PRE-APPLICATION DOCUMENT
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Appendices

LIST OF ACRONYMS

APCO – Appalachian Power Company
ASMFC – Atlantic States Marine Fisheries Commission
^{o}C – degrees Celsius
CD – compact disk
CEII – Critical Energy Infrastructure Information
CFR – Code of Federal Regulations
cfs – cubic feet per second
CPUE – Catch Per Unit Effort
CT – Chewacla-Toccoa
CWA – Clean Water Act
DA – Draft Application
DO – Dissolved Oxygen
EA – Environmental Assessment
EIS – Environmental Impact Statement
ESA – Endangered Species Act
FERC – Federal Energy Regulatory Commission
FMP – Fishery Management Plan
FPA – Federal Power Act
GPS – global positioning station
in – inch
JAI – juvenile abundance index
km - kilometer
KV - Kilovolt
KVA – kilovolt amp
KW - Kilowatt
KWH – kilowatt hour
LU – Liberty University
m - meter
mm - millimeter
msl – mean sea level
MWh – megawatt hour
NEPA – National Environmental Policy Act
NRHP – National Register of Historic Places
NMFS – National Marine Fisheries Service
NOAA Fisheries – National Oceanographic and Atmospheric Administration, National Marine Fisheries Service
NOI – Notice of Intent
NRCS – Natural Resources Conservation Service
NTU – Nephlo-tubidity Units
O&M – Operations and Maintenance
PAD – Pre-Application DoAPEA – Applicant Prepared Environmental Assessment
PCB – Polychlorinated biphenyls
PM&E – Protection, Mitigation, and Enhancement
ppb – parts per billion

RM – River mile
RKM – River kilometer
RPM – revolutions per minute
SCORP – State Comprehensive Outdoor Recreation Plan
Taf - Tallapoosa
TBD – To Be Determined
TLP – Traditional Licensing Process
UL – Urban Land
USDA – United States Department of Agriculture
USEPA – U.S. Environmental Protection Agency
USFS – U.S. Forest Service
USFWS – U.S. Fish and Wildlife Service
USGS – U.S. Geological Survey
VDEQ – Virginia Department of Environmental Quality
VDGIF – Virginia Department of Game and Inland Fish
VDHR – Virginia Department of Historic Resources
VDRC – Virginia Department of Recreation and Conservation
VMRC – Virginia Marine Resources Commission
YOY – Young of year

PRE-APPLICATION DOCUMENT
SCOTT'S MILL DAM (P-14425)
SCOTT'S MILL HYDRO, LLC

PRE-APPLICATION DOCUMENT

1.0 PROCESS PLAN, SCHEDULE, AND COMMUNICATIONS PROTOCOL

The following sections contain information concerning the licensing approach and early consultation; process plan and schedule; communications and document distribution; and development of a licensing study program.

1.1 Overview of Licensing Approach and Early Consultation

Liberty University (LU / applicant) is studying and evaluating the Scott's Mill Project under a Preliminary Permit issued by the Federal Energy Regulatory Commission (Commission or FERC) pursuant to Section 4(f) of the Federal Power Act. LU proposes to use the Traditional Licensing Process (TLP) for the application development process in a collaborative and efficient manner. The Notice of Intent (NOI) and Pre-Application Document (PAD) are being filed simultaneously and distributed to federal and state resource agencies, local governments, Native American tribes, members of the public, and other interested parties. The TLP provides a framework for consultation, study plan development and execution, and application review and comment. Pursuant to the Commission's regulations at 18 CFR §4.38(e)(4), LU proposes that the Commission conduct early scoping in lieu of the applicant conducting a joint meeting. LU proposes to otherwise use the TLP regulations.

The PAD follows the form and content requirements of 18 CFR §5.6. The purpose of the PAD is to provide substantial background information related to the engineering, operational, economic, and environmental aspects of the project. It also identifies and describes issues and potential study needs. LU intends to use the TLP to develop appropriate protection, mitigation, and enhancement (PM&E) measures to be included in the license application.

In preparing the PAD, LU researched and reviewed reasonably available, relevant information concerning the existing conditions and environment in and around the project site. This information was obtained through the search of various public information and reference sources, and stakeholder contacts and consultations. Information from licensing and relicensing of upstream hydropower projects was especially helpful in compiling available information.

LU representatives have contacted the U.S. Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Department of Environmental Quality (VDEQ), Virginia Department of Historic Resources (VDHR-

SHPO), and American Rivers. These consultations have helped LU identify and scope the issues presented in the PAD. The list of preliminary issues is presented in Section 4.

1.2 Process Plan and Schedule

The Process Plan and Schedule outlines the specific timeframes, deadlines, and responsibilities of LU, FERC, and other stakeholders in the TLP. In accordance with FERC regulations (18 CFR §5.6 (d)(1)), LU must adhere to the plan and schedule for pre-application activities. The process plan and schedule presented in Table 1.2-1 includes proposed locations and dates for the site visit and joint meeting (or scoping meeting).

Table 1.2-1 – Scott's Mill Proposed Process Plan and Schedule

18 CFR	Lead	Action	Date
§5.5	LU	File NOI	August 31, 2015
§5.6	LU	File PAD	August 31, 2015
§5.7	FERC	Tribal Consultation	September 30, 2015
§5.8	FERC	FERC Decision on Use of TLP	October 30, 2015
§4.38(b)(3)(i)	LU	Meeting Notice and Agenda	November 16, 2015
§4.38	LU	Joint (Scoping) Meeting & Site Visit	December 2, 2015
§4.38	Participants	Comments on PAD and Studies	February 2, 2016
§4.38(c)	LU	Conduct Studies	2016
§4.38(c)	LU	Draft License Application (DA)	TBD
§4.38(c)	Participants	Comments on DA	90 d after DA
§4.38(c)	All	DA Meeting	<60 d after comments
§4.38(d)	LU	File License Application	TBD
§4.32(b)	FERC	FERC Tendering Notice (of App.)	TBD
§4.32(b)	Participants	Requests for Studies (60 d after Not.)	TBD
§4.32(d)	FERC	Notice of Acceptance	TBD
§4.34(b)	FERC	FERC Ready for Env. Analysis	TBD
§4.34(b)	Agencies	Preliminary Terms and Conditions	60 d after REA
§4.34(b)	LU/Particip.	Reply Comments	105 d after REA
§380	FERC	FERC Draft EA or EIS	TBD
§380	All	Comments on FERC NEPA Doc	45 d after EA/EIS

Because of the available information on the affected environment, LU anticipates that the field effort can be conducted in one field season. This will be confirmed or modified through the study plan development process and additional meetings if necessary.

Under the TLP, the Commission conducts its National Environmental Policy Act (NEPA) scoping meeting after the applicant has filed its license application. LU is requesting that the Commission conduct the NEPA scoping process early, because considerable study has already been undertaken on the James River in association with the upstream hydropower projects. The Commission will make the determination on the timing of the scoping process. If FERC strictly follows the TLP for scoping, scoping would occur after the Commission determines the application is Ready for Environmental Analysis.

1.3 Communications and Document Distribution

The Communications Protocol (Protocol) is intended to facilitate communications and cooperation among LU, federal and state agencies, Native American Indian tribes, and other interested organizations and parties. This Protocol is structured to complement the requirements of the TLP for the pre-application consultation period. LU anticipates that the Protocol will allow meaningful input by participants without undue burden. The Protocol is intended to provide a framework for communications among all participants and provide LU's plans regarding access to information regarding consultation activities related to the licensing and planning of the Project. The Protocol is not intended to apply to communications solely between participants, or to any participant's internal communications. The Protocol is intended to provide a flexible framework for dissemination of information and for document consultation among all participants involved in the licensing process.

1.3.1 Maintenance of the Public Reference File

LU will maintain copies of relevant written communications and other materials produced during the consultation process. The consultation record will be updated regularly and available to the public on the website. CDs of the PAD and NOI will be distributed to the listing attached in Appendix A. The PAD and license application will be distributed to the Lynchburg public library, and will be available at the LU library. To reduce the administrative burden, after the PAD is distributed all future documents will be made available on the project website. Copies of the letters transmitting documents will be distributed via email, and hard copies of the transmittal letters (and documents) will be made to those requesting hard copies.

This information will constitute the Formal Consultation Record covering the period prior to LU filing the final license application with FERC and will be available for viewing at:

1. Scott's Mill Project Licensing Website: http://www.scottsmillhydro.com
2. Liberty University Library, Candlers Mountain Road, Lynchburg, VA 24515

These materials will be available for public inspection during regular business hours in a form that is readily accessible, reviewable, and reproducible. Copies of the materials will be available to a requester through the mail or electronically. LU may charge the public the reasonable cost of reproduction and postage (if applicable), for any hard copies.

LU will delete from any information made available in the public reference file, specific site or property locations the disclosure of which would create a risk of harm, theft, or destruction of archeological or Native American Indian tribe cultural resources or of the site at which the resources are located or would violate any federal law, including the Archeological Resources Protection Act of 1979 (16 U.S.C. 479w-3) and the National

Historic Preservation Act of 1966 (16 U.S.C. 470hh). Certain documents may also be restricted from publication on the licensing website in accordance with FERC's regulations protecting Critical Energy Infrastructure Information (CEII) (18 CFR §388.113) or in cases where the document contains privileged information (e.g., sensitive species locations, cultural resources sites, etc.). LU will address requests for access to this information on a case-by-case basis, in accordance with Virginia Commonwealth and federal law, as needed during the licensing process.

Consistent with the federal and state paper-reduction policies, and in accordance with the objectives of FERC Order No. 604, LU will transmit and receive related communications and other written materials in electronic format when possible. Preferred formats are MS Word, Adobe, MS Excel, or ASCII text.

1.3.2 Licensing Website

LU will maintain a website (www.scottsmillhydro.com) as the primary mode of document distribution and access to key documents developed during the course of the licensing consultation, such as the PAD and NOI, meeting notices, meeting summaries, study plans and study reports, draft license application, and final license application.

LU will maintain a current calendar of upcoming and past meetings, and will post meeting materials (including agendas, handouts, and summaries) on the website to increase the availability of these materials to all participants.

LU will use email notifications to participants to announce important new postings, which will help maximize review and comment opportunities, where applicable. The following table summarizes the general guidelines that LU will follow in determining the appropriate mode of distribution for licensing documents.

Table 1.3-1 Documents Distribution Guidelines

Document Type	Distribution
Informal Communications	Email or regular mail
Formal TLP Meeting Notices and Agendas	Website with email notice
Meeting Summaries	Website with email notice
Licensing Related Documents	Website with email notice and or CD through regular mail; paper format upon request

1.3.3 TLP Meetings

LU anticipates that limited meetings will be needed over the course of the licensing process. These will include meetings required by the TLP and any special meetings to resolve challenging issues. To the extent possible, telephonic/Go To Meeting conference calls will be utilized. For any required meetings, LU will comply with the applicable regulatory requirements and in addition, LU will post the information on the project website.

LU will schedule meetings for which it is responsible and will consult with stakeholders on meeting dates and agendas. To the extent practicable, LU will schedule meetings at least 30 days in advance. Notification may be made via email, posting on the project website, or by telephone. If circumstances dictate, LU may hold meetings with less than 30 days notice.

LU will provide draft meeting agendas at least two weeks prior to a scheduled meeting to the extent possible. Participants may submit comments on the agenda before the scheduled meeting. LU will distribute a final agenda at the meeting and with the consensus of the participants, the agenda may be modified at the beginning of the meeting.

LU will strive to make available documents and other information necessary to prepare for a consultation meeting at least two weeks prior to the scheduled meeting.

1.3.4 TLP Documentation

All of the documentation requirements described below apply to substantive communications regarding the licensing of the project. Communications related to procedural matters (e.g., responding to inquiries regarding meeting scheduling) will not be subject to the documentation requirements.

1.3.4.1 Meeting Summaries

LU will provide a written meeting summary of the matters addressed at meetings. To the extent practicable, a meeting summary will be posted to the project website within 15 days of the meeting. Comments should be submitted within 15 days of the meeting. LU will modify and finalize meeting summaries within two weeks after receipt of comments.

1.3.4.2 Technical Documents

Because of the existing information available for the project, LU does not anticipate developing numerous technical documents. To the extent that documents will be prepared, LU will communicate to participants review time frames for providing comments. LU will typically request 30-day review periods unless the Commission's regulations require longer periods (e.g., 90 days on the draft license application). LU may adjust review periods in consultation with participants.

1.3.4.3 Written Correspondence

LU requests that licensing-related correspondence or other materials intended or required to be part of the Formal Consultation Record contain the following reference: "Liberty

University, Scott's Mill Project, FERC No. 14425, Request for Inclusion in Formal Consultation Record" and to be addressed to:

Mr. Lee Beaumont
Liberty University
1972 University Blvd.
Lynchburg, VA 24502
lbeaumont@liberty.edu

1.3.5 Distribution of Licensing Documentation

Distribution of the PAD will be accomplished by mailing of CDs. Additional licensing documents will be posted on the project website and in FERC's e-Library. Hard copies of the PAD and licensing documents will be made available in the Lynchburg public library and at LU.

1.3.6 Communications with FERC Staff

Communications with FERC staff that address the merits of the proceeding will be included in the public record. In order to have written communication with FERC staff made a part of the record for a project, it must be formally filed with FERC as follows:

The Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

All correspondence not filed with FERC electronically must include an original and eight copies and have the following displayed on the first page:

"Liberty University, Scott's Mill Project, FERC Project No. 14425 – Application for License."

The Commission encourages participants to file their comments electronically via the Internet instead of submitting comments by mail. Instructions for e-Filing are provided at www.ferc.gov under the e-Library link. Additional information on this program can be found in the regulations at 18 CFR 385.2001(a)(1)(iii). Filing comments electronically with FERC also eliminates the need for filing an original and eight copies.

1.4 Development of Licensing Studies

The PAD includes summaries of existing, relevant information that LU has compiled. This body of information and preliminary consultations with resource agencies and other participants form the basis for LU's current understanding of the resources in the vicinity of the Project potentially impacted by its development and operation. LU has developed a list of potential issues that will provide the basis for potential resource studies to support the license application. Section 4 presents LU's preliminary list of licensing issues and study needs. LU intends to work cooperatively with resource agencies and other participants to develop targeted studies to address the issues.

2.0 PROJECT LOCATION, FACILITIES, AND OPERATIONS

2.1 Name, Address, and Telephone Number of Agent

Mr. Lee Beaumont
Liberty University
1972 University Blvd.
Lynchburg, VA 24502
(434) 592-3315

2.2 Detailed Maps

Maps of the site have been can be found in Appendix B.

2.3 Description of Existing and Proposed Facilities

2.3.1 Existing Facilities

Scott's Mill Dam was constructed between 1830 and 1840. From left to right looking downstream, the left overflow spillway is a 735-foot-long by 15-foot-high masonry construction with a crest elevation of 511.0 feet. The rock pier is 25 feet wide, and the crest elevation is unknown. The right overflow spillway is a 140-foot-long by 16-foot-high masonry construction with a crest elevation of 512.0 feet. The right abutment is 36 feet wide and constructed of concrete. The canal head gate structure is 22 feet wide with three sluice gates measuring 3 feet by 3 feet.

2.3.2 Proposed Facilities

Dam, Spillway, Penstock, Canal, Powerhouse, Tailrace and Other Structures

The proposed facilities would consist of the following: (1) a new powerhouse containing four generating units with a total installed capacity of 3.8 megawatts, (2) a new 500-foot-long underground transmission line, and (3) appurtenant facilities (which may include reinstallation of flashboards that have historically been used at the dam). The project would have an estimated annual generation of 13,500 megawatt-hours, and would be sold to a local utility. There are no federal or state lands associated with the project.

Generating equipment alternatives evaluated to date include new turbines of various types, including vertical Kaplan, vertical Francis, bulb-type horizontal Kaplan, horizontal pit Kaplan, and axial-flow pit type. In addition, two used equipment packages identified by LU were evaluated. Salient features of various equipment types considered are presented below.

Scott's Mill Dam is classified as a low-head project. Equipment arrangements at low-head projects can include both vertical and horizontal turbine orientations. Vertical Kaplan turbines are considered uneconomical for this site due to the required negative runner setting and large volume of rock excavations that would be required for elbow draft tubes. A second vertical turbine option (Francis open-flume turbines) can be set above tailwater, but would require either large-diameter runners (which are costly and difficult to procure) or many smaller units (which would be uneconomical). Therefore, both types of vertical units were dismissed for the proposed project. Small, standard, horizontal bulb-style turbines are available in the required sizes, and would require less excavation for the draft tube, as the setting is only slightly below (and in some cases above) the tailwater. Two potential layouts using bulb-style horizontal Kaplan turbines (Eco-bulbs manufactured by Andritz) were included in the evaluation. One option includes the use of three 2,600-mm units, while the second includes the use of four 2,240-mm units. These units have a relatively slow rotational speed of 150 rpm and do not require speed increasers. Speed increasers (gearboxes) have historically been prone to mechanical failure and require more maintenance than other equipment components. Eliminating any style of speed increaser will significantly reduce maintenance and project operational costs.

LU evaluated two new equipment packages. The first was from Mavel and included two 2,800-mm horizontal pit Kaplan units with parallel gearboxes. The second was from Canadian Hydro Components and included two options. The first option was for four units, three having 2,000-mm runners and one having a 1,250-mm runner. The second option was for three equal-sized units with a runner diameter of 2,250 mm.

One used equipment package is from an unknown Chinese supplier of horizontal tubular fixed blade turbines, and includes three 1,250-kilowatt (kW) units and one 350-kW unit. Fixed Kaplans are not typically efficient over varying head conditions, which are expected to be typical of this site. Performance data and runner diameters were not included with this package. To perform an evaluation, runner diameters were assumed using the equipment's model numbers as a guide, and estimates of expected equipment performance were taken from turbines with similar-sized runners.

The second used equipment package is from Canadian Hydro Components. Two options were proposed, the first of which includes three 2,000-mm units and one 1,250-mm unit, both horizontal pit Kaplans with belt drive gearboxes. The second option proposes three 2,250-mm horizontal pit Kaplan units with right angle gearboxes.

Equipment selection was based on generation potential, cost, and maintenance expectations. Each of the proposed turbine configurations were entered into a specialized computer program that integrates site specific data, including average river flows, headwater, and tailwater levels. Gross annual generation was estimated at 11.9 MWh for the Andritz Eco-bulb units, 10.5 MWh for the used Sulzer units, 6.7 MWh for the Mavel units, and 5.6 MWh for the Canadian Hydro Components units or 13.4 MWh using Natel HydroEngine. A cursory life-cycle cost evaluation was conducted to determine the approximate cost-per-MWh for each of the generating units. This evaluation identified the four-unit Andritz installation as being more economical than equipment supplied by Canadian Hydro Components and Mavel, as well as the three-unit Andritz alternative. It should be noted that, although the Sulzer units appear to promise satisfactory generating performance, their cost was not available. Therefore, an economic evaluation of this alternative was not conducted. Therefore, the four-unit 2,240-mm-diameter Andritz EcoBulb alternative was identified as the preferred equipment option.

Project Layout

The proposed four-unit powerhouse will be approximately 82 feet wide and will be located behind the 140-foot-long gravity arch spillway. A portion of the spillway will be removed to allow water to flow into the powerhouse. Using this technique, the spillway can be used as an upstream cofferdam during construction. A separate downstream cofferdam will be required, but will not need to be as tall as an upstream cofferdam. Once the powerhouse is completed, a portion of the upstream spillway section will be removed in the wet without an upstream cofferdam. It is assumed that any loss of spillway capacity as a result of installing the powerhouse will need to be replaced with another spillway structure. Therefore, an overflow style powerhouse is proposed to allow flood flows to pass over the top of the powerhouse without significant increases in headwater levels. The existing gravity arch spillway has one foot of freeboard. This would be maintained with the proposed powerhouse, and watertight hatches would be incorporated into the roof for equipment installation and maintenance. Based on results of the evaluation, LU preliminarily proposes a project layout that includes four horizontal full Kaplan units. New standard equipment EcoBulb units are available from Andritz, while used equipment is also available from Sulzer that closely matches the Andritz equipment. Both of these suppliers offer a slightly inclined horizontal turbine with runner diameters between 1,950 mm and 2,240 mm. Advantages of the Andritz equipment are efficient generation and elimination of the need for a speed increaser, which will reduce future maintenance costs. The Sulzer equipment also appears to offer generating efficiency at a potentially attractive cost, but will require slightly higher construction costs. Average annual generation is estimated at approximately 13,500 MWh.

Project Operation

The headwater elevation at the site will either be held constant until inflows exceed turbine capacity, or the project may be operated in coordination with the upstream Reusens Dam to essentially provide run-of-river flows downstream of Scott's Mill Dam. In the latter case, operations would be coordinated with the Reusens Dam to provide base flows into the Scott's Mill reservoir plus some level of peaking flow during times of maximum demand. The normal headwater elevation is 511 feet, equal to the crest of the spillway. Liberty University is considering the use of three-foot-high flashboards at the site, which would raise the headwater elevation from 511.0 to 514.0. The minimum tailwater elevation at the site is 497.0. This tailwater elevation results in the gross head available for energy generation being either 14 feet without flashboards or 17 feet with three-foot-high flashboards.

The available flow at Scott's Mill Dam has been updated to include recent flow data at Holcomb Rock gaging station. A flow duration curve was developed using data from the U.S. Geological Survey (USGS) Holcomb Rock Gage (Gage No. 02025500), which is located 3,259 feet upstream of Scott's Mill Dam. The period of record is from 1927 to the present, and represents 87 years of recorded flows. The drainage area for the Holcomb Rock Gage is about one percent less than the drainage area at the proposed project site. Thus, gage flow data was considered to be representative of site flow without adjustment.

If fish passage flows are required at the proposed project, flows of 25-50 cubic feet per second (cfs) may be needed and would not be available for generation. Flows required for fish passage are estimated to reduce generation about one percent, and have not been included in the energy estimates.

Generation potential was estimated based on gross head and the flow duration curve. The flow duration curve shows the percentage of time that a specified flow is equaled or exceeded in a typical year. Theoretical annual generation potential is estimated to be 13,500 MWh. This does not include an allowance for unscheduled outages, which would be expected to result in slightly reduced generation.

Project operations during flood conditions would essentially remain unchanged from current conditions. When the turbine design is confirmed, LU will verify that project operations will not have a significant effect on upstream water levels during flood conditions.

3.0 DESCRIPTION OF EXISTING ENVIRONMENTAL AND RESOURCE IMPACTS

3.1 Basin Description

The James River originates in the Allegheny Mountains at the junction of the Jackson and Cowpasture Rivers near Clifton Forge, Virginia. The river flows generally southeast, traversing the Blue Ridge Mountains, the Piedmont Plateau, and finally the Coastal Plain/Tidewater where it discharges into Chesapeake Bay (approximately 340 miles [544 kilometers] from its origin). The total drainage area of the basin is an estimated 10,060 square miles (approximately 25% of the state).

There are approximately 45 dams and associated hydroelectric facilities in the basin, half of which are in the lower third of the basin and half in the upper third of the basin, with approximately 80 miles of river in between (Dominion, 2006). The dams affect anadromous fisheries of the James River, as well as canoeing and kayaking. A series of seven low-head dams over a 22-mile stretch of river begins as the river enters the Piedmont Plateau province (Appendix C Photographs). The first of the seven dams (Cushaw Dam) is located a few miles below Balcony Falls (near Glasgow, Virginia), which is where the James River leaves the Blue Ridge Mountains and enters the Piedmont Plateau. The Scott's Mill Dam is the downstream-most dam, and is located approximately 147 river miles (235 km) upstream of Chesapeake Bay.

A nearly four-mile long pool is formed upstream of the Scott's Mill Dam and the next dam upriver (Reusens Dam). Several islands lie within the Scott's Mill Dam impoundment, including Daniel Island, Treasure Island, and Woodruff Island. Harris Creek enters the James River from the north near Treasure Island.

The nearest U.S. Geological Survey gage is at Holcomb Rock (Station No. 02025500), approximately 11.2 miles upstream of Scott's Mill Dam. The total drainage area at the Holcomb Rock gage is 3,256 square miles, representing about one third of the drainage of the James River Basin.

Scott's Mill Dam is located in the Piedmont physiographic province of Virginia, approximately 20 miles east-southeast of the Blue Ridge Mountains and approximately 80 miles west-northwest of the Coastal Plain/Tidewater region. The Scott's Mill Dam is approximately 3,000 feet north-northwest of downtown Lynchburg, Virginia. The James River valley is approximately 180-200 feet deep and 3,000 feet wide at the subject property.

The area surrounding the project site is largely industrial/urban, with railroad tracks on the west side and a road on the east side of the river. The area in the vicinity of the project is characterized by heavily forested hills (valley sideslopes) that rise up 500 to 1,000 feet from either side of the reservoir and river. George Washington National Forest and Jefferson National Forest are upstream of the project area.

Water withdrawals from the James River throughout its 340 miles are used by municipalities and industry for industrial uses (73 percent), public water supply (17 percent), and agriculture (ten percent).

3.2 Geology and Soils

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), there are four general soil types present in the study area, with Chewacla-Toccoa (CT) soils in/adjacent to the river, Urban Land (UL) soils along the western railroad corridor, Stott Knob-Rhodhiss (37E) soils on the western valley side slope, and Tallapoosa (TaF) loam soils on the eastern valley side slopes. Alluvial Chewacla-Toccoa (CT) complex soils are found on the riverbanks and Daniel's Island (upstream of the dam). These soils are typically present on floodplains, are somewhat poorly drained, are often low-gradient (0-2%), and have shallow groundwater (at 6-18" depth). Soils along the western railroad corridor are Urban Land, which has been highly modified by canal, railroad, and pipe foundry activities (and has disturbed soil structure). Further west (along the valley side slope) are Tallapoosa loam soils, with slopes of 25-60%. These soils are often found on hill slopes, are well-drained, and are not prone to flooding. Along the valley slopes east of the project site are Stott Knob-Rhodhiss complex soils, with slopes of 25-50%. These soils are typically present on hill slopes, are very stony, are well-drained, and are not prone to flooding.

The Scotts Mill Dam is located approximately 3,000 feet upstream (northwest) of downtown Lynchburg, Virginia. In this area of the Piedmont physiographic province, underlying geological strata generally trend in a southwest-northeast direction. According to the Virginia Department of Mines, Minerals, and Energy (DMME), the southeastern portion of the study area is underlain by the Ashe Formation (biotite gneiss), while the northwestern portion of the study area is underlain by the Alligator Back Formation (feldspathic metagraywacke). The Ashe formation has been aged as Proterozoic Z, with biotite gneiss being the primary rock type. The Alligator Back Formation has been aged as Proterozoic Z-Cambrian. Its primary rock type is meta-argillite, with a schist secondary rock type.

3.3 Water Resources

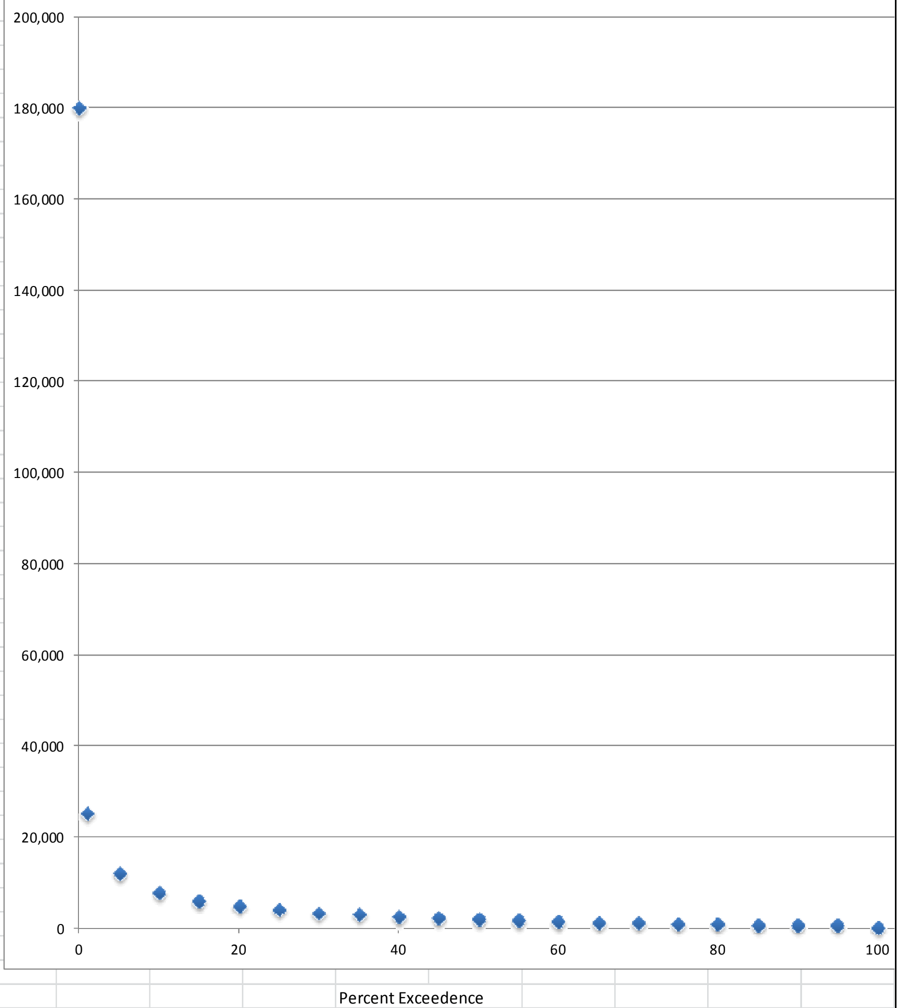
3.3.1 Stream Flow and Water Regime

The average daily flow at USGS Gage No. 0202550 (Holcomb Rock) from July 1927 to September 30, 2014 was approximately 3,630 cfs. During this period, the highest discharge recorded at Holcomb Rock was 180,000 cfs (November 5, 1985), and the lowest discharge was 223 cfs (July 27, 1930). The highest daily flows most frequently occur in March and, less frequently, in January, February, and April. The lowest daily flows occur most frequently in September and, less frequently, in July, August, October, and November (Figure 3.3-1). In general, flows in the James River can vary rapidly from one day to the next. Daily flow records for the period of record are provided in Appendix D.

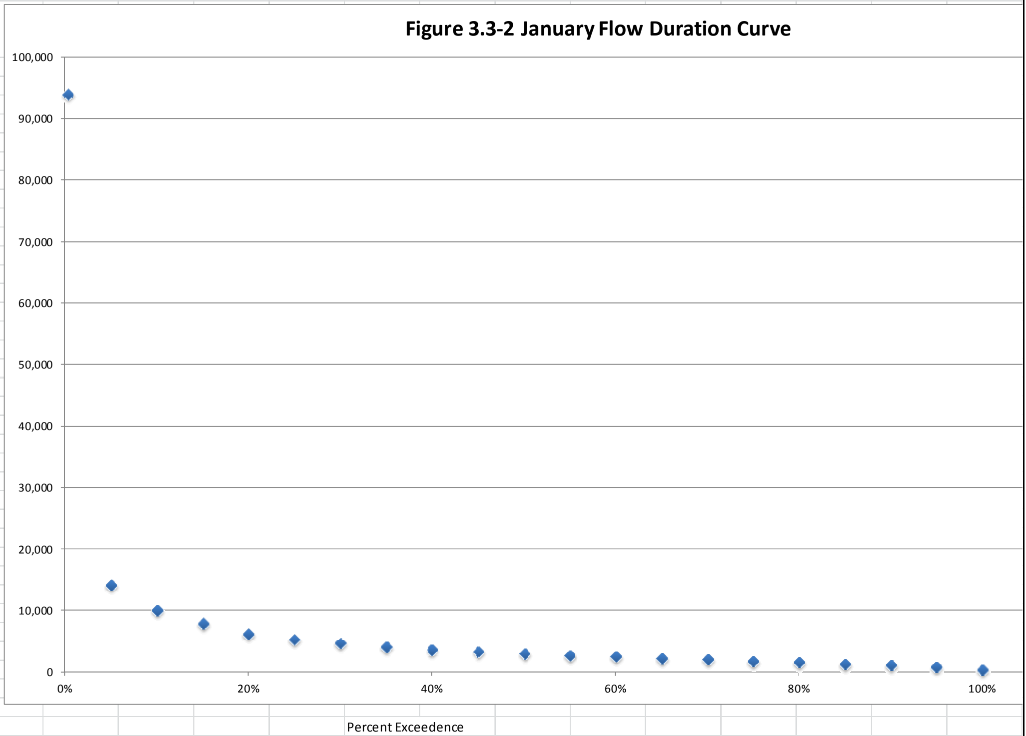
The 50 percent exceedence values for the period of record at Holcomb Rock range from 887 cfs (September) to 4,790 cfs (March). The annual and monthly flow duration curves for Holcomb Rock are presented in Figures 3.3-1 through 3.3-13.

Percent Exceedence	Flow (cfs)
0.003	180,000
1	25,300
5	12,000
10	7,900
15	6,000
20	4,850
25	4,050
30	3,460
35	3,010
40	2,630
45	2,300
50	2,000
55	1,760
60	1,520
65	1,340
70	1,170
75	1,030
80	917
85	812
90	716
95	609
100	223

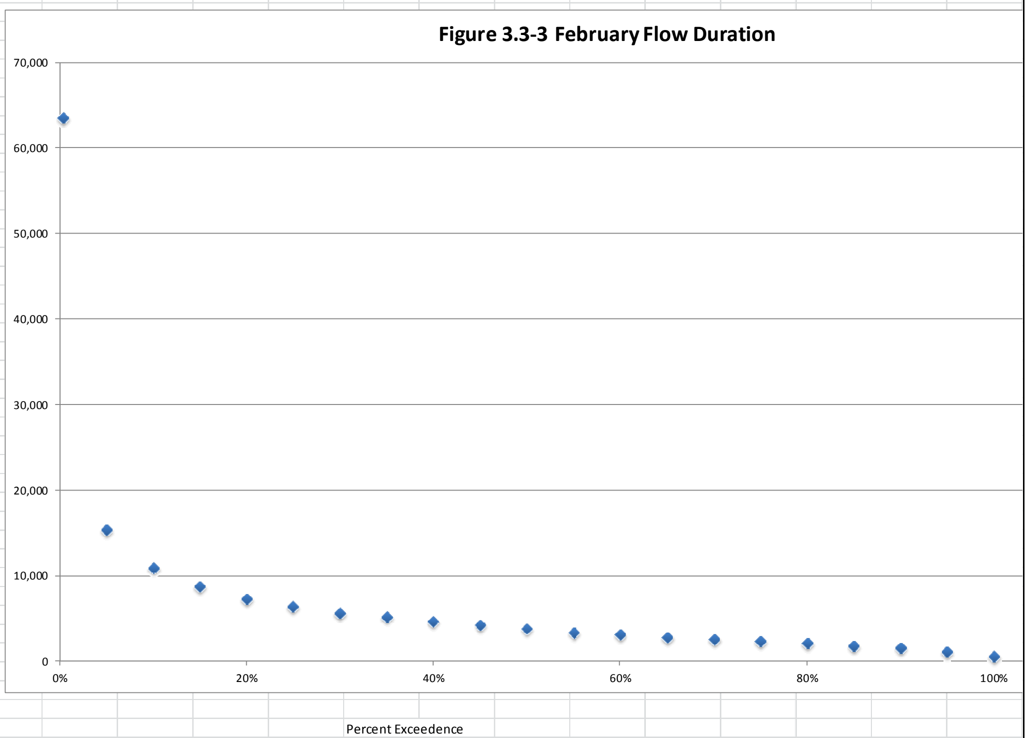
Figure 3.3-1 Annual Flow Duration Curve



Percent Exceedence	Flow (cfs)
0%	93,900
5%	14,200
10%	10,100
15%	7,900
20%	6,270
25%	5,290
30%	4,650
35%	4,030
40%	3,650
45%	3,300
50%	3,010
55%	2,790
60%	2,540
65%	2,310
70%	2,080
75%	1,840
80%	1,580
85%	1,360
90%	1,120
95%	840
100%	431



Percnet Exceedence	Flow (cfs)
0%	63,600
5%	15,300
10%	11,000
15%	8,790
20%	7,360
25%	6,410
30%	5,700
35%	5,200
40%	4,720
45%	4,230
50%	3,770
55%	3,400
60%	3,110
65%	2850
70%	2,630
75%	2,400
80%	2,140
85%	1,850
90%	1550
95%	1,160
100%	579



Percent Exceedence	Flow (cfs)
0%	110,000
5%	21,000
10%	14,300
15%	11,600
20%	9,540
25%	8,290
30%	7,210
35%	6,410
40%	5,760
45%	5,200
50%	4,790
55%	4,360
60%	4,080
65%	3,760
70%	3,470
75%	3,200
80%	2,930
85%	2,610
90%	2,140
95%	1,700
100%	882

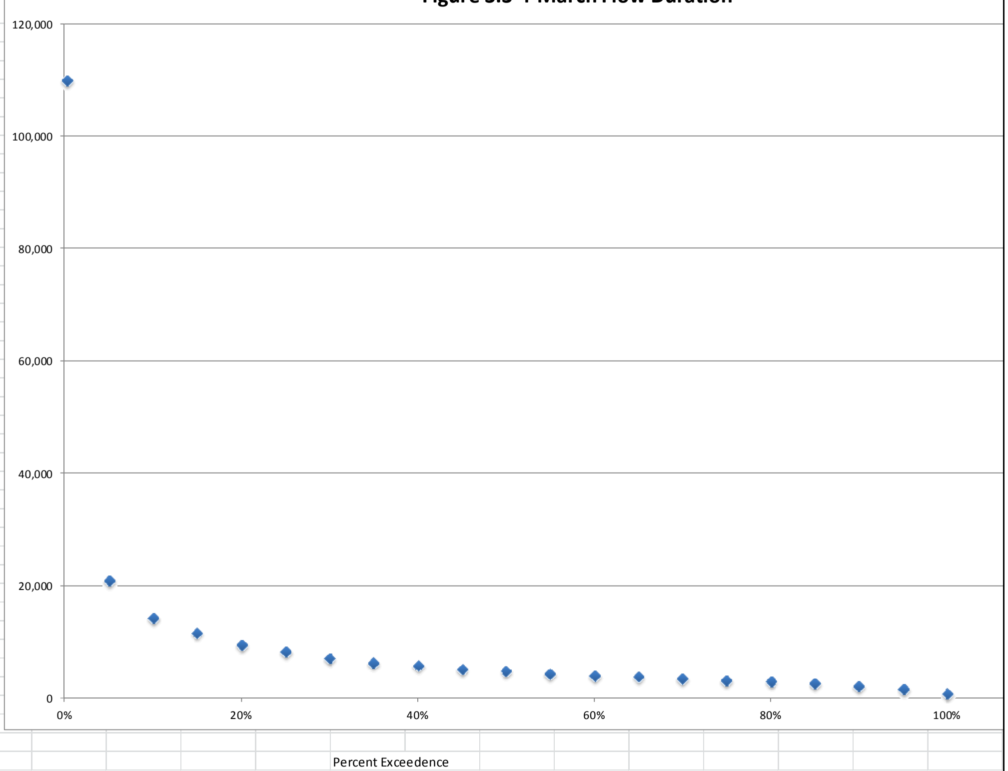


Figure 3.3-4 March Flow Duration

Percent Exceedence	Flow (cfs)
0%	96,700
5%	15,900
10%	11,800
15%	9,340
20%	7,810
25%	6,740
30%	5,900
35%	5,200
40%	4,660
45%	4,280
50%	3,870
55%	3,570
60%	3,290
65%	3,040
70%	2,820
75%	2,620
80%	2,450
85%	2,290
90%	2,060
95%	1,780
100%	966

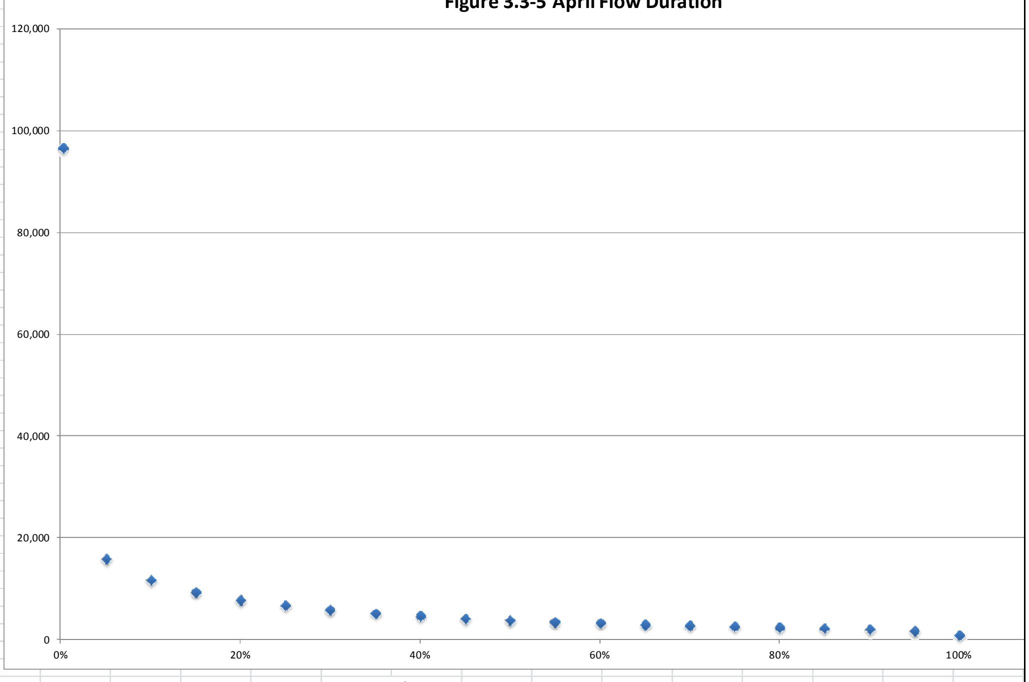
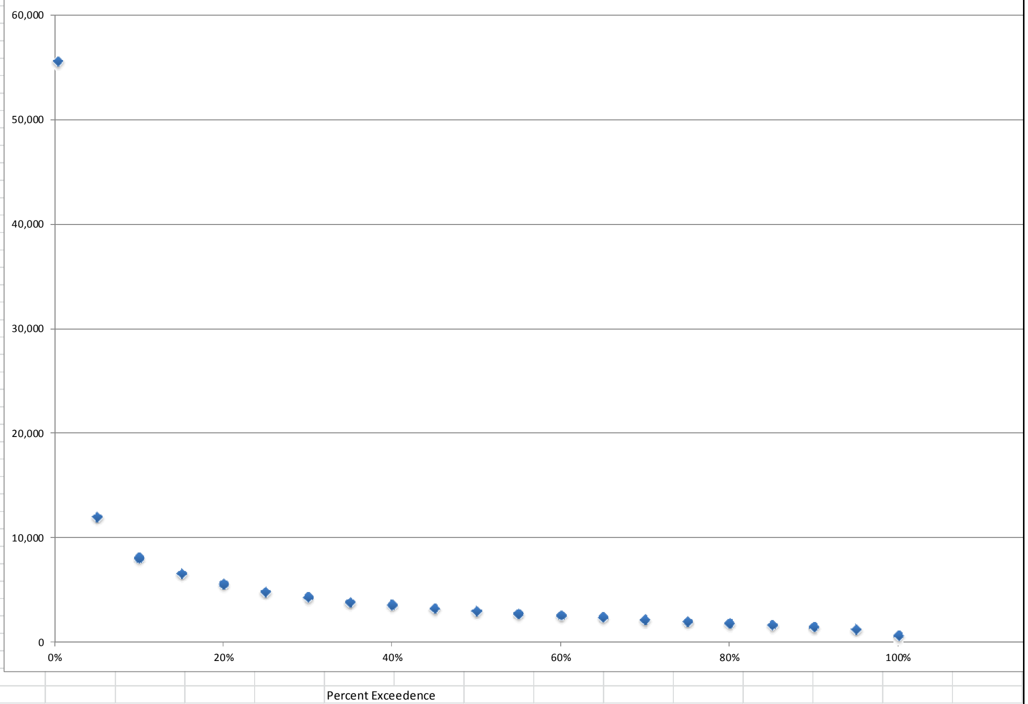


Figure 3.3-5 April Flow Duration

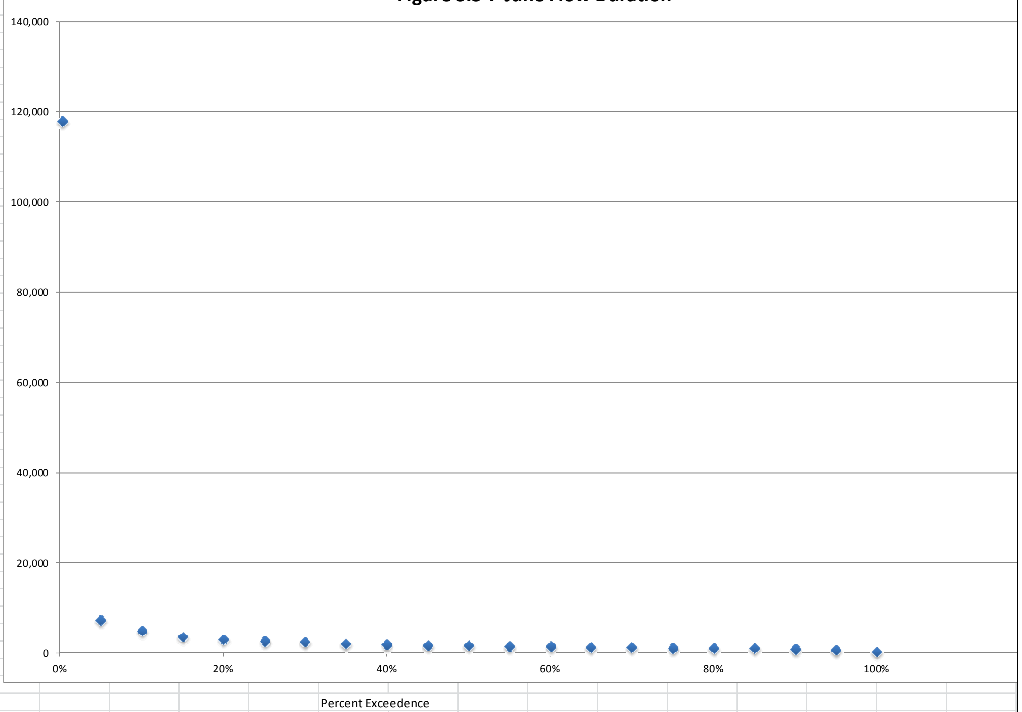
Percent Exceedence	Flow (cfs)
0%	55,600
5%	12,000
10%	8,130
15%	6,600
20%	5,610
25%	4,880
30%	4,340
35%	3,900
40%	3,590
45%	3,300
50%	3,040
55%	2,810
60%	2,620
65%	2,430
70%	2,240
75%	2,050
80%	1,880
85%	1,720
90%	1,510
95%	1,270
100%	685

Figure 3.3-6 May Flow Duration



Percent Exceedence	Flow (cfs)
0%	118,000
5%	7,350
10%	4,940
15%	3,770
20%	3,160
25%	2,750
30%	2,430
35%	2,160
40%	2,000
45%	1,840
50%	1,730
55%	1,590
60%	1,500
65%	1,410
70%	1,340
75%	1,260
80%	1,170
85%	1,080
90%	968
95%	854
100%	424

Figure 3.3-7 June Flow Duration



Percent Exceedence	Flow (cfs()
0%	26,800
5%	4,280
10%	2,880
15%	2,200
20%	1900
25%	1,700
30%	1,550
35%	1,430
40%	1,320
45%	1,240
50%	1,160
55%	1,100
60%	1,050
65%	1,000
70%	948
75%	893
80%	835
85%	780
90%	706
95%	595
100%	223

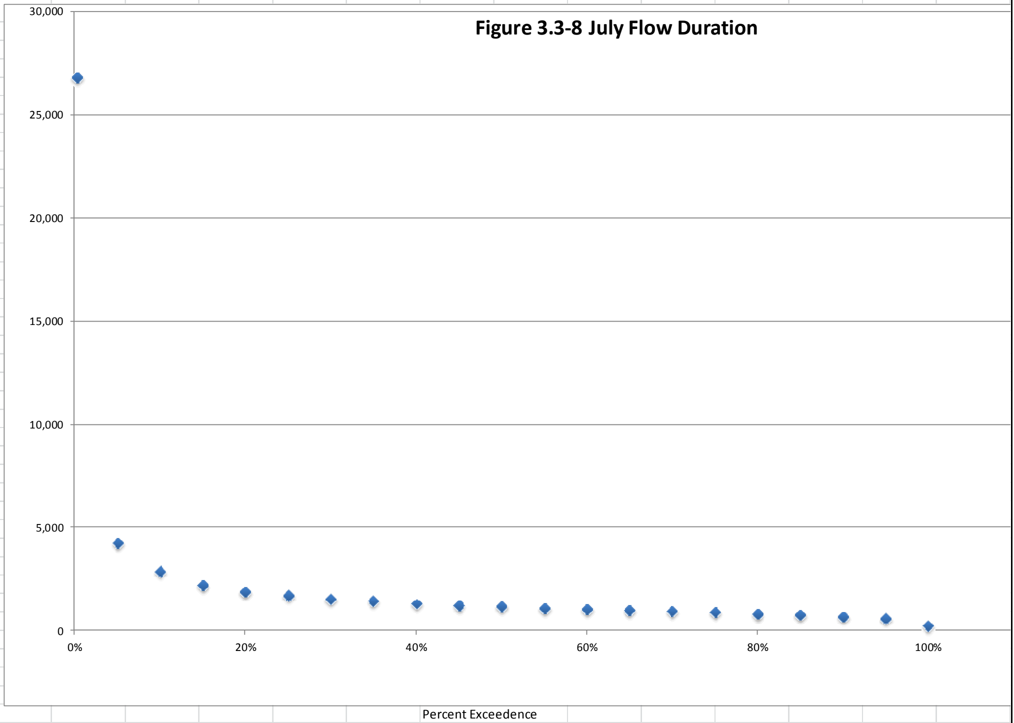


Figure 3.3-8 July Flow Duration

Percent Exceedence	Flow (cfs)
0%	98,800
5%	5490
10%	2,990
15%	2140
20%	1,770
25%	1,540
30%	1,360
35%	1,240
40%	1,150
45%	1,080
50%	1,010
55%	956
60%	903
65%	854
70%	809
75%	764
80%	714
85%	655
90%	574
95%	508
100%	244

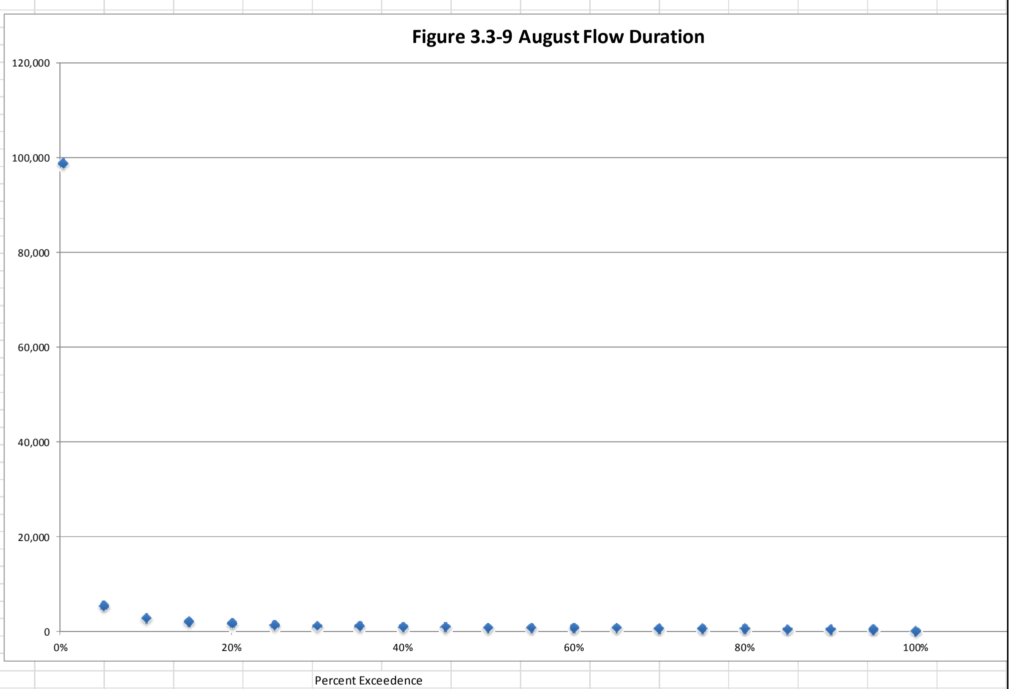
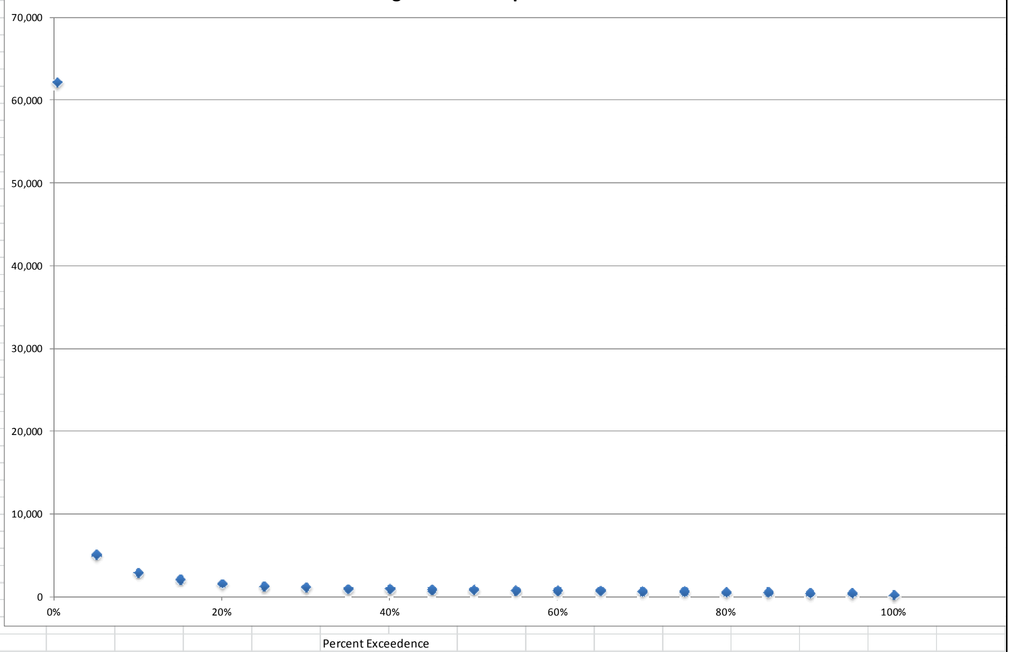


Figure 3.3-9 August Flow Duration

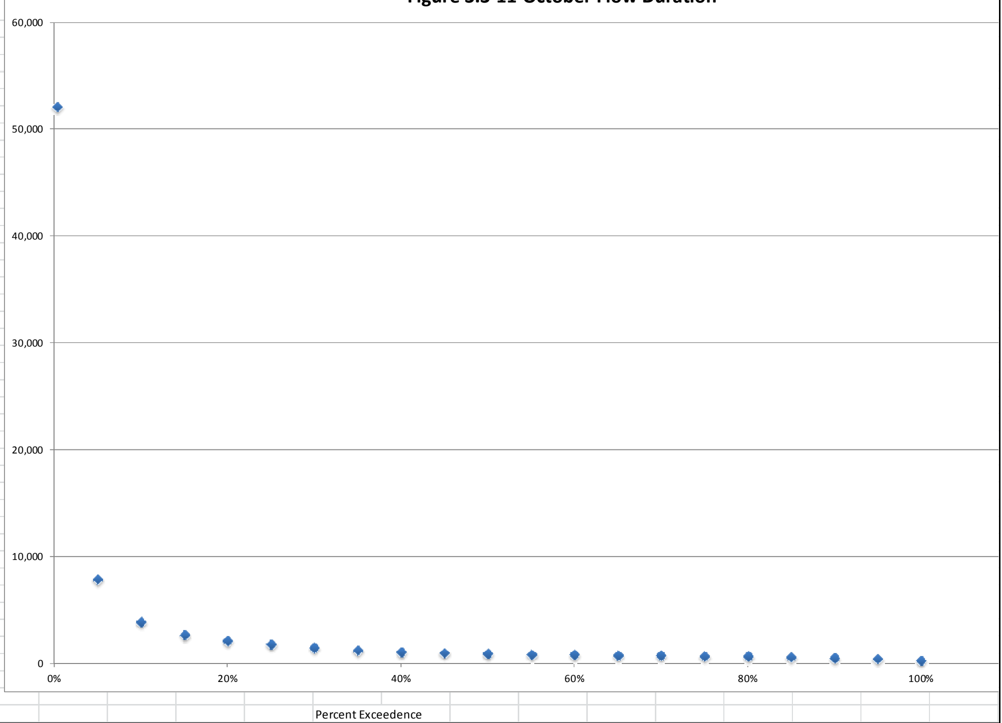
Percent Exceedence	Flow (cfs)
0%	62,200
5%	5,130
10%	3,010
15%	2,120
20%	1600
25%	1,340
30%	1190
35%	1,060
40%	1,000
45%	936
50%	887
55%	842
60%	795
65%	755
70%	708
75%	674
80%	640
85%	580
90%	528
95%	450
100%	280

Figure 3.3-10 September Flow Duration



Percent Exceedence	Flow (cfs)
0%	52,100
5%	7,900
10%	3,930
15%	2,700
20%	2,180
25%	1,810
30%	1510
35%	1300
40%	1,140
45%	1,040
50%	953
55%	890
60%	835
65%	795
70%	757
75%	716
80%	670
85%	634
90%	580
95%	489
100%	266

Figure 3.3-11 October Flow Duration



Percent Exceedence	Flow (cfs)
0%	180,000
5%	8,100
10%	5,040
15%	3,860
20%	3,100
25%	2,590
30%	2140
35%	1,890
40%	1,670
45%	1,500
50%	1340
55%	1,200
60%	1,090
65%	969
70%	892
75%	831
80%	782
85%	730
90%	657
95%	576
100%	400

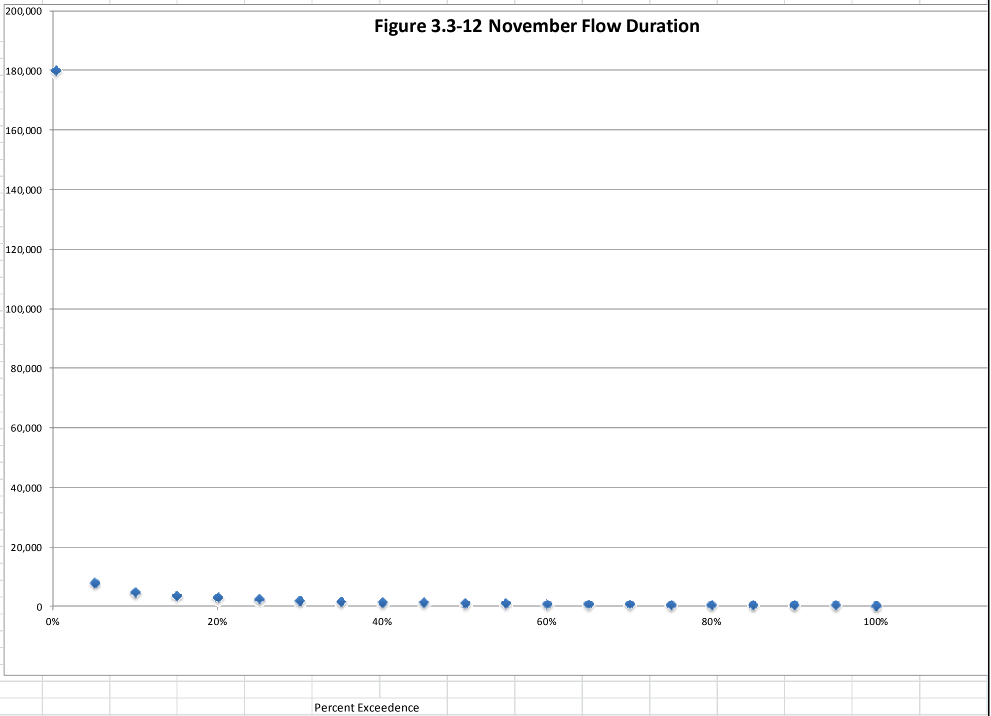


Figure 3.3-12 November Flow Duration

Percent Exceedence	Flow (cfs)
0%	62,900
5%	11,300
10%	7380
15%	5,630
20%	4,500
25%	3,920
30%	3,410
35%	3,020
40%	2,700
45%	2,440
50%	2,210
55%	2,000
60%	1,790
65%	1600
70%	1,430
75%	1,290
80%	1,130
85%	947
90%	792
95%	662
100%	452

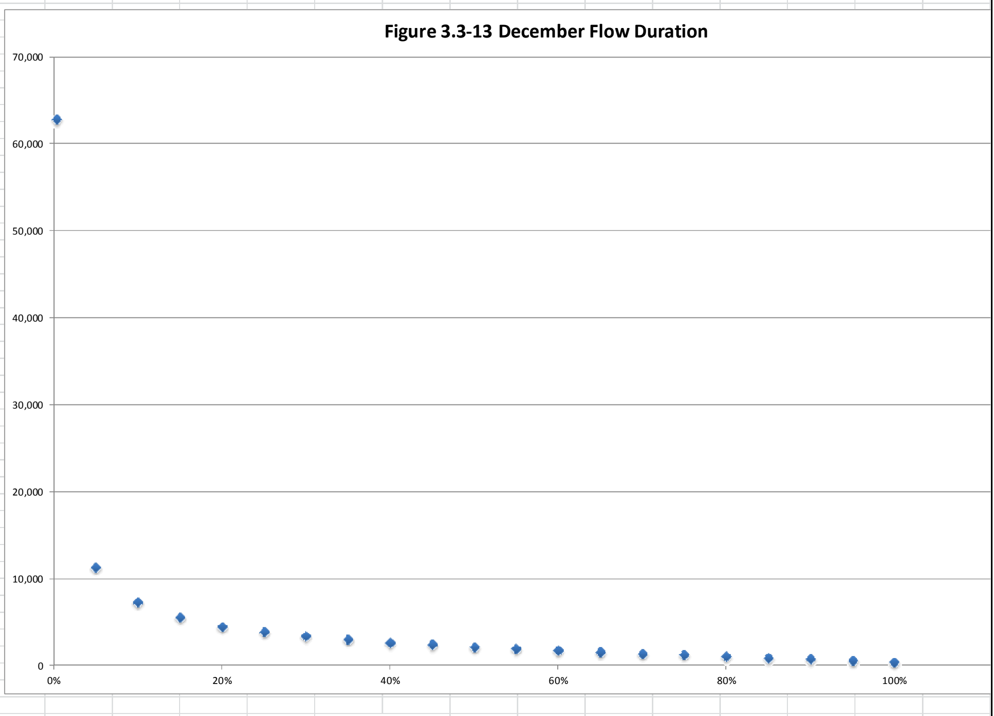


Figure 3.3-13 December Flow Duration

3.3.2 Water Quality

The Scott's Mill Dam is located in a reach of the James River that the Virginia Department of Environmental Quality (VDEQ) identifies as Section 11j. This Section is considered Class III, Non-tidal Waters, in which VDEQ numerical water quality criteria for minimum and daily dissolved oxygen (DO), pH, and maximum temperature are as follows (AC 25-260-5 et seq. Water Quality Standards):

Minimum DO (mg/l)	Daily Avg. DO (mg/l)	pH	Max Temp (^{0}C)
4.0	5.0	6.0 – 9.0	32

The City of Lynchburg has an emergency water withdrawal from the James River immediately downstream of Scott's Mill dam and as such, water quality criteria for parameters other than DO, pH and temperature are identified under the category "Aquatic Life, Freshwater (Acute and Chronic)", and "Human Health, All Other Surface Waters." The numerical water quality criteria for specific parameters other than DO, pH, and temperature are included in Appendix E.

VDEQ has classified this portion of the James River as being Category 5D impaired (due to elevated bacteria concentrations and polychlorinated biphenyls [PCB's]). According to the VDEQ, this 4.2-mile section of the river (VAC-H03R JMS 04A02, from Reusens Dam [upstream] to Highway 29 [downstream]) currently supports aquatic life uses, public water supply uses, and wildlife uses, but does not support recreational uses or fish consumption. Elevated *E. coli* bacteria concentrations in the water and high PCB levels in fish tissue have resulted in this impairment classification.

The VDEQ identifies the James River at the vicinity of the Project as "Impaired Waters" (VDEQ 2002 303(D) Impaired Waters Fact Sheet). It is identified as impaired for both 2012 and 2014. A river segment located about four miles downstream of the project was listed in 1998 as impaired due to seven out of 59 fecal coliform bacteria samples exceeding 1,000 n/100 ml. VDEQ identified a mix of agricultural and industrial nonpoint source runoff as the likely sources.

VDEQ currently measures water quality (at about 0.3m depth) bi-monthly in the James River at Percival's Island (downstream of Scott's Mill Dam). This sampling location is identified by VDEQ as Ambient Station 2-JMS258.54. Results for selected parameters for the period 2014 to 2015 are provided in Table 3.3-2. Water temperatures during the sampling events varied from 3.5 C to 29.5 C. Dissolved oxygen values ranged from 7.9 to 13.4 mg/l, while pH values ranged between 7.2 and 8.4. Turbidity was generally low, but ranged from 1.8 to 210.0 NTU. Four of the 21 samples contained fecal coliform concentrations that exceeded the 1,000 n/100 ml criterion.

Table 3.3-2 Water Quality in Vicinity of Scott's Mill Dam

Station 2-JMS258.54 Percivals Island Lot (Under Rt 29 Bridge)

Collection Date Time	Rec Code	Depth	Depth Desc	Temp Celcius	Do Probe (mg/l)	Field Ph	TS RESIDUE, TOTAL (MG/L) Value	TSS RESIDUE, TOTAL NONFILTRABLE (MG/L) Value	NITROGEN, TOTAL (MG/L AS N) Value	NITROGEN, KJELDAHL, TOTAL, (MG/L AS N) Value	PHOSPHORUS, TOTAL (MG/L AS P) Value	HARDNESS, TOTAL (MG/L AS CACO3) Value	FECAL COLIFORM,MEMBR FILTER,M-FC BROTH,44.5 C Value	E. COLI - MTEC-MF N0/100ML Value	ENTEROCOCCI-ME-MF N0/100ML Value	TURBIDITY,LAB NEPHELOMETRIC TURBIDITY UNITS, NTU Value	E.COLI BY COLILERT SM 9223-B Value
2/13/2012 12:20	SCRO	0.3	S	6.56	10.03	7.68	140	2	0.48	0.2	0.02		25	25		2.2	
3/26/2012 15:00	SCRO	0.3	S	15.06	10.42	7.35	166	75	0.9	0.6	0.11		2000	1325		52.6	
5/9/2012 13:00	SCRO	0.3	S	19.89	9.12	7.81	149	30	0.67	0.4	0.07		2000	1200		41.2	
7/24/2012 15:00	SCRO	0.3	S	28.52	8.12	8.06	262	1	0.45	0.4	0.03		125	25		1.38	
9/6/2012 12:00	SCRO	0.3	S	26.79	8.45	8.07	235	3	0.38	0.3	0.03		75	50		2.76	
11/14/2012 13:50	SCRO	0.3	S	9.79	13.03	8.04	267	2	0.3	0.5	0.02		200	25		2.46	
1/15/2013 10:40	SCRO	0.3	S	7.6	11.95	7.64	167	14	0.57	0.4	0.04		275	300		12.8	
3/7/2013 10:30	SCRO	0.3	S	4.69	13.38	7.64	163	7	0.54	0.3	0.02		25	100		8.92	
5/8/2013 15:40	SCRO	0.3	S	12.79	10.88	7.63	337	259	1.21	1.6	0.34		2000	1300		210	
7/25/2013 16:50	SCRO	0.3	S	26.17	8.16	8.04	180	14	0.58	0.3	0.05		25	125		19.8	
9/25/2013 15:10	SCRO	0.3	S	21.1	9.5	8.23	231	2	0.35	0.3	0.03		100	25		2.13	
11/21/2013 15:20	SCRO	0.3	S	8.73	12.54	8.38	265	7	0.34	0.3	0.01		25	25		3.38	
1/21/2014 15:00	SCRO	0.3	S	3.51	13.58	7.91	133	6	0.66	0.2	0.03		50	25		7.43	
3/11/2014 15:40	SCRO	0.3	S	9.17	11.35	7.79	122	4	0.49	0.1	0.02		50	25		3.58	
5/7/2014 14:45	SCRO	0.3	S	18.76	9.64	7.76	121	8	0.57	0.2	0.03		100	25		6.37	
7/23/2014 17:45	SCRO	0.3	S	29.09	7.88	8.13	222	2	0.51	0.4	0.02		25	25		1.8	
9/25/2014 13:40	SCRO	0.3	S	21.29	10.13	8.28	226	1	0.56	0.3	0.04		25			2.22	
11/24/2014 14:10	SCRO	0.3	S	9.13	11.47	8	186	8	0.59	0.3	0.04		550			8.7	450
2/23/2015 9:30	SCRO	0.3	S	3.69	12.92	7.97	299	7	0.84	0.3	0.02	93	25		100	9.48	75
4/20/2015 9:45	SCRO	0.3	S	15.63	10.25	7.22	363	254	1.21	1.1	0.47	84	2000		800	222	2755
6/17/2015 13:00	SCRO	0.3	S	29.45	7.94	7.75	172	4	0.47	0.3	0.03	96	50		70	3.57	10

3.4 Fish and Aquatic Resources

3.4.1 Fishery Resources

The James River is the third largest tributary to the Chesapeake Bay, and the largest river located entirely within Virginia. The Upper River, from the headwaters downstream to Lynchburg, flows through the Blue Ridge Mountains physiographic province. This upper section is characterized by cool water with mainly swift boulder-filled rapids and pool/run complexes with gravel/cobble substrates (VDGIF, 2015b). There is an array of habitat types in the project area, with areas of slow to moderate current and mixed substrate. None of the seven dams between Buchanan and Lynchburg currently provide fish passage.

The Middle River, from Lynchburg downstream to Bosher Dam in Henrico, flows through the Piedmont Plateau. This section is the flattest portion of the non-tidal James, and is composed of mild to moderate rapids and long sandy runs (VDGIF 2015b). A fish passage facility has been in operation at Bosher Dam since 1999. Below the Middle River, the character of the river changes dramatically. The nine-mile stretch of the James River that flows through Richmond (known locally as the fall-line section) separates the non-tidal and tidal portions of the James River and contains various habitat types including rocky outcrops, large runs, deep pools, shallow riffles, and intense rapids (VDGIF, 2015b).

The James River supports a variety of warm water game and non-game fish, and currently provides an excellent smallmouth bass fishery, with additional angling opportunities for muskellunge and catfish. Smallmouth bass are the dominant game species, but spotted and largemouth bass can also be caught. Other plentiful species in the James River include channel catfish, flathead catfish, and various sunfish species (redbreast, bluegill, and rock bass). The river also supports many non-game species of shiners, minnows, darters and suckers. Several diadromous fish species including American shad, alewife, blueback herring, striped bass, sea lamprey and American eel occur in the James River as well.

VDGIF surveys the James River annually. During boat electrofishing conducted in September and October of 2014, a total of 48 species were documented at 27 sample sites located between river kilometer (RKM) 168 and RKM 555[1] (VDGIF, 2015a). The five most numerous species collected were smallmouth bass (25.5%), rock bass (12.8%), American eel (11.0%), redbreast sunfish (6.7%), and bullhead chub (6.2%), per VDGIF (2015a).

Analysis of the 2014 data indicated no significant trend in diversity by RKM. All sites were essentially equal in diversity score, with the exception of one site that is possibly influenced by the Tye River (VDGIF, 2015a). However, there was a significant difference in the fish assemblage between the Upper River (Eagle Rock to Lynchburg) and the middle and lower portions of the river. The difference in fish assemblages is most likely due to the series of dams between Buchanan and Lynchburg, impeding movement of migratory species, and a change in river morphology below Lynchburg associated with a change in physiographic province.

The Upper River is characterized by higher catch rates of centrarchids (sunfish and bass), catostomids, and muskellunge (VDGIF, 2015a). Annual fish surveys of the Cushaw Project reservoir (also known as the Snowden Pool), conducted between 1991 and 2001 by VDGIF, found a similar assemblage. Forty-one species of fish were collected (Table 3.4-1; Dominion, 2003). Smallmouth bass, telescope shiner, bluntnose minnow, rock bass, bluegill, and redbreast sunfish were collected every year and were generally among the most-abundant species. Rosyface shiner and northern hogsucker occurred in all years except one. Mimic shiner and swallowtail shiner were also abundant in some years.

<u>*Table 3.4-1 List of fish species documented in James River Basin*</u>

Common Name	Scientific Name	Snowden Pool[a]	Middle River[b]
Bass, Largemouth	*Micropterus salmoides*	x	x
Bass, Rock	*Ambloplites rupestris*	x	x
Bass, Smallmouth	*Micropterus dolomieu*	x	x
Bass, Spotted	*Micropterus punctulatus*	x	x
Bluegill	*Lepomis macrochirus*	x	
Bullhead, Brown	*Ameiurus nebulosus*	x	
Bullhead, Yellow	*Ameiurus natalis*	x	
Common Carp	*Cyprinus carpio*	x	x
Catfish, Blue	*Ictalurus furcatus*		x
Catfish, Channel	*Ictalurus punctatus*	x	x
Catfish, Flathead	*Pylodictis olivaris*	x	x

[1] This reach includes the Scott's Mill dam at approximately RKM 235.

Catfish, White	*Ameiurus catus*		
Chub, Bluehead	*Nocomis leptocephalus*	x	
Chub, Bull	*Nocomis raneyi*	x	x
Chub, Creek	*Semotilus atromaculatus*		
Chub, River	*Nocomis micropogon*		
Chubsucker, Creek	*Erimyzon oblongus*	x	
Crappie, Black	*Pomoxis nigromaculatus*	x	x
Dace, Blacknose	*Rhinichthys atratulus*		
Dace, Longnose	*Rhinichthys cataractae*		
Dace, Mountain Redbelly	*Phoxinus oreas*		
Dace, Rosyside	*Clinostomus funduloides*		
Darter, fantail	*Etheostoma flabellare*		
Darter, glassy	*Etheostoma vitreum*		
Darter, johnny	*Etheostoma nigrum*		
Darter, longfin	*Etheostoma longimanum*		
Darter, Roanoke	*Percina roanoka*	x	
Darter, Shield	*Percina peltata*		x
Darter, Stripeback	*Percina notogramma*	x	
Darter, tessellated	*Etheostoma olmstedi*		
Eel, American	*Anguilla rostrate*		x
Fallfish	*Semotilus corporalis*	x	
Gar, Longnose	*Lepisosteus osseus*		x
Goldfish	*Carassius auratus*		x
Hogsucker, Northern	*Hypentelium nigricans*	x	x
Jumprock, Black	*Moxostoma cervinum*	x	x
Lamprey, Sea	*Petromyzon marinus*		
Madtom, margined	*Noturus insignis*		
Minnow, Bluntnose	*Pimephales notatus*	x	
Minnow, Cutlips	*Exoglossum maxillingua*		
Muskellunge	*Esox masquinongy*	x	
Perch, Pirate	*Aphredoderus sayanus sayanus*		
Pumpkinseed	*Lepomis gibbosus*	x	
Quillback	*Carpiodes cyprinus*		x
Redhorse, Golden	*Moxostoma erythrurum*	x	
Redhorse, Shorthead	*Moxostoma macrolepidotum*	x	x
Sculpin, Mottled	*Cottus bairdi*		
Shad, American	*Alosa sapidissima*		
Shad, Gizzard	*Dorosoma cepedianum*		x
Shiner, Comely	*Notropis amoenus*	x	

Shiner, Common	*Luxilus cornutus*	x	
Shiner, Crescent	*Luxilus cerasinus*	x	
Shiner, Golden	*Notemigonus crysoleucas*	x	
Shiner, Mimic	*Notropis volucellus*	x	
Shiner, Rosefin	*Lythrurus umbratilis*	x	
Shiner, Rosyface	*Notropis rubellus*	x	
Shiner, Roughhead	*Notropis semperasper*	x	
Shiner, Satinfin	*Cyprinella analostana*	x	
Shiner, Spottail	*Notropis hudsonius*	x	
Shiner, Swallowtail	*Notropis procne*	x	
Shiner, Telescope	*Notropis telescopus*	x	
Stoneroller, Central	*Campostoma anomalum*	x	
Sucker, Torrent	*Moxostoma rhothoecum*		
Sucker, White	*Catostomus commersonii*	x	x
Sunfish, Green	*Lepomis cyanellus*	x	x
Sunfish, Hybrid	*Lepomis sp*	x	
Sunfish, Redbreast	*Lepomis auritus*	x	x
Sunfish, Redear	*Lepomis microlophus*	x	x
Trout, Brook	*Salvelinus fontinalis*		
Trout, Rainbow	*Onchorhynchus mykiss*		
Warmouth	*Lepomis gulosus*		

Sources:
a Snowden Pool sampling from 1991 through 2001, no sampling occurred in 1996 (Dominion 2003);
b Middle James River between Columbia and Watkins Landing, October 2011 (VDGIF 2012)

The American eel has also been found above Lynchburg to a limited extent. VDGIF annual electrofishing surveys have documented eels below Reusens Dam, above Reusens Dam, and one individual upstream of Big Island (Dominion 2006). Dominion conducted eel sampling during the fall of 2004, and spring, summer, and fall of 2005. Eel pots were fished in three locations: 1) downstream of the Scott's Mill Dam in Lynchburg, 2) downstream of the Cushaw Dam in Bedford, and 3) in the Snowden Pool above Cushaw Dam. Twenty-six eels were collected at the Lynchburg site, five at Bedford, but no eels were collected within the Snowden Pool (Dominion, 2006).

Below Lynchburg, the Middle River is characterized by higher ictalurid (catfish) abundance, migratory species (American eel and gizzard shad), and centrachids more common to low-gradient habitats (largemouth bass and spotted bass). Flathead catfish and channel catfish abundance peaks in the Middle River section, while blue catfish abundance is greatest in the Lower River.

In October 2011, VDGIF sampled the fish community in the Middle James River at six locations between Columbia and Watkins Landings (VDGIF, 2012). Twenty-three species were collected. American eel was the most abundant species collected, followed by smallmouth bass, sunfish and channel catfish (Table 3.4-1). Smallmouth bass were present at all six sampling sites. Redbreast sunfish and bluegill comprised the bulk

(88%) of sunfish collected. Flathead catfish were also found in the Middle River, but not nearly as abundant as channel catfish. Largemouth bass were fairly uncommon throughout the Middle James River, and were generally small (<12 inches) (VDGIF, 2012).

3.4.2 Key Resident Fish Species

Smallmouth Bass

Smallmouth bass, the most popular sport fish in the basin, were introduced into the James River in the 1800's (Dominion, 2006). Smallmouth bass are common throughout the basin, with a higher abundance in the Upper River. Smallmouth bass were the most abundant species collected during the VDGIF fall 2014 sampling in the Upper River, with 905 individuals collected ranging from 3 to 22 inches (VDGIF, 2015b). Approximately 51 percent of all smallmouth bass collected were juveniles (less than 7 inches). Conversely, adult abundance was considerably low, likely still recovering from several years of poor recruitment. The majority of the adult smallmouth bass collected in the Upper River were between 7-14 ,inches and only 36 individuals greater than 14 inches were collected (VDGIF, 2015b). Results for the Middle River were similar.

In recent years, recruitment has been poor throughout the river due to low spring and summer flow conditions (VDGIF, 2012). However, 2014 flow conditions were ideal for young-of-year bass survival. The second highest CPUE of age zero fish since 1991 was documented during VDGIF fall 2014 sampling (VDGIF, 2015a).

Smallmouth bass live in both cool and warm water environments of large creeks and rivers with clear water, gravelly or rocky substrates, and plenty of shade and cover. While bass can tolerate periodic episodes of turbidity, prolonged turbidity reduces survival (Dominion, 2006). They exhibit strong cover-seeking behavior during all life stages, without preference for any specific type. While they mostly inhabit runs and pools, they prefer systems with a frequent succession of riffles, runs and pools. During the winter, smallmouth bass inhabit deep pools.

Smallmouth bass are carnivorous, feeding on macroinvertebrates, insects and small fish while fingerlings, and then crayfish and larger fish as adults (Dominion, 2006). Smallmouth bass reach sexual maturity in 3-4 years and typically live up to 7 years. Spawning occurs late April through May when water temperatures are between 16 and 22°C (Dominion, 2006). Males defend the nests until several days after hatch.

Sunfish

Several species of sunfish occur in the James River, with the most common being the rock bass, redbreast sunfish, and bluegill (all of which are native to the basin, and are considered valuable sport fish in the system).

Rock bass are the most common sunfish captured in the Upper River, and least abundant captured in the Middle River (VDGIF, 2015b). During fall 2014 surveys, captured rock bass ranged in size from 2-10 inches (average 6 inches) in the Upper River and 2-7 inches (average 5 inches) in the Middle River (VDGIF, 2015b). Rock bass are typically found in perennial streams with low turbidity, abundant cover, and silt-free bottoms (Dominion, 2006). They occupy pools and backwaters, spending much of their time hiding near underwater structures. Rock bass primarily feed at night on aquatic insects, but will also consume fish and crayfish. Rock bass reach sexual maturity at three years, and typically do not live beyond six years. Spawning occurs April through July, when water temperatures are between 16 and 22°C (Dominion, 2006). Rock bass nests (like redbreast sunfish and bluegill nests) are constructed by the male in coarse sand or fine gravel substrate, and are guarded by the male for a short period following hatch.

Redbreast sunfish have a greater abundance in the Upper James River above Lynchburg and the Lower River, and are least abundant in the Middle River (VDGIF, 2015a). During fall 2014 surveys, captured redbreast sunfish ranged in size from 2-10 inches, with most in the 4-8 inch range (VDGIF, 2015b). Redbreast sunfish live in a range of streams from small creeks to big rivers and reservoirs. While they can tolerate silted turbid water, they prefer warm, clear water. They can be found in the same habitats as smallmouth bass and rock bass, as well as shallower water. They can inhabit waters as warm as 39°C (Dominion, 2006). At cool temperatures, redbreast sunfish will form schools, but are solitary at warmer water temperatures. Redbreast feed on aquatic and terrestrial insects, crayfish, other arthropods, mollusks, and sometimes fish. Redbreast typically reach sexual maturity at two years, and live four to five years. Spawning occurs May through July, when water temperatures are between 16 and 28°C.

Bluegill occupy slow water habitats including pools, backwater areas, lakes, reservoirs, and ponds. They can inhabit both clear and turbid systems, with hard or silted substrates, and in areas with submerged cover. They will use deep pools in both the winter and the summer. Optimal temperatures range within 22 to 34°C, depending on life stage. Bluegill feed opportunistically on zooplankton, insects, and plant material (based on availability). Bluegill typically reach sexual maturity in one to two years, and live four to six years. Spawning occurs May through August (and sometimes into September). VDGIF sampling in fall 2014 found bluegill abundance was greatest in the Lower River, and gradually declined up-river, except in the three dammed sections at Lynchburg, Monacan Park, and Big Island (RKM 214-240), which exhibited an increase in abundance (VDGIF, 2015a). Captured bluegill were similar in size to the redbreast sunfish (VDGIF, 2015b).

During VDGIF fall 2014 sampling, the lowest abundance for all three sunfish species occurred between RKM 300 and 400, where greater catch rates of flathead and channel catfish occurred (VDGIF 2015a).

Muskellunge

Muskellunge are a non-native species introduced into the James River in the 1960's for sport fishing, and have been stocked regularly since that time (Dominion, 2006). Analysis of VDGIF CPUE data from 1991-2014 showed a significant increase in relative abundance over time, indicating that the muskellunge population is expanding (VDGIF, 2015a). Their population density is dependent on prey abundance, as well as stocking levels. Muskellunge are carnivorous and voracious feeders, consuming fish, amphibians, crustaceans, and even mammals and birds. They prefer clear water streams with aquatic vegetation and submerged structures, with temperatures between 17 and 25°C (Dominion, 2006). They reach sexual maturity in three to five years, and typically live six to eight years. Spawning occurs from April to June, at temperatures between 9.5 and 15.5°C, with 13°C being optimal (Dominion, 2006). Muskellunge are broadcast spawners, typically spawning in shallow water over detritus or living vegetation. These fish are scarce, but some very large fish can be caught. Most of the muskellunge are found upstream of Lynchburg.

Catfish

Flathead, channel, and blue catfish are present in the James River. Flathead and channel catfish are distributed throughout the entire river, and are generally found in pool and ledge areas. Catfish populations are exceptionally good throughout the Middle James River. During VDGIF fall 2014 sampling, peak abundance of both species occurred in the reaches near Lynchburg and Big Island (VDGIF, 2015a). Flathead catfish appear to be more numerous upstream from Lynchburg, and channel catfish are more numerous downstream of Lynchburg. While flathead catfish are not nearly as abundant as channel catfish in the Middle River, when caught they are generally larger fish. Sizes of channel catfish ranged from 3-27 inches and weighed up to eight pounds, whiles sizes of flathead catfish collected ranged from 3-44 inches and weighed up to 16 pounds (VDGIF, 2015b). Blue catfish occur in the lower James River, below RKM 175.

3.4.3 Disease

Chronic spring-time fish mortality and disease events have occurred in the Upper James River from 2007-2010 (VDGIF, 2014). These episodes have not been uniform in location or severity, and have not occurred every year. These events have been less common since 2010. In 2014, mortality was low in the James River. Angler reports of dead or diseased fish were almost non-existent. Adult smallmouth bass, redbreast sunfish and rock bass have been the primary fish affected, but several other species have also been inflicted. Affected fish typically exhibit open sores or lesions on the sides of their bodies, though some dead and dying fish have no visible external abnormalities. Other external symptoms include: dark patches of skin, raised bumps, loss of scales, split or eroded fins, and discolored/eroded gills (VDGIF, 2010).

The cause of these mortality/disease events has not been determined (VDGIF, 2014). Scientists are conducting studies of fish health, pathogens, water quality, contaminant exposure, and possible toxins released by bacteria. The fact that these events have occurred in multiple watersheds that differ in many ways has added to the complexity of understanding the primary cause.

3.4.4 Recreational Fishery

Angling pressure on the James River is exceptionally high. VDGIF conducted an angler survey of the Upper James River at sixteen access points from Cushaw Dam upriver to Lick Run in summer and early fall of 2000 (Dominion, 2003). Approximately 78% of the anglers surveyed were targeting smallmouth bass, 17% expressed no species preference (but were generally fishing for smallmouth bass), 4% were targeting muskellunge, and 1% sought flathead or channel catfish. Smallmouth bass constituted 82% of all fish caught, while rock bass accounted for 10% and sunfish 7% (Dominion, 2003). All other species contributed less than 1% of the total estimated catch. Approximately 10% of all smallmouth bass caught by anglers were greater than 14 inches in length, indicative of a high quality fishery. The survey also indicated an overall catch rate of 2.17 fish/hour, which is considered high (compared to angler surveys on other water bodies). Approximately 73% of the anglers surveyed practiced catch and release. Fish densities for the upper James River have not been quantitatively determined, but qualitative electrofishing data suggest a smallmouth bass density in the range of 10-20 fish $\geq$ 14 inches length/mile (Dominion, 2003).

3.4.5 Diadromous Fish Species

American Shad

American shad are anadromous fish that spend the majority of their life at sea, and only enter freshwater to spawn. Shad are river-specific, and each major river along the Atlantic coast appears to have a discrete spawning stock. Mixed stocks of American shad enter the lower Chesapeake Bay in late winter-early spring and segregate into river-specific populations (ASMFC, 2007). Most adults spawn once and die, though repeat spawning does occur, the incidence of which increases with increasing latitude (NMFS 1999).

American shad spawn in freshwater portions of the rivers, usually beginning in March and ending in June with peaks in April, by broadcasting a large quantity of eggs into the water column. The annual spawning run consists of virgin fish three to seven years in age (based on analysis of scales) plus repeat spawners (age-4 through age-12). American Shad age-9 and older are rare. Maximum age recorded is 12 years.

Fertilized eggs are carried by river currents and hatch within 2-17 days, depending on water temperatures (NMFS, 1999). Larvae drift with the current until they mature into juveniles. Juveniles remain in nursery areas, feeding on copepods, other crustaceans, zooplankton, chironomid larvae, and aquatic and terrestrial insects (NMFS, 1999). By late fall, most juvenile shad migrate to nearshore coastal wintering areas. Immature shad will remain in the ocean for three to six years, before returning to spawn. Little information is available on the life history of sub-adult and adult American shad after they emigrate to the sea. American shad is a highly migratory, schooling species. After spawning, iteroparous adult American shad return to the sea and migrate northward to their summer feeding grounds in the Gulf of Maine/Bay of Fundy, where they primarily feed on zooplankton and small fishes. Overwintering (winter habitat) occurs along the mid-Atlantic coast, particularly from Maryland to North Carolina (NMFS, 1999). American shad typically follow fairly specific temperature windows of 3 to 15ºC during their migration at sea (ASMFC, 2007).

As an anadromous fish, American shad are negatively impacted by obstructions to migration from marine and estuarine habitats to the upstream freshwater spawning and rearing habitats. Habitat degradation, water withdrawals and pollution, overfishing, and dams that block migrationn to spawning grounds have contributed to the decline of the American Shad (Hilton, et al. 2014).

In response to the declining populations, members of the ASMFC recommended the preparation of a cooperative interstate Fishery Management Plan (FMP) for American Shad and River Herring, which was adopted in 1985. The FMP recommended management measures, focused primarily on regulating exploitation and enhancing stock restoration efforts. The FMP was amended and approved in 1999. The goal of Amendment 1 is to protect, enhance, and restore East Coast migratory spawning stock of American shad, hickory shad, and river herring (alewife and blueback herring collectively) in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass. In the James River, the sampling program was to address: annual spawning stock survey and representative sampling for biological data, calculation of mortality and/or survival estimates, juvenile abundance surveys, hatchery evaluation, monitoring of recreational landings, and catch and effort every five years. In 2010, the Shad and River Herring Management Board approved Amendment 3, addressing American shad management (ASMFC, 2010). As a requirement of Amendment 3, biologists from Virginia Institute of Marine Science, Virginia Marine Resources Commission, and VDGIF collaboratively developed the American Shad Habitat Plan for the Commonwealth of Virginia (Hilton, et al. 2014).

Shad have historically ascended farther upriver than at present within tributaries that are obstructed. Construction of the Bosher Dam fishway, functional beginning in 1999, was intended to restore migration to these historic habitats. The goal for the Upper James River is to restore 500,000 shad passing Bosher Dam annually, and 34.66 catch-per-unit-effort in the Lower River (Chesapeake Bay Program, 2014). The Lower James River target is based on shad abundance levels during the 1950's and the Upper James River target is based on the number of shad that can be supported by the 137 miles (or 11,930 acres) of habitat available above the Bosher Dam fishway.

Between 2000 and 2014, abundance of American shad in the James River has hovered around 10% of the target, with peaks of 14% in 2003 and 2011 and a low of 2% in 2006 (Chesapeake Bay Program, 2014). Abundance estimates for the James are a weighted combination of data collected in the upper and lower portions of the river. In the Upper[2] James, abundance has remained minimal at less than 1% of the target. The range of shad passing Bosher Dam over this period was 24-669 annually, with an average of 217 fish. In the Lower James, abundance has fluctuated between 4% and 27% of the target. Between 2013 and 2014, abundance rose from 7% to 12% of the target. In the Upper James, abundance remained minimal at less than 1% of the target (from 192 to 24 shad passing Bosher Dam). In the Lower James, abundance rose from 13% to 21% of the target (4.5 to 7.4 CPUE) (Chesapeake Bay Program, 2014).

The Virginia Marine Resources Commission imposed a moratorium on the taking of American shad in Virginia rivers and the Chesapeake Bay in 1994, in response to sharp declines in commercial landings (Hilton, et al. 2013). The ocean-intercept fishery in Virginia coastal waters was closed in December 2004 (ASMFC, 2007). Drift-net fishing by two Native American tribal governments and the taking of brood stock by the Virginia Department of Game and Inland Fisheries on the spawning grounds of the York River system for stock restoration in the James River are permitted. An active catch and release recreational fishery exists on the James River.

In spring 1994, the Virginia Department of Game and Inland Fisheries and the U.S. Fish and Wildlife Service began hatchery-restocking efforts in the James and Pamunkey rivers. Adult shad from the Pamunkey River are used as brood stock for the James River releases. The success of the restoration program in the James River was evidenced by increasing adult catch rates by monitoring gear in 1998 through 2002, as large numbers of mature hatchery fish returned to the spawning grounds.

In the James River, juvenile abundance indices (JAI) show a period of relatively high values in early 1980's, a low period from the mid-1980s to the mid-1990's, and then occasional high values until 2005, when all Lower Chesapeake Bay River indices declined (ASMFC, 2007). The James River JAI time series displays no measurable recruitment in most years with only five non-zero years since 1980. There has been a significant increase in staked gill net CPUE on the James River since the 1980's, while there has been no trend in fishery-independent electrofishing or gill-net survey indices on the James River over the same time (ASMFC, 2007).

A comparison of the historical and current catch indices indicates that the James River stock has not recovered from the severe declines in the 1980's and early 1990's. Although densities of larval shad are often high on the spawning grounds, there is little evidence of recruitment success on the James River, and the stock is dependent on hatchery inputs (ASMFC, 2007). In 2012, 34% of the James River returns were composed of hatchery fish (Hilton, et al. 2014).

The American Shad habitat plan (Hilton, et al. 2014) identifies the need for further study of freshwater habitat use by American shad in Virginia. Specifically, quantification and analysis of specific reaches of riverine habitats used during residency is needed (adults

[2] In this context the Upper James River is above Bosher's dam.

during the spawning run, larvae, and juveniles), to better manage and address habitat concerns of the species.

River Herring

The anadromous river herring (alewife and blueback herring) spawn in the spring in rivers from Florida through Maine, and into Canada. The newly spawned fish migrate out of the rivers into the ocean in the fall, where they spend the next three to five years of their life (ASMFC, 2012b). When they are sexually mature, they return to the river where they were born to spawn. Unlike salmon, river herring do not all die after spawning and may return to spawn several times over the course of their lives. The oldest observed ages for river herring are 14 years for alewife and 11 for blueback herring, but the oldest fish seen in rivers today are six to eight years old (ASMFC, 2012b).

The Fishery Management Plan (FMP) for shad and river herring was developed by the ASMFC in 1985. In 1994, the Shad and River Herring Management Board determined that the FMP was no longer adequate for protecting or restoring the remaining shad and river herring stocks (ASMFC, 2012b). Amendment 1 recommended fishery-dependent and independent monitoring programs in order to improve stock assessment capabilities (ASMFC, 2012b). In 2009, the Shad and River Herring Management Board approved Amendment 2, which strengthened river herring management by prohibiting state waters commercial and recreational fisheries beginning January 1, 2012, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Management Board (ASMFC 2012b). Amendment 2 required states to implement fisheries-dependent and independent monitoring programs, and contains recommendations to member states and jurisdictions to conserve, restore, and protect critical river herring habitat. As of January 1, 2012, the Shad and River Herring Management Board approved sustainable fishery management plans for Maine, New Hampshire, New York, North Carolina and South Carolina.

In 2011, the National Resources Defense Council petitioned NOAA Fisheries to list river herring on the endangered species list throughout all or part of the species range. NOAA Fisheries conducted a status review and found that the listing was not warranted in 2013. In May 2015, the Commission and NOAA Fisheries released the River Herring Conservation Plan (http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/conserv/index.html), with the goals of increasing public awareness about river herring (alewife and blueback herring), and fostering cooperative research and conservation efforts to restore river herring along the Atlantic coast.

ASMFC completed a benchmark stock assessment of river herring in 2012. For many rivers, data were inadequate to conduct a model-based stock assessment. Estimates of abundance and fishing mortality could not be developed because of the lack of adequate data (ASMFC, 2012b). Trend analysis was used to identify patterns in the available fishery-dependent and -independent data sets. James River data was inadequate to develop a stock status. However, of the 52 stocks of alewife and blueback herring for which data were available, 23 were depleted relative to historic levels, one stock was increasing, and the status of 28 stocks could not be determined because the time-series of available data was too short (ASMFC, 2012b).

Since the mid-1990s, commercial CPUE indices for alewives showed declining trends in the James River. The juvenile-adult indices from fisheries-independent seine, gillnet, and electrofishing surveys showed a stable or increasing trend for alewife and blueback herring in the James River. VDGIF has conducted annual electrofishing surveys; between 2002 and 2010, compared to alewives (<0.2 fish per minute), blueback herring (0.4-2 fish per minute) have dominated the catch (ASMFC, 2012b). There are no obvious trends in the JAI time series for either of the species, and variability about the annual estimates has been fairly high.

American Eel

The stock status of the American eel, an endemic catadromous species, is classified as *depleted* (ASMFC 2012a). The American eel is regarded as a single panmictic population, found from the southern tip of Greenland, Labrador and the northern Gulf of St. Lawrence in the north, south along the Atlantic and Gulf coasts of North America and eastern Central America to the northeast coast of South America, and into the inland areas of the Mississippi and Great Lakes drainages.

They are opportunistic feeders that will eat phytoplankton, zooplankton, insects, crustaceans, and fish depending on their life stage. Individuals grow in freshwater or estuarine environments for anywhere from 3 to 30 or more years before maturing and returning to the Sargasso Sea as adults to spawn once and die (ASMFC, 2012a). Sexual metamorphosis of eels takes place in freshwater habitats during the summer and sexually mature adults migrate downstream during the fall to spawn in the Sargasso Sea. During downstream river migration, silver eels typically move at night during the darker moon phases, high water flows, and decreasing water temperatures (ASMFC, 2012a).

Eel larvae (leptocephali) are randomly dispersed by ocean currents along the Atlantic coasts of northern South, Central, and North America. Genetic research indicates that there is no reproductive isolation of American eels migrating from the Atlantic Coast (ASMFC, 2012a). Glass eels and elvers use selective tidal stream transport for migrating upriver. Migration typically occurs at night, and is related to reaching a minimum threshold temperature in rivers (usually 10 to 12 degrees Celsius), and the occurrence of a full or new moon and freshets (ASMFC, 2012a). Upstream migration typically occurs in the glass eel and elver stage, but yellow American eels sometimes continue upstream migrations. Upstream migration of glass eels and elvers can occur over a broad period of time from May (during peak migration) through October. Eels settle in a diversity of habitats, ranging from estuaries to freshwater habitats hundreds of miles from the ocean. When upstream migration is complete, eels are usually in the yellow phase and typically set up relatively small home ranges with some exhibiting local seasonal migrations.

Eels were formerly extremely abundant in inland waters of eastern North America, colonizing lakes, rivers, streams, and estuaries. The current depletion of the American eel is in part due to fishing that occurred in the 1970's into the 1980's as export demand rose. A suite of stressors including habitat loss from dams or urbanization, turbine mortality, the non-native swim bladder parasitic nematode *Anguillicolla crassus*, toxic pollutants, and climate change are all factors that act in concert with fishing mortality on American Eel (ASMFC, 2012a).

A. crassus may be reducing American eel survival during the yellow and silver eel life stages. The nematode prefers freshwater but can survive brackish or salt water. Chesapeake Bay infection rates were between 10% and 29% in the late 1990's and had increased to between 13% and 82% by 1998 to 1999 (ASMFC, 2012a). In 2007, infection rates in James River eels was 17.8% (ASMFC, 2012a). Dominion conducted surveys for eels in the vicinity of Cushaw Dam in 2004 and 2005. The eels captured were examined in a laboratory for the presence of *A. crassus*. Seven of the 26 eels collected at Lynchburg downstream of Scott's Mill Dam were infested with the parasite, with a maximum of seven nematodes found in one 435mm long eel (Dominion, 2006). No *A. crassus* were found in the five eels collected further upstream from the Bedford pool below Cushaw Dam (Dominion, 2006).

With the implementation of the ASMFC Interstate Fishery Management Plan for American eel in 2001 (ASMFC, 2000), Virginia among other states implemented a six-inch minimum size limit for American eels. Currently, there is no silver eel fishery in Virginia. Catch rates were calculated for the James River commercial eel pot fishery from data associated with positive effort by dividing the amount of harvest of American eels landed by the number of eel pots. Annual catch rates were variable between 1994 and 2009, ranging from approximately 1.2 to 4.5 pounds per number of pots. Catch rates demonstrated a decline during the mid to late 1990's, with the peak catch rate occurring in 2002. While not a target of recreational fishing, data has indicated a significant decline in American eel as bycatch in the mid-Atlantic region since the 1980's.

Under the FMP for American eel, Virginia is required to conduct an annual young-of-year (YOY) abundance survey (ASMFC, 2000). Accordingly, sampling for young-of-year has occurred at Wareham's Pond on the lower James River since 2003, following the standard protocol approved by the ASMFC American Eel Technical Committee (ASMFC, 2012a). However, annual recruitment indices have not been computed (ASMFC, 2012a). VDGIF and USFS have also conducted investigations of eel movement in the Tye River between 1999 and 2001 (Strickland, 2002).

3.4.6 Fish Passage

Historically, a number of anadromous fish species including American shad, alewife, blueback herring, and striped bass (as well as the catadromous American eel) occurred in the James River. Numerous dams on the James River and its tributaries have historically blocked migration of fishes. There are approximately 45 dams in the James River Basin that provide hydroelectric generation (Dominion, 2003). Prior to damming, which began in the colonial period, shad and river herring (alewife and blueback herring) were reported to reach the headwaters and far into the major tributaries of the James River. The annual input of marine-derived biomass from post-spawning carcasses of anadromous fish was an important source of energy and nutrients for the non-tidal portion of the James River (NMFS, 1999).

It is a goal of resource agencies to restore American eel and American shad to their historic spawning grounds by establishing upstream passage facilities at James River dams. Efforts are underway to restore anadromous fish runs in the James River below Lynchburg. Between 1989 and 1993, three dams in the fall zone of the James River were breached or notched, extending available habitat to the base of Bosher Dam. Fish passage was installed in Bosher Dam (built in 1823) in 1999, reopening 221 km of the upper James River and 322 km of its tributaries to American Shad and other anadromous fishes, including sea lamprey (Hilton, et al. 2014; Fisher 2007). Scott's Mill Dam is the next dam upstream on the river mainstem. Currently there are no upstream or downstream fish passage facilities at the Scott's Mill Project. Upstream of Scott's Mill Dam, there are six dams spaced over a total of approximately 22 river miles.

The importance of migratory fish species was recognized in the 1987 Chesapeake Bay Agreement and re-affirmed in Chesapeake 2000. A commitment was endorsed to 'provide for fish passage at dams and remove stream blockages whenever necessary to restore natural passage for migratory and resident fish' (Hilton, et al. 2014). The Fish Passage Work Group of the Bay Program's Living Resource Subcommittee developed strategies (1988) and implemented plans (1989) to fulfill this commitment. To date, the partners have reopened a grand total of 2,575 miles of Chesapeake Bay tributaries, which is 92% of the 2,807 mile goal (Hilton, et al. 2014). The proposed new fish passage goal in the new Chesapeake Bay Agreement will be to reopen an additional 1,000 miles by 2025.

3.4.7 Impingement/Entrainment of Fishes

Fish can become impinged on intake screens or trashrack bars, if fish are not able to overcome the approach velocity. An analysis conducted by APCO as part of the relicensing of the Reusens Project (FERC No. 2376) found that fish encountering the intake screens were able to easily negotiate the currents (APCO, 1991). Calculated velocities at the Reusens intake ranged from 1.4 to 2.6 feet per second. Similarly, water velocities calculated at the Cushaw Project (FERC No. 906-006) intake ranged from 1.4 to 2.6 feet per second. There has been no reported incidence of fish mortality at the Cushaw project intakes (FERC, 2008). Based on the intake velocities at Cushaw and Reusen projects, and the size of the trashrack bar spacing (three inches) at Cushaw, it was concluded that most fish avoid impingement on the trashrack, but would be susceptible to entrainment through the project turbines (FERC, 2008).

The potential for significant entrainment effects at the Reusens Project was found to be low. Mortality of fishes that were entrained was estimated to be less than ten percent. Dominion calculated survival rates for fish of various lengths passing through the

Cushaw Project using the Franke *et al.* (1997) model. Predicted fish survival ranged from 98% to 84% on average (for fishes ranging in size from 2 to 18 inches, respectively) (FERC, 2008). In addition, a review of 16 projects with Kaplan or propeller-type turbines similar to those at the Cushaw Project corroborated, for the most part, the estimates from the Franke *et al.* analysis. For species common to the James River, centrarchids (sunfish and bass) and ictalurids (catfish), survival for fish less than eight inches in total length ranged between 93% and 98% at projects similar to Cushaw. For larger fish (up to 15 inches) of the same species, survival rates averaged 93%. Survival rates for American eel were less, at 74%.

Fish mortalities through the Scott's Mill powerhouse are expected to also be less than 10% for fish species other than the American eel, because either propeller-type turbines or advanced turbines are planned.

3.5 Wildlife and Botanical Resources

The James River valley near the project site has been significantly affected by previous human activities during the past 200 years. These have included road construction, canal/railroad construction and operation, industrial land uses (along the western riverbank), downtown urban center growth (Lynchburg, 3,000 feet to the southeast), river impoundment, and residential development (on valley slopes and hills east and west of the site). As a result, the dominant wildlife species present nearby are generalists that typically survive well in close proximity to human land uses. These include a variety of omnivores and opportunistic species.

The riverbank west of the Scott's Mill dam is characterized by a narrow 20-30'wide woody riparian buffer, steep riverbanks (15-20' high), roadways, railroad/railyard tracks (up to seven parallel tracks), and industrial pipe foundry operations. Within this manufacturing corridor, there is very little undisturbed vegetation, and those species present are typically hardy pioneer/early successional herbaceous plants.

The area east of the Scott's Mill Dam has generally experienced less previous human alteration and disturbance, likely due to the presence of a steep, rocky, 200' high hill slope approximately 50' east of the river. The steep riverbank (20-25' high) and adjacent hill slope are dominated by young-mature hardwood tree species. A public road (River Road/Route 685) is located within the narrow relic terrace/floodplain along the eastern riverbank.

3.5.1 Vegetation

The site area is hilly and characterized by second-growth forest. The shoreline is steep on both sides of the reservoir. Vegetation in this area is limited primarily to riparian and weedy species such as poison ivy, honeysuckle, Virginia creeper, jewelweed, sawbrier, smartweed, dock and vetch. Predominant tree species include box elder, buckeye, black willow, sycamore, silver maple and river birch.

3.5.2 Wildlife

Wildlife species likely to occur in the area include white-tailed deer, wild turkey, mourning dove, duck, squirrel, eastern cottontail rabbit, groundhog, opossum, muskrat, and raccoon. Numerous resident and neotropical migrant bird species likely occur and breed within (or in the vicinity of) the project boundaries. A list of wildlife species that likely occur within ten miles of the Scott's Mill dam is included in Appendix F (VDGIF).

3.6 Wetlands, Riparian, and Littoral Habitat

Due to the steep riverbanks (15-25' high in some areas) and previous land development activities over the past 200 years, there do not appear to be any jurisdictional wetlands near the eastern or western dam abutments. The US Army Corps of Engineers (USACE) has verified the presence of a jurisdictional wetland area on Daniels Island (in the northern portion of the project area, see attached January 22, 2014 USACE letter in Appendix G). Additionally, some portions of the alluvial island downstream of Scott's Mill dam may be potentially jurisdictional wetlands (though much of the island is rocky).

The James River itself is classified as a perennial (jurisdictional) surface water, and any impacts to it would be classified as stream impacts. As noted previously, there is little riparian habitat west of the dam. While there is some forested riparian habitat east of the dam, this area has been bisected by a public roadway for many years.

3.7 Rare, Threatened and Endangered Species

Protected species information from the U.S. Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), and Virginia Department of Conservation and Recreation (VDCR) Natural Heritage (NH) program has been reviewed for the project area. These records suggest the potential presence of the following species in proximity to the study area:

USFWS Protected Species (*per IPaC database*)

James River spinymussel (*Pleurobema collina*) – Federal Endangered
Northern long-eared bat (*Myotis septentrionalis*) – Federal Candidate Species

VDGIF Protected Species (*per VA Fish and Wildlife Information System*)

James River spinymussel (*Pleurobema collina*) – Federal Endangered
Peregrine falcon (*Falco peregrinus*) – State Threatened
Upland sandpiper (*Bartramia longicauda*) – State Threatened
Loggerhead shrike (*Lanius ludovicianus*) – State Threatened
Green floater (*Lasmigona subviridis*) – State Threatened
Atlantic pigtoe (*Fusconaia masoni*) – State Threatened
Migrant loggerhead shrike (*Lanius ludovicianus migrans*) – State Threatened
Northern long-eared bat (*Myotis septentrionalis*) – Federal Candidate Species

VDCR Natural Heritage Species (*for James River HUC 020802030305 watershed*)

Green floater (*Lasmigona subviridis*) – State Threatened
Smooth coneflower (*Echinacea laevigata*) – Federal Endangered/State Threatened

Legal protection under the federal Endangered Species Act (ESA) normally exists for species listed as Endangered or Threatened (and Candidate/Pending). The proposed project should not eliminate avian nesting or loafing habitat, and should not significantly affect feeding/foraging habitat for the listed bird species. The project should also not significantly reduce the extent of mature forest or alter natural hibernacula for bat species. No suitable habitat for smooth coneflower has been observed within the project area. Since the project will affect some aquatic habitat however, the most significant protected species review will likely be associated with aquatic species (specifically James spinymussel, green floater, and Atlantic pigtoe). These freshwater mussel species have not been found during nearby upstream and downstream mussel surveys during the past five to ten years.

The James spinymussel is typically found in "runs with moderate current and sand, gravel, and cobble substrata." Although it occurred in prehistoric times in the upper James River, it is "now restricted to small, headwater tributaries" (Neves, 1991). The Atlantic pigtoe is another mollusk known to have occurred in the James River; "it seems to prefer clean, swift waters and is often found in gravel, or sand and gravel, substrata" (Neves, 1991). The green floater is often encountered in "very small to small streams" (Neves, 1991), rather than large riverine systems like the James River.

3.8 Recreation and Land Use

The James River, Virginia's longest river, is an important recreational resource. It typically supports about 100,000 angling trips and about 50,000 boating trips annually (Stanovick, et al., 1991), and is designated a State Scenic River in certain reaches, including a reach that is upstream of the Cushaw Project.

VDGIF calculated from a 2000 survey that anglers accounted for 1,926 angling hours/mile on the upper James River, a value that VDGIF considered "very high." Most anglers interviewed lived within a one-hour drive of the river, indicating a generally local fishery. About 82% of the interviewed anglers were fishing from a boat, while about 11% were fishing from the shore, and 4% were wading. 18% indicated that boating access was a negative attribute of the upper James River fishery, while about 34% indicated there were no negative attributes (Scott Smith, VDGIF).

The 2013 Virginia Outdoors Plan (State Comprehensive Outdoors Recreation Plan or SCORP) through a survey conducted in 2011, identified the top six most-needed recreational facilities as: 1) hiking and walking trails (68%), 2) fishing, swimming, and beaches (60%), 3) natural areas (55%), 4) bicycling trails (54%), 5) historic areas (51%), and 6) canoeing and kayaking (46%). Because of its location, with the exception of bicycling trails, the Scott's Mill project has the potential to partially satisfy five of the top six recreation needs.

However, the Scott's Mill impoundment offers little opportunity for boating and fishing, because of limited access and lack of public boat ramps. The Chesapeake and Ohio Railroad is on the west side of the James River, and a public roadway is on the east side. There is one private boat ramp on the west side that is used for access. Anecdotally, some angling takes place in the 316-acre impoundment upstream of Scott's Mill Dam, with access most likely from the private boat ramp. Opportunities for improving shoreline and river access at the project are very limited, due to steep terrain extending to the river's edge, and the industrial development adjacent on the west side of the project. However, should LU develop access to Daniel Island, there would be additional potential for trails, and access to fishing, natural areas, historic areas (i.e., remnants of the historic adjacent canal), and canoeing/kayaking.

The James River Canoe Ramp is located approximately 0.4 mile downstream of Scott's Mill Dam on the west (Lynchburg) side of the James River. The ramp permits car top carried boats only. The ramp is primarily used for canoeing, kayaking, and fishing.

Scott's Mill dam is owned by Luminaire Technologies. LU owns Daniel Island. LU is developing the Scott's Mill Project in partnership with Luminaire Technologies.

3.9 Aesthetic Resources

The setting for the Scott's Mill Dam and reservoir is industrial/urban. Photo 1 in Appendix C shows the Scott's Mill Dam. The dam and reservoir can be viewed primarily from the roadway on the east side of the reservoir. Arguably, the dam and water flow over the dam contribute to the scenic value of the area. The historic resources associated with the James River and Kanawha Canal also contribute to the value of aesthetic resources. However, relative to the scenic area of the Blue Ridge Parkway upstream, the industrial setting diminishes the aesthetic value of the project area.

There are three islands located within the Scott's Mill Dam impoundment: Daniel Island, Treasure Island, and Woodruff Island. There is no roadway access to any of these islands at this time, although a bridge previously connected the western shoreline to Treasure Island. This bridge was destroyed during a 1985 flood.

The annual natural water level fluctuation of the Scott's Mill Dam impoundment is on the order of three feet, between typical low and high flows. Because of the steepness of the shoreline on each side of the river, there is relatively little exposed shoreline. LU proposes to vary the reservoir level by up to three feet (if flashboards are installed). Although daily fluctuations could be up to three feet during project operations, there would be little change in high flow water levels. If the increased water levels during flood conditions would adversely affect property along the shoreline, the flashboards would be designed to fail under significant flood conditions.

3.10 Cultural Resources

The James River and Kanawha Canal was one of the nation's major commercial and transportation arteries during the mid-19th century. Lynchburg was the terminus of the "First Grand Division," which extended 147 miles from the Richmond basin to a feeder dam just above Lynchburg [*Scott's Mill Dam*]. This section was opened to traffic in December 1840, and was the only one of three divisions which was ever completed. During the 1850's, the canal enjoyed its greatest prosperity and assisted in Lynchburg's development as the major commercial and industrial center of the Piedmont. The canal suffered some damage late in the Civil War, and during the 1870's was severely harmed by two disastrous floods. In 1880, the newly organized Richmond and Alleghany Railway Company was authorized to take over the canal company's property. By 1881, tracks had been laid on the canal towpath, and trains were running from Richmond through Lynchburg to Clifton Forge. Although the remains of the Lynchburg portions of the canal have been largely ignored in the 20th century, three important features still remain: The Ninth Street Bridge and canal right-of-way, Blackwater Aqueduct, and the Scott's Mill Dam. Considered as a thematic group, these sites provide important information on the development of engineering and transportation technology in the first three-quarters of the 19th century. In addition, they are key monuments to the commercial development of the state as well as tangible reminders of the water power necessary for industrial development in the 19th century.

Architecture Summary: Lynchburg was the terminus of the First Grand Division of the James River and Kanawha Canal. As the expected center of a great deal of commerce, and as the result of a number of natural and manmade features which had to be accommodated at the city's waterfront, Lynchburg was given a number of components of the work. Only in a few short stretches through the city did the canal resemble the tranquil waterway with attendant towpath that characterized its approximately hundred and fifty-mile course upstream from Richmond. When the first boats arrived in Lynchburg in 1841, the major portions of the canal in Lynchburg consisted of the Lynchburg Basin (later to be termed the Lower Basin), a stone bridge carrying Water (now Ninth) Street over the canal, a major aqueduct over the Blackwater Creek, and a dam [*Scott's Mill Dam*] supplying water both to the canal and to the city's pump house for its own water supply. Only between the aqueduct and the dam did the waterway assume the traditional appearance of a canal.

Although the canal bed can still be traced, and records and plats do exist to pinpoint the locations of its various original features, a Historic American Engineering Record survey of the Lower Basin conducted in the summer of 1977 revealed that only a few of the Lynchburg portions of the long-abandoned canal exist in anything resembling their original state. Both the Lower Basin and a later Upper Basin survive primarily in name only (as the traditional designations of the two major centers of the city's industrial activity on the banks of the James River). Both basins have been filled in, paved over, or built upon. In addition to buildings, a number of railroad tracks crisscross the spaces once occupied by the basins. Only at its upstream end, where the Lower Basin approached the Ninth Street Bridge, is there a relatively undisturbed (though filled) remnant of the canal. Only these portions of the canal, that are in relatively original condition, form components of this thematic nomination. These portions are divided into three sections, corresponding to the three nominated sites:

A: Upper portion of Lower Basin and Ninth Street Bridge

B: Blackwater Aqueduct

C: Waterworks dam, James River dam and guard locks.

Source: VDHR V-CRIS database and NRHP Nomination Form data for VDHR architectural Site ID 118-0209 (1/1/1984 and 12/11/1984) and VDHR archaeological Site ID 44CP0069 (2/17/1983 and 6/8/2000), 2015

3.11 Socio-economic Resources

The Scott's Mill Dam project is located in Bedford County, Amherst County, and the City of Lynchburg. Statistics for Lynchburg, Bedford County, and Amherst County are as follows:

	Lynchburg	Bedford County	Amherst County
Population (2014)	79,047	76,583	32,041
Per Capita Income	$21,440	$28,697	$22,580
Med. Household Income	$38,138	$57,596	$44,945
Percent Below Poverty Lev.	24.7	8.2	11.4

Source: http://quickfacts.census.gov/qfd/states/51/51680.html

In comparison to the Commonwealth of Virginia, the per capita income and median household income are below the state level of $33,493 and $63,907 respectively. With Lynchburg having 24.7% of its population below the poverty level, it is well below the state poverty level of 11.3%. Bedford and Amherst counties are on par statewide with the percent of the population below the poverty level.

3.12 Tribal Resources

The project area was historically used by Native American Tribes, including the Cherokee, Tuscarora, and Shawnee. Although there are no Tribes located in the immediate project area, through FERC's contact list and previous FERC licensing projects in the area, LU has identified eight Native American Tribes: 1) Cherokee Nation; 2) Eastern Band of Cherokee Indians; 3) Monacan Tribe; 4) Tuscarora Indian Nation, 5) Absentee-Shawnee, 6) Eastern Shawnee Tribe of Oklahoma, 7) Shawnee Tribe, and 8) United Keetoowah Band of Cherokee Indians.

4.0 PRELIMINARY ISSUES AND STUDIES LIST

LU's study plan will include an analysis of the effects of hydropower operation of the upstream Reusens Dam Project on water levels at the Scott's Mill Dam project. LU plans to coordinate operations with the upstream Reusens Dam Project. LU anticipates some level of load following at Reusens, associated with up to three feet of water level fluctuation in the Scott's Mill Dam impoundment. LU proposes to operate Scott's Mill Dam generally in a run-of-river operation, meaning that Scott's Mill Dam outflows will not exhibit significant hourly fluctuations, and generally will maintain the daily average flows at Holcomb Rock on a continuous basis.

The City of Lynchburg expressed concerns regarding the potential of a hydropower project at the Scott's Mill Dam to affect water rights and water supply for the Lynchburg area. LU will assess project effects on the City's water supply and any associated water rights.

LU's preliminary assessment of water quality effects is that water quality effects would be minor because of the short residence time of water within the impoundment and the fact that the dam is already present. LU will conduct an effects analysis of water quality impacts, but LU believes that significant water quality baseline data is unnecessary.

A concern was raised that the dam could act as a trap for pollutants (primarily bound to sediment). The project as proposed would not likely affect the movement of sediment in the impoundment. However, local dredging may be needed to construct the project. LU will test associated sediments for toxicity levels as part of the licensing studies.

Although it was proposed that the dam be removed to clean out the potential pollutants, that is not the purpose of the licensing studies. However, LU will include dam decommissioning as an alternative in its licensing studies. Since removal of Scott's Mill dam would only open three additional miles of the James River, and since the Reusens Dam and the additional five other hydro dams upstream of Reusens are not likely to be decommissioned, LU does not propose to conduct extensive decommissioning studies.

A substantive data base exists for baseline fisheries, as discussed in the fisheries section of the PAD. LU believes that additional fisheries baseline data is unnecessary. However, LU proposes to conduct an assessment of potential operational effects on the impoundment fishery, including effects on spawning (if flashboards are installed). Since much of the James River flow will be routed through the powerhouse, the local effects on fish habitat immediately upstream and downstream of the dam will be investigated (including the potential for dewatering of habitat downstream of the spillway).

Several parties (including resource agencies) have identified fish passage as a licensing issue. The PAD provides a detailed status of current fish passage goals and restoration efforts. LU proposes to cooperate with agencies and other licensing participants to develop a fish passage study plan. Because of the seven dams that are located in a 22-mile reach, LU believes that a trap and haul program may be the most feasible approach for moving anadromous fish upstream of these dams. American eel may require special consideration.

LU proposes to conduct an entrainment study using a desk-top approach similar to the study done for the Cushaw Dam Project relicensing. The study would be done to evaluate alternative turbine designs.

LU's PAD assessment indicates that the federally-listed endangered James spinymussel and smooth coneflower are not likely to be within the project boundary (including the short transmission line corridor). However, this will be discussed at the joint meeting in December 2015 and, if appropriate, a study plan will be developed to assess the potential effects of the project on these threatened and endangered species.

As part of the recreation studies, LU proposes to investigate the feasibility of a safe, small boat portage around the dam and boating access upstream the Scott's Mill Dam.

Concerns were raised during the development of the PAD related to the potential effect of the project on recreational, historical, cultural, and other resources in Lynchburg and surrounding areas. LU will develop a study plan to assess the effect of the project on the historical and cultural resources of the resources within the project boundary. LU believes that the effect of the project on recreational resources outside the project boundary will be small.

LU will assess the effect of operations on the aesthetic value of reducing water flowing over the spillway compared to the current condition.

Since final decisions regarding the above issues have not yet been fully made, the potential costs of mitigation measures are not addressed in this report

5.0 SUMMARY OF CONTACTS

In preparing the PAD and the preliminary issues and studies list, LU reviewed the comments on the Preliminary Permit application and contacted several resource agencies and American Rivers. LU has prepared an extensive mailing list, based upon the Commission's mailing list and the mailing list used for recent relicensing projects on the James River. LU anticipates that through further consultation with interested parties the issues and potential studies list will be refined. Documentation of consultation with the following entities can be found in Appendix H:

- US Fish and Wildlife Service
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Historic Resources
- Virginia Department of Environmental Quality
- American Rivers

6.0 REFERENCES

APCO (Appalachian Power Company). 1991. Application for License for Major Project Existing Dam. Reusens Hydroelectric Project No. 2376. Exhibit E and appendices.

ASMFC. 2000. Interstate Fishery Management Plan for American Eel. Fishery Management Report No. 36. ASMFC. A report of the Atlantic States Marine Fisheries Commission pursuant to U.S. Department of Commerce, National Oceanic and Atmospheric Administration Award Nos. NA97 FGO 0034 and NA07 FGO 024. 93 pp.

ASMFC. 2007. Stock Assessment Report No. 01-01 American Shad Stock Assessment Report for Peer Review Volume I. Accepted by the Shad and River Herring Management Board August 16, 2007. A publication of ASMFC pursuant to NOAA Award No. NA05NMF4741025. 238 pp.

ASMFC. 2010. Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management). Approved February 2010. ASMFC. 169 pp.

ASMFC. 2012a. Stock Assessment Report No. 12-01 American Eel Benchmark Stock Assessment. A publication of the Atlantic States Marine Fisheries Commission pursuant to National Oceanic and Atmospheric Administration Award No. NA10NMF4740016. 342 pp.

ASMFC. 2012b. Stock Assessment Report No. 12-02 River Herring Benchmark Stock Assessment Volume I. A publication of the Atlantic States Marine Fisheries Commission pursuant to National Oceanic and Atmospheric Administration Award No. NA10NMF4740016. 392 pp.

Chesapeake Bay Program. 2014. http://www.chesapeakebay.net/indicators/indicator/american_shad_abundance.

Dominion Virginia Power (Dominion). 2003. Notification of Intent to File Application for New License, Cushaw Project, FERC Project No. P-906. 39 pp + appendices.

Dominion. 2006. Cushaw Hydroelectric Project FERC Project No. 906. Application for Federal Energy Regulatory Commission License.

FERC. 2008. Final Environmental Assessment for New Hydropower License, Cushaw Hydroelectric Project, FERC Project No. 906-006. FERC Office of Energy Projects, Division of Hydropower Licensing, Washington, D.C. 84 pp + appendices.

Fisher, M.T. 2007. Temporal and Spatial Patterns of Anadromous Fish Passage at Bosher Dam Vertical Slot Fishway on the James River, Richmond, VA. Virginia Commonwealth University. Richmond, VA. 63 pp.

Franke, Gary F., Donald R. Webb, Richard K. Fisher, Jr., Dilip Mathur, Paul N. Hopping, Patrick A. March, Michael R. Headrick, Istvan T. Laczo, Yiannis Ventikos, Fotis Sotiropoulous, 1997. Development of Environmentally Advanced Hydro Turbine Design Concepts, Voith Hydro, Inc., Report 2677-0141, INEL/EXT-97-00639.

Hilton, E.J., Cimino, J., Weaver, A. 2014. American Shad Habitat Plan for the Commonwealth of Virginia. Submitted to the Atlantic States Marine Fisheries Commission as a requirement of Amendment 3 to the Interstate Management Plan for Shad and River Herring. Approved February 6, 2014. 20 pp.

Mitchell, J.C. 1991. Amphibians and Reptiles, in K. Terwilliger (coord.), 1991, Virginia's Endangered Species, The McDonald and Woodward Publishing Company (Blacksburg, VA), pages 251 – 320.

National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission: shad and river herring [includes Alewife (*Alosa pseudoharengus*), Blueback Herring (*Alosa aestivalis*), Alabama shad (*Alosa alabamae*), American Shad (*Alosa sapidissima*), and hickory shad (*Alosa mediocris*)] – Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. 77 pp.

Neves, R.J. 1991. Mollusks, in K. Terwilliger (coord.), 1991, Virginia's Endangered Species, The McDonald and Woodward Publishing Company (Blacksburg, VA), pages 251 – 320.

Stanovick, J.J., Kokel, R.W., Creamer, A.E., Nielsen, L.A., and D.J. Orth. 1991. James River Mainstem Investigation, Job 4-Angler Survey. Federal Aid in Fish Restoration Project F-74-R.

Strickland, P.A. 2002. American Eel distribution and growth in selected tributaries of the James River. Master's thesis. Virginia Polytechnic Institute and State University, Blacksburg, VA. 82 pp.

Trout, W.E., III. 2001. The Upper James River Atlas, Virginia Canals and Navigations Society (Lexington, VA), 117 pages.

USFS (U.S. Forest Service). 2003. Proposed Revised Land and Resource Management Plan, Jefferson National Forest, Management Bulletin R8-MB 103B, Forest Service Southern Region.

VDEQ (Virginia Department of Environmental Quality). 1999. Virginia Ambient Water Quality Monitoring Report, Monitoring Year 1999 (Richmond, VA).

VDEQ Final 2012 305(b)/303(d) Water Quality Assessment integrated Report, January 27, 2014.

VDEQ Draft 2014 305(b)/303(d) Water Quality Assessment Integrated Report, December 15, 2014.

VDGIF. 2010. Shenandoah and James River Fish Disease and Mortality Investigations 2010. VDGIF. 4 pp.

VDGIF. 2012. Middle James River 2012. VDGIF. 6 pp.

VDGIF. 2014. A Decade of Fish Disease and Mortality Investigations. VDGIF http://www.dgif.virginia.gov/fishing/fish-kill/. Post updated December 2014.

VDGIF. 2015a. RF02-04 Warm water Stream Investigations James River 2014. 17 pp.

VDGIF. 2015b. The Non-Tidal James River. 14 pp.

Virginia Department of Historic Resources (VDHR) Cultural Resource Information System (V-CRIS) online, 2015. https://vcris.dhr.virginia.gov/vcris/

Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Fish and Wildlife Information System (VAFWIS) online, 2015. http://vafwis.org/fwis/

US Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) online system (IPaC), 2015. http://ecos.fws.gov/ecp/

APPENDICES

A Distribution List
B Maps
C Photographs
D Holcomb Rock Daily Flow Records
E State of Virginia Water Quality Standards
F Protected Species Lists (USFWS, VAFWIS, and VDCR NH)
G US Army Corps of Engineers Wetland Delineation Documentation
H Consultation Documentation

APPENDIX A

DISTRIBUTION LIST

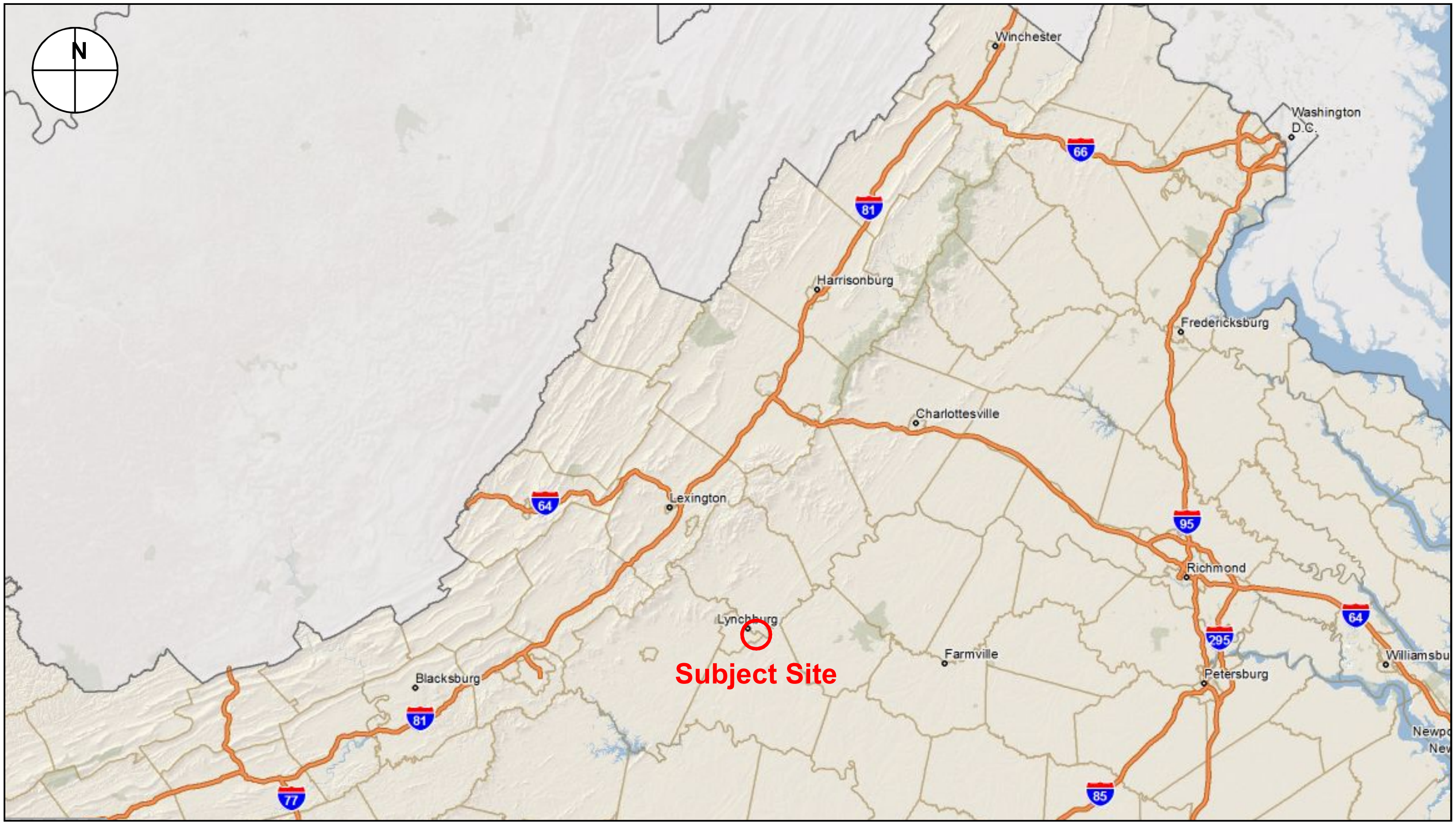
SCOTT'S MILL HYDROPOWER PROJECT
DISTRIBUTION

Ms. Kimberly Bose, Secretary, Federal Energy Regulatory Commission
Ms. Jon Scott, Federal Energy Regulatory Commission
Division of Dam Safety and Inspection, Federal Energy Regulatory Commission
Cultural Resources Specialist, Cherokee Nation
Chief, Tuscarora Indian Nation
Ms. Diane Shields, Monacan Tribe
Tribal Historical Preservation Officer, Absentee-Shawnee
Tribal Historical Preservation Officer, Eastern Shawnee Tribe of Oklahoma
Tribal Historical Preservation Officer, Shawnee Tribe
Resources Department, Eastern Band of Cherokee Indians
Chief, United Keetoowah Band of Cherokee Indians
Virginia Council On Indians
District Engineer, Norfolk District, U.S. Army Corps of Engineers
Mr. David Sutherland, U.S. Fish and Wildlife Service
Ms. Cindy Shultz, Virginia Field Office, U.S. Fish and Wildlife Service
Southwest Virginia Field Office, U. S Fish and Wildlife Service
Director, National Marine Fisheries Service
Administrator, National Oceanic and Atmospheric Admin., Fisheries Regional Office
Superintendent National Park Service, Blue Ridge Parkway
James River District Ranger, National Park Service
Ms. Joan Harn, National Park Service
U.S. Department of Agriculture, Forest Service, Washington, DC
U.S. Forest Service, Roanoke
Executive Director, Appalachian Trail Conservancy
Environmental Impact Review Officer, U.S. Environmental Protection Agency
Advisory Council on Historic Preservation
U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management, Springfield VA Office
Mr. Scott Smith, Virginia Department of Game and Inland Fisheries
Director, Virginia Department of Game and Inland Fisheries
Manager Environmental Services Section, Virginia Dept of Game and Inland Fisheries
Planning Bureau Manager, Virginia Department of Conservation and Recreation
Director Office of Environmental Enhancement, Virginia Dept. of Environmental Quality
Director Water Division, Virginia Department of Environmental Quality
Permits and Planning Support, Virginia Department of Environmental Quality
Mr. Brian McGurk, Env. Program Planner, Virginia Department of Environmental Quality
Blue Ridge Regional Office, VDEQ
Ms. Roger W. Kirchen, Virginia Department of Historic Resources
Kathleen Kilpatrick, Virginia Department of Historic Resources
Virginia Marine Resources Commission
Director, DCR Dam Safety
Ms. Sara Lu Christian, Director, Amherst County
Amherst County Library

Bedford County Administration
Bedford County Library
Lynchburg Library
Mr. Timothy Mitchell, City of Lynchburg Utilities
Kristian M. Dahl, McGuire Woods, LLP
Mr. Billy Bright, Big Island Sportsman Club
Pat Culvert, James River keeper
Mr. William Tanger, Friends of the Rivers of Virginia
Mr. Charles Ware, Coastal Canoeists, Inc.
Trout Unlimited
Mr. Thomas W. Evans, Virginia Wildlife Federation
Mr. Mark Fendig, Luminaire Technologies
Mr. Frank Simms, American Electric Power
Technical Services Director, Georgia Pacific
American Rivers, Washington, DC Headquarters
Executive Director, American Whitewater
National Coordinator, Hydropower Reform Coalition
Mr. Julian T. Bolton, Izaak Walton League, Virginia Chapter
Mr. Michael Lipford, The Nature Conservancy – VA Field Office
American Canoe Association
Sierra Club, Virginia Chapter
Ms. Sylvia Brugh, Upper James Scenic Advisory Board
Mr. Corey Chamberlain, Virginia Power
Mr. Ben Leatherland, Hurt and Proffitt Inc,
Mr. Lee Beaumont, Liberty University

APPENDIX B

MAPS



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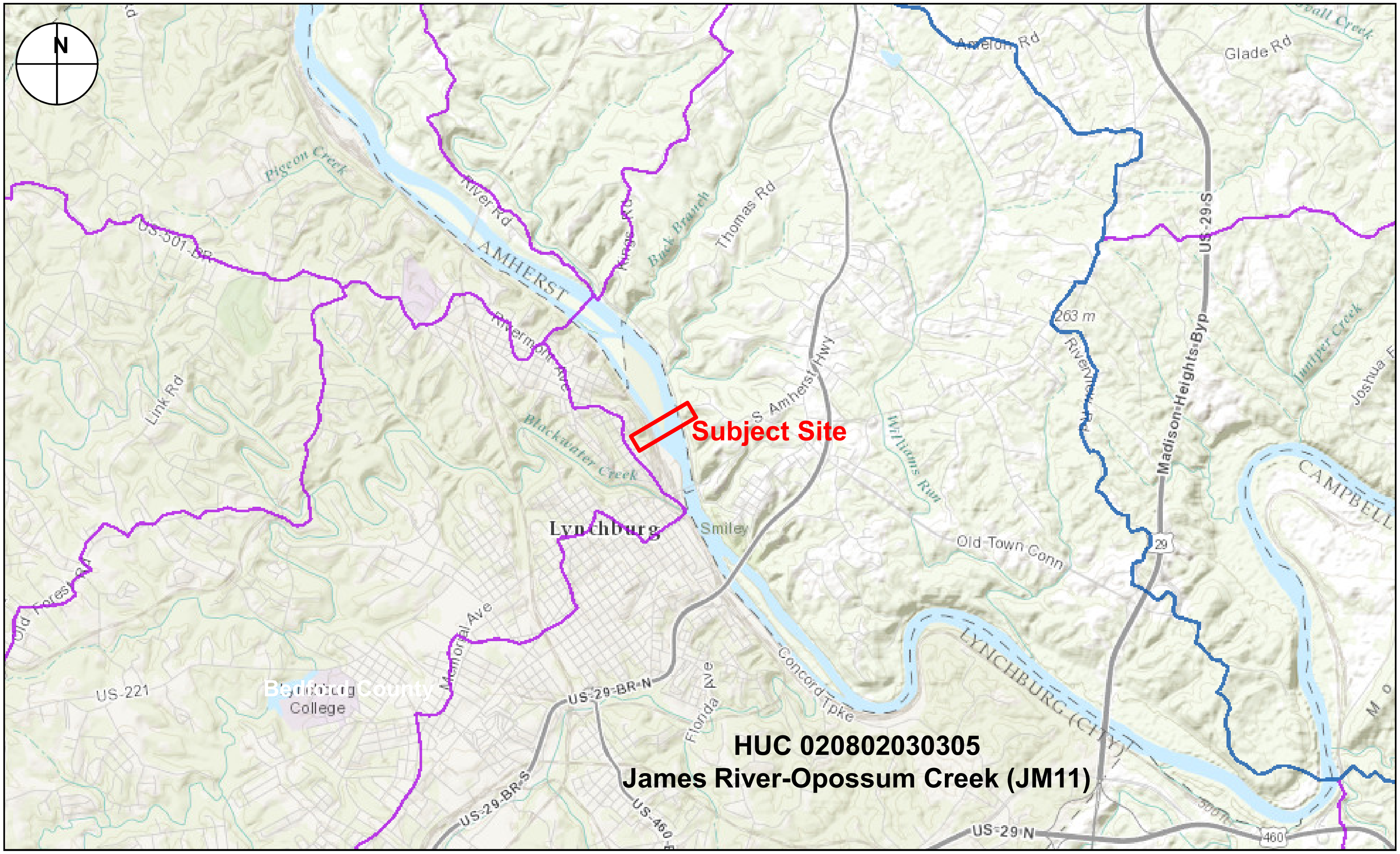
Scotts Mill Dam **James River** **Lynchburg, Virginia** *Source: VDEQ Hydrologic Unit Explorer (2012), NTS*	Location Map	**Figure 1**



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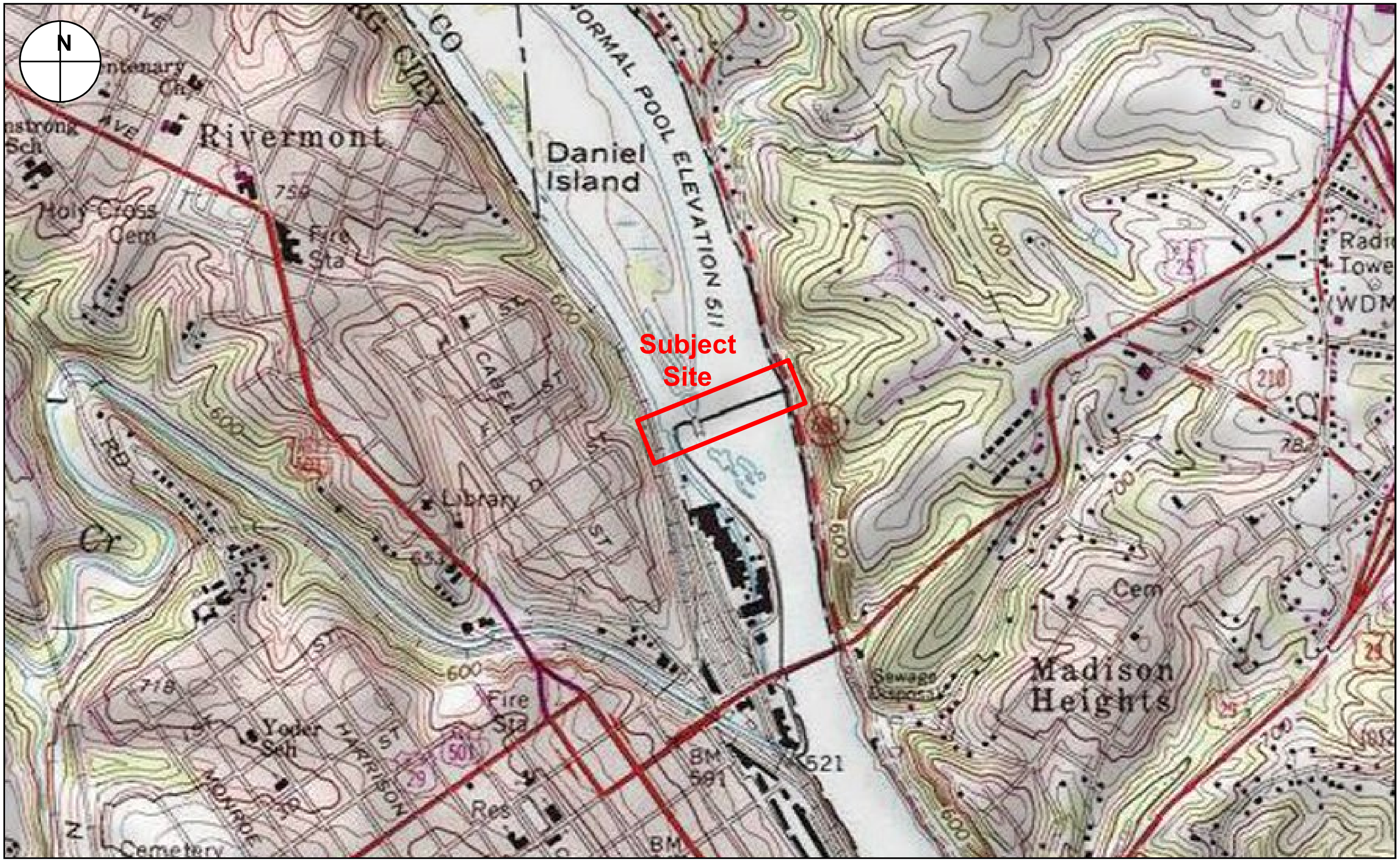
Scotts Mill Dam **James River** **Lynchburg, Virginia** *Source: VDEQ Hydrologic Unit Explorer (2015), NTS*	Hydrologic Unit Code (HUC) Map	**Figure 2**



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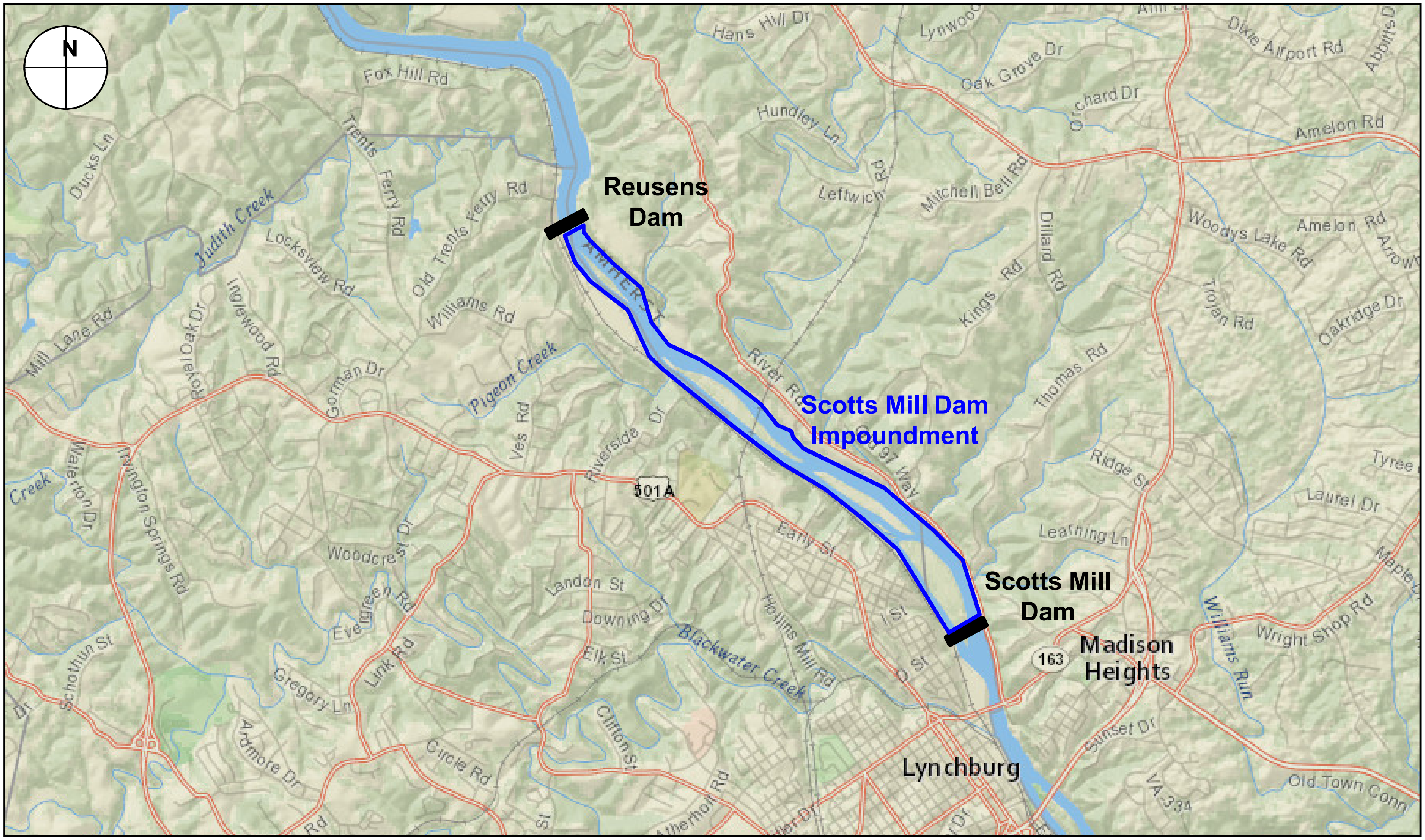
Scotts Mill Dam
James River
Lynchburg, Virginia

Source: Terrain Navigator Pro (2014), USGS Map, NTS

USGS Map Excerpt

Figure 3



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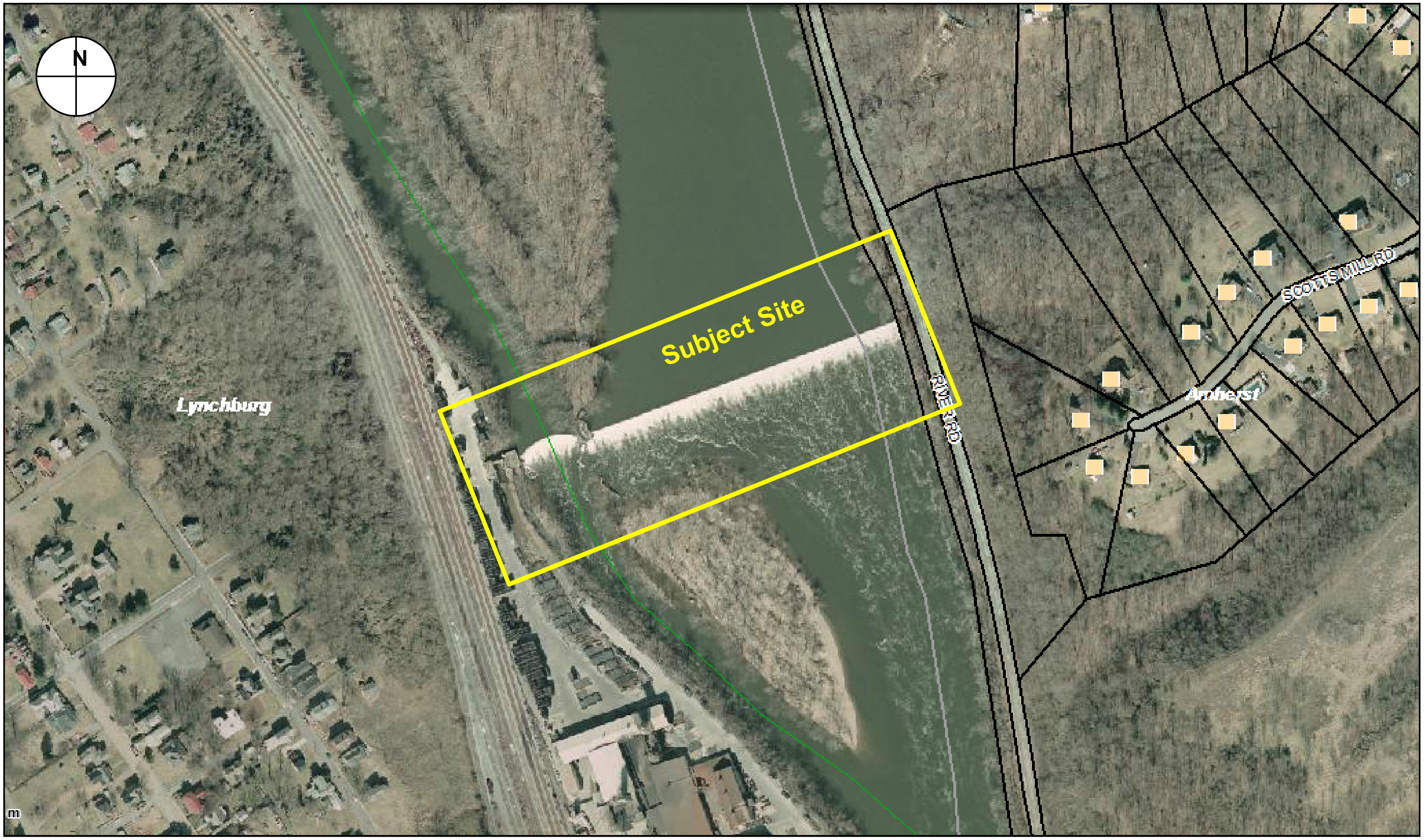
Scotts Mill Dam
James River
Lynchburg, Virginia

Source: Virginia DEQ VEGIS (2015), NTS

Project Impoundment Map

Figure 4



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Scotts Mill Dam
James River
Lynchburg, Virginia

Source: Amherst County, VA GIS (2015), NTS

2014 Aerial Photograph

Figure 5

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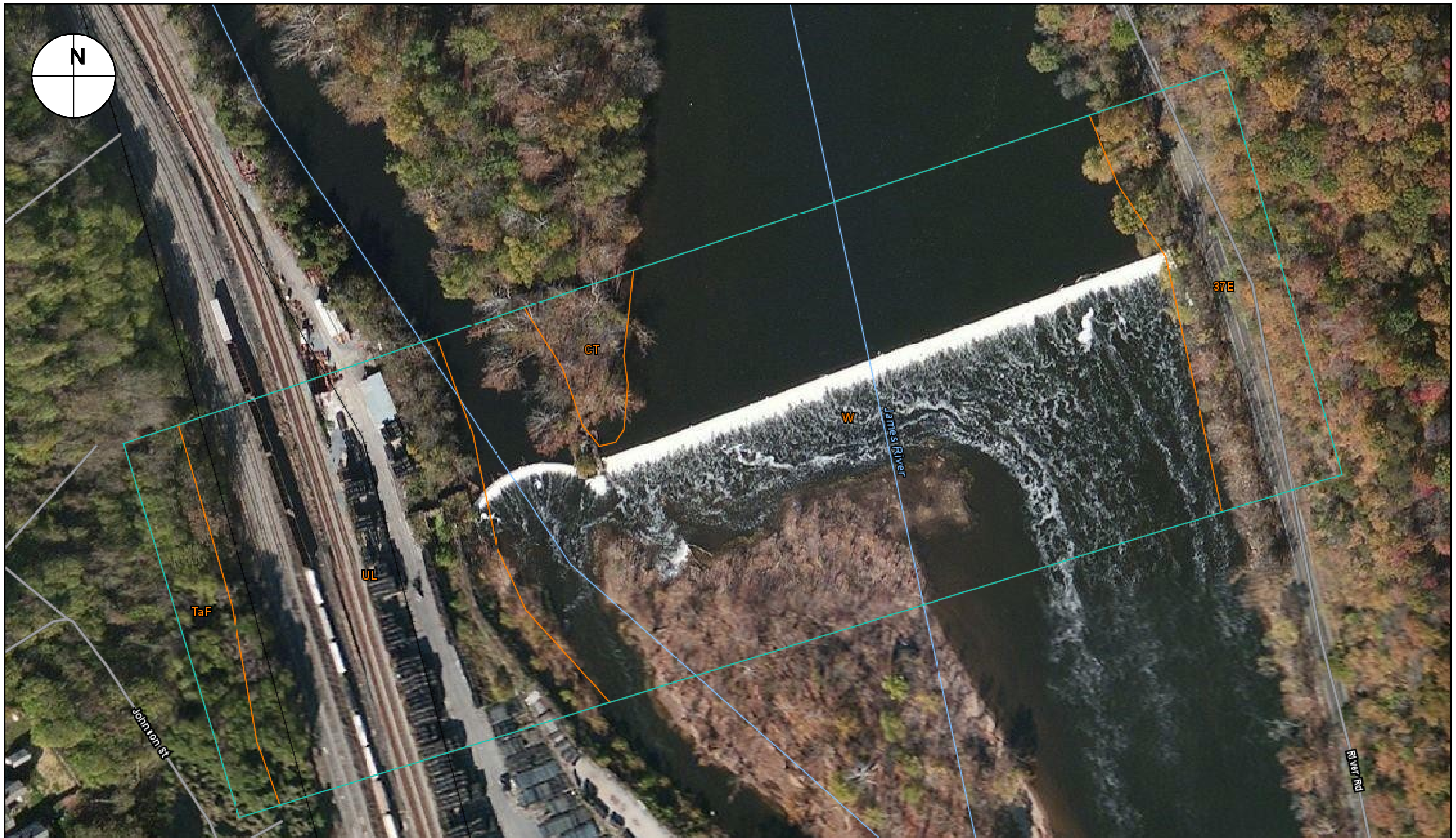
Scotts Mill Dam
James River
Lynchburg, Virginia

Source: Virginia DEQ VEGIS (2015), NTS

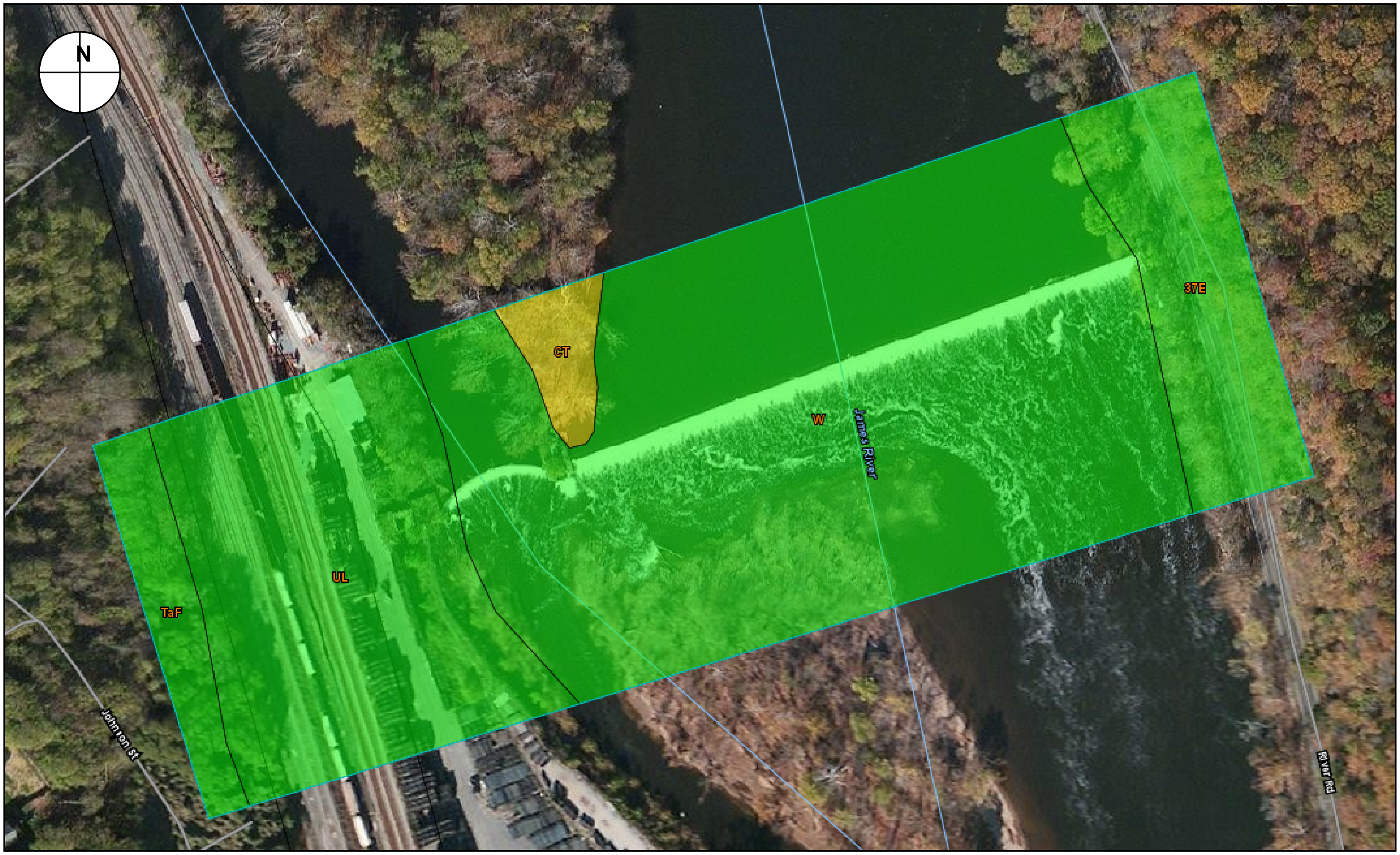
2011 Aerial Photograph

Figure 6



37E – Stott Knob-Rhodhiss complex, 20-50% slopes, very stony
CT – Chewacla-Toccoa complex
Tf – Tallapoosaloam, 25-60% slopes
UL – Urban Land
W - Water

HURT & PROFFITT INCORPORATE 2524 LANGHORNE ROAD LYNCHBURG, VA 24501 800.242.4906 TOLL FREE 434.847.7796 MAIN 434.847.0047 FAX WWW.HANDP.COM	**Scotts Mill Dam** **James River** **Lynchburg, Virginia** *Source: USDA NRCS Web Soil Survey (2015), NTS*	Soils Map	**Figure 7**



Not Hydric
33-65% Hydric

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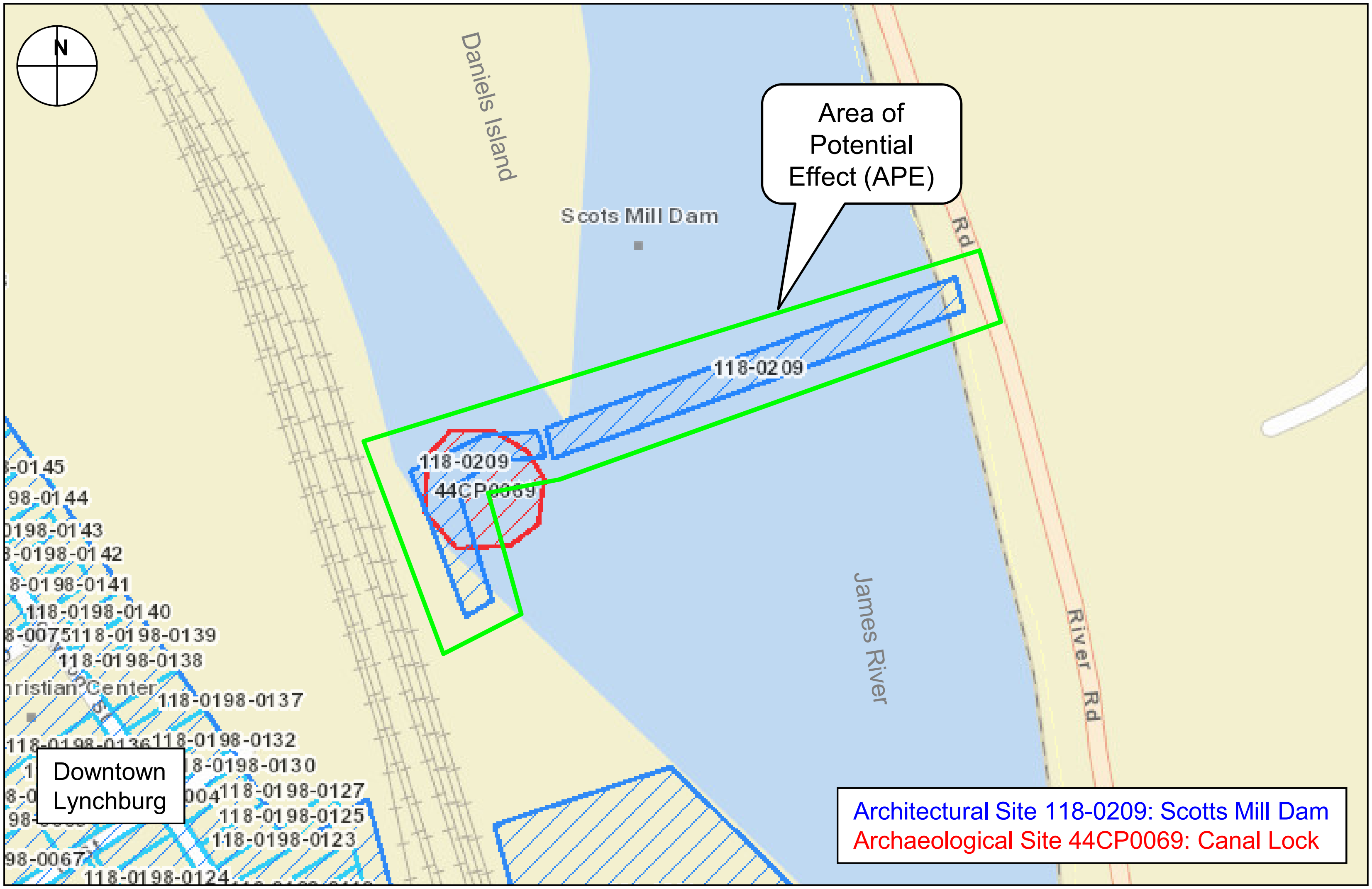
Scotts Mill Dam
James River
Lynchburg, Virginia

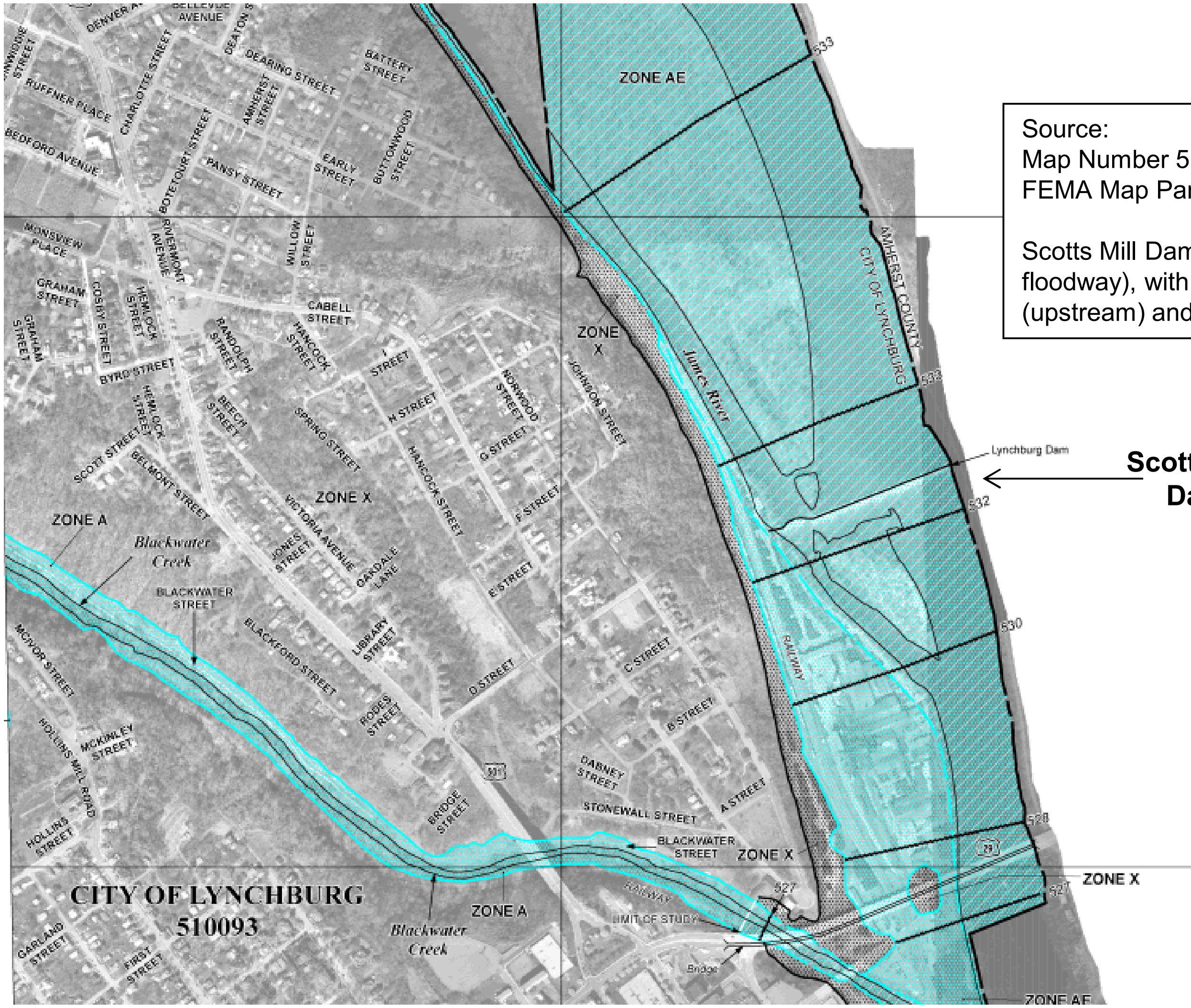
Source: USDA NRCS Web Soil Survey (2015), NTS

Hydric Soils Map

Figure 8



HURT & PROFFITT INCORPORATED 2524 LANGHORNE ROAD LYNCHBURG, VA 24501 800.242.4906 TOLL FREE 434.847.7796 MAIN 434.847.0047 FAX WWW.HANDP.COM	**Scotts Mill Dam** **James River** **Lynchburg, Virginia** *Source: VDHR V-CRIS system (2015), NTS*	Cultural Resources APE Map	**Figure 9**



Source:
Map Number 5100930042D (dated June 3, 2008)
FEMA Map Panel 42 of 131

Scotts Mill Dam is located within Zone AE (mapped floodway), with Base Flood Elevations of 533' MSL (upstream) and 532' MSL (downstream)

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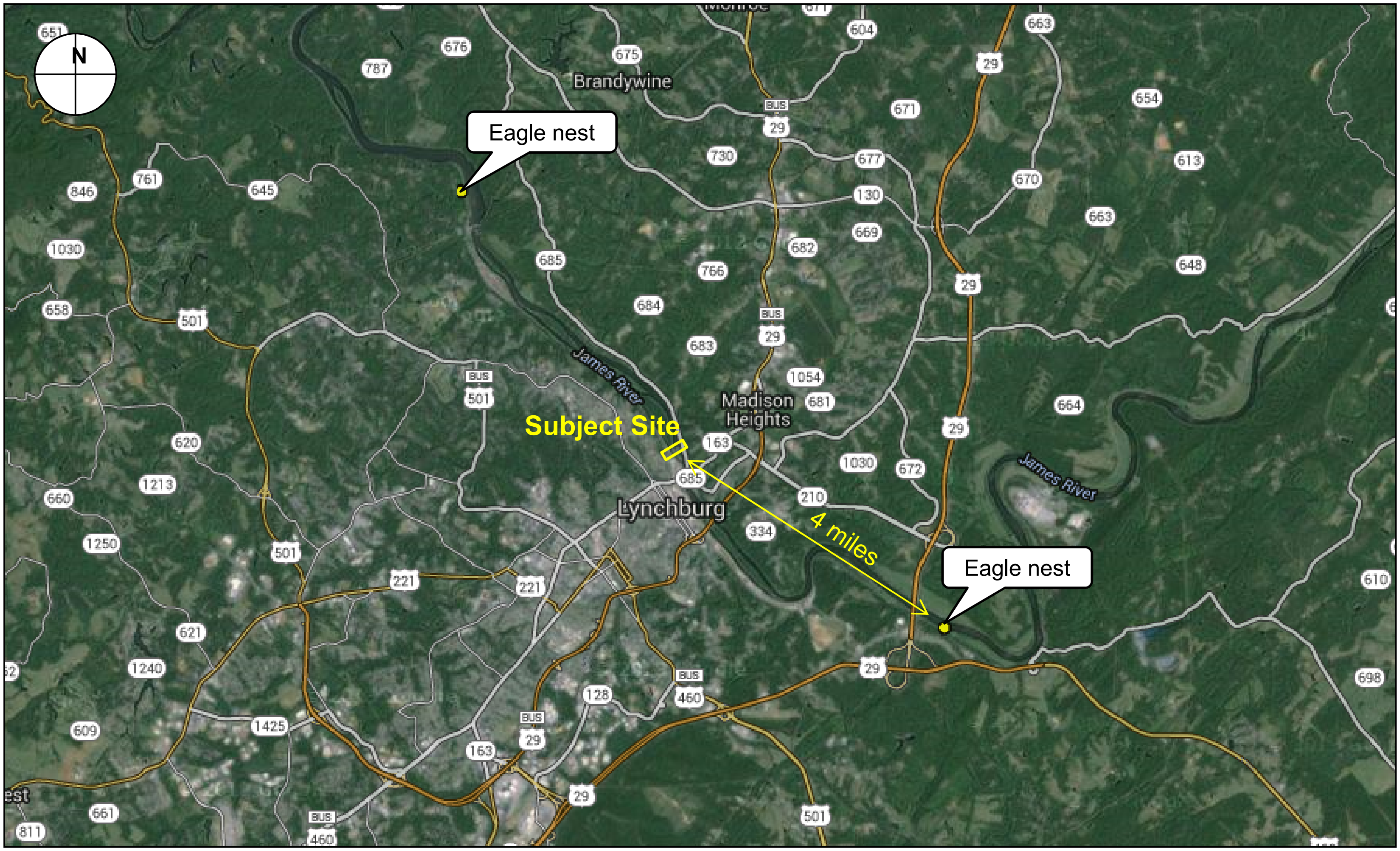

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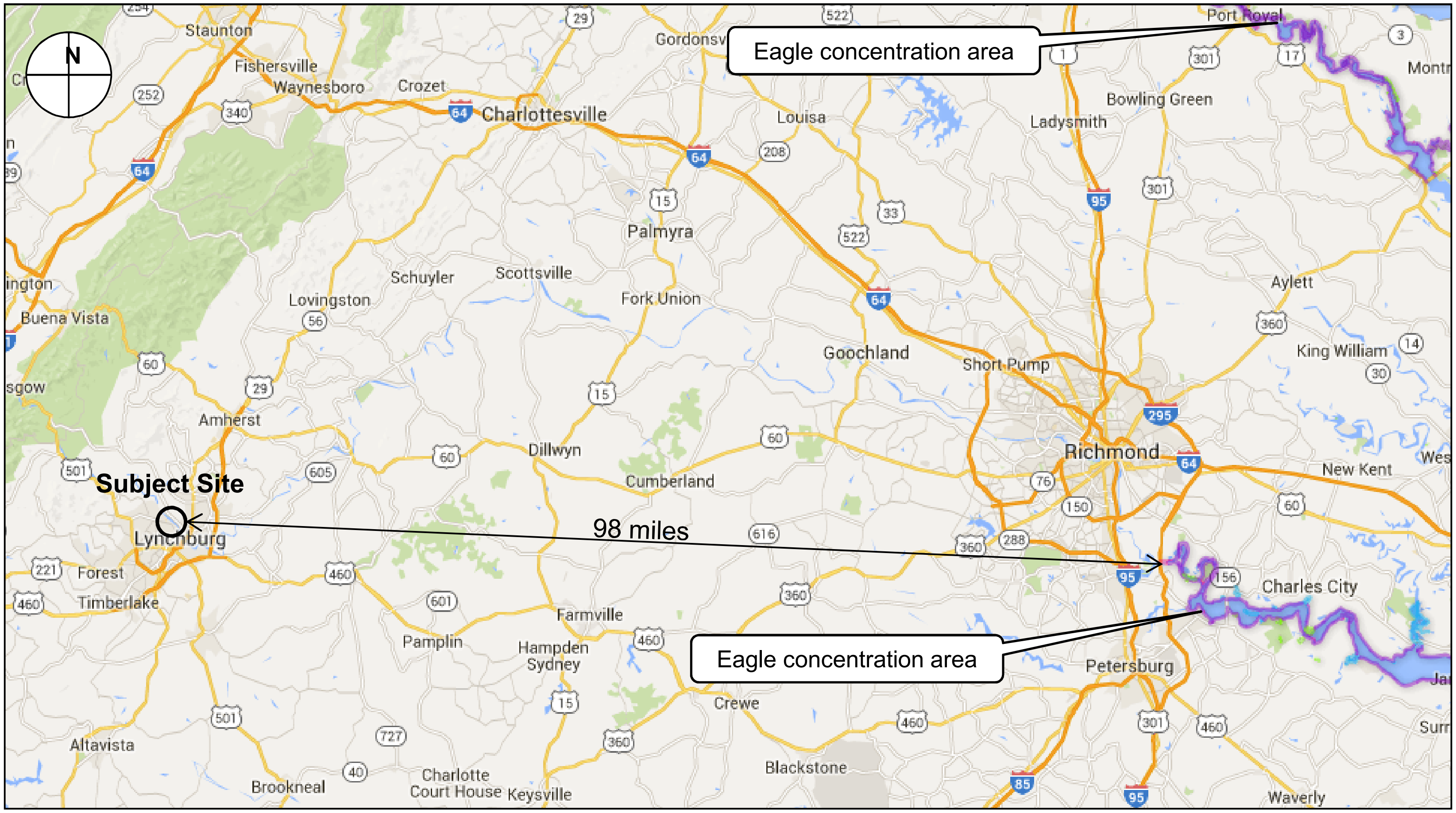
Scotts Mill Dam
James River
Lynchburg, Virginia

Source: Center for Conservation Biology (2015), NTS

Bald Eagle Nest Map

Figure 11



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Lynchburg, Virginia

Source: VDGIF VAFWIS system (2015), NTS

Bald Eagle Concentration Area Map

Figure 12

APPENDIX C

PHOTOGRAPHS

Photograph 1: Arched western portion of dam (view east-northeast)

Photograph 2: Straight eastern portion of dam (view west-southwest)

Photograph 3: Relic canal wall stonework remnant at western terminus of dam (view east)

Photograph 4: Relic stonework remnant at eastern terminus of dam (view north)

Photograph 5: Relic stonework, eastern terminus of dam, and view upstream (view north)

Photograph 6: View downstream, from southeastern end of Daniels Island (view southeast)

Photograph 7: Scott's Mill Dam upstream impoundment, at Daniel's Island (view east)

Photograph 8: Daniel's Island wetland (view northwest)

APPENDIX D

HOLCOMB ROCK DAILY FLOW RECORDS