed in advance of creating a specific data collection plan. Data sources may include U.S. Geological Survey (USGS), USACE, Pennsylvania Spatial Data Access, Ohio Geographically Referenced Information Program, and published studies and models. The existing available data will be compiled, and additional data needs evaluated in partnership with Alden Labs and Edge Engineering & Science. Current Hydro is in the process of communicating with ORSANCO, USGS, USACE, and other hydropower providers to determine to what extent our efforts can be coordinated in terms of both data collection and modeling of the upper Ohio River.

### Methodology

Task 1 - Compile available hydrologic and bathymetric data; Estimate the Project APE and collect additional data if needed

Hydrologic data representative of Project area flows is available from USGS and USACE. Current Hydro will use existing data and analytical hydraulic principles with input from stakeholders, to estimate the APE for each Project. Considering the interests of the various stakeholders, Current Hydro will choose the hydraulic study area appropriate for each Project, which will, at a minimum, include the estimated APE. This study area will extend at least 1600 meters below the dam and include any sensitive habitat areas identified at the time of study area selection.

Some bathymetric data is also available for the Project area from previous studies and operational needs. The existing data will be evaluated to determine if it is up to date and suitable for this study’s objectives. If the study area is found to extend beyond the range of the existing, useable bathymetric data, Current Hydro will conduct further field measurements to obtain additional bathymetric data and substrate characterization. To obtain sufficient resolution and quality Current Hydro will perform bathymetric mapping using a high-frequency multibeam sonar unit tethered to a submeter GPS. The bathymetric

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mapping vessel will laterally delineate the APEs at an acceptable speed relative to flow. ArcGIS spatial analysis extensions will be utilized to provide appropriate interpretation and mapping of bathymetric data.

Task 2 - Develop a two-dimensional hydraulic model of existing flow conditions upstream and downstream

Use dataset developed in Task 1 to create a two-dimensional, vertically-averaged hydraulic model of the study area using software suitable to the application and accepted by stakeholders. The model will be developed with the following questions in mind and validated at high, average, and low flow conditions.

- How will powerhouse diversions change the major flowlines within navigational channels?
- How will flow velocities and lateral flow patterns change at the intake and tailrace areas of the powerhouse?
- Will water surface levels upstream and downstream of the dam be affected?
- Where do important areas of aquatic habitat coincide with predicted velocity or flow direction changes?
- What impact, if any, will powerhouse flows have on sediment transport in key areas within the study area?

Task 3 - Confirm the upstream and downstream boundaries of the APE;

Using the hydraulic model results, the boundaries of the APE will be confirmed based on hydraulic effect. If needed, the study area will be expanded to include all of the APE.

Task 4 - Model future flow conditions (velocity, direction, and depth) at high, average, and low flows in the APE using the hydraulic model.

The proposed hydraulic model will demonstrate flow conditions longitudinally, along the direction of flow, and laterally. Model inputs will be prepared from the best possible data and with study objectives in mind. Modeling will be performed by Current Hydro's in-house hydrology team and reviewed at key points by qualified third-party reviewers.

It is a design objective that hydropower operations at Pike Island and New Cumberland have minimal effect on spillway flows, especially during critical flow periods. A primary modeling objective is to enumerate how spillway flows will be affected during low flow periods. Modeling results will assist in the design of state-of-the-art air injection systems proposed to be installed in the powerhouse to proactively mitigate any reduction in spillway flows and to support target DO levels during critical periods.

Task 5 - Model changes in sediment movement and deposition in the APE using the two-dimensional model.

Hydraulic modeling will be targeted both to overall changes in riverbed sedimentation, especially as it affects identified habitat areas or navigation and potential impacts to existing structures and riverbanks.

Task 6 - Model pool levels under future flow conditions at high, average, and low flows in the APE.

Pool levels are not expected to change under the proposed operating procedures of any of the three plants. Current Hydro is aware that other hydropower projects on the Ohio River have had unexpected effects on pool levels in the vicinity of the Project. However, attention will be focused on steady-state pool levels and not on pulse flows because of the small quantity of water the powerhouse will be designed to pass. It

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is unlikely that hydropower operations will have an appreciable effect on pool levels at average or high flows. At low flows, steady-state pool levels will be examined for potential hazards should water levels change as a result of start-up or shut-down.

### Level of Effort and Cost

A comprehensive hydraulics modeling requires a high level of effort by staff experienced in fluid mechanics and hydraulics with access to large amounts of empirical data. Uncertainty in available field data may increase the level of effort and cost considerably. Current Hydro welcomes the opportunity to discuss further methodologies and the possibility of collaboration on more extensive basin-wide studies. Hydraulic modeling is scheduled to be completed in July 2022 and the final report submitted in September 2022. The expected cost to conduct this study for Pike Island and New Cumberland is \$50,000 to \$75,000.

## 2.2 Fish Assemblage Surveys

### Goals and Objectives

This survey aims to provide a comprehensive assessment of fish populations and current information on the occurrence, abundance, and distribution of fish species in and around the Project area; and provide quality data for use in a desktop fish entrainment analysis. Design of fisheries studies and analysis of corresponding data will pay particular attention to game species and state-protected benthic fishes.

### Resource Management Goals

As the state resource agency, the West Virginia Division of Natural Resources (WVDNR) is charged with protecting and managing all wildlife within West Virginia, including the Ohio River fisheries. The Ohio Department of Natural Resources (ODNR) Division of Wildlife (DOW) aims to conserve and improve fish and wildlife resources and their habitats within the state of Ohio. Operations at the Pike Island and New Cumberland Project may impact Ohio River fish populations. An adequate fish survey would thus be necessary for making the most quality decisions about the fishery management within the Project area.

The ORSANCO is an interstate agency, composed of federal partners and eight member states bordering or within the Ohio River basin. ORSANCO was formed in 1948 and, commissioned to abate existing pollution and prevent future degradation of waters within the Ohio River basin. ORSANCO conducts water quality monitoring and assessments on behalf of Ohio River mainstem states, including West Virginia and Ohio. ORSANCO's biological program uses fish studies to establish biological criteria for the Ohio River to provide insight into the overall health of the river ecosystem, and assessment results are consequently utilized for regulatory, restorative, and protective efforts within the Ohio River basin.

### Existing Information

Both ODNR and WVDNR have conducted numerous fish annual studies near the Pike Island and New Cumberland projects. These studies, however, focus primarily on game fish species and utilize techniques that do not offer a full assessment of the total fish assemblages within the river reach. ORSANCO conducts fish assemblage assessments within discrete navigational pools of the Ohio River as part of their biological monitoring program on regular annual cycles. ORSANCO assessed the fish assemblages of New Cumberland Pool in 2004, 2005, 2011, and 2017 and Pike Island Pool was assessed in 2007, 2012,

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and 2018. Hannibal Pool is located downstream of Pike Island pool and was assessed in 2008, 2013, and 2021. Between 2006 and 2008, ORSANCO also collected benthic trawling data to supplement their nighttime electrofishing dataset.

According to the most recent ORSANCO survey events within of New Cumberland and Pike Island pools, the biological health (assessed via the modified Ohio River Fish Index- *mORFIN*) is categorized as “Fair” and “Good,” respectively. An assessed pool is deemed to be in full support of its aquatic life-use (ALU) designation (i.e., supporting intact biological communities) if both the *mORFIN* and Ohio River Macroinvertebrate Index (*ORMIn*) result in biological ratings of “Fair,” “Good,” “Very Good,” or “Excellent.” The biological ratings for both navigational pools indicate full support of its ALU designation (ORSANCO 2017; ORSANCO 2018). ORSANCO’s contemporary fish assessments and extensive historical database exhibit an adequate baseline characterization of the fish assemblage in the vicinity of New Cumberland and Pike Island Projects.

Based on the current, best-available data (electrofishing, trawling, creel surveys), no federally endangered or threatened fish species are known to occur in this portion of the Ohio River. The Lake Sturgeon (*Acipenser fulvescens*) is petitioned for federal listing but has not been collected in the mid or upper Ohio River mainstem since 1971 and is generally considered extirpated from Ohio (Ohio River watershed only) and West Virginia (Rice and Zimmerman 2019; Center for Biological Diversity 2018). Thirty-one fish species are listed by the ODNR as endangered ( $n=22$ ) or threatened ( $n=11$ ), and a subset of these species are known or could potentially occur in the upper Ohio River mainstem.

### Project Operation Potential Impact

The hydropower facility and associated USACE locks and dam structure create a partial physical barrier to fish species’ upstream and downstream movement. During hydropower operation, river flow is partially directed through the powerhouse. Increased flow through the powerhouse is attractive to many fish moving downstream. Passing through the powerhouse poses inherent risks to fish. Fish may become entrained and may suffer turbine-induced injury and mortality, primarily due to blade strikes. In addition, alterations in flow patterns may alter fish behaviors and degrade suitable habitat downstream of the Project.

Current Hydro is developing hydropower projects at Pike Island and New Cumberland Locks and Dam with the philosophy and intention of causing minimal impact to hydraulic, ecological, and recreational resources both at the powerhouse and downstream. This is the motivation for designing a powerhouse that uses maximum flows of 90% flow exceedance at these locations and a powerhouse hydraulic capacity of 13,773 cfs (see appendix A for annual and monthly flow duration curves). Thus, it is expected and intended that the Projects will have minimal effects on Project-area resources and will protect existing uses of the Project-area waters. There may be localized changes in flow velocity and direction due to small proportions of water to be released from the powerhouse rather than exclusively over the dam or via spillway gates and lockage operations. These changes will be analyzed in the Project Hydraulics Study and Water Quality Study, but lower hydraulic diversion is an important factor when analyzing effects on fish ecology. Lower volumes of water required for maximum powerhouse capacity equates to lower intake velocities and a higher percentage of spillage. Rated flow velocities at both Pike Island and New Cumberland project will be about 3.3 feet per second (fps) at the trash racks and 2.5 fps at the transect immediately upstream of the powerhouse intake piers, just upstream of the trash racks. All encountered fish from assemblage surveys and any other existing fisheries data will be modeled as part of entrainment and impingement studies outlined in section 2.3.



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## Study Methodology

Project-specific fisheries surveys are proposed and include night-time electrofishing and benthic trawling to complement the aggregation of existing fisheries data compiled from various survey techniques. Survey methodologies should target the complete array of fish species found at the Pike Island and New Cumberland projects, including a notable interest dedicated to American Eel (*Anguilla rostrata*) presence.

Under guidelines defined in Appendix A of ORSANCO's Biological Programs Standard Operating Procedures (SOP) (February 2020), fisheries assessments will occur in the vicinity of New Cumberland and Pike Island dams. Current Hydro will conduct night-time boat electrofishing surveys at six, 0.5-kilometer-long sampling sites located upstream ( $n=3$ ) and downstream ( $n=3$ ) of both Pike Island and New Cumberland locks and dams. Sites will be placed within approximately 1.6 kilometers upstream and downstream of each dam. Four sites will be surveyed along the shorelines supporting the hydroelectric operations (i.e., left descending bank [LDB] at New Cumberland dam and right descending bank [RDB] at Pike Island dam), and two sites will be surveyed along the opposing shore (i.e., lock-chamber sides). A total of 12 electrofishing sites will be sampled. Electrofishing is performed at night to maximize gear efficiency and fish capture effectiveness resulting from increased foraging activity of predators that consequently increase prey movements along the littoral zone adjacent to the riverbank. One sampling event will be conducted per site in mid/late summer (July - September) during suitable survey conditions with regard (but not limited to) water transparency (i.e., Secchi depth), river flows, weather conditions, water temperatures, and safety (e.g., field staff, the general public). Fishes will be netted and placed in a live well for subsequent processing (e.g., identification, enumeration, size class lengths, physical condition), data recording, vouchering (photographic or preserved – as needed), and returned to the river. Characterization of instream habitats will occur using the "Copper-Pole Method" and following Appendix C of ORSANCO's SOP to assign a discrete habitat classification that ultimately accounts for each biotic index's scoring expectations.

Benthic trawling is a survey method used to target benthic fish species that boat electrofishing methods may underrepresent. Several benthic fishes listed in the state of Ohio as threatened (T), such as American Eel (T), River Darter (*Percina shumardi*) (T), Channel Darter (*Percina copelandi*) (T), may potentially occur in the vicinity of the locks and dam. No fish species listed as threatened or endangered by the USFWS are known to occur in this portion of the Ohio River. Benthic trawling will be performed at each of the 12 electrofishing sites associated with the New Cumberland and Pike Island dams to supplement boat electrofishing survey data and existing datasets. Benthic trawling will occur within the 0.5-kilometer-long sampling sites using an eight-foot mini-Missouri trawl net for sampling small-bodied benthic fishes (Herzog et al. 2009) or equivalent netting. Diurnal sampling will involve three trawls per site, each lasting approximately one minute as the boat travels in a downstream direction with the boat powered in reverse (i.e., bow upstream). One sampling event will be conducted per site in mid/late summer (July - September) during suitable survey conditions with regard (but not limited to) water transparency (i.e., Secchi depth), river flows, weather conditions, water temperatures, and safety (e.g., field staff, the general public). Fishes will be netted and placed in a live well for subsequent processing (e.g., identification, enumeration, size class lengths, physical condition), data recording, vouchering (photographic or preserved – as needed), and returned to the river.

American Eels are a cryptic and elusive species that are not easily captured during standard fisheries collection methods employed in the Ohio River mainstem. To target this species, passive trapping methods (i.e., eel traps) may be a viable option as these collection methods are productive in other river basins within the U.S. Baited eel traps will be deployed within the tailrace of both New Cumberland and Pike Island dams. A minimum of 5 traps will be set on the bottom of the riverbed and checked every 18-24 hours. To maximize efficiencies, deployment of traps will occur solely in conjunction with fisheries or

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freshwater mussel surveys instead of independent field studies.

### Level of Effort and Cost

A qualitative and comprehensive study of the fishery would necessitate a high level of effort by staff experienced in fisheries and with a working knowledge Ohio River of fish identification. Conducting research targeting each trophic level and species in the Project area would be relatively costly compared to other recent electrofishing surveys in the area. However, such a comprehensive analysis of the fishery is necessary for proper management decisions and for the later determination of fish entrainment through the desktop entrainment analysis request in study request #4. Additionally, the Current Hydro team welcomes the opportunity to further discuss methodologies and study plans with all stakeholders. The anticipated level of efforts and costs associated with fisheries studies are below:

<b>Task</b>	<b>Hours</b>	<b>Anticipated Costs</b>
Electrofishing	350	\$50,000
Benthic Trawling	100	\$15,000
Eel Trapping	40	\$5,000

## 2.3 Fisheries and Fish Entrainment and Impingement Studies

### Goals and Objectives

The Applicant will conduct a desktop fish impingement and entrainment study. This study will describe the physical characteristics of the proposed Project that may influence fish impingement and entrainment rates, including the intake location and dimensions; the estimated velocity of flow approaching the intake structure; and the clear spacing between trash rack bars. Next, current and future routes for fish movement past the dam and the risks of injury or mortality for each will be identified, considering current and future flow management regimes (i.e., concerning flow allocations for spill and turbines based on river discharge). The analysis will identify individual species and guilds/groups for factors that may influence their vulnerability to entrainment and mortality. The assessment will include an evaluation of the potential for fish impingement and provide estimates of entrainment, turbine passage survival, total Project survival, and monthly and annual fish losses due to turbine entrainment.

### Resource Management Goals

The WVDNR is charged with protecting and managing all wildlife within West Virginia, including within the section of the Ohio River that passes through its borders. WVDNR maintains the biological integrity of the State's fisheries and, when needed, ensures the ability of fish to move upstream or downstream in accordance with requirements governing Water Quality Standards, W.Va. C.S.R. §47-2-1, et seq. (26) and antidegradation implementation procedures, W.Va. C.S.R. §60-5-1, et seq. (2008).

### Existing Information

To the best of its knowledge, Current Hydro is not aware of any entrainment studies that have been performed at the Pike Island or New Cumberland Project sites, or at the very least, no recent entrainment

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studies (within the last five years) have been conducted. American Electric Power (AEP) completed a detailed entrainment study on the Racine =Pool on September 8, 2021.

### Project Operation Potential Impact

During the operation of the turbines at each Project, fish of a certain size will be able to pass through the trash racks and become entrained through the turbines. As the turbines operate, it is likely that some fish will suffer lethal injuries during passage, primarily from blade strikes. The likelihood of blade strike and turbine-induced mortality increases as the size of the fish increases, but they are also dependent on certain turbine design and operation parameters (e.g., runner rotational speed and diameter, blade spacing, blade leading edge thickness, and relative velocity of inflow to blades). Depending on entrainment and turbine survival rates, the loss of fish due to turbine entrainment can potentially impact fish populations in the vicinity of each Project.

### Study Methodology

The Fish Impingement and Entrainment Study will utilize the existing fish community information, fisheries data collected upstream and downstream in the vicinity of the Project (i.e., Fish Assemblage Study), hydrological data, and design/operational characteristics of the Project to support the analysis of turbine entrainment and mortality for a select list of fish species (typically the most abundant and any considered to be important sportfish by the resource agencies). Current Hydro will develop an initial target list of species from all available sources, including ORSANCO's pools survey and AEP's approved list of 82 species at the Racine Pool. The methodology employed will include standard and widely used desktop evaluation and modeling methods that have been accepted by state and federal agencies (including FERC) at projects throughout the U.S. The standard practice has been to utilize the Electric Power Research Institute (EPRI) turbine entrainment and survival database as a model in evaluating the potential for entrainment at a facility. Entrainment data (monthly and annual) will be provided for all target species and presented for up to three size groups (e.g., <250, 250-500, and >500 mm); turbine mortality will be estimated for 2-inch class sizes starting at a length of 2 inches.

For species and life stages that are expected to encounter the intake, impingement risk will be determined based on fish size and available swim speed data. The length at which each species will be too large to pass through the trashrack bar spacings will be determined using body depth and length ratios available in the literature, and the swim speed data will be used to determine if fish that are physically excluded from entrainment can avoid impingement based on the estimated intake approach flow velocities.

Monthly and annual entrainment numbers will be estimated for abundant species and those specifically identified by the resource agencies for inclusion in the analysis. The estimation of entrainment will be conducted with data provided in the EPRI Turbine Entrainment and Survival Database for sites that are similar to the Pike Island and New Cumberland projects with respect to fish community composition, geographic proximity, reservoir size and volume, and turbine flow. Using the data selected from the EPRI database, entrainment rate estimates (i.e., number of fish entrained per a specified volume of generation flow) will be calculated by month for each species and specified size group. Monthly entrainment numbers will be summed to obtain an annual entrainment estimate.

Turbine survival will be calculated using a theoretical blade strike probability and mortality model that is

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similar to the one described by Franke et al. (1997). This model has been used to estimate turbine survival of fish entrained at more than 30 hydropower projects in the Midwest and Northeast, including three projects on the Upper Mississippi River in Minnesota and the Willow Island Project on the Ohio River. Using the turbine survival component of the EPRI database, the survival rates calculated with the theoretical model will be compared to data from field studies conducted at projects with similar turbine designs as the equipment proposed for Pike Island and New Cumberland. Comparison of the theoretical results to field estimates allows for an assessment of consistency with the empirical data (i.e., a measure of model validity).

For each selected species, the turbine survival rates will be applied to entrainment numbers to estimate the total number of fish killed during turbine passage on a monthly and annual basis. A total project survival rate will also be calculated using estimates of the proportion of fish that pass through each available route (e.g., turbines and spill gates) for the range of river flows that occur at the project (and the probability of flow occurrence) and route-specific survival rates (i.e., turbine survival estimates as described previously and literature-based spillway survival rates).

#### Level of Effort and Cost

The level of effort required to conduct a desktop impingement and entrainment analysis is relatively minor and several consulting firms are well equipped to perform such an analysis. Additionally, the cost of a desktop analysis is much more attainable when compared to the alternative of an in-field study. The desktop modeling methods are currently considered standard practice for estimating impingement, entrainment, and turbine and total project survival at hydropower projects, and they have been accepted by numerous state and federal resource agencies and FERC. The expected cost to complete this study for Pike Island and New Cumberland is \$20,000 to \$30,000.

## 2.4 Freshwater Mussel Surveys

#### Goals and Objectives

Freshwater mussels (Unionidae) are among the most threatened group of aquatic organisms in the United States. The upper Ohio River system harbors a unique and diverse assemblage of freshwater mussels that may be impacted by Project activities. To alleviate freshwater mussel concerns, Current Hydro will survey the Project APEs for populations of freshwater mussels. The goal of a mussel survey is to fully and completely assess the mussel populations; determine the presence of rare, threatened, and endangered species; provide information on the occurrence and distribution of mussels; and to establish current and baseline conditions of mussels within 1500 meters downstream of the Project. Anticipated upstream impacts will be limited to a short stretch of suboptimal habitat against the existing dam. Upstream freshwater mussel resources will not be assessed due to safety concerns.

#### Resource Management Goals

USFWS and WVDNR are charged with the protection and management of threatened and rare

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wildlife within West Virginia. This includes populations of sensitive freshwater mussels in the Ohio River. All native mussels are protected in the State of Ohio under Section 1533.324 of the Ohio Revised Code. However, the Ohio River mainstem is predominantly owned by the state of West Virginia; thus, ODNR defaults regulation of freshwater mussel consultation and management to WVNDR. All mussels are protected in the State of West Virginia pursuant to West Virginia §20-2-4 and CSR 58-60-5.11. In addition, federally listed mussel species within the state are protected under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). The goal of this study, from a management perspective, is to determine what impacts, if any, the Projects' construction and operations may have on established mussel beds or suitable mussel habitat. A USFWS approved survey plan is not required as no federally protected freshwater mussel species are known from within the Project vicinities.

### Existing Information

Throughout the 19th and 20th centuries, the upper Ohio River was heavily degraded by a wide array of pollutants from municipalities, the steel industry, chemical production, and mining. Freshwater mussel populations in the upper Ohio River suffered severe declines but have begun to recover over the last 30 years. Both Project sites are within sections of the upper Ohio River mainstem that are known to support mussel populations, but sensitive federally protected species are not expected to occur (WVDNR 2020).

Mussel survey efforts within the upper Ohio River have been predominantly limited to small construction and dredging footprints at industrial facilities. Mussel populations in the upper Ohio River mainstem are typically distributed throughout suitable shoreline habitat with moderate diversity but low abundances. In 2021, Current Hydro preemptively initiated mussel survey efforts outside of the USACE Restricted Navigation Zones in the downstream buffers of both proposed Projects. Surveys at Pike Island included completion of eight 100-meter transect searches yielding 1,274 live unionids of 16 species. Divers encountered excellent, clean swept heterogeneous substrates in the downstream portions of the survey area. Suitable habitat generally dissipated moving upstream toward the existing locks and dam structure. Survey efforts at the New Cumberland Project site included completion of nine 100-meter transects yielding 292 live individuals of 13 species. Substrates were noticeably scoured by the upstream locks and dam, providing poor unionid habitat. No live nor deadshell specimens of federally protected species were encountered at either site.

### Project Operation Potential Impact

Project operations have the potential to directly impact mussel communities by altering flow regimes, scouring potentially suitable habitat, redefining sediment transport downstream, disrupting preferred hydraulic conditions during crucial life stages, restricting movement of host fish species, and causing turbine mortality to host fish species (Haag 2012; Wegscheider et al. 2019). Unionid mussels are long-lived organisms that typically reproduce slowly and are sensitive to changes in environmental conditions. Changes in the flow dynamics from hydropower operation may produce significant impacts to unionid communities within close proximity to the powerhouse. Therefore, if unionids are encountered within the Project footprint, they will be relocated downstream to suitable habitat that will remain unimpacted by

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continued hydroelectric operation.

## Study Methodology

The WVDNR requires that any mussel survey be conducted in a manner consistent with the guidelines provided by the 2022 Protocol which can be found at <https://wvdnr.gov/plants-animals/freshwater-mussels/>. The selected contractor must employ a malacologist on the 2020 West Virginia Approved Freshwater Mussel Survey List for Group 3 stream consultation. The list is available through the WVDNR website at <https://wvdnr.gov/wp-content/uploads/2021/07/CertifiedMusselSurveyors.pdf>. Prior to survey commencement, mussel survey plans and designs will be submitted to WVDNR for approval. Survey plan review by USFWS is not required as no federally protected freshwater mussel species are known from within the Project vicinity. A state scientific collection permit and site-specific amendment will be obtained prior to conducting any survey work. Mussel work will be completed in coordination with WVDNR and ODNR during the approved mussel survey season (May 1 – October 1).

Mussel survey efforts at the proposed Projects on the Ohio River will be completed as a Group 3 project scoping phase for hydropower activity with a minimum of 1.6 kilometers of downstream mixing zone sampled every 100 meters ( $n=16$ ) with a 100 meter transect length extending perpendicular to flow into the channel. Additionally, 50 meter transects spaced every 25 meters will be placed in the proposed powerhouse construction footprint ( $n=3$ ). Additional surveys may be required if subsequent modeling determines hydraulic changes will extend farther downstream. In total, searches will be conducted along an estimated 1,900 meters. All collected mussels will be identified to species, measured, photographed for vouchers, and returned to the substrate. If initial survey efforts identify freshwater mussel resources within the Project footprint, they will be relocated downstream prior to construction.

## Level of Effort and Cost

Conducting an adequate mussel survey in accordance with the West Virginia Mussel Survey Protocol requires an intensive surveyor certification process. Approved West Virginia mussel surveyors have a minimum of 3 years survey experience, are trained to assess and identify over 60 species of mussels, and maintain the necessary expertise to properly implement the survey Protocol. This need for an experienced and knowledgeable surveyor increases the cost of a mussel survey. In addition, the Ohio River is a large, highly trafficked waterway. Mussel surveys require SCUBA diving, communication with commercial traffic, and an understanding of dangerous riverine conditions. Large rivers pose unique mussel survey challenges, thus precluding many firms from performing a safe and successful survey. However, numerous mussel surveys have been conducted in large river settings throughout West Virginia and the United States. Experienced dive teams can conduct Ohio River surveys within a level of cost and effort that is both reasonable and prudent while still meeting the high level of effort required by the Protocol. The combined initial survey efforts for both facilities are expected to require 750 hours with an approximate cost of \$115,000. If freshwater mussel populations are encountered at either site, substantial additional costs may be associated with relocation efforts or mitigation.

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## 2.5 Water Quality Study

### Goals and Objectives

The objectives of the water quality study are to ensure the Projects' compliance with state water quality standards, provide early detection for potential deviations in water quality measurements (i.e., DO levels approaching 5.0 milligrams per liter [mg/L]), and provide the mechanisms to correct these deviations. Current Hydro's goal is to maintain DO levels downstream of the Project. Operational procedures will include alarm procedures below 6.5 mg/L followed by a combination of a powerhouse draft tube air injection system, and flows through the Dam spillway gates to provide suitable DO concentrations downstream.

### Resource Management Goals

Our consultations with ORSANCO and West Virginia resource agencies have shown that DO is the primary water quality parameter of concern with respect to the proposed Project. For the first three quarters of the 20th century, DO concentrations in the Ohio River were depressed because of the discharge of raw or inadequately treated sewage. Water Quality conditions began to improve following the promulgation in 1970 of ORSANCO's standard requiring secondary treatment for all sewage (Corps, 2006). DO is consistently less of a problem in the Upper Ohio River as reported in 2020 ORSANCO 305 (b) Report Table 7. DO as expressed as a percentage of days which never exceeded the applicable DO criterion, at and above Willow Island on the Ohio River, from 2014 through 2018.

The ORSANCO is an interstate commission that operates programs to improve water quality in the Ohio River basin. ORSANCO includes membership from eight states in the Ohio River Basin, as well as five federal agencies (National Oceanic and Atmospheric Administration [NOAA], USACE, United States Environmental Protection Agency [USEPA], USFWS, and USGS). Under the terms of an interstate agreement known as the Ohio River Valley Water Sanitation Compact, Article VII recognizes individual member states' authority to adopt water use designations and water quality standards that are no less stringent than the ORSANCO standards for the Ohio River mainstem. Within this portion of the Ohio River, ORSANCO, Ohio EPA, and WVDEP establish designated uses for the Ohio River and include fish and other aquatic life; contact recreation; public, agricultural, industrial, and wildlife water supply; water transport; cooling and power; and fish consumption. ORSANCO issued a 2019 Revision of the Pollution Control Standards and established numerous water quality criteria that are identified and established to protect designated uses (ORSANCO 2019). The entire Ohio River is designated as impaired for fish consumption because of high levels of PCBs and dioxin (ORSANCO 2017).

In West Virginia, water quality criteria for the Ohio River are found in West Virginia's Code of State Regulations (CSR §47-2, et seq. ([2016]) and in Ohio are found in the Ohio Administrative Code (OAC) 3745-1-32. Numeric water quality criteria exist for DO concentrations and are the same for ORSANCO, WVDEP, and Ohio EPA; however, the narratives associated with the reported DO criteria are slightly discrepant. The average DO concentrations for the protection of warm water aquatic life habitats shall be at least 5.0 mg/L for each calendar day; the minimum DO concentration shall not be less than 4.0 mg/L; and from April 15 to June 15, a minimum DO concentration of 5.0 mg/L shall be maintained at all times

(ORSANCO 2021).

Water temperature criteria vary throughout the year and are based on daily maximum water temperature, period average, and instantaneous maximum temperatures. As of 2019, water temperature criteria for the Ohio River differ slightly for the ORSANCO, WVDEP, and Ohio EPA. Water temperature criteria are summarized in Table 1 and Table 2.

*Table 1. ORSANCO’s Daily Maximum Water Temperature Criteria*  
Degrees Fahrenheit (°F) in the Ohio River between Ohio River Miles 0-341

ORSANCO	
Julian Day**	Daily Maximum Water Temperature
1-49	$47.1 - 0.086 * \text{Julian Day}$
50-166	$26.6 + 0.328 * \text{Julian Day}$
167-181	87
182-243	89
244-258	87
259-366	$160.8 - 0.300 * \text{Julian Day}$

\*\*Julian Day is the number day of the year (1-366)

*Table 2. Water Temperature Criteria (degrees Fahrenheit [°F]) in the Ohio River.*

Month	Date Range	ORSANCO	Ohio EPA		WVDEP	
		Monthly Max Water Temperature	Period Average	Instantaneous Maximum	Period Average	Instantaneous Maximum
January	1-31	45.7	45.7	47.0	45	50
February	1-29	43.9	43.9	46.3	45	50
March	1-15	51.2	51.2	56.4	51	56
	16-31				54	59
April	1-15	61.2	61.2	66.3	58	64
	16-30				64	69
May	1-15	71.2	71.2	76.5	68	73
	16-31				75	80
June	1-15	78.8	78.8	81.0	80	85
	16-30	87.0	87.0	87.0	83	87
July	1-31	89.0	89.0	89.0	84	89
August	1-31	89.0	89.0	89.0	84	89
September	1-15	87.0	87.0	87.0	84	87



	16-30	81.0	81.0	83.1	82	86
October	1-15	74.1	74.1	78.3	77	82
	16-31				72	77
November	1-30	65.0	65.0	69.0	67	72
December	1-31	55.8	55.8	60.0	52	57

Existing Information

Historical and contemporary water quality information within the Projects’ vicinity was described in detail in Section 5.2 of the New Cumberland and Pike Island PAD. The USGS gage at the Montgomery Locks and Dam (03108490), located approximately 23 and 53 river miles upstream of New Cumberland and Pike Island Locks and Dam, respectively, documents daily temperature, DO, and pH levels in the Ohio River. The available information suggests Ohio and West Virginia state water quality standards are realized upstream in the Ohio River. ORSANCO retains and maintains a database of water quality parameters along the entirety of the Ohio River. Routine water quality data is collected at Pike Island Dam in collaboration with USGS as well as ORSANCO’s Water Quality Monitoring Program that are disseminated in their biennial 305(b) report. Additional data is available from ORSANCO’s historical and special-interest projects (e.g., biological monitoring program, bimonthly clean metals monitoring) dataset at and near New Cumberland Locks and Dam and will be synthesized and analyzed. Locally relevant water quality data will also be used in accordance with Project-generated data (from above and below each project) to assess Project impacts on water resources.

Project Operation Potential Impact

Current Hydro is developing hydropower projects at Pike Island and New Cumberland Locks and Dam with the philosophy and intention of causing minimal impact to hydraulic, ecological, and recreational resources both at the powerhouse as well as downstream. This is the motivation for designing a powerhouse that limits maximum flows to 90% of flow exceedance at these locations and powerhouse hydraulic flow capacity of 13,773 cfs (see Appendix A for annual and monthly flow duration curves). In this section of the Ohio River the average flow is approximately 38,000 cfs. Previously FERC licensed projects at Pike Island and New Cumberland planned for powerhouse hydraulic flow capacity of 46,600 cfs and 30,500 cfs respectively. Current Hydro’s approach spills a larger percentage of the available flow over spillways. Thus it is expected and intended that the Projects will have minimal effects on Project-area resources and will protect existing uses of the Project-area waters. There may be localized changes in flow velocity and direction due to small proportions of water to be released from the powerhouse, rather than exclusively over the dam or via spillway gates. These changes will be analyzed in the Project Hydraulics Study and Water Quality Study but lower hydraulic diversion is an important factor when analyzing effects on water quality and most importantly DO.

Current Hydro is committed to maintaining DO levels downstream and is actively investigating aeration alternatives when flows are within the operational range of the Project. Alternatives will include an air injection system in the powerhouse draft tubes, and providing minimum flows over the dam spillway gates as ways of ensuring suitable DO below the Project to meet state water quality standards. Current Hydro will monitor DO and install alarms that will draw operational attention to DO when saturation approaches 6.5 mg/L and will curtail power generation prior to downstream DO reaching 5.0 mg/L. The

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USACE maintains the pool elevation to allow for a depth suitable for navigation; Current Hydro will not have the ability or authority to operate the powerhouse in anything but run-of- river mode. The USACE determines the total discharge flow from the dam, and the Applicant will use an allocated portion of that flow for power generation.

## Study Methodology

Multiple water quality parameters could be assessed at New Cumberland and Pike Island locks and dams although water temperatures and DO concentrations will be the primary parameters of interest. Additionally, continuous monitoring of these two parameters will occur for one year prior to construction to establish baseline conditions and to generate background water quality data used to further document existing conditions. One water quality monitoring station will be placed above the dam and one below the dam. The APE precise locations of each monitoring station (within each of the general areas noted above) will be determined in coordination with stakeholders.

Continuous DO and temperature probes will be deployed and monitored at each locks and dam Project from May 1, 2022, through October 31, 2022. DO and temperature measurements will be recorded every 15 minutes and are accessible to ORSANCO and the public. Data loggers will be maintained and calibrated on a routine basis to address potential fouling of data and other malfeasances with the probe's operation.

Monthly sampling of other parameters such as pH, turbidity, and conductivity may also be included before and during the construction period to track and manage turbidity, sedimentation, and other potential changes in water quality as outlined in FERC License conditions. DO and water temperature data will be collected from the Project intake and tailrace areas. Project operations information (e.g., production / output) will be compared to concurrent water quality data to identify influential trends within the Project area.

## Level of Effort and Cost

The cost of conducting an ongoing and continual water quality monitoring program with a focus on two parameters (DO and temperature) is reasonable and attainable. An ongoing study would require approved scientific equipment (i.e., a water quality probe capable of recording readings at regular intervals and with a minimum of one month of data storage) and routine maintenance (calibration/maintenance of instruments and retrieval of data). Continual monitoring efforts of the requested parameters are being conducted at other facilities throughout the state of West Virginia and these can be used as estimates for total cost and effort. Total costs for water quality monitoring are not expected to exceed \$90,000.

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## 2.6 Aquatic Habitat Study

### Goals and Objectives

To ensure hydroelectric operations are consistent with the USACE prescribed water level management strategies for New Cumberland and Pike Island locks and dams, the applicant will delineate physical habitat characteristics throughout the downstream Project hydraulic footprint. A habitat field survey is proposed to delineate aquatic littoral and demersal habitat in terms of substrate and cover. Major habitat and shoreline types will be delineated with the data used to evaluate Project effects on aquatic resources in the area. Habitat suitability is defined primarily by substrate, cover, and depth, and will assist in characterizing the benthic community. Each of these habitat parameters will be assigned specific attributes to be used for field delineation. These will generally include:

- substrate: fines (sediment, organic detritus, mud etc.), sand, gravel, cobble, boulder, bedrock, anthropogenic rubble (concrete, rip-rap rock, etc.)
- cover type: object cover (i.e., boulder, woody debris, riprap, etc.), overhead cover (overhanging limbs, structures, etc.); vegetative cover (emergent, submergent)
- cover density: absent, low, moderate, high
- depth (at normal pool): surface to substrate (ft)

### Resource Management Goals

The USACE is tasked with protecting the integrity of navigable waters throughout the US, including the benthic zones. Identification of habitat types and features will provide a framework of locations within the Project footprints that may harbor sensitive aquatic fauna. The map of existing suitable habitats (i.e., instream cover features, heterogeneous substrates, etc.), combined with data from hydraulic modeling (sediment deposition and bed shear forces), will identify areas that may be negatively affected by altered flow dynamics. It is also important to understand habitat availability and alterations while interpreting fisheries data (e.g., habitat, trophic, and feeding guilds).

Any hydropower project developed by Current Hydro will be required to conform to USACE operational goals, which include ensuring that “all applicable state and federal water quality standards are met, water quality degradation of Corps resources is avoided or minimized, and project responsibilities are attained.” (ER-1110-2-8154, Sec 2.1, 2018). Likewise, the Corps is responsible for maintaining a number of water control functions on the Ohio River, including flow regulation, navigation, and recreational access. The Ohio River is home to a large number of fish and mussel species, some of which are federally listed as threatened or endangered, and the management of the habitat of these species becomes the concern of Current Hydro within the APE of the proposed hydroelectric Projects.

### Project Operation Potential Impacts

The initial operation of both powerhouses will cause localized changes in riverine flow dynamics. Changes in hydraulic conditions may cause scour or deposition of downstream benthic habitats, thus impacting the resident aquatic community. However, over time, downstream habitats will shift and adjust to the altered flow regime, forming new areas of suitable benthic habitats. The overall velocity and flow volume coming through the locks and dam facilities will remain unchanged. The absence of Project-related alterations to water depth and velocity over time will lead to near-constant quantities of available

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habitat.

## Methodology

Downstream depths and velocities will be mapped during hydraulic modeling and physical habitat characteristics will be delineated via SCUBA diving during mussel survey efforts. Divers will record substrate sizes / categories (Wentworth 1922), depth, and type and amount of cover. Habitat will be recorded along survey transects spaced 100 meters apart (perpendicular to stream flow) and extending 1,600 meters downstream from the proposed Project locations. Instream littoral habitats will also be assessed during fisheries studies using the “Copper-Pole Method” as described in Appendix C of ORSANCO’s SOP.

Habitat surveys and delineations will occur during summer months with base riverine flows to provide adequate underwater visibility, observations of cover under consistent conditions, and accurate measurements of depth relative to substrate. Additionally, by mid-summer, annual aquatic vegetation beds have reached their peak yearly growth limits. Reporting of the habitat characteristics and potential influence of modified flow dynamics will include consideration of sensitive aquatic species within the tailraces and expected impacts to their habitats. Reports will be augmented with detailed maps from hydraulic modeling efforts that depict areas where increased velocities may be expected to scour suitable benthic habitats.

## Level of Effort and Cost

Habitat mapping will be performed concurrently with freshwater mussel survey efforts and fisheries studies. Performing the aquatic habitat assessment during mussel survey efforts will provide cost savings with a minimal increase in the time commitment. Collection of habitat data and preparation of detailed maps and reports is expected to require approximately 85 hours and cost \$12,000.

## 2.7 Terrestrial Habitat and RTE Species Study

### Goals and Objectives

A terrestrial field study within both APEs will be conducted to describe and document general wildlife habitat types and conditions, rare and invasive plant species, and habitat for federally protected bats. The primary goals of terrestrial studies include establishment of baseline conditions and identification of sensitive or ecologically valuable habitat types (i.e., old growth forest). A comprehensive understanding of baseline conditions will maximize the effectiveness of restoration efforts and species-specific mitigation measures (i.e., bat boxes) following ground disturbance.

### Resource Management Goals

All wildlife within the state of Ohio is owned by the state under the Ohio Revised Code 1531.02. The ODNR’s mission is to conserve and improve fish and wildlife resources and their habitats for sustainable use and appreciation by all. Terrestrial habitats impacted by the Pike Island construction footprint are within the known range of rare and threatened wildlife (i.e., bats) within the state of Ohio. All species classified as state “threatened” or “endangered” are protected by ODNR under the Ohio Revised Code 1531.25.

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West Virginia does not recognize state listings of rare or threatened species; however, all wildlife within the state of West Virginia is owned by the state under Code § 20-2-3. The mission of the WVDNR is to provide and administer a long-range comprehensive program for the exploration, conservation, development, protection, enjoyment and use of the natural resources of the State of West Virginia. Thus, the terrestrial footprint of the New Cumberland hydroelectric facility must be constructed in a manner consistent with all environmental preservation and development standards set by WVDNR.

Additionally, as both Projects are within the range of federally protected and/or candidate bat species, protection of said bats and their habitats falls within the jurisdiction of USFWS under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). The goal of this study from a resource management perspective is to ensure Project activities fall within the guidelines of all applicable state and federal regulations and do not harm sensitive or rare terrestrial species and their associated habitats.

### Project Operation Potential Impacts

Following completion of Project infrastructure, terrestrial habitats will remain relatively uninfluenced by Project operations. A small portion (<1.5 acres) of the landscape at each Project site will be permanently appropriated for the powerhouse and substation footprints. Transmission lines will require periodic clearing that may impact ground nesting birds and pollinators and encourage colonization of invasive plant species. However, transmission lines are known to create useful edge habitats for foraging bats and state protected Timber Rattlesnakes (*Crotalus horridus*).

### Study Methodology

Both Project locations lie within the known range of the federally protected Indiana Bat (*Myotis sodalis*) and the proposed Northern Long-Eared Bat (*Myotis septentrionalis*; NLEB). Projects within range of the Indiana bat and NLEB must initiate formal consultation with USFWS by requesting information regarding known records of state and federally listed bats in the vicinity of the proposed Project (i.e., identify known occupied habitat). Following results of the formal consultation process terrestrial site assessments may/can occur. This includes coordination with USFWS, ODNR, and WVDNR to ensure bat roosting trees and/or maternity roosts are not adversely impacted by a Project from loss of summer habitat (e.g., forests) or winter hibernacula (e.g., caves, mines) due to construction or operation.

In the state of Ohio, state and federally listed bat species carry similar regulatory requirements; thus, protected bat consultation at Pike Island will include consideration of state listed bat species known from the area (i.e., Little Brown Bat [*Myotis lucifugus*], Tri-Colored Bat [*Perimyotis subflavus*], NLEB).

If the Projects occur outside of known, listed bat capture buffers, an area-based presence and absence survey using mist nets (i.e., 9 net-nights) may be necessary to proceed with tree felling during time of year restrictions. Indiana bats and NLEB live in trees during the summer and live underground in winter. Determining the presence of portals to underground voids (such as caves or mines) is necessary to properly complete ESA compliance for federally listed bats.

As both Projects include a relatively small footprint, all other terrestrial habitat delineations (i.e., rare and invasive plants surveys) will be performed by qualitatively assessing the entire Project footprint. Surveyors will use submeter Global Positioning System (GPS) units to accurately mark all species or areas of interest.

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## Level of Effort and Cost

Costs for bat and general habitat assessments, surveys of rare and invasive plants, and underground portal searches will include two days of field efforts, study plan preparation and coordination with the appropriate agencies, and report generation. The total time commitment is expected to require 80-100 hours with a cost range of \$10,000 to \$14,000.

If either Project a) lies within an Indiana Bat or state-listed (i.e., Ohio) bat capture buffer or b) tree clearing is scheduled in the off-season (if feasible), Current Hydro may forego summer mist netting surveys. Costs will increase significantly if mist netting surveys are required to determine presence/probable absence of listed bats.

## 2.8 Wetlands and Waters Delineation

### Goals and Objectives

Sensitive wetland features may exist within the proposed powerhouse footprints or associated construction staging yards. The Applicant proposes to conduct a desktop review and field study to document the location and extent of jurisdictional wetlands/waters of the U.S. (WOTUS) within the Project study areas including all areas that may be temporarily or permanently displaced during construction and/or operation in the APE. Completion of wetland surveys would aid the Applicant in designing Project features that would minimize impacts on jurisdictional wetlands/waters of the US and inform the design of appropriate mitigation if necessary. The study will also seek to advance the gathering of information needed to support the USACE Section 404 process.

### Resource Management Goals

All jurisdictional wetlands within the United States are regulated by USACE (Section 404 of the CWA), USEPA (Section 401), and state agencies (i.e., Ohio EPA or WVDEP). State agencies coordinate with the USACE and issue of a Water Quality Certification (as needed) that ensures compliance with applicable state laws and water quality standards. Wetland and stream delineations are performed to comply with all temporary and permanent infrastructure associated with the Project in support of avoiding and minimizing impacts to these resources if determined to be present.

### Project Operation Potential Impacts

Construction of the Project powerhouses is expected to permanently impact a small footprint (<0.6 acre) at each site in areas that have likely already experienced disturbance during construction of the locks and dam structures. Temporary impacts can be expected within the temporary construction lot footprints. However, these spaces are temporary and land contours will be returned to their original state following completion of the Projects. The continual Project operation is not expected to impact WOTUS not already impounded for USACE operations.

### Methodology

Qualified wetland delineators based within the region will conduct wetland delineations in accordance with the procedures set forth in the USACE 1987 Wetland Delineation Manual, applicable Regional Supplement, and any applicable District-specific, EPA, or state designated requirements. Prior to

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conducting the field surveys, the team will obtain and review available aerial photography, Natural Resource Conservation Service (NRCS) soil surveys, USFWS National Wetland Indicator (NWI) maps, and county hydric soils lists to identify the number, type, size, and location of potential wetlands and waterbodies within the Project area. Following initial desktop review, wetland delineators will conduct field surveys to ensure any changes to previously documented resources as well as any new resources within the APE are recorded. Documented waterbody boundaries will be recorded with submeter GPS technology, following standardized survey protocols and collecting all applicable data and forms.

### Level of Effort and Cost

Desktop and on-site delineations of all wetland resources will be performed by qualified wetland scientists based in the upper Ohio River valley and expected to require two days of field day of work. The small Project footprints and close proximity to qualified delineators will keep costs for wetland assessment low. Costs for desktop review, site visits by a certified wetland delineator and their technician, and reporting are expected to require approximately 130 hours and cost less than \$20,000. If construction staging is performed within existing industrial spaces, costs will be greatly reduced.

## 2.9 Recreational Uses

### Goals and Objectives

The Applicant proposes to conduct a desktop review to document the location and extent of recreation within the Project study areas including recreation activities that may be impacted during construction and/or operation. Given the construction of the facility structures (e.g., a new intake, powerhouse, tailrace, transmission) for the New Cumberland Project will occur exclusively on private lands, that are not permitted recreation sites, impacts on recreationalists in the Study Area will be generally short-term, associated with construction related noise and increased traffic. Alternatively, the new electric station for the Pike Island Project will be installed within a parking lot for a nearby fishing pier, which may result in temporary and permanent impacts on recreationalists. The Applicant will consult with state and local governments and appropriate interests to better ascertain recreational conditions, future plans, and potential Project impacts as well as opportunities to facilitate recreation in the Project Areas, including the location of a new fishing pier and associated parking lot to offset Project impacts. Current Hydro will consult throughout the licensing process regarding recreation needs as well as appropriate measures for protection and/or mitigation of identified recreational resources.

Current Hydro is committed to a collaborative design process to create new temporary and permanent Americans with Disabilities Act (ADA) compliant public river access. The goal is to avoid the current fishing location in the downstream wastewater/greywater outfall with consideration for public and fisherman safety. The early concept is to incorporate the fishing platform immediately adjacent (perhaps connected to the downstream powerhouse structure), and downstream of the powerhouse to allow fishing in the powerhouse tailrace channel. This is often desired by fishermen. The actual fishing platform will be a concrete platform surface approximately 8 to 10 ft wide and 20 to 30 ft long. The platform will include a safety handrail around its perimeter. The width of 8 to 10 ft allows ADA access around other people that may be fishing. It is early to define access to the platform as this will be done once the powerhouse is in final design in a year or so. Current Hydro envisions an asphalt or concrete path from the parking area to the fishing platform. Again, ADA access compliant (no stairs) with handrails in some locations along the path. The fishing access will be discussed with the USACE as the designs

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develop. Then once early concepts are further along, we plan to consult with local fishermen prior to finalizing the arrangements.

### Resource Management Goals

A variety of recreational opportunities occur within the Project study areas and are managed by federal and state agencies including USACE, USFWS, ODNR, and WVDNR. These agencies are tasked with management and protection of the natural environment (e.g., waters, fisheries) and its use and enjoyment.

### Project Operation Potential Impacts

The New Cumberland powerhouse and associated transmission infrastructure lies within restricted private property owned primarily by the railroad and USACE. Although this property is restricted to the general public, it is a popular fishing site. Riverine access to the proposed powerhouse outfall is restricted by USACE. Continued operation is not expected to impact the general public lawfully accessing the Ohio River.

The Pike Island powerhouse footprint will partially impact a public access parking lot that is used by fisherman to access the Ohio River below the Pike Island Locks and Dam. The site is readily used by the general public and construction/continued operation of the hydroelectric facility will require extensive public outreach and access mitigation. Riverine access to the hydroelectric powerhouse outfall is restricted by USACE.

### Methodology

The Applicant will initiate a desktop review of available USACE, ODNR, and WVDNR data (i.e., creel surveys, public stakeholder comments, etc.). Public survey forms will be available on the Current Hydro website with notifications in and around the Pike Island fishing pier using Quick Response (QR) scan codes and website signage. Comments from survey forms and joint meeting will be documented within the recreational use report. The New Cumberland powerhouse and associated transmission infrastructure is situated within a USACE Restricted Area. If existing data and survey information is unavailable or insufficient to properly characterize recreation use at the Pike Island Project area, the Current Hydro will initiate field studies. Field studies will consist of the installation of passive cameras to mark parking lot and key recreation areas, such as fishing piers. A total of two cameras would be installed for a period (up to 90 days) to document use patterns. Time lapse photographs would be taken at intervals every two hours from dusk to dawn, to document utilization density of the parking lot and at the fishing pier.

### Level of Effort and Cost

Costs for development of a recreation use report will include a desktop analysis based on publicly available data, study plan preparation and coordination with the appropriate agencies, and report generation. The total time commitment is expected to require no more than 70 hours at a maximum cost of \$11,000.

If agency or stakeholder feedback results in the need for data collection via passive cameras, additional costs up to \$30,000 would be required. Further, if agency or stakeholder feedback results in the need for primary data collection, costs will increase significantly to cover survey design and implementation to support a quantitative analysis.



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## 2.10 Cultural Resources

Cultural resources are defined as physical evidence or place of past human activity: site, object, landscape, structure; or a site, structure, landscape, object or natural feature of significance to a group of people traditionally associated with it. A historic property is any cultural resource that is either listed on, or considered eligible for listing on the National Register of Historic Places (NRHP). For this Project, it is anticipated that archaeological sites and historic buildings and structures are the resource types considered most relevant and are therefore the focus of the goals and objectives described below.

### Goals and Objectives

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires federal agencies to take into account the effects of their undertakings on properties listed in, or eligible for listing in, the NRHP, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Current Hydro, as the Applicant and non-federal party, will assist FERC in meeting its obligations under Section 106, and the implementing regulations, by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

Therefore, the objective of the cultural resources work will be to identify and assess the potential effects of Project construction and operation (if any) on historic properties, including archaeological sites and historic architectural buildings and structures. To do so, the APE (direct and indirect) must first be defined by Current Hydro in consultation with the FERC, USACE, Ohio Historic Preservation Office (OHPO) and West Virginia State Historic Preservation Office (WVSHPO), collectively referred to as the SHPOs, federally-recognized Tribes with historic cultural ties to the Project area, and other Project stakeholders, as appropriate. Upon establishment of direct and indirect APEs, qualified cultural resources consultants will work to develop a scope of work to investigate the Project potential to affect archaeological and historic architectural resources. Throughout the licensing process, Current Hydro will consult with the FERC, USACE, SHPOs, Tribes, and any other appropriate stakeholders invited to participate in the Section 106 consultation process will be consulted to develop approved scopes of work for inventory-level investigations (i.e., Phase I surveys) including the identification of previously undocumented resources as well as appropriate measures for protection and/or mitigation of identified resources considered to be historic properties.

### Resource Management Goals

It is not always possible for the FERC (and the other Section 106 consulting or contributing parties) to determine all of the potential effects that may occur over the course of a license. Therefore, the FERC typically requires that a Historic Preservation Management Plan (HPMP) be developed and maintained for the term of the license. The purpose of the HPMP is to require the licensee to consider the appropriate management of effects on historic properties throughout the term of the license and ensures that the FERC meets the requirements of Section 106 for its undertakings.

### Project Operation Potential Impacts

At this time, it is unknown whether the operation of the proposed Project would have impacts on cultural resources. However, following the desktop and required field studies, if it is determined that historic

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properties may be affected, Current Hydro will work with the FERC, SHPOs, Tribes, and other appropriate stakeholders to develop a Project-specific HPMP.

### Archaeological Methodology

In advance of completing any archaeological fieldwork within the direct APE, a desktop archival review will be used to collect data on known cultural resources within a 1-mile radius. The data collected will be limited to that on file at the respective state SHPO office. This will provide information on all previous archaeological, architectural, and National Register-listed properties including previously conducted cultural resources investigations in Ohio and West Virginia.

In general, the direct APE has been significantly altered by construction of both the New Cumberland and Pike Island locks and dam structures. Little to no greenfield or undisturbed areas will be affected by construction or operation of the Projects. However, should initial consultations result in a determination that a Phase I archaeological survey is needed, this work will be completed in accordance with regulations implementing the Section 106 review process (36 CFR 800), Section 101(b)(4) of the National Environmental Policy Act of 1969, the ACHP's Section 106 Archeology Guidelines, the Archaeological Resources Protection Act (ARPA) of 1979 which applies to projects on federal or tribal land, and if applicable, 43 CFR Part 10 of the Native American Graves and Repatriation Act (NAGPRA), which applies to human remains, sacred objects, and items of cultural patrimony (described as "cultural items" in the statute) located on federal or tribal lands or in the possession and control of federal agencies or certain museums.

If required, all fieldwork including site delineation and recordation, shall conform to guidelines for conducting archaeological surveys and investigations in Ohio as established by the OHPO and in West Virginia as established by the WVSHPO. In general, the Phase I archaeological survey would follow standardized methodology for areas located on landforms with less than 20% slope and with less than 50% surface visibility and includes the excavation of shovel tests at 15-meter intervals along systematically spaced transects. A maximum of one transect of shovel tests will be placed in each workspace to ensure that information concerning the subsurface conditions is recorded for each location. All shovel tests will be refilled immediately, and no test pits will remain open overnight. Shovel test locations will be plotted with an iPad using the Collector application and a submeter GPS receiver. Shovel tests will be approximately 50 by 50 centimeters in size. Ground surface inspection will be conducted in those areas where surface visibility exceeds 50 percent, there is visible ground disturbance, and/or slope is greater than 20 percent. Data will be consolidated into a letter report.

The need for archaeological field investigations beyond Phase I survey will be determined following the completion of an initial approved scope of work and in consultation with the FERC, USACE, SHPOs, Tribes, and other stakeholders participating in the Section 106 consultation process.

### Historic Architectural Methodology

The results of the desktop archival review (described above) will be used to develop a proposed scope of work for field investigations. As required following initial agency and stakeholder consultations, Current Hydro will carry out an approved scope of work to identify historic architectural resources within the Project's indirect APE to evaluate the NRHP eligibility of historic buildings and structures within the Project's APE pursuant to both SHPO's state guidelines and requirements. Current Hydro will conduct additional property-specific research on historic buildings and structures within the indirect APE, and complete the requisite state inventory forms for newly identified properties (if any) and provide information to each SHPO sufficient to determine the NRHP eligibility of each.

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## Reporting

In compliance with Section 106 and state reporting requirements, Current Hydro will draft cultural resources study reports for both Ohio and West Virginia that present the results of the archaeological and architectural surveys. The draft reports will incorporate the results of the background research and archival review, including a cultural history of the research area and a description of previous work in and around the APEs. The reports will describe the approved methodologies, results, and recommendations regarding the need for additional fieldwork, for regarding investigations (e.g., archaeological site evaluations) and/or management measures. As appendices to the reports, Current Hydro will also prepare a record of consultation/correspondence with the FERC, SHPOs, USACE, Tribes, and other parties (as appropriate). For review and comment, the draft reports will be submitted to the consulted parties described above. Following review, all received comments will be considered and incorporated into the final reports to be submitted and archived with each SHPO.

## Level of Effort and Cost

The level of effort and cost associated with cultural resource studies is highly dependent on the quality and quantity of undisturbed land within the Project footprints. If the initial desktop review indicates that the Project footprints fall entirely within land disturbed by locks and dam construction or previous industrial sites, cultural resource studies (i.e., archaeology and architectural history) including consultation with the SHPOs and Tribes will require a commitment of approximately 20-30 hours and an estimated \$5,000 for both sites. However, depending on the results of the desktop review and Project plans, if both sites require full Phase I archeology and architectural history field surveys and reporting efforts, the commitment may include an estimated 80 – 100 hours, or approximately \$30,000.

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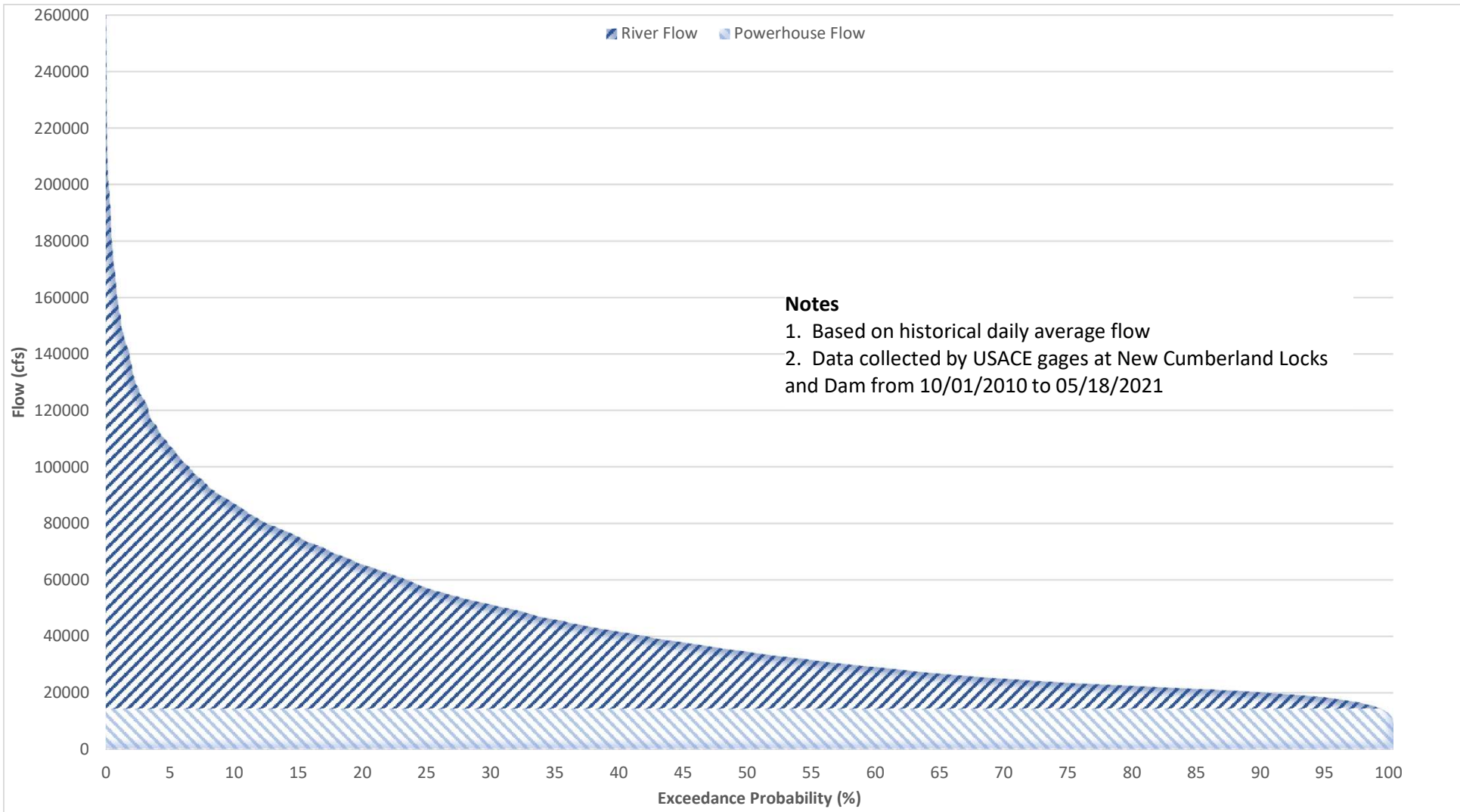
## Literature Cited:

- Center for Biological Diversity. 2018. "Petition to List U.S. Populations of Lake Sturgeon (*Acipenser fulvescens*) as Endangered or Threatened under the Endangered Species Act."  
<https://www.biologicaldiversity.org/species/fish/pdfs/Lake-Sturgeon-petition-5-14-18.pdf>
- Haag, W. North American Freshwater Mussels: Natural History, Ecology, and Conservation. Cambridge University Press. 505 pgs.
- Herzog, David, P., David E. Ostendorf, and Robert A Hrabik. 2009. The Mini-Missouri Trawl: A Useful Methodology for Sampling Small-Bodied Fishes in Small and Large River Systems. *Journal of Freshwater Ecology*, 24(1): 103-108
- ORSANCO. 2017. 2017 Ohio River Pool Assessments: New Cumberland, Meldahl, and Newburgh Pools. <https://www.orsanco.org/wp-content/uploads/2019/02/2017-Combined-Pool-Assessment-FINAL-1.pdf>. 22 pgs.
- ORSANCO. 2018. 2018 Ohio River Pool Assessments: Emsworth and Pike Island Pools. [https://www.orsanco.org/wp-content/uploads/2019/07/2018-Combined-Pool-Report\\_Master.pdf](https://www.orsanco.org/wp-content/uploads/2019/07/2018-Combined-Pool-Report_Master.pdf). 19 pgs.
- ORSANCO. 2019. Pollution Control Standards for Discharges to the Ohio River. Notice of Requirements. 2019 Revision. Online <https://www.orsanco.org/programs/pollution-control-standards/> (Accessed March 2, 2022)
- ORSANCO. 2021. Water Quality Parameters: Dissolved Oxygen. Online: <https://www.orsanco.org/data/dissolved-oxygen/>
- Rice, D., and B. Zimmerman. 2019. A Naturalist's Guide to the Fishes of Ohio. Special Publication of the Ohio Biological Survey. 391 pgs.
- Wegscheider, B., H. O. MacLean, T. Linnansaari, and R. A. Curry. 2019. Freshwater Mussel Abundance and Species Composition Downstream of a Large Hydroelectric Generating Station. *Hydrobiologia*. 836:2017-218.
- Wentworth, C.K. 1922. A Scale of Grade and Class Terms for Classic Sediments. *The Journal of Geology*. 30(5):377-392.
- WVDEP (Department of Environmental Protection Water Resources). 2022. W. Va. Code R. § 47-2-1 Requirements Governing Water Quality Standards.
- WVDEP (Department of Environmental Protection Secretary's Office). 2000. W. Va. Title 60 Series 5 Antidegradation Implementation Procedures.
- WVDNR (West Virginia Division of Natural Resources). 2020. West Virginia Mussel Survey Protocols. Elkins, WV. 29 pgs.

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## Appendix A: Flow Duration Curves

Appendix A includes Flow Duration Curves (FDCs) for both projects and are based on a 10-year average.



## New Cumberland Locks and Dam

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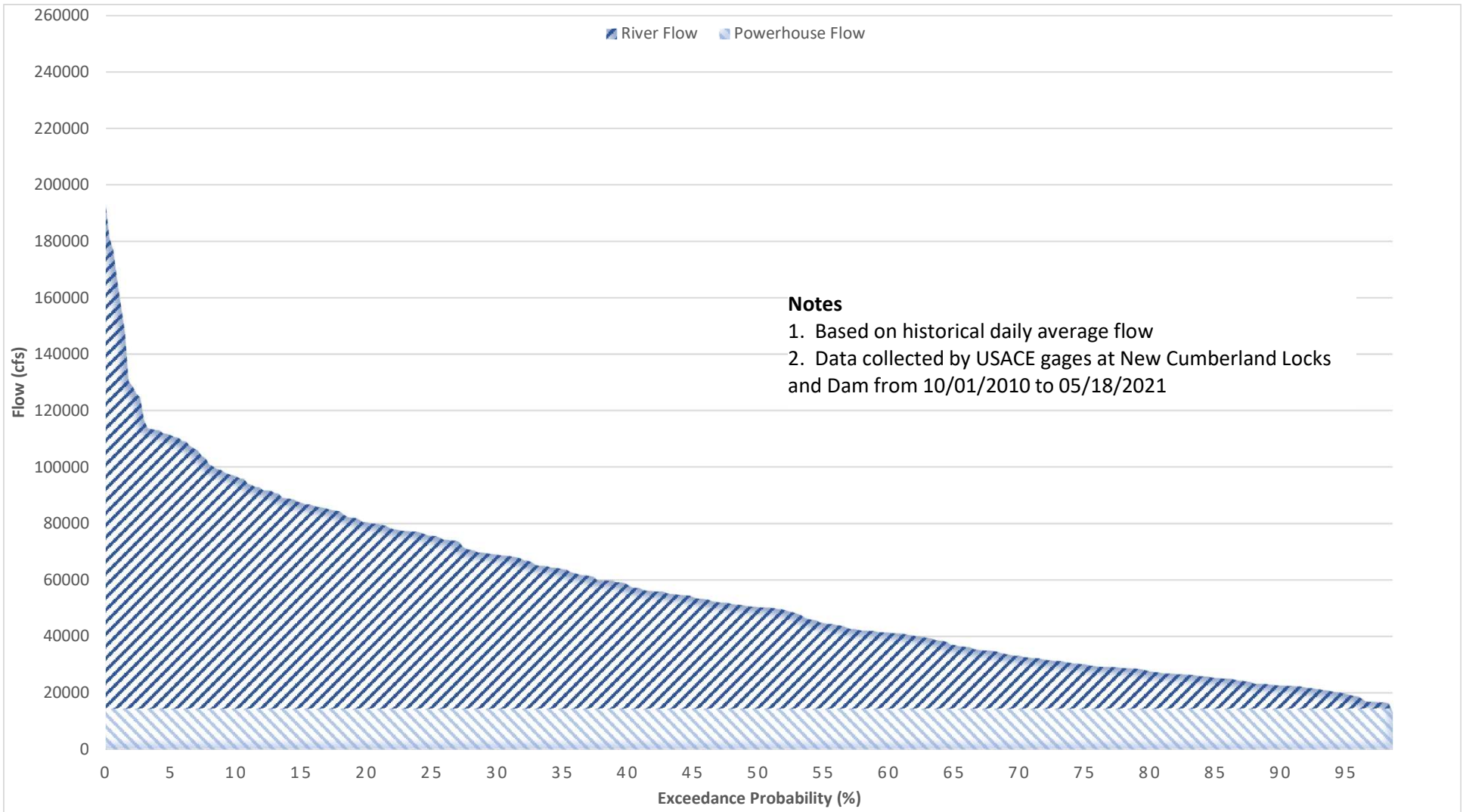


CURRENT HYDRO

## Figure 2: Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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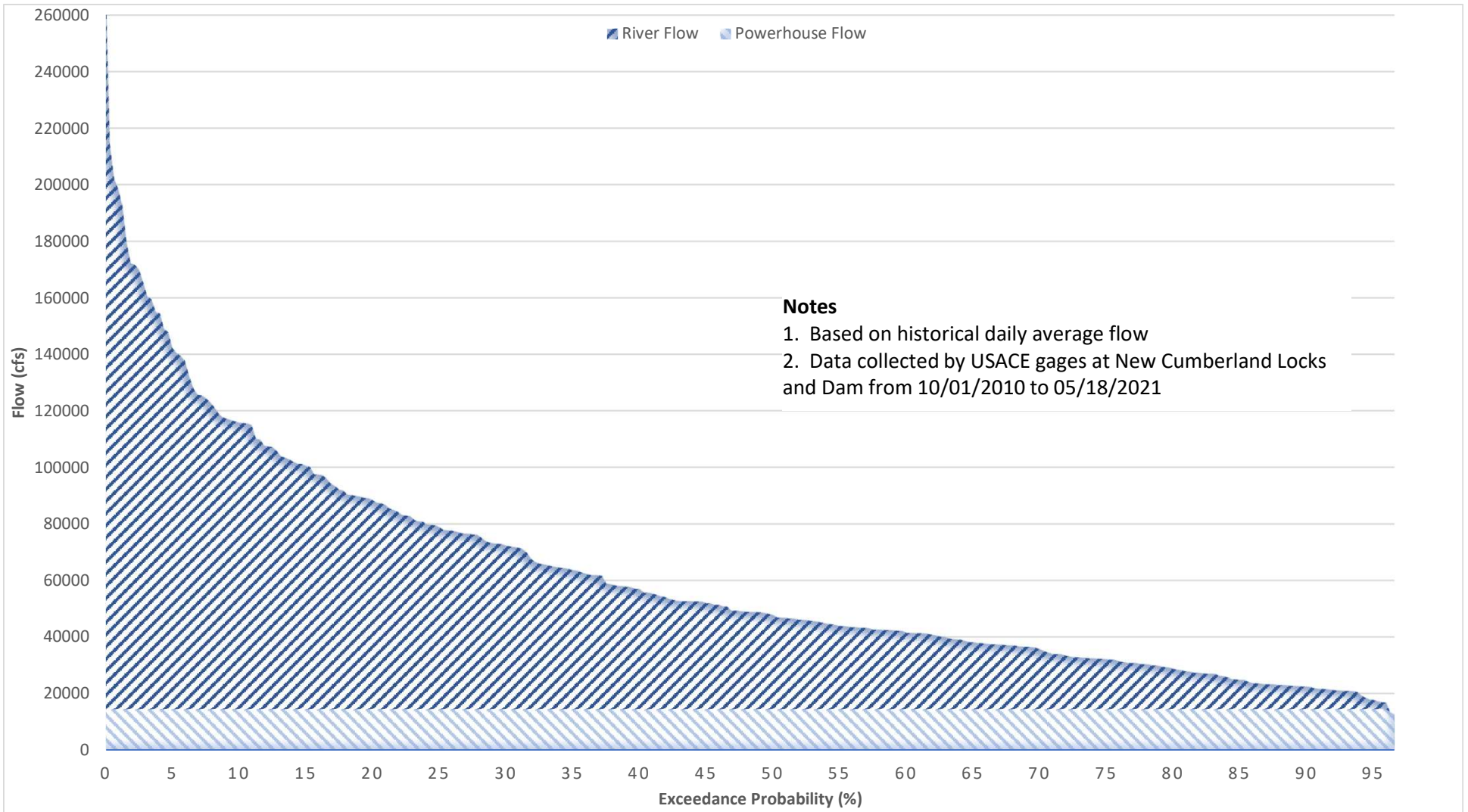


CURRENT HYDRO

## Figure 3: January Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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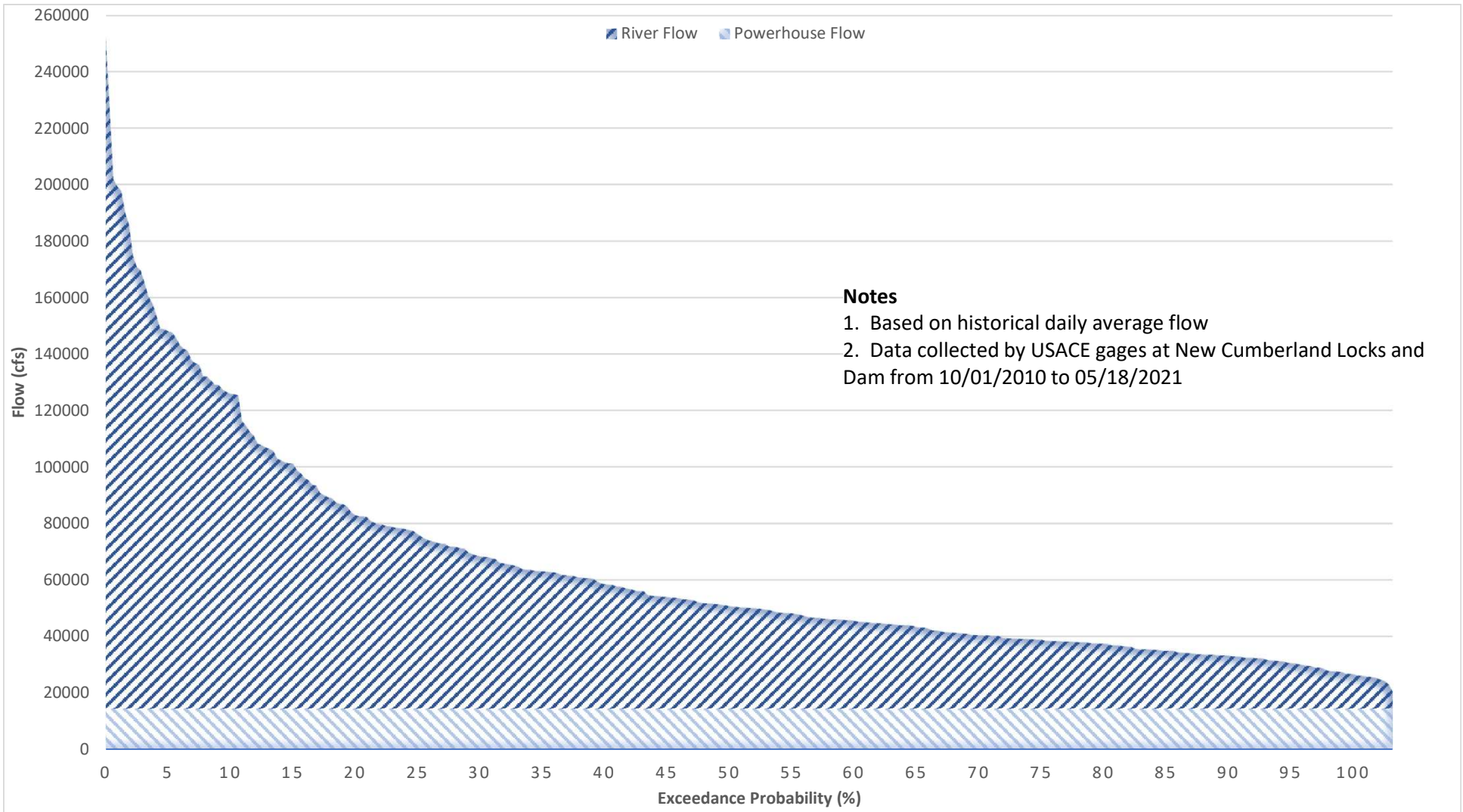
CURRENT HYDRO

## Figure 4: February Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez





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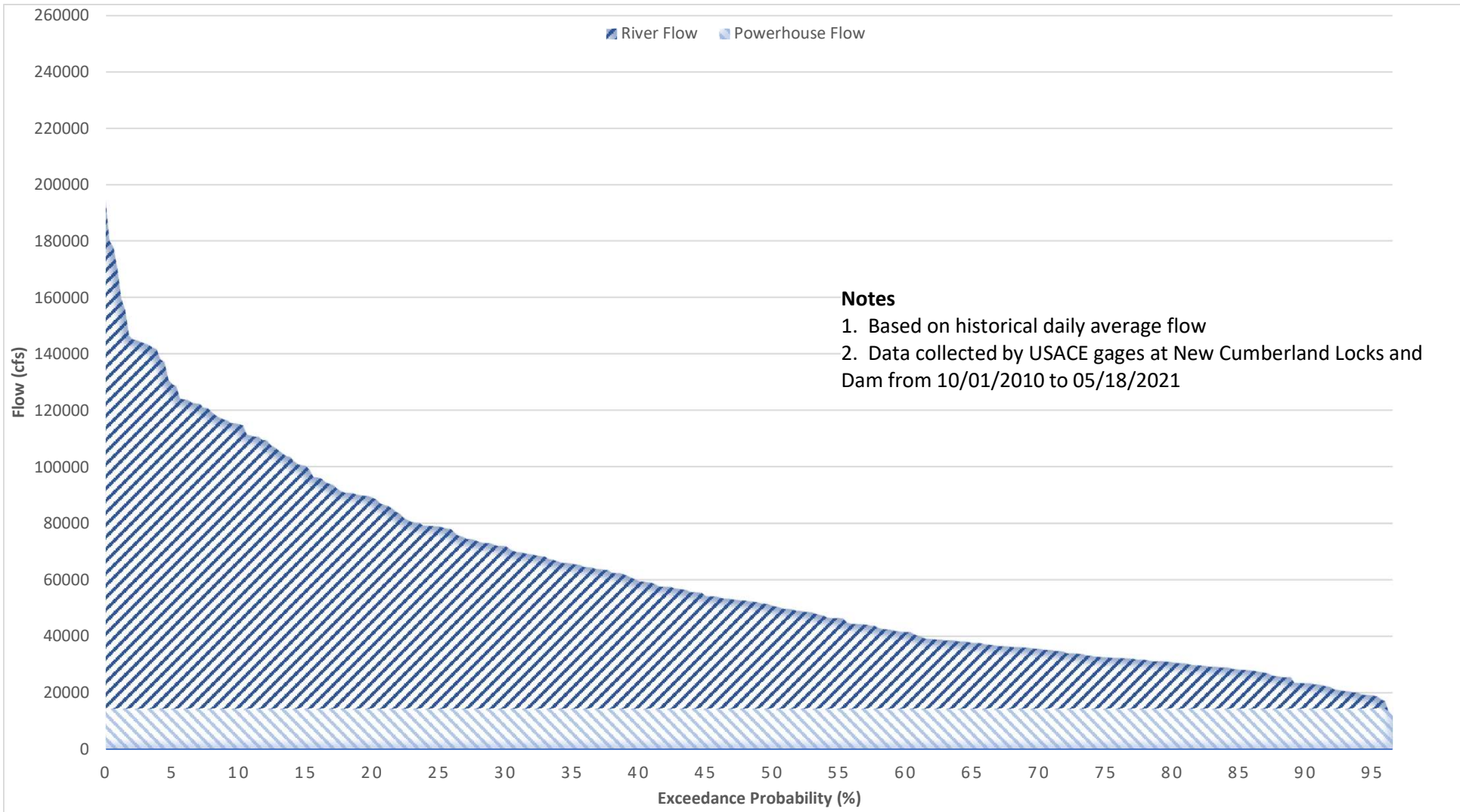


CURRENT HYDRO

## Figure 5: March Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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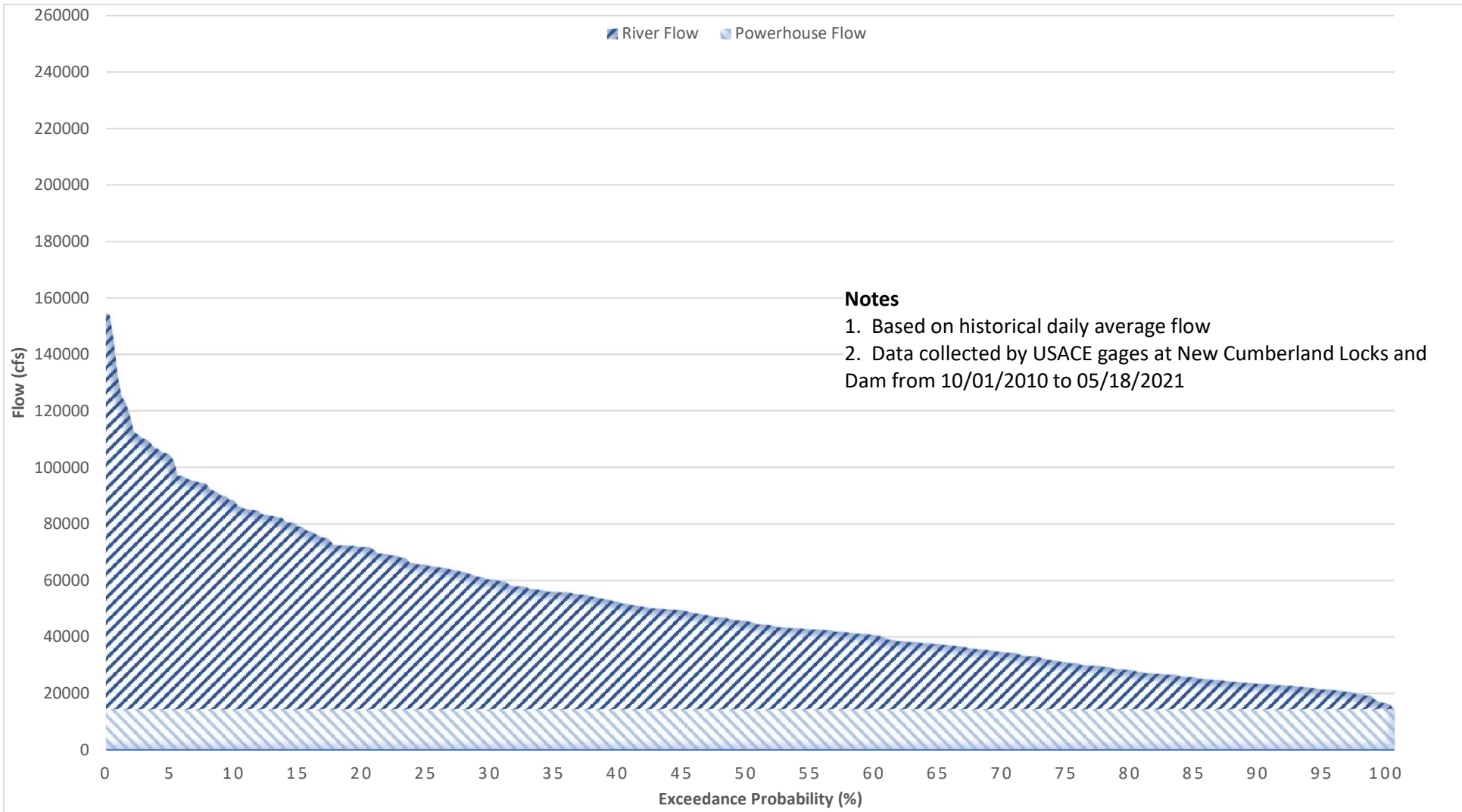


CURRENT HYDRO

## Figure 6: April Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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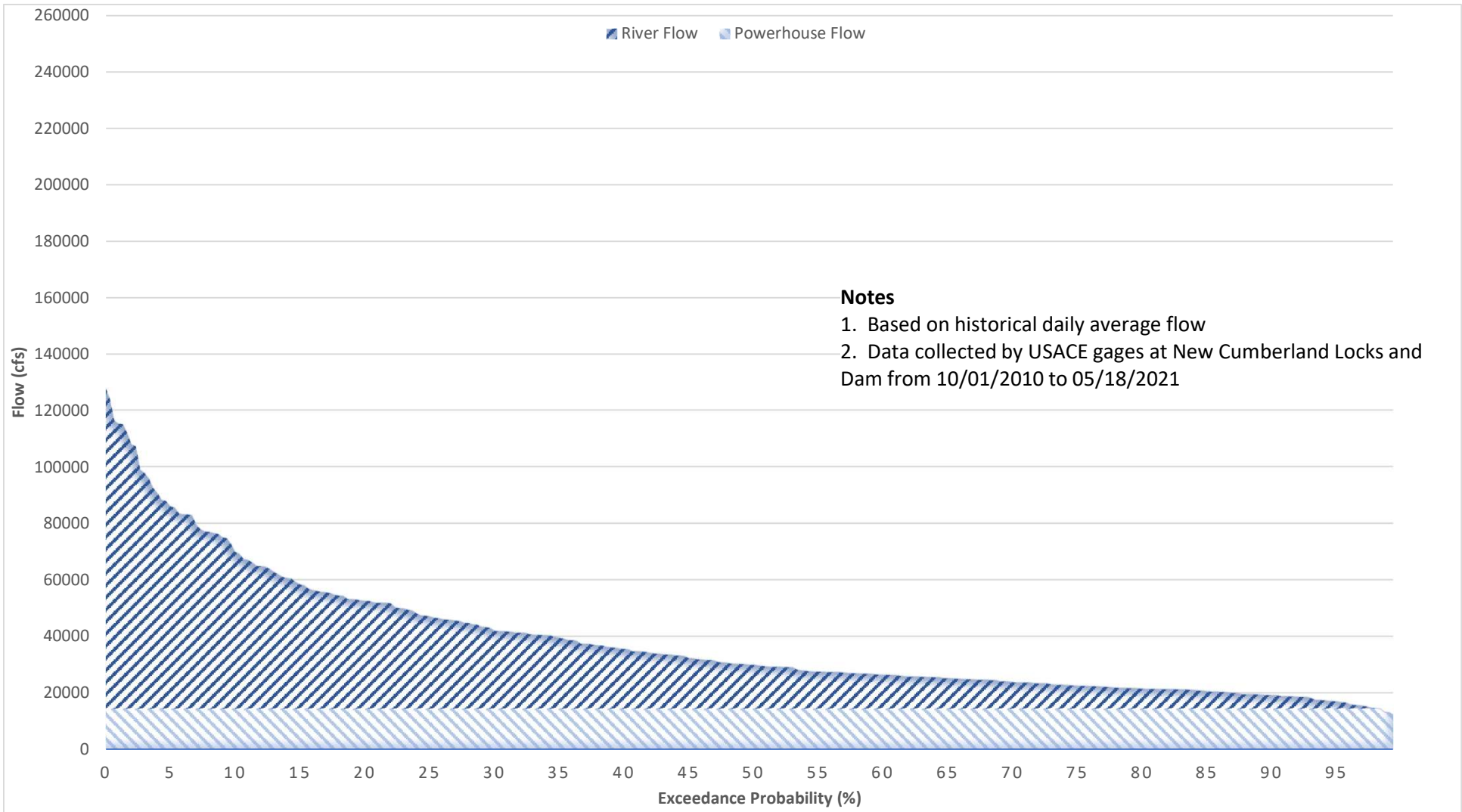


CURRENT HYDRO

## Figure 7: May Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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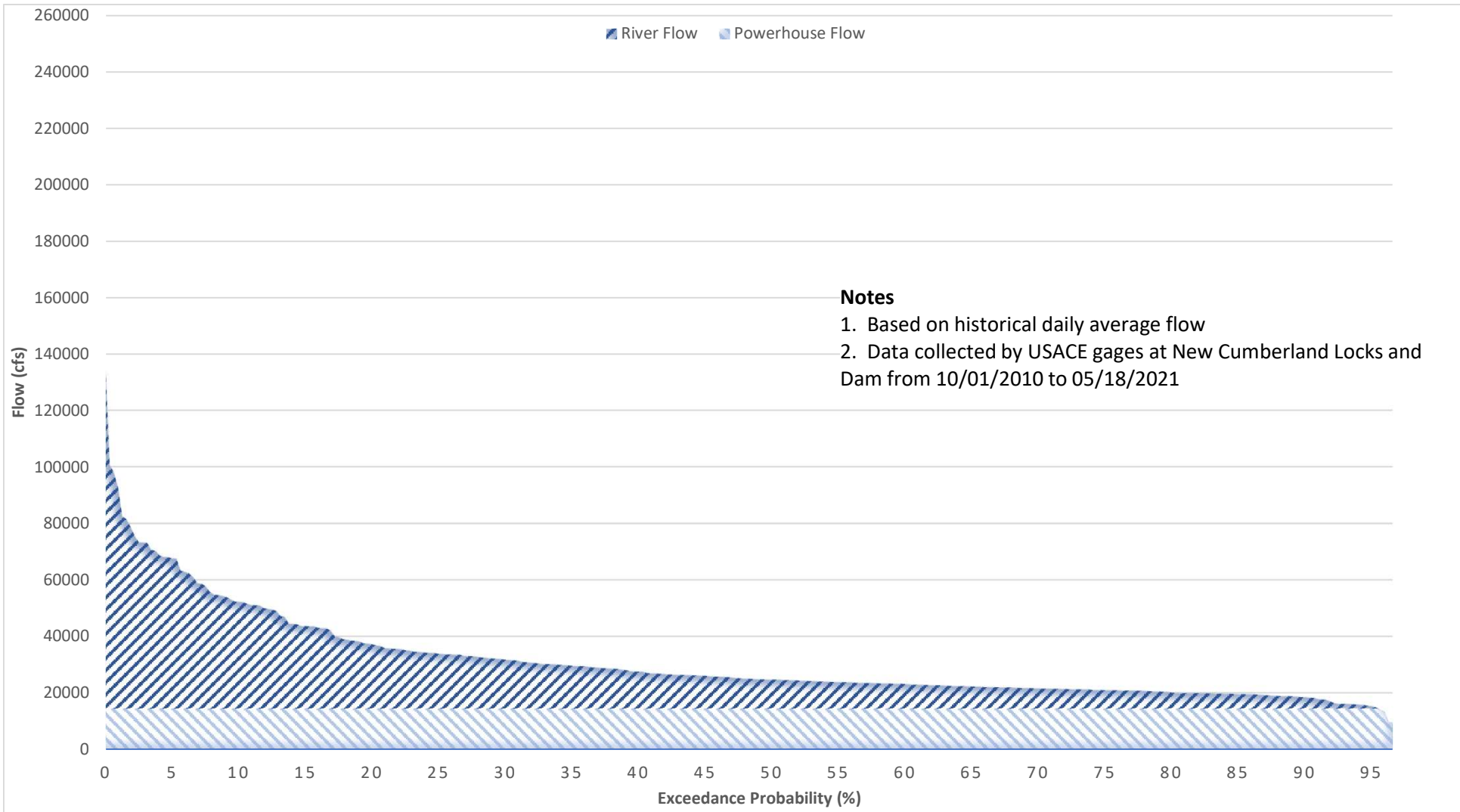


CURRENT HYDRO

## Figure 8: June Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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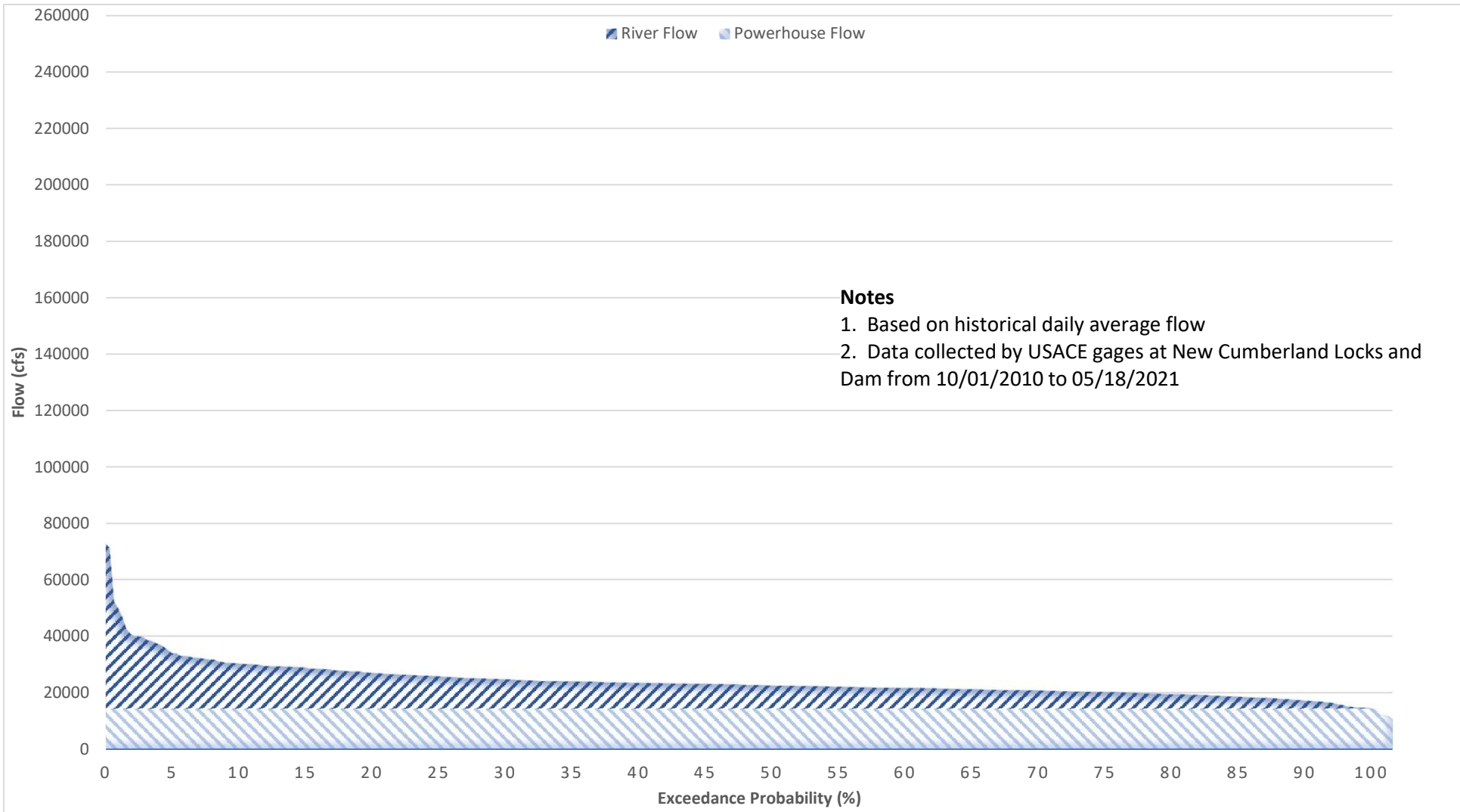


CURRENT HYDRO

## Figure 9: July Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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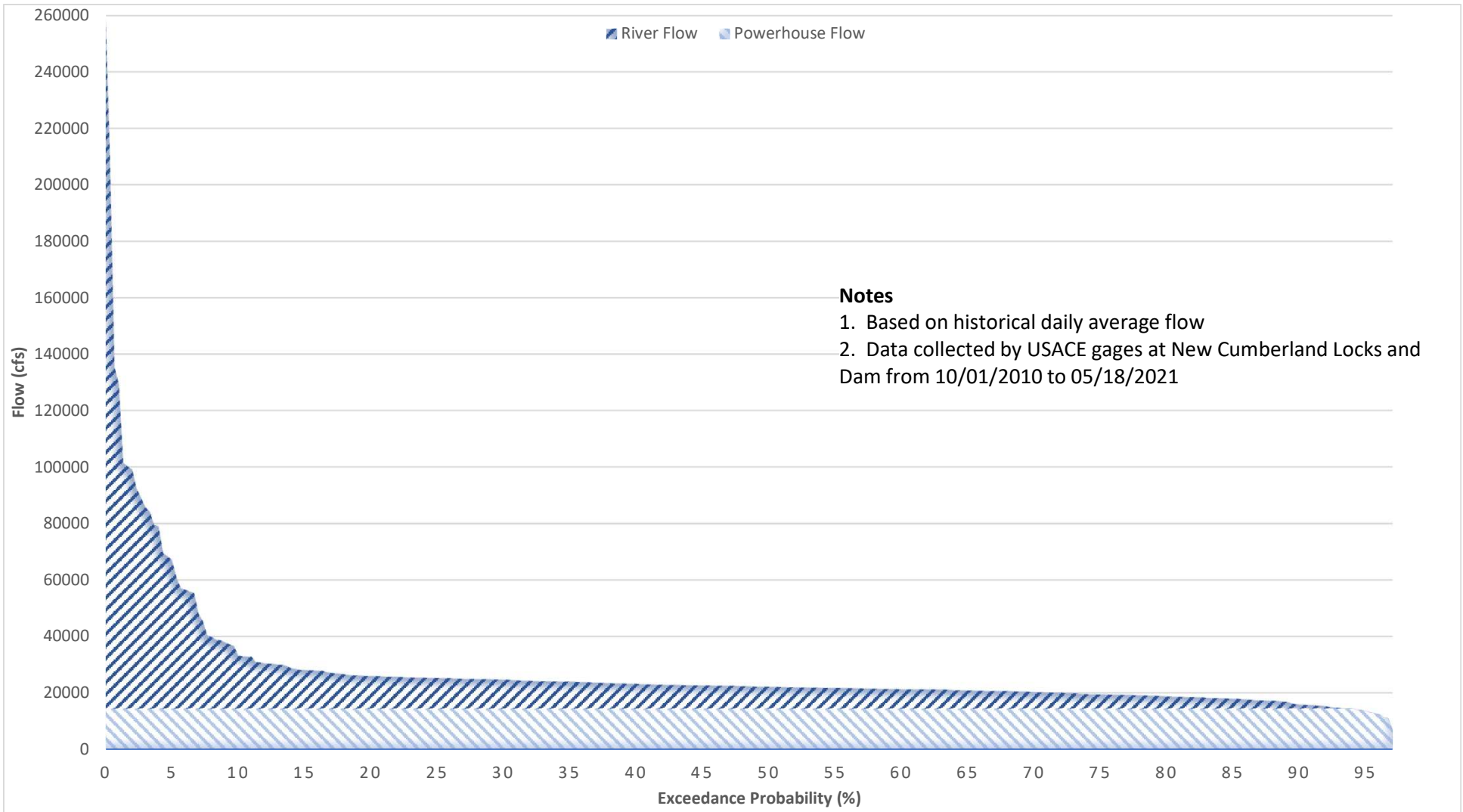


CURRENT HYDRO

## Figure 10: August Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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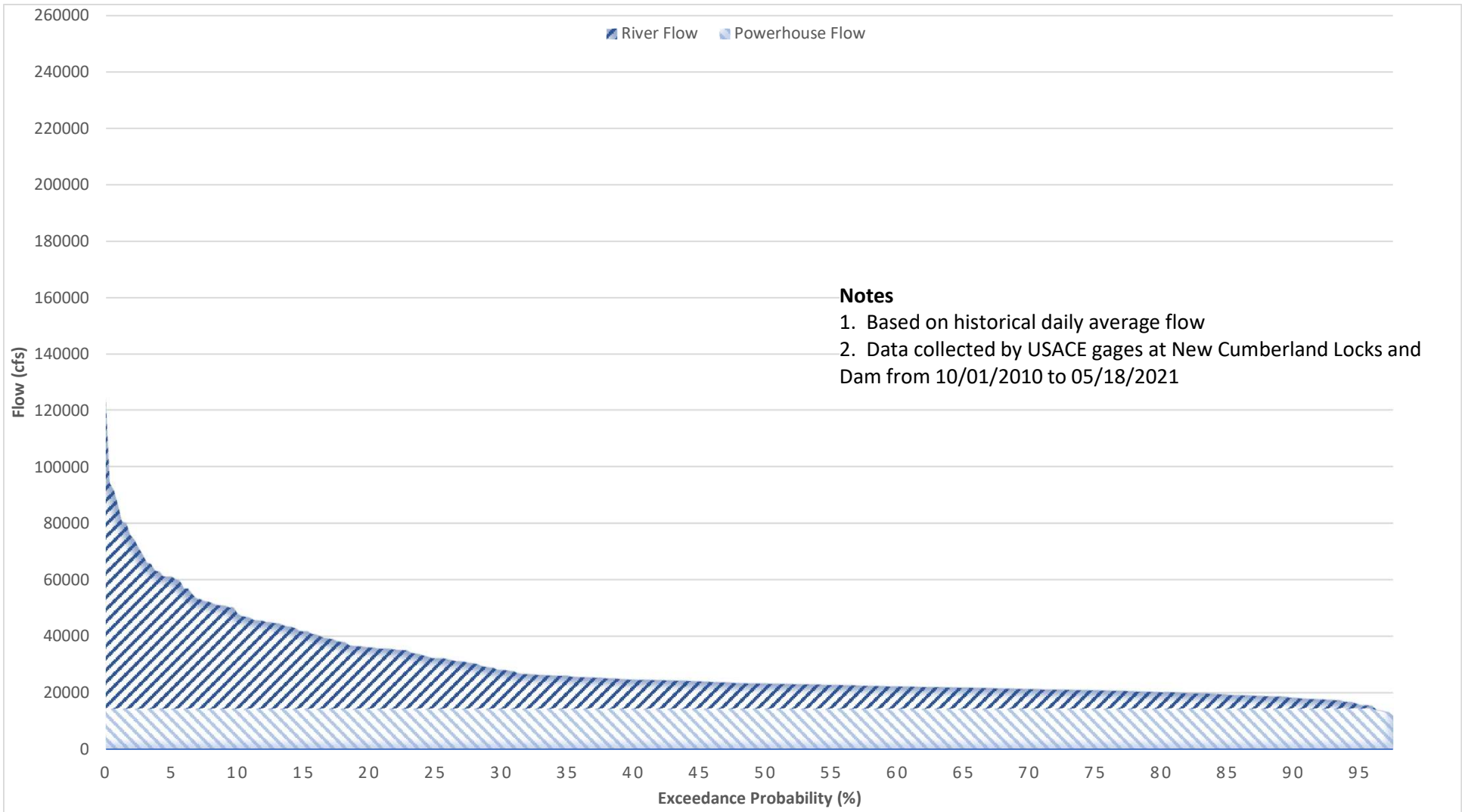


CURRENT HYDRO

## Figure 11: September Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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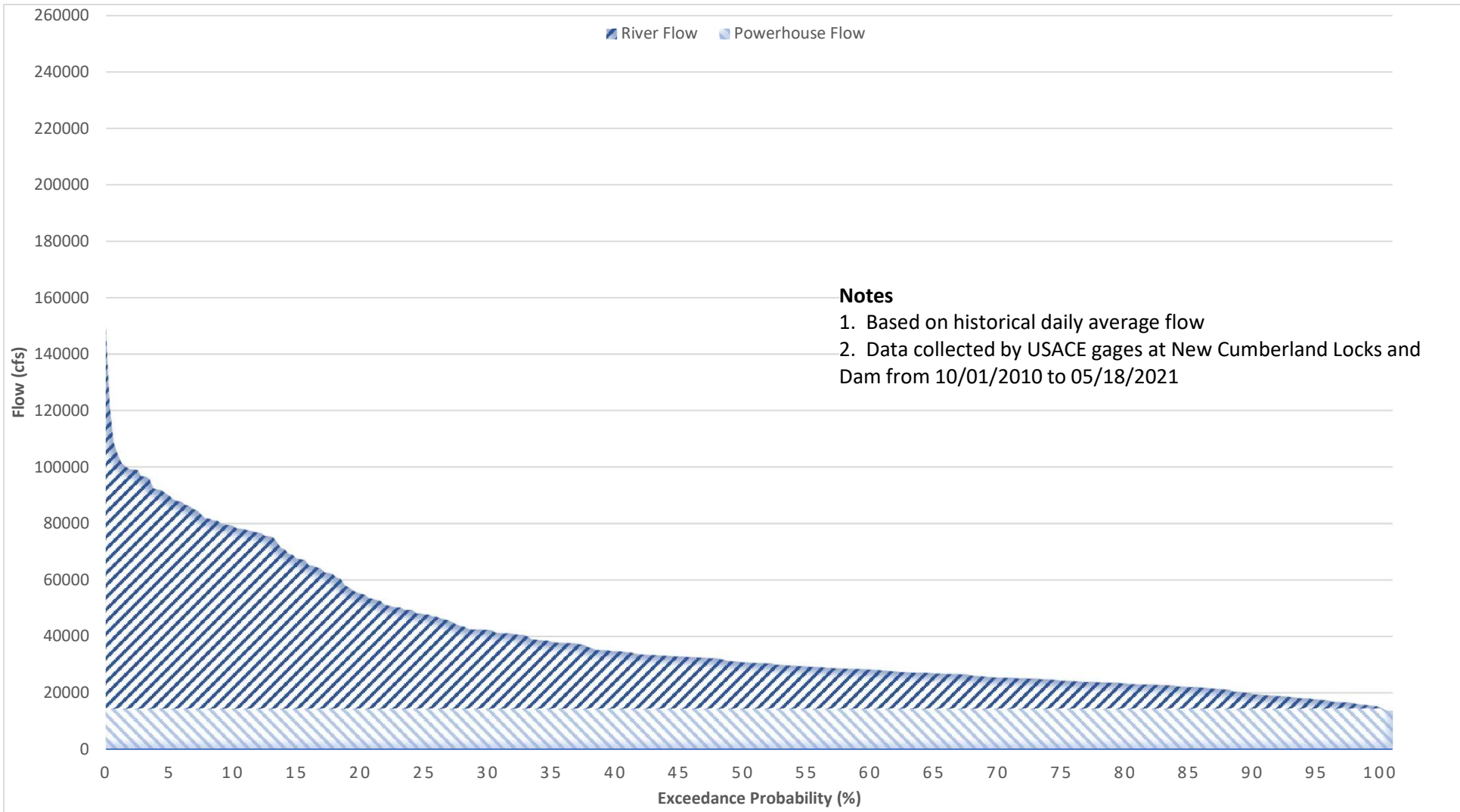
CURRENT HYDRO

## Figure 12: October Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez





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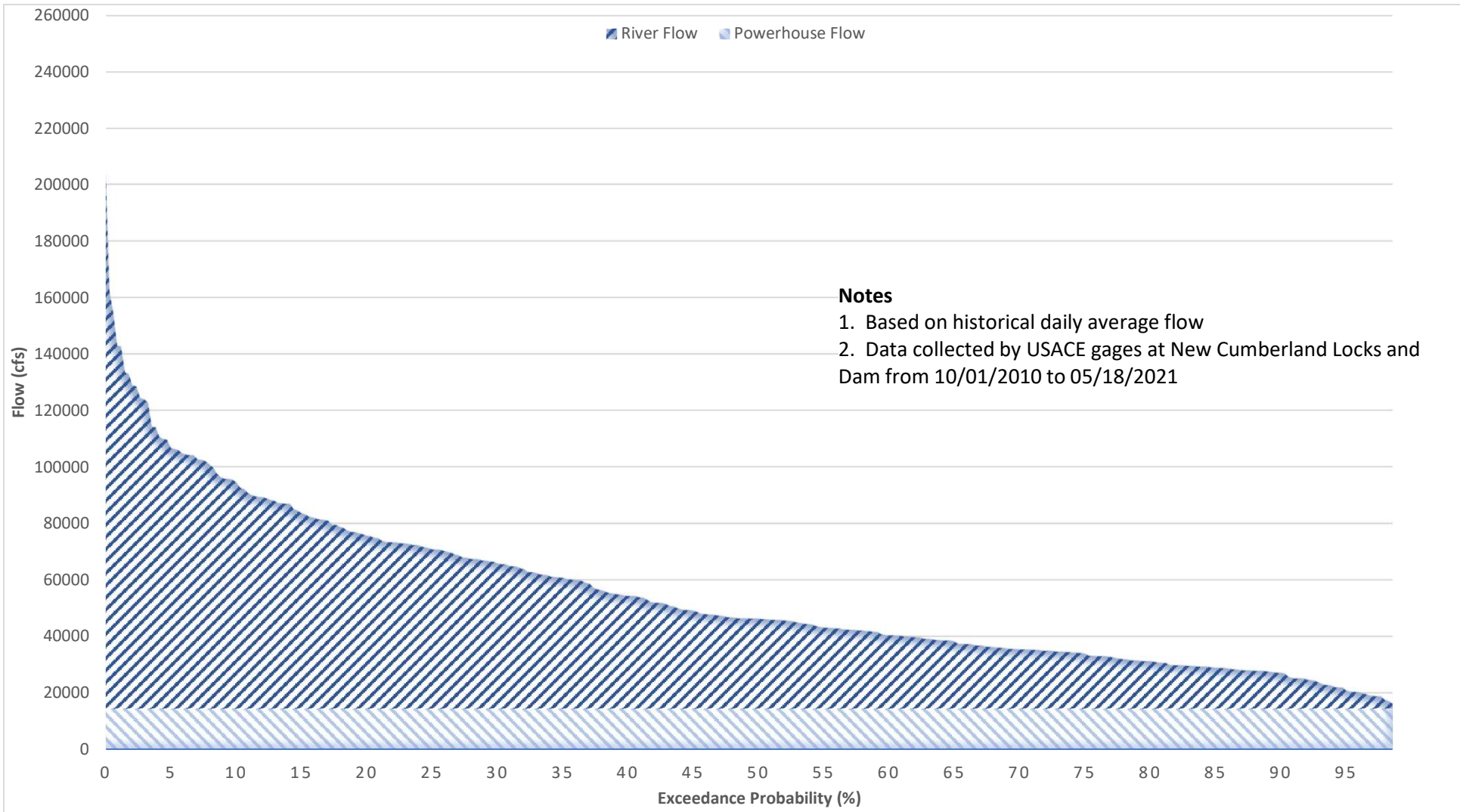


CURRENT HYDRO

## Figure 13: November Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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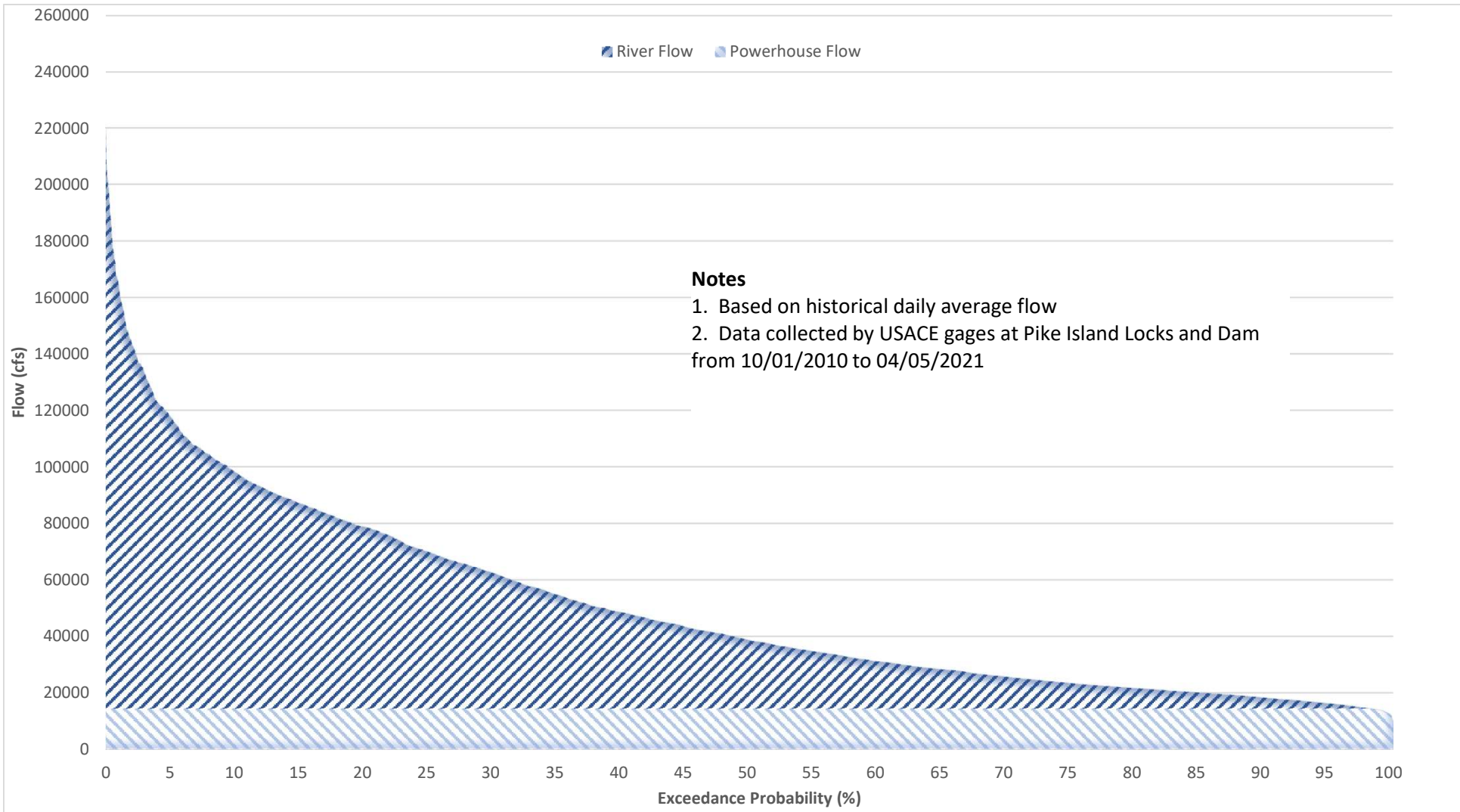


CURRENT HYDRO

## Figure 14: December Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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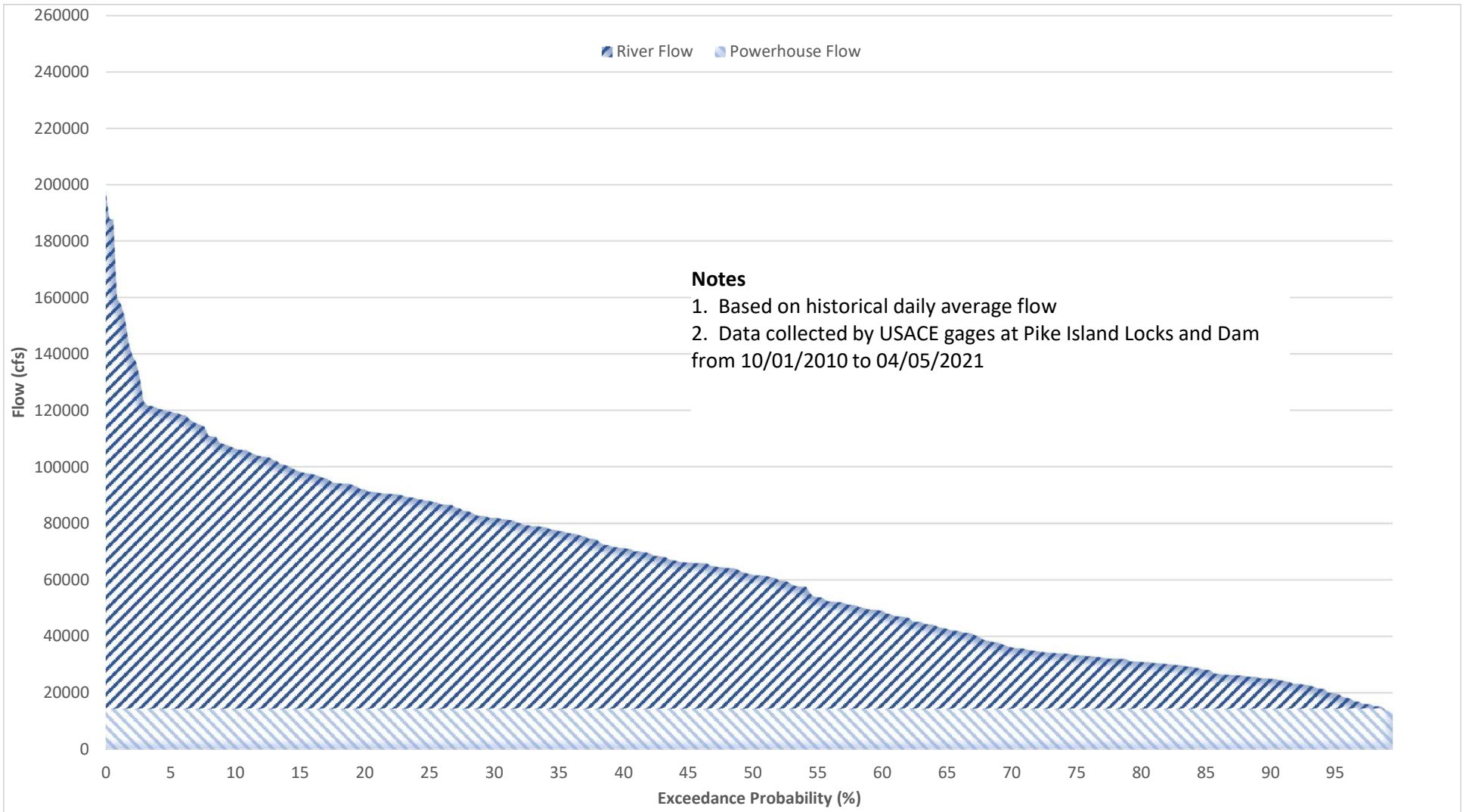


CURRENT HYDRO

## Figure 2: Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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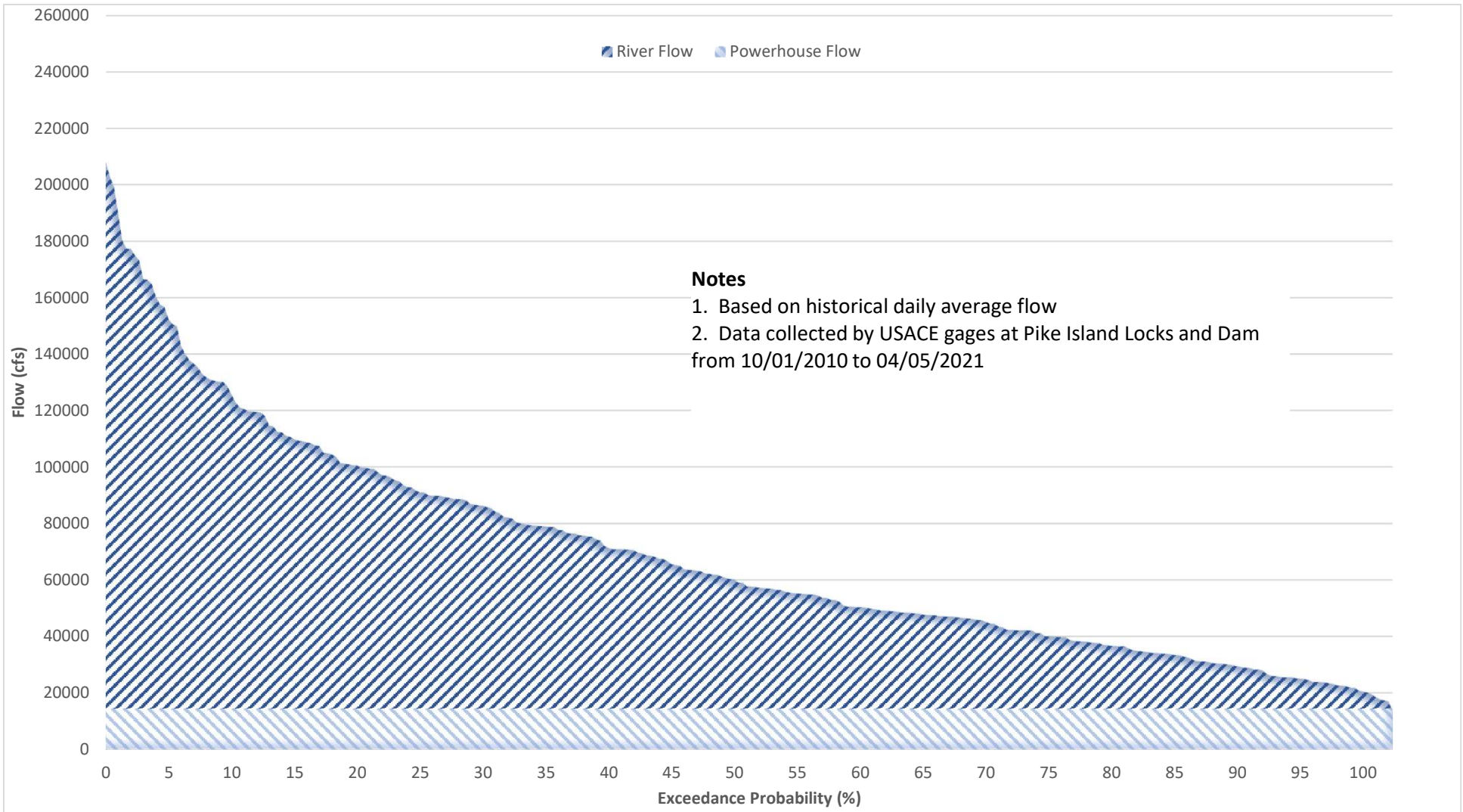


CURRENT HYDRO

## Figure 3: January Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



## Pike Island Locks and Dam

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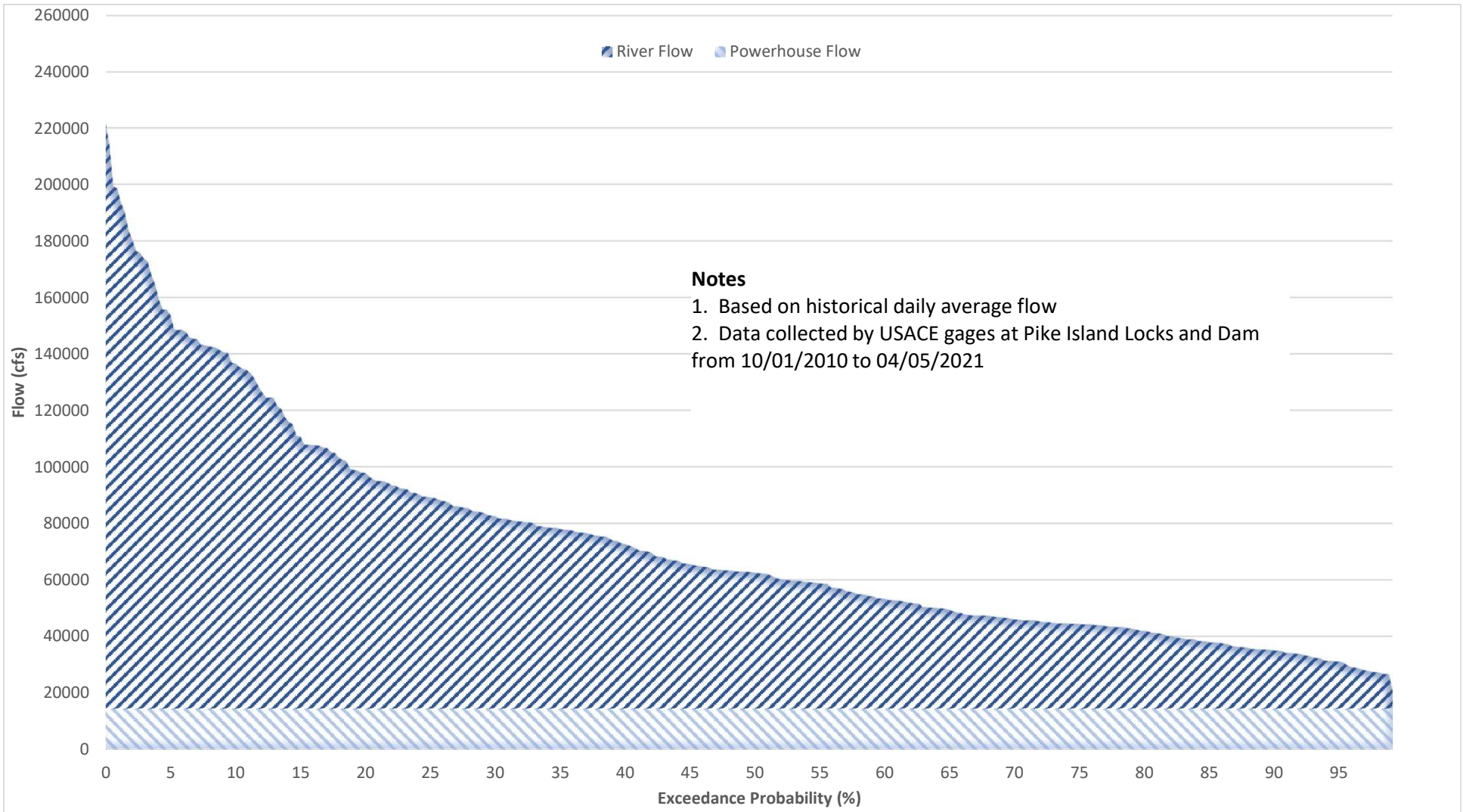


CURRENT HYDRO

## Figure 4: February Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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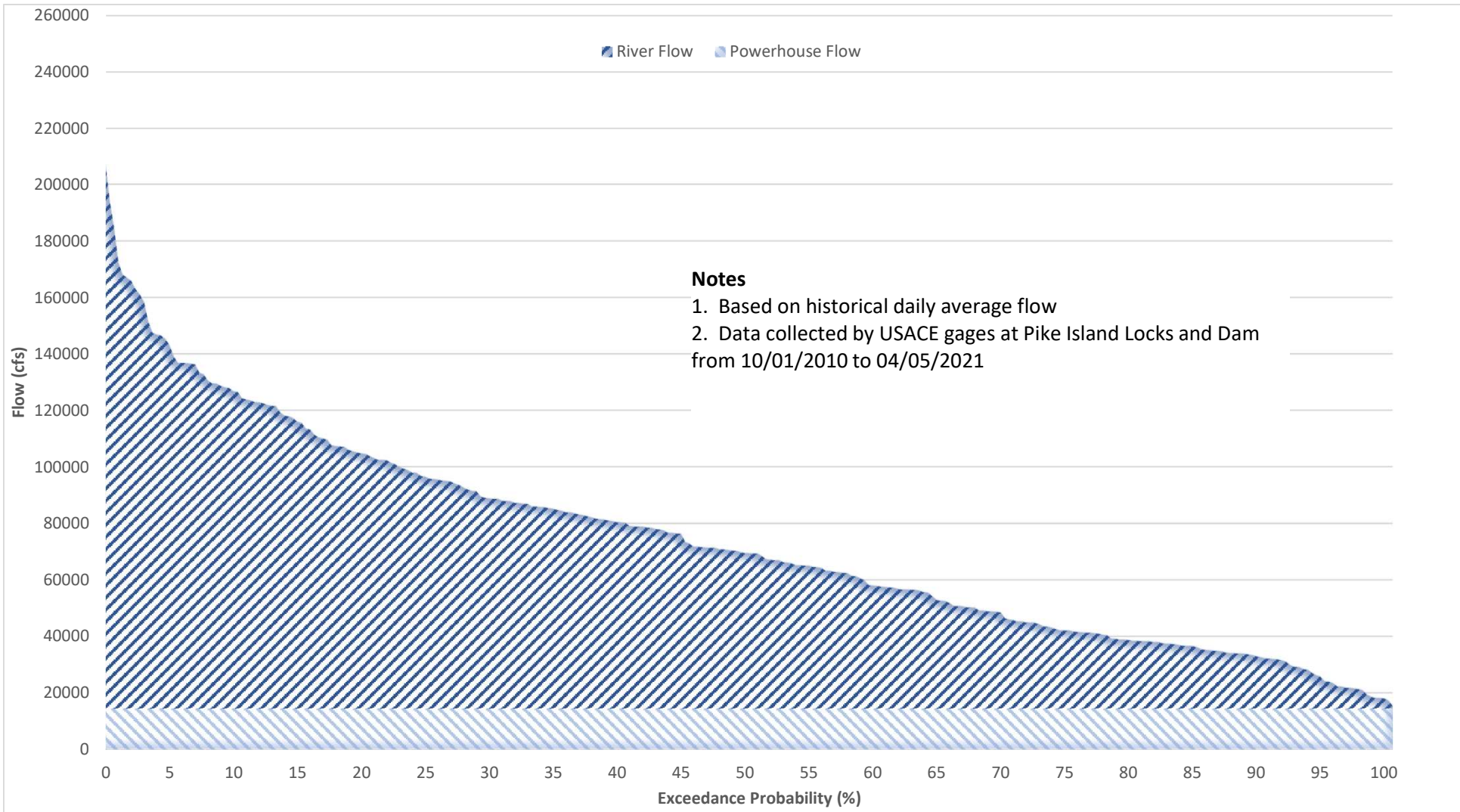


CURRENT HYDRO

## Figure 5: March Flow Duration Curve

Date: May 24, 2021

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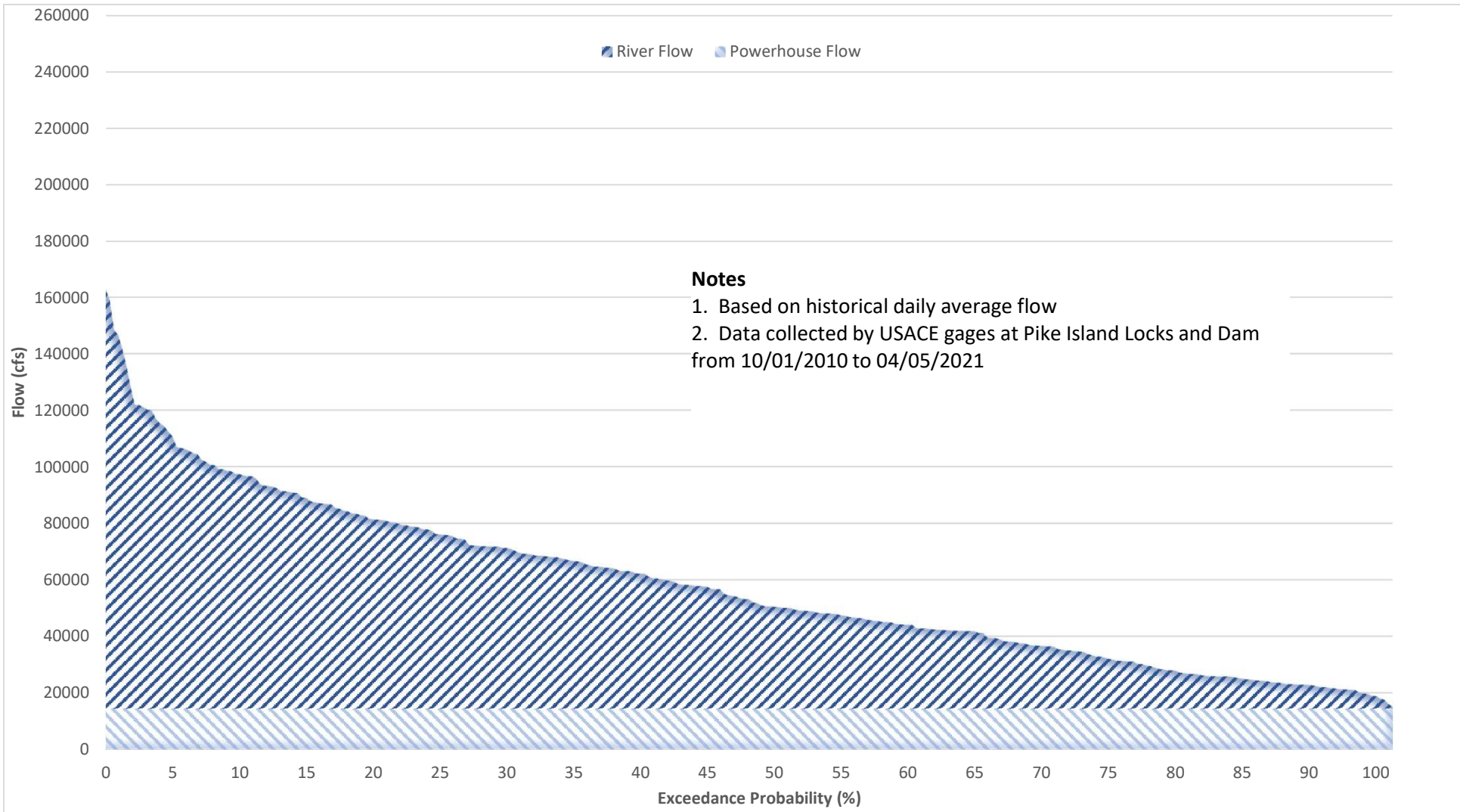


CURRENT HYDRO

## Figure 6: April Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez



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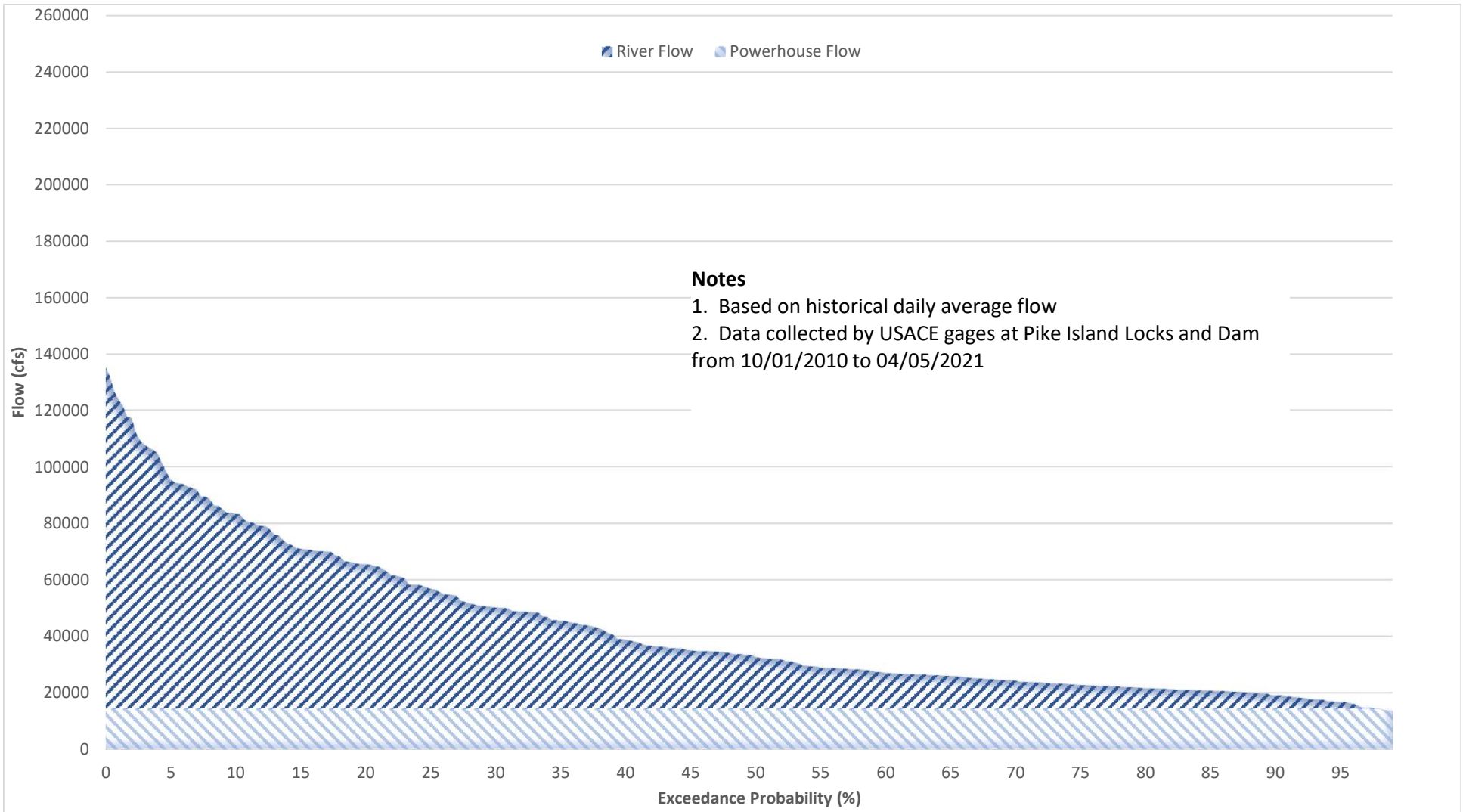
CURRENT HYDRO

## Figure 7: May Flow Duration Curve

Date: May 24, 2021

Prepared by: LMGonzalez





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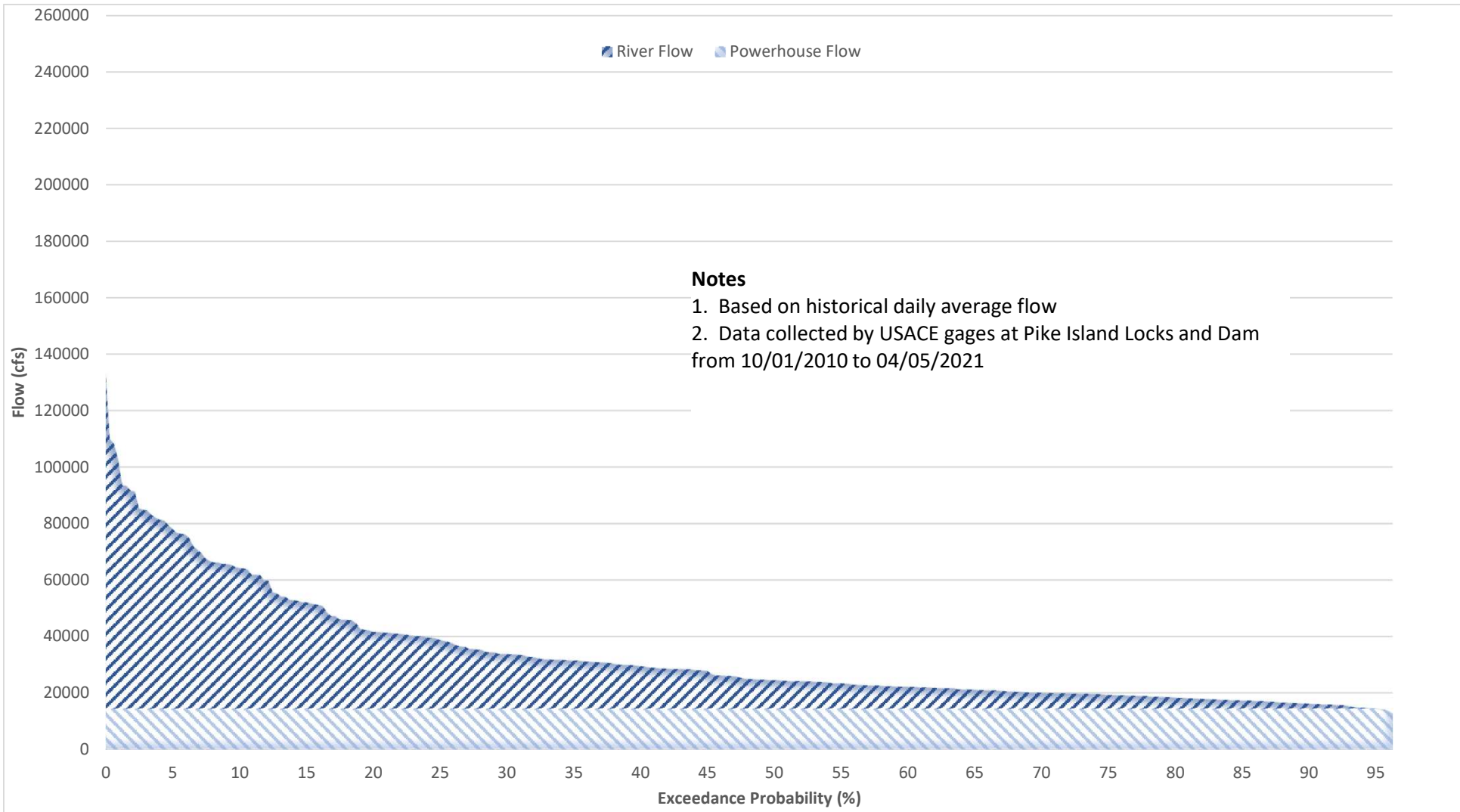


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## Figure 8: June Flow Duration Curve

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Prepared by: LMGonzalez



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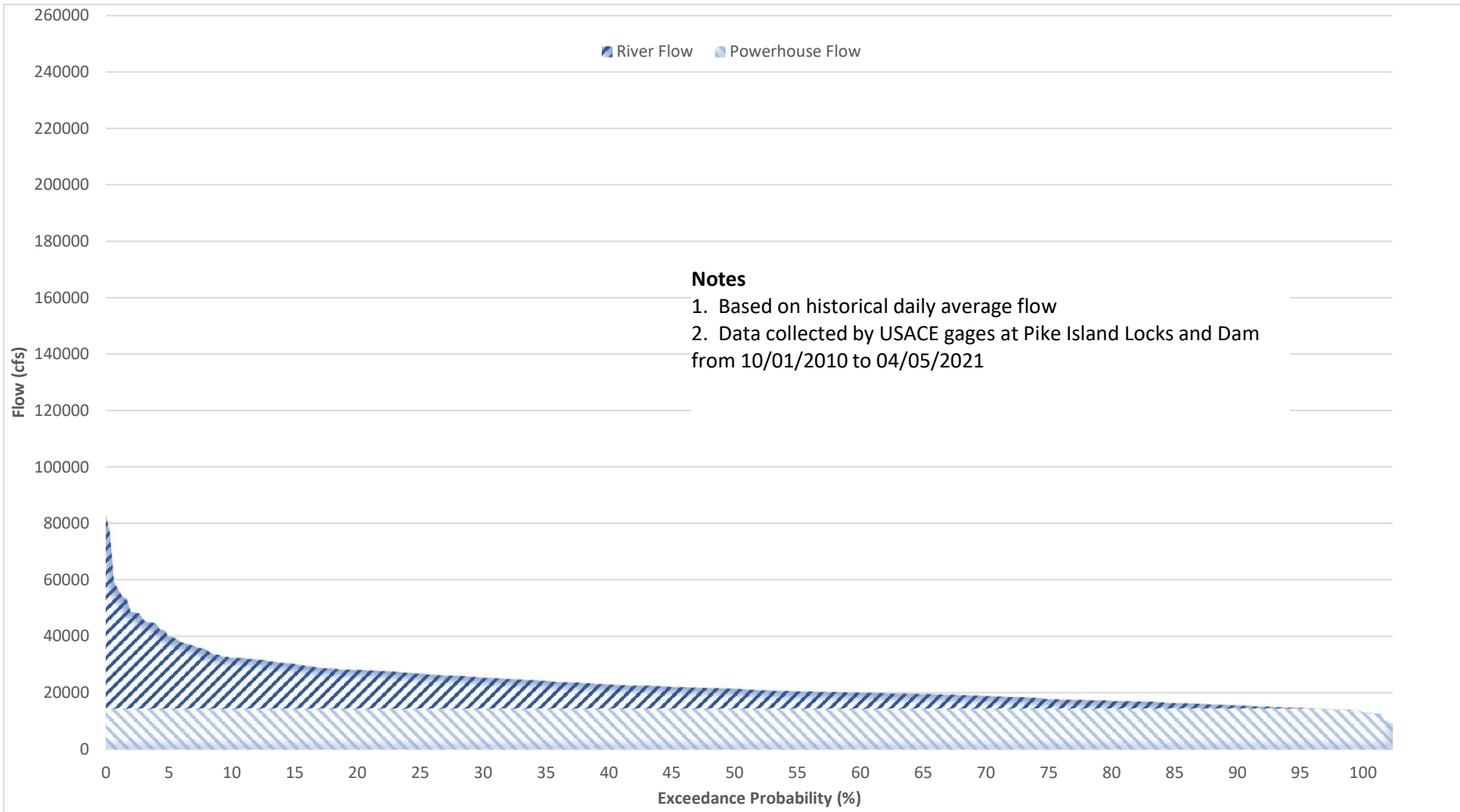


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## Figure 9: July Flow Duration Curve

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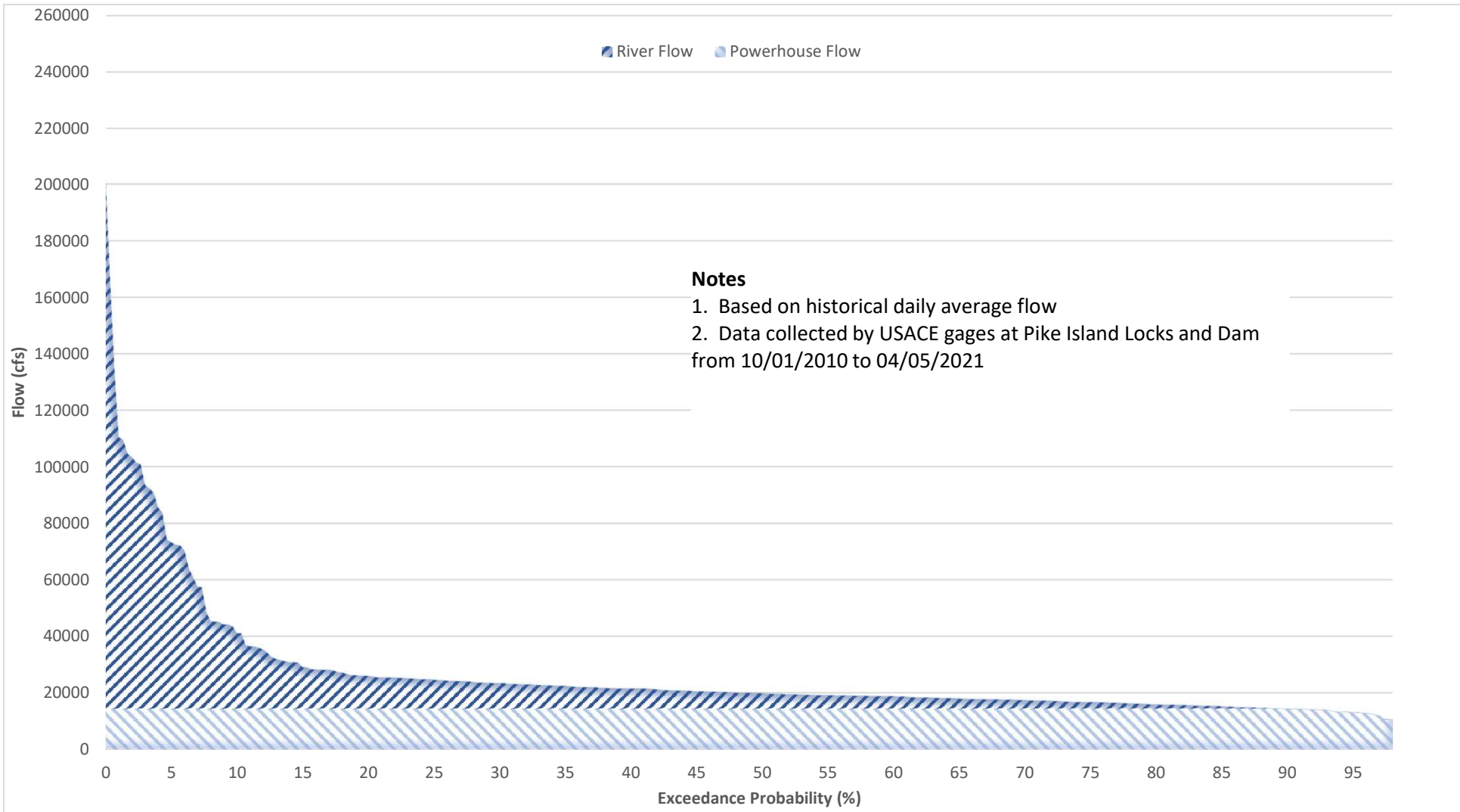


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## Figure 10: August Flow Duration Curve

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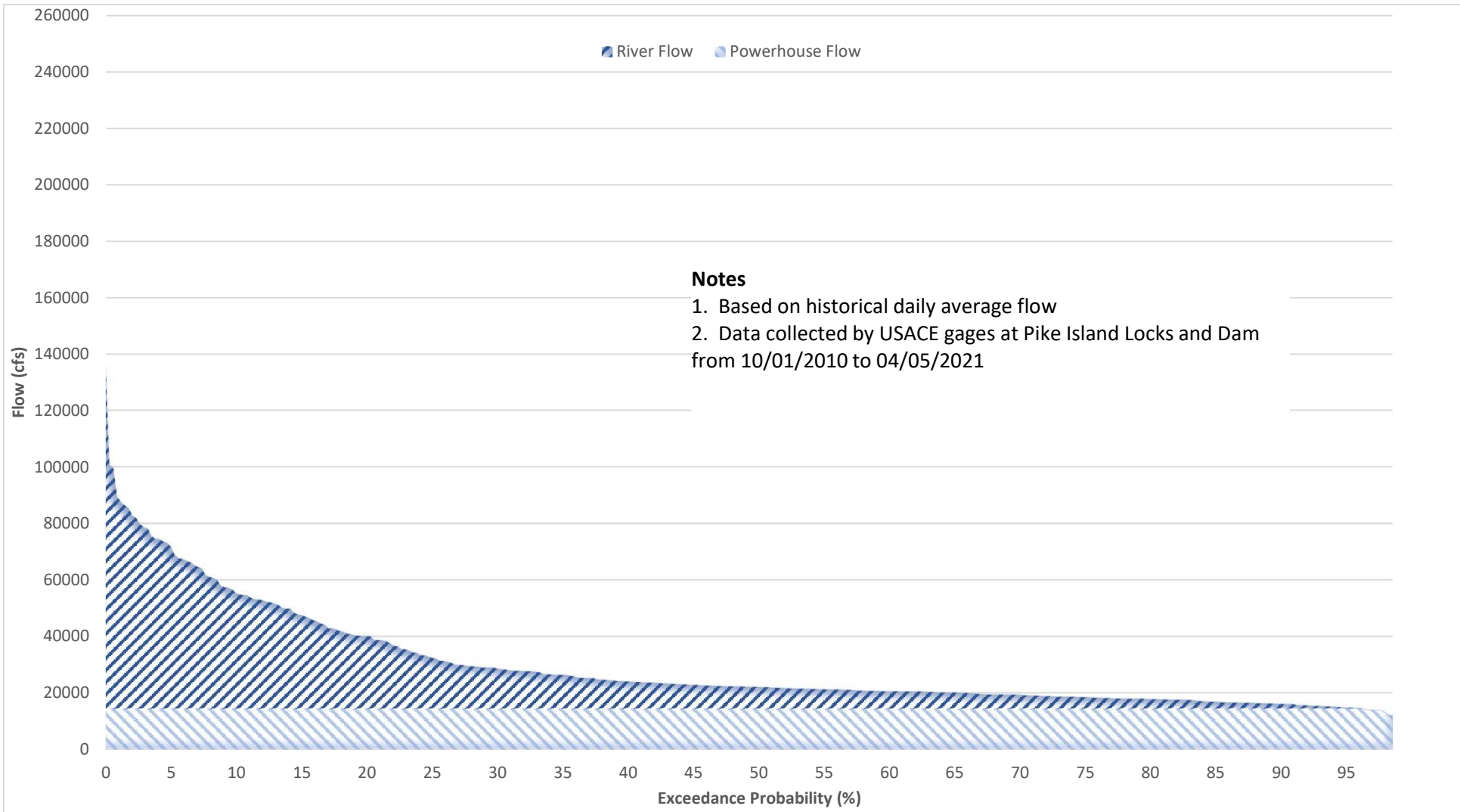


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## Figure 11: September Flow Duration Curve

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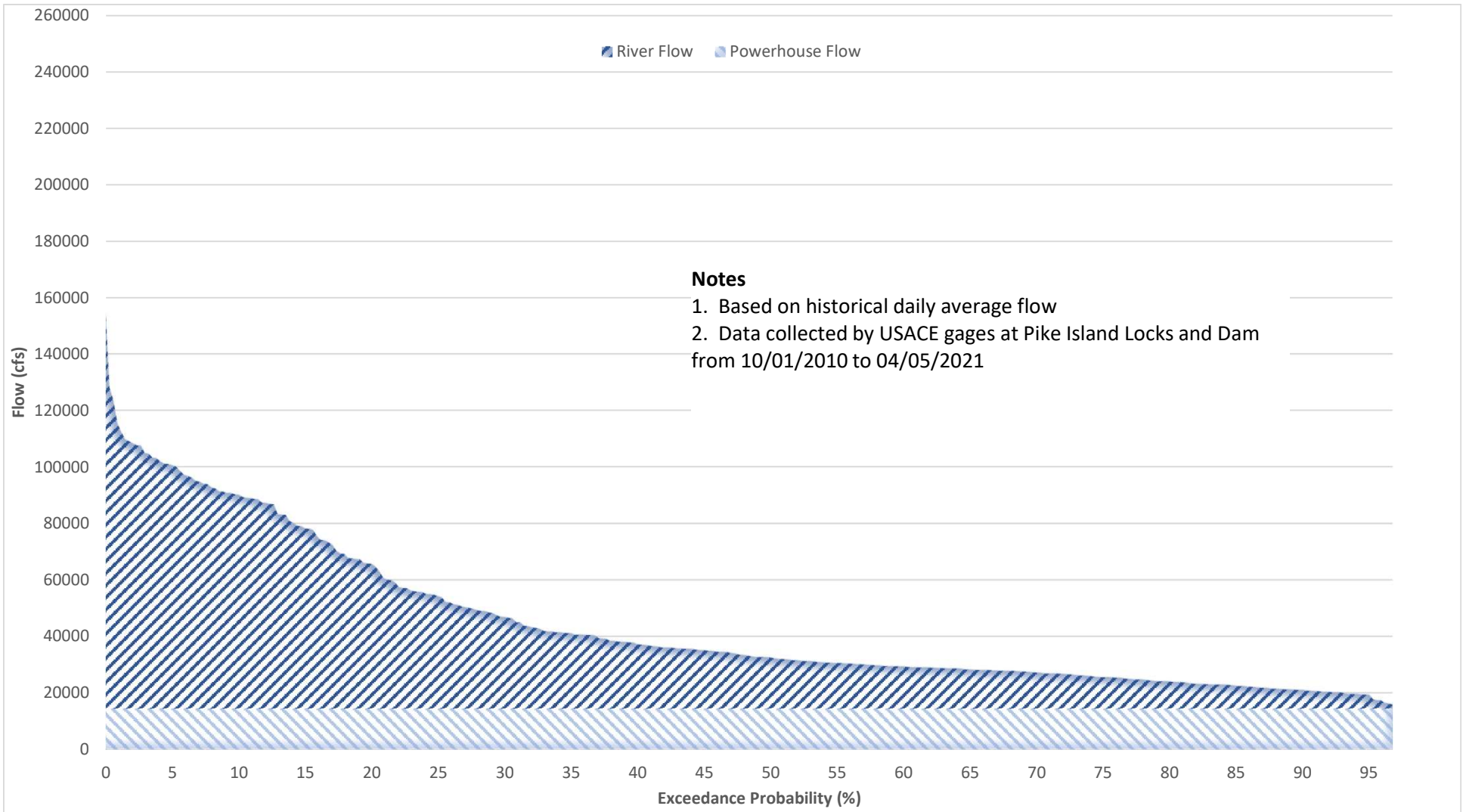


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## Figure 12: October Flow Duration Curve

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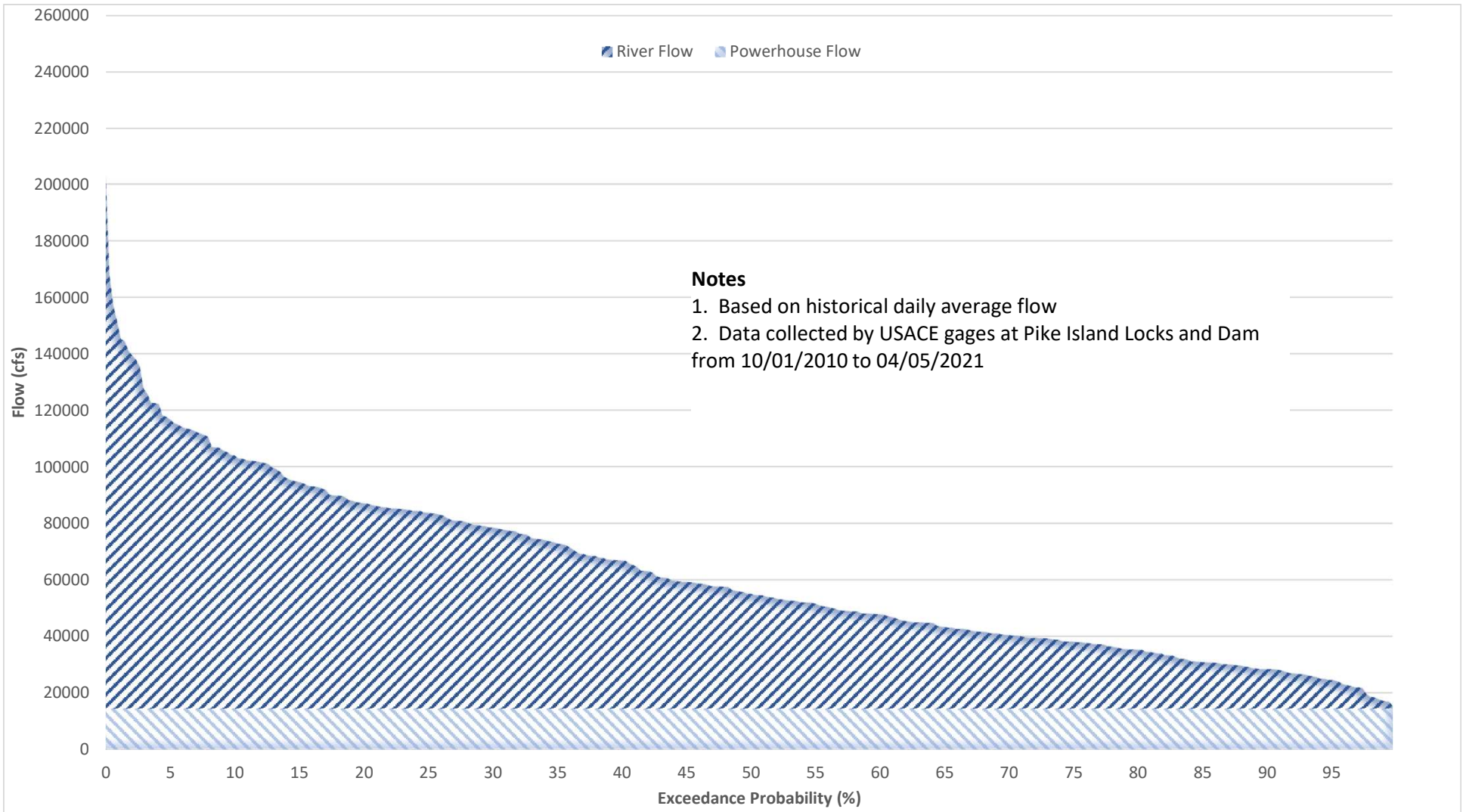


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## Figure 13: November Flow Duration Curve

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## Figure 14: December Flow Duration Curve

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