135 FERC ¶ 62,047
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Appalachian Power Company Project No. 2210-201

ORDER MODIFYING AND APPROVING WATER QUALITY MONITORING PLAN UNDER ARTICLE 405

(Issued April 15, 2011)

1. On June 28, 2010, Appalachian Power Company, licensee for the Smith Mountain Pumped Storage Hydroelectric Project (Smith Mountain Project) (FERC No. 2210), filed a water quality monitoring plan pursuant to Article 405 of the project license.[1] The project is located on the headwaters of the Roanoke River in Bedford, Campbell, Franklin and Pittsylvania Counties, Virginia.

Background

2. Article 405 requires, within 90 days of the effective date of the license, the licensee to file, for Commission approval, a final water quality monitoring plan that addresses water quality monitoring and remediation, as appropriate, at the Smith Mountain Project. The plan shall include the provisions of the proposed water quality monitoring plan, filed July 15, 2008, with, at a minimum, the following revisions:

(a) a provision to operate the turbines at Smith Mountain Dam from July 1st through September 30th to minimize or eliminate violations of water quality standards for dissolved oxygen (DO) in the tail waters downstream from the Smith Mountain Dam, whereby the turbines with intakes that are highest in the water column are operated first and taken offline last;

(b) a provision to develop and file, in accordance with the requirements of Article 401(a) for Condition F.4 found in Part I of the Virginia Department of Environmental Quality's (Virginia DEQ) water quality certification (WQC), a feasibility study and plan for physical or mechanical alterations of water release procedures, developed in consultation with the Water Quality

[1] *See* Order issuing New License 129 FERC ¶ 62,201 (issued December 15, 2009).

Technical Review Committee (WQTRC[2]), to address violations of water quality standards for DO caused by turbine discharge from Smith Mountain Lake, should the operating practices required by paragraph (a) prove insufficient at improving DO levels in Smith Mountain's turbine discharge;

(c) a stipulation to provide the WQTRC with the water quality data collected on a monthly (May 1 to October 31) and bi-monthly (November 1 to April 30) basis; and

(d) a program to annually monitor, or arrange for the annual monitoring of, water quality on Smith Mountain and Leesville Lakes that (i) is consistent[3] with the current programs implemented by the Smith Mountain Lake Association (SMLA) and the Leesville Lake Association and (ii) is developed in consultation with the Virginia Department of Game and Inland Fisheries (Virginia DGIF), the Virginia DEQ, the SMLA, the Leesville Lake Association, Ferrum College, and Lynchburg College.

3. The water quality monitoring plan shall be prepared in consultation with the Virginia DGIF, the Virginia DEQ, the Tri-County Administrative Commission, the SMLA, the Leesville Lake Association, Ferrum College, and Lynchburg College. The licensee shall include with the water quality monitoring plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the aforementioned consulted entities, and specific descriptions of how their comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

---

[2] The WQTRC consists of the Virginia Department of Game and Inland Fisheries, Virginia DEQ, Tri-County Administrative Commission, Smith Mountain Lake Association, Leesville Lake Association, Ferrum College, and Lynchburg College.

[3] In the Commission's Final Environmental Impact Statement (FEIS) for the relicensing of the project (issued August 7, 2009) staff defined the term consistent used in this context to mean that the licensee's water quality monitoring program for the lakes would, at a minimum, be similar to (or comparable to) the existing programs implemented by the SMLA and the Leesville Lake Association. The licensee's program would be conducted in such a way so as to facilitate the use of the data to establish long-term trends for nutrients and other measured parameters.

4. The Commission reserves the right to require changes to the water quality monitoring plan. Implementation of the water quality monitoring plan, including any land-disturbing activities therein, shall not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement any such modification(s), including any changes required by the Commission.

Proposed Plan

5. The licensee's proposed water quality monitoring plan includes the provisions required by paragraphs (a), (b), and (c) listed above. In addition, the plan describes locations, frequency, and parameters to be measured in the Smith Mountain Tailrace and in Smith Mountain and Leesville Lakes as required by paragraph (d).

Smith Mountain Tailrace Monitoring

6. The licensee proposes to monitor DO and water temperature in the tailrace of the Smith Mountain Development at the first bridge leading to the Visitors Center. The monitoring will be conducted for the first five years following issuance of the new license. For the first two years of monitoring, DO and temperature data will be collected continuously year-round. If after two years of data collection, it is determined that year-round data is not warranted, the monitoring period would be reduced accordingly.

7. In addition, at least once per year during the five-year monitoring period, DO and temperature monitoring will be conducted along a transect just upstream of the Smith Mountain Dam near the forebay. The forebay monitoring will be conducted during the generation mode and during the anticipated stratification period between the beginning of July and the end of September. Measurements will be taken at two-meter intervals from the lake surface to the bottom of the lake at four locations across the transect.

8. The licensee will consult annually with the WQTRC. The WQTRC will meet at least once per year to review the monitoring results and discuss the success of the operational modifications in maintaining state standards for DO in the project discharge.

Smith Mountain Lake Monitoring

9. The licensee proposes to monitor, or arrange for the monitoring of, water quality at 26 sites on Smith Mountain Lake. The sites correspond to locations included in the SMLA water quality monitoring program and are identified in the plan. At these 26 sites, total phosphorus, chlorophyll-a, and secchi depth will be measured on a monthly basis between June 1 and September 30 for a total of four sampling events each year. At the same time, sampling for bacteria (E. coli) will be conducted at the fourteen sampling sites identified in the 2008 SMLA water quality monitoring plan.

Leesville Lake Monitoring

10. The licensee proposes to monitor, or arrange for the monitoring of, water quality on Leesville Lake. Sampling for total phosphorus, DO, and secchi depth will be monitored at six sites identified in the licensee's plan and chlorophyll-a will be monitored at three of those six sites. In addition, sampling for bacteria (E. coli) will be conducted at seven sites identified in the licensee's plan. The monitoring sites correspond to locations included in the Leesville Lake Association's water quality monitoring program for Leesville Lake. Sampling will occur on a monthly basis between May 1 and September 30 for a total of five sampling events each year.

Annual Reporting

11. The licensee proposes to prepare annual reports of the water quality monitoring results of the previous year. The annual reports would include the following: all monitoring data; an analyses of the effects of power generation on DO levels in the Smith Mountain Tailrace; recommendations for continued monitoring or revisions to the following year's monitoring plan; a summary of other water quality monitoring results that have been completed outside of the project license; and any other support documents including documentation of consultation with the WQTRC. The licensee would submit the reports to the WQTRC for a 30-day review and comment period and then file final reports with the Commission.

Consultation

12. On May 11, 2010, the licensee forwarded copies of the plan to the Virginia DGIF, Virginia DEQ, SMLA, Leesville Lake Association, and Ferrum and Lynchburg Colleges for a 30-day review period. The licensee received responses from the Virginia DEQ, Virginia DGIF, SMLA, and Leesville Lake Association. In addition, the SMLA, Mr. William C. Brush, and the Tri-County Relicensing Committee filed comments with the Commission regarding the water quality monitoring program.

13. The Virginia DGIF did not have any additional comments on the plan. The Virginia DEQ made minor recommendations to the plan which the licensee incorporated into the final plan. The Leesville Lake Association requested that the licensee include monitoring for bacteria in its plan. The licensee modified the plan accordingly. The SMLA, Tri-County Relicensing Committee, and Mr. William C. Brush filed similar comments stating that the licensee's plan for monitoring water quality at Smith Mountain Lake should be more similar to (or the same as) the existing SMLA water quality monitoring program. These entities state that the FEIS and project license require the licensee's plan to be more similar to the SMLA monitoring program.

Discussion and Conclusion

14. During the relicensing process, the SMLA, Leesville Lake Association, Tri-County Relicensing Committee, and others made recommendations that the licensee be required to implement or fund water quality monitoring programs on the Smith Mountain and Leesville Lakes identical to the programs that the respective lake associations currently implement. The Commission did not adopt that recommendation when it issued a new license for the project, rather, it required that the licensee develop a program to annually monitor, or arrange for the annual monitoring of, water quality on Smith Mountain and Leesville Lakes that is consistent (see definition above) with the current programs implemented by the lake associations.

15. In the FEIS, Commission staff concluded that the primary water quality issues for the lakes are caused by nutrients and bacteria from watershed inputs and not from project operations (see FEIS pg. 88). However, staff also recognized that the nutrient and bacteria input from the watershed and (to a limited extent) pump-back operations, affect DO concentrations in Smith Mountain Lake. In addition, staff concluded that monitoring water quality on the lakes would help ensure that the changes in operation of the project under the new licensee do not adversely affect water quality in the lakes. Therefore, the project license requires the licensee to monitor water quality throughout the project lakes in a manner consistent with the existing monitoring programs. Commission staff recognized that the licensee's plan would not necessarily be as comprehensive as the two lake associations' programs. In the FEIS Commission staff states that the licensee's water quality monitoring program, "...should do less in terms of sampling locations and protocols, as well as the chemical constituents sampled, than the lake association's programs (see FEIS pg. D-55)."

16. The licensee's plan includes a sufficient number of sampling events and monitoring locations in Smith Mountain and Leesville Lakes to monitor water quality in the project lakes over the long-term and ensure that operations under the new license do not adversely affect water quality in the lakes. The selected sampling sites are distributed throughout project waters and the sampling locations, frequency, parameters to be measured, and methods are consistent with the lake associations; monitoring programs. The additional sites and sampling events included in the SMLA program are not necessary to identify water quality issues related to project operation in Smith Mountain Lake and the collection of data under the licensee's plan would allow for tracking of water quality trends and comparison of monitoring data over the long-term.

17. In addition, the licensee will include in its analysis and annual reports the data collected by other monitoring conducted outside the project license. The annual meeting to discuss water quality monitoring results, and annual reports will give the resource agencies and lake associations the opportunity to provide feedback and make recommendations regarding the water quality monitoring program. Commission staff

will consider any recommendations to modify the monitoring program in its review of the annual reports.

18. The licensee's plan appears to propose separate reports for the Smith Mountain Tailrace monitoring and the monitoring in the lakes. However, the licensee should file only one annual report with the Commission which includes the results of all water quality monitoring conducted at the project and the annual consultation as described in the plan. The annual reports should be filed with the Commission by March 30 of each year as stated in the licensee's plan. Prior to filing the reports with the Commission, the licensee should submit the reports to the WQTRC members and allow a minimum of 30 days for the committee to review and comment on the reports. The final reports should include documentation of consultation and the licensee should address all comments and recommendations received from the committee. If the licensee does not adopt a recommendation from the committee, the report should include the licensee's reasons based on project-specific information. The Commission should reserve the right to modify the water quality monitoring plan in order to protect aquatic resources at the project.

19. The licensee's plan contemplates adjusting the monitoring frequency in the tailrace based on the results of the first two years of monitoring data. Any changes to the monitoring plan must be made in consultation with the members of the WQTRC and then filed for Commission approval. The licensee may not implement any changes to the plan unless and until it has received Commission approval of the proposed changes.

20. The licensee's water quality monitoring plan includes numerous monitoring locations and several monitoring events throughout the year which will enable the licensee, resource agencies, stakeholders, and the Commission to identify water quality issues related to project operations over the long-term. The plan includes provisions to review the water quality monitoring results on an annual basis and includes resource agency and stakeholder participation in that process. The plan, as modified, meets the requirements of Article 405 and, therefore, should be approved.

The Director orders:

(A) Appalachian Power Company's (licensee) water quality monitoring plan, filed June 28, 2010, pursuant to Article 405 of the Smith Mountain Pumped Storage Hydroelectric Project license, as modified by paragraph (B), is approved.

(B) The licensee shall file annual water quality monitoring reports with the Commission by March 30 of each year. Prior to filing the reports with the Commission, the licensee shall submit the reports to the Water Quality Technical Review Committee members and allow a minimum of 30 days for the committee to review and comment on the reports. The final reports shall include documentation of consultation and the licensee shall address all comments and recommendations received from the committee.

If the licensee does not adopt a recommendation from the committee, the report shall include the licensee's reasons based on project-specific information. The Commission reserves the right to modify the water quality monitoring plan in order to protect aquatic resources at the project.

(C) The licensee shall file any document required by this order with the Secretary of the Commission. Filings may be submitted electronically via the Internet, see 18 CFR 385.2001 (a)(1)(iii) and the instructions on the Commission's web site under the "e-filing" link. The Commission strongly encourages electronic filings. In lieu of electronic filing, an original and eight copies of all documents may be mailed to:

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

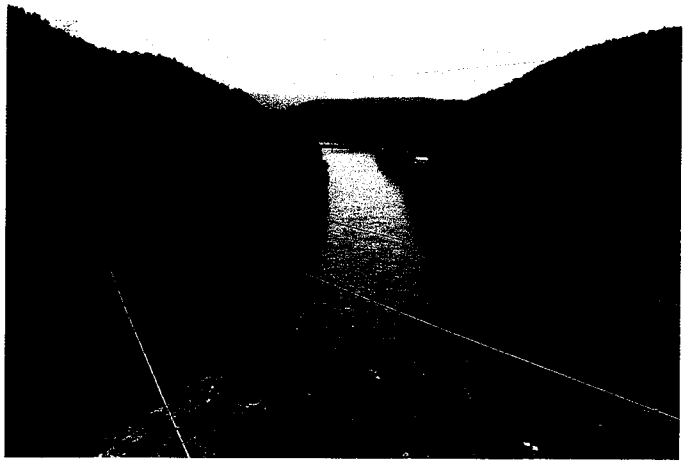
(D) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and the Commission's regulations 18 C.F.R. § 385.713 (2010). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Steve Hocking
Chief, Environmental Review Branch
Division of Hydropower Administration
and Compliance

OEP/DHAC Price, R.D.: rdp April 14, 2011 041

Appalachian Power Company
Smith Mountain Hydroelectric Project
FERC No. 2210

Water Quality Monitoring Plan



June 2010

TABLE OF CONTENTS

SUMMARY

The Smith Mountain Project (No. 2210) is licensed to Appalachian Power Company (Appalachian) and is a pumped storage hydroelectric project located on the Roanoke River in Bedford, Campbell, Franklin and Pittsylvania counties in Virginia. The upper reservoir of the pumped storage facility is the Smith Mountain Development, while the lower reservoir is the Leesville Development.

The purpose of this Water Quality Monitoring Plan (Plan) is to outline how Appalachian will ensure that the low dissolved oxygen conditions observed in the tailrace of the Smith Mountain Development during the Water Quality Study completed for relicensing and how Appalachian will monitor the dissolved oxygen levels. The goal of this Plan is to provide a means to ensure that the observed low dissolved oxygen levels in the tailrace of the Smith Mountain Development are mitigated by the order in which units are brought online to the greatest extent practicable. In addition, the plan outlines water quality monitoring on the reservoirs that will be completed as part of Appalachian's license.

The Water Quality Monitoring Plan has been submitted to the Federal Energy Regulatory Commission (FERC) as part of the license application and has been revised to reflect the measure that Appalachian will be responsible for as the licensee. However, there will be times when it makes sense to develop a cooperative agreement between Appalachian and other parties to manage a resource in a mutually beneficial way. These types of agreements will be outside of relicensing and may reflect additional measures that are above those required by this monitoring plan.

1.0 INTRODUCTION

The purpose of this Water Quality Monitoring Plan (Plan) is to outline how Appalachian will mitigate the low dissolved oxygen conditions observed in the tailrace of the Smith Mountain Development during the Water Quality Study completed for relicensing and how Appalachian will monitor the proposed mitigation to ensure dissolved oxygen levels remain above water quality standards in the tailrace. The plan also outlines water quality monitoring that will be completed on the reservoirs as part of Appalachian's license requirements. The goal of this Plan is to provide a means to ensure that the observed low dissolved oxygen levels in the tailrace of the Smith Mountain Development are mitigated to the extent practicable. This Plan has been prepared in consultation with agencies and stakeholders.

1.1 Smith Mountain Development and Leesville Development Project Lands and Waters

The Smith Mountain Project consists of two developments, both located on the Roanoke River in Bedford, Campbell, Franklin, and Pittsylvania counties in Virginia. The upper development of the Project is Smith Mountain and the lower development is Leesville. The Smith Mountain Development has five generating units, with a combined generating capacity of 586 MW. The reservoir behind Smith Mountain dam has a surface area of 20,260 acres at an operating pool elevation of 795 feet National Geodetic Vertical Datum (NGVD) and 500 miles of shoreline. The Leesville Development has two generating units, with a combined generating capacity of 50 MW. The reservoir behind the Leesville dam has a surface area of 3,260 acres at an operating pool elevation of 613 NGVD and 100 miles of shoreline.

The Project boundary for the Smith Mountain Development is 800 feet NGVD. The Project boundary for the Leesville Development is 620 feet NGVD. During operations of the pumped storage facility, the Smith Mountain reservoir can fluctuate up to 2 feet, while the Leesville reservoir fluctuates up to 13 feet (between elevation 600 feet and 613 feet).

In 2006, Appalachian retained Kleinschmidt Associates and Downstream Solutions to conduct a Water Quality Study as part of Appalachian's relicensing efforts for the Project. In conclusion of the study, Kleinschmidt Associates and Downstream Solutions recommended further water quality monitoring, specifically for dissolved oxygen, in the tailrace of Smith Mountain so that the data can then be evaluated to determine the frequency of low DO values in the discharge, the effect of unit operation on dissolved oxygen and a method to address the issue if warranted. Since it was shown during the study that low dissolved oxygen levels can be experienced in the tailrace during certain operational and environmental conditions. Specifically, when Smith Mountain Lake is thermally and chemically stratified, water near the surface has relatively high DO levels but these levels decrease with depth and there is little DO present within the deeper portions of the water column. These conditions are typical in deep, dimictic lakes such as Smith Mountain. The water quality in the project discharge is directly related to the water quality drawn into the

projects turbine intakes. Therefore, the location of the intakes within the water column, in part, determines the withdrawal zone and the DO of the water entering the turbines and subsequently the turbine discharge. Of the five units at Smith Mountain, Units 1 and 5 have intakes that are located much deeper (82 ft and 137 ft, respectively) within the water column than units, 2, 3, and 4. In addition, the hydraulic capacity of Units 1 and 5 is approximately 5,200 cfs each while the capacity of Units 2, 3, and 4 ranges from 9,000 to 14,000 cfs (Table 1).

In order to enhance DO conditions in the project discharge, Appalachian has elected to generate from Units 2, 3 and 4 before bringing Units 1 and 5 online during the months of July through September. In addition, Units 1 and 5 will be the first Units to shut down during this time period. This "first on, last off" operating mode for Units 2, 3, and 4 will maximize the percentage of water from the upper portion of the water column (i.e. higher DO concentration) within the project discharge. This Plan has been developed to discuss Appalachian's proposed monitoring of the tailrace to ensure the low dissolved oxygen levels in the tailrace have been successfully mitigated.

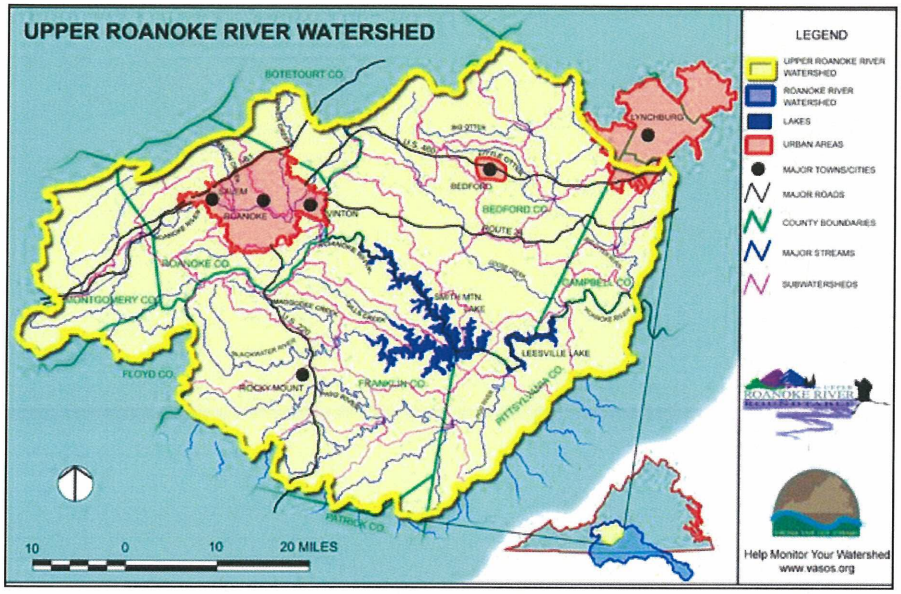
Table 1 Intake elevation and hydraulic capacity of the Units at Smith Mountain Development

Unit	INTAKE INVERT ELEVATION (FT.) (NGVD29)	HYDRAULIC CAPACITY MAXIMUM (CFS)
1	655	5,200
2	737	14,000
3	737	9,000
4	737	14,000
5	600	5,200

2.0 LAKE AND WATERSHED CHARACTERISTICS

The Smith Mountain Project is located on the Roanoke River in the south-central portion of Virginia. The watershed to the Project is the upper Roanoke River which is designated as Hydrologic Unit Code 03010101 (Figure 1). The Smith Mountain reservoir is approximately 20,260 acres with 500 miles of shoreline. Shoreline development consists primarily of residential development with some multi-family and commercial development. In contrast, the Leesville reservoir is 3,260 acres and approximately 100 miles of shoreline. The majority of the shoreline is undeveloped, with some residential and two commercial areas developed.

Figure 1. Upper Roanoke River Watershed Map (www.upperroanokeriver.org)



The Smith Mountain reservoir has a drainage area of 1,029 square miles while the total drainage area for the Leesville development is 1,505 square miles. Inflows originate primarily from the Roanoke River and secondarily from the Blackwater River. The project also receives inflow from several other tributaries including Beaver Dam Creek, Gills Creek, Craddock Creek, Witcher Creek, Walton Creek and Backwater Creek. The primary inflow into Leesville Reservoir, other than the releases from Smith Mountain Dam, is from the Pigg River.

2.1 Project Water Quality Characteristics

Based on Virginia Department of Environmental Quality's (DEQ) monitoring efforts within the Smith Mountain Project and watersheds, and Virginia's Water Quality Standards (9VAC 25-260-450 Roanoke River Basin, Roanoke sub-basin) the following classifications have been assigned to Project waters:

- Smith Mountain and its tributaries within five miles of the 795 ft pool elevation are Class IV (Mountainous zone) with public water supply designation.
- Smith Mountain and its tributaries (except Roanoke River) are classified as "Nutrient Enriched Waters" (Special Standard 9 VAC25-260-350).
- Various tributaries to Smith Mountain Lake, upstream of the five-mile range, are Class III (Non-tidal), Class V (Stockable trout), and Class VI (Natural Trout) waters.
- Leesville Reservoir is Class IV (Mountainous Zone) water with public water supply designation for the reservoir only.
- Tributaries to Leesville Reservoir are Class III (Non-tidal) waters.

Water quality data collected as part of the Smith Mountain Lake Association's (SMLA) Water Quality Monitoring Program and data collected by VDEQ was reviewed for the Roanoke River arm, Blackwater River arm, mainstem of Smith Mountain Lake and Leesville Lake. The water quality data for these water body sections are summarized as follows:

2.1.1 *Roanoke River Arm Summary*

- Chlorophyll and nutrients increased significantly as you move up the arm (towards the headwaters and away from the main body of the lake)
- Secchi decreased significantly as you move up the arm
- Fecal coliforms are highest at upper end of the arm
- Chlorophyll increased in the upstream and middle zone from 1995 to 2005 (SMLA)
- Secchi decreased in the upstream and middle zone from 1995 to 2005 (SMLA)
- Nitrate increased from 1990 to 2002 at upper 3 sampling sites (VDEQ)

2.1.2 *Blackwater River Arm Summary*

- Chlorophyll and nutrients increased significantly as you move up the arm (towards the headwaters and away from the main body of the lake)
- Secchi decreased significantly as you move up the arm
- Fecal coliforms were highest at the upper end of the arm
- Chlorophyll increased and secchi decreased from 1995 to 2005 in upper zone (SMLA)
- Fecal coliforms decreased at the most upstream site from 1990 to 2002 (VDEQ)
- Nitrate decreased in the arm from 1990 to 2002 (VDEQ)
- Orthophosphate increased from 1991 to 2005 at 5 downstream sites (VDEQ)
- Total phosphorus decreased from 1995 to 2005 in lower (downstream) zone (SMLA)

2.1.3 *Mainstem Smith Mountain Lake Summary*

- Chlorophyll increased significantly as you move upstream from the dam
- Nitrate decreased with distance as you move upstream from the dam
- Secchi decreased significantly as you move upstream from the dam (strongly influenced by data at the most upstream site only)
- Chlorophyll increased from 1995 to 2005 in lower zone (SMLA)
- Nitrate decreased from 1990 to 2002 (VDEQ)
- Orthophosphate increased from 1994 to 2005 (VDEQ)

- Secchi decreased from 1996 to 2005 (VDEQ)

2.1.4 *Leesville Lake Summary*

- Chlorophyll decreased significantly as you move upstream from the dam
- Secchi decreased significantly as you move upstream from the dam
- Chlorophyll decreased from 1998 to 2005 (VDEQ)
- Secchi decreased from 1993 to 2003 (VDEQ)

Water is released from the Project through the Leesville development. The average annual daily inflow into the Smith Mountain reservoir is 976 cfs while the average annual daily inflow into the Leesville reservoir is estimated at 1,483 cfs.

The water in the reservoirs is used for generation, domestic water supply, recreation, agricultural purposes, irrigation for golf courses and other minor uses by residents.

3.0 PROBLEM STATEMENT

The Water Quality Study conducted by Kleinschmidt Associates and Downstream Solutions on behalf of Appalachian during 2006 found that low dissolved oxygen levels (below 3 mg/L) in the tailrace can occasionally result during specific operating and environmental condition. The study concluded that when Smith Mountain Lake is chemically stratified, low DO levels in the tailrace can occur if units 1 and/or 5 are operated in the generation mode solely or together due to the deep location of their intakes. Although the low DO conditions can be experienced within the tailrace, it is expected that DO levels enhance through natural processes (i.e. mechanical aeration and photosynthesis) as the water moves downstream. The extent of this recovery zone would vary based on factors such as flow, meteorological and environmental conditions. In order to mitigate this Project effect, Appalachian has elected to implement a "first on, last off" operating mode for Units 2, 3 and 4. In this modes operation of these Units would receive priority over Units 1 and 5 during the months of July through September. The goal of this Plan is to provide a means to ensure that the observed low dissolved oxygen levels in the tailrace of the Smith Mountain Development are mitigated by the order in which units are brought online.

In the Final Environmental Impact Statement, FERC indicated that the primary water quality issues for Smith Mountain and Leesville lakes are related to nutrients and bacteria. The source of these nutrients and bacteria is not related to project operation, but rather to shoreline development around the lakes (e.g., erosion, wastewater and stormwater runoff, treated lawns, etc.) and overall watershed development (e.g., sedimentation and agricultural run-off entering the lakes from tributary sources.) FERC states that the Smith Mountain Development affects water quality in a portion of Smith Mountain Lake and the 13-foot drawdown in Leesville

influences water quality in the lake, as well as the quality of water that passes downstream. FERC further states that on-going monitoring of water quality on Smith Mountain Lake should continue, that the establishment of a monitoring program on Leesville Lake is important and that monitoring the lake water quality would help ensure that the proposed changes in the operational strategy at the Smith Mountain development do not adversely affect water quality in Smith Mountain Lake, as well as the future health of the lakes (e.g., documenting trends in the lake's water quality and identifying areas of concern that may lead to the degradation in water quality).

4.0 SMITH MOUNTAIN UNIT OPERATION

The Unit 2, 3 and 4 turbines at Smith Mountain dam will be operated "first on, last off" between July 1st and September 30th to minimize or eliminate violations of water quality standards for dissolved oxygen in the tail waters from the Smith Mountain dam, whereby the turbines with intakes that are highest in the water column are operated first and taken offline last. Appalachian implemented this change in operation starting in July 2009.

5.0 MONITORING AND CONSULTATION MEASURES – SMITH MOUNTAIN TAILRACE

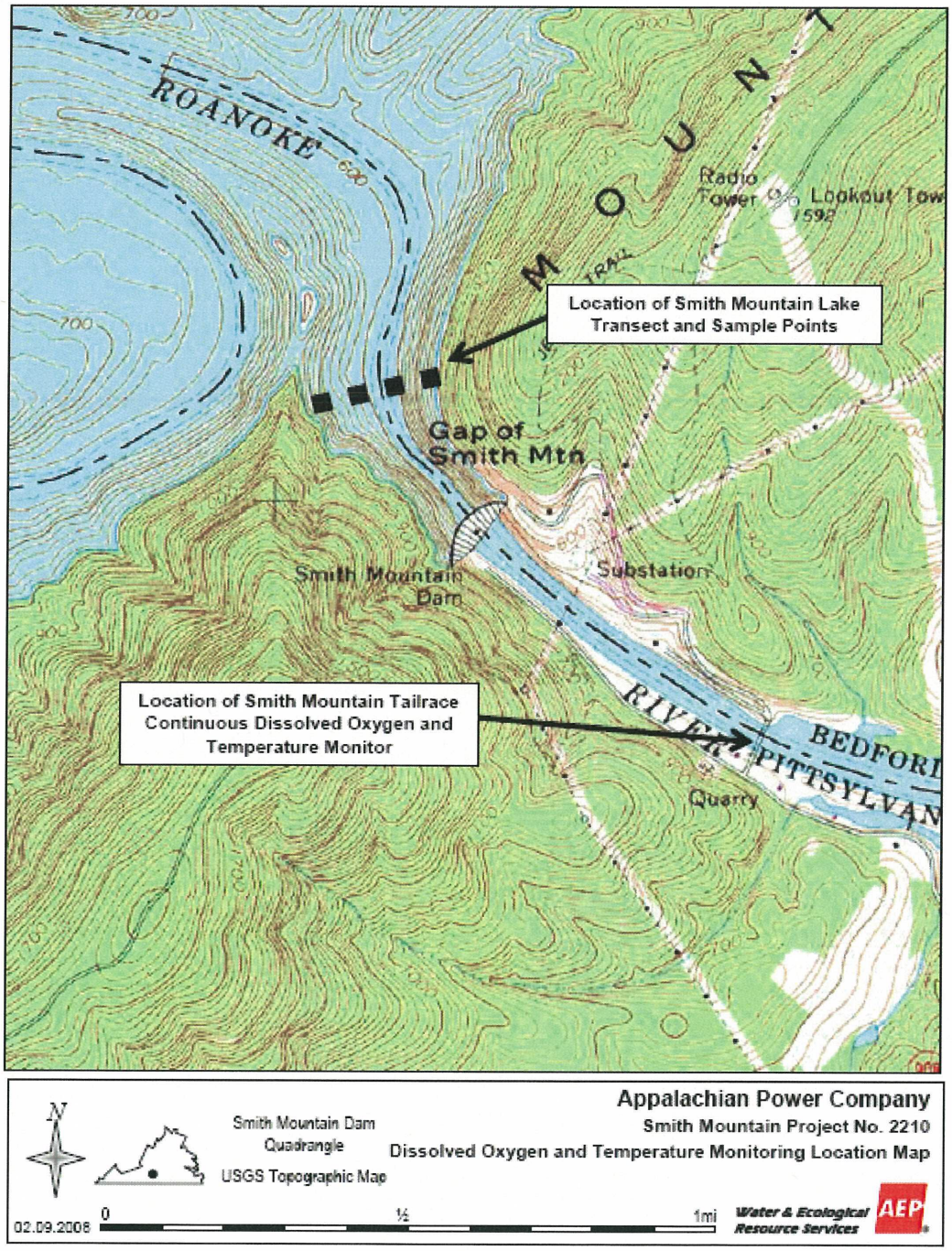
The purpose of this section of the Plan is to outline the proposed water quality monitoring protocol, the process for consultation with the state agencies and other interested stakeholders and Plan revisions.

5.1 Monitoring Methods

Monitoring and assessment of the proposed operational changes on dissolved oxygen in the tailrace of the Smith Mountain Development will be conducted for five (5) years following issuance of the new license. Monitoring will consist of deployment of a continuous dissolved oxygen and temperature monitor in the tailrace at the first bridge leading to the Visitors Center (Figure 2). Although Kleinschmidt Associates and Downstream Solutions conclusions suggest low dissolved oxygen during the lake stratification period in summer and early fall, the continuous monitors will collect data year-round to ensure Project effects on dissolved oxygen are not experienced outside of the identified period of concern. If after two years of data collection it is determined that year-round data is not warranted, the monitoring period will be reduced accordingly. Data will be downloaded on a biweekly basis and compared with operation of the generating units at Smith Mountain. The dissolved oxygen and temperature monitor(s) will be maintained and calibrated within acceptable timeframes bases on the manufacture's recommendations and on-site experience. Occasional grab samples will also be taken between the dam and the bridge. The deployed DO probe will be optical with a self cleaning feature. Additional DO grab samples will be taken as close to the probe as possible to validate the deployed probe readings.

In addition, at least once per year during the five-year monitoring period, monitoring will be conducted along a transect just above Smith Mountain Dam near the forebay as sampled during the Water Quality Study for relicensing (Figure 2). This forebay monitoring will be conducted during generation mode and during the anticipated stratification period between the beginning of July and the end of September and as confirmed by other water quality monitoring efforts as practical (e.g. the SMLA program). Water quality parameters that will be measured will consist of dissolved oxygen and temperature 2-meter intervals from surface to bottom at four locations across the transect. Measurements will be made in accordance with DEQ-accepted protocols for field measurements of this type. DEQ protocols can be found in the document titled "Standard Operating Procedures Manual for the Department of Environmental Quality Office of Water Quality Monitoring and Assessment".

Figure 2. Dissolved Oxygen and Temperature Monitoring Location Map.



5.2 Report and Consultation

Appalachian will establish a Water Quality Technical Review Committee to review and comment on the monitoring results. This committee will consist of representatives from Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, Tri-County Lake Administrative Commission, Smith Mountain Lake Association (SMLA), Leesville Lake Association (LLA), Ferrum College, Lynchburg College and Appalachian. The Technical Review Committee will meet at least once per year to review the monitoring results and additional meetings will be held on an as-needed basis.

As part of the annual review process, the Committee will assess the success of the operational modifications in terms of maintaining the state standard DO requirements in the project discharge. Should these operating practices prove insufficient at improving DO levels in Smith Mountain's turbine discharge, a feasibility study and plan for physical or mechanical alterations of water release procedures will be developed and filed in accordance with Article 401(a) for Condition F.4. found in Part I of the Virginia Department of Environmental Quality's water quality certification. This study and plan will be developed in consultation with the Water Quality Technical Review Committee. The feasibility study will be due by December 31, 2015 unless the operational changes alone are sufficient to eliminate contraventions of the dissolved oxygen standard.

Water quality data will be provided to the Water Quality Technical Review Committee on a monthly basis from May 1 to October 31 and bi-monthly basis from November 1 to April 30.)

Appalachian will provide an annual report outlining the monitoring results, analyses and recommendations for continued monitoring or additional measures for addressing dissolved oxygen to the Water Quality Technical Review Committee for review and comment. The Committee will be given thirty (30) days for review and comment.

A revised report will then be compiled for submission to the Federal Energy Regulatory Commission. Included in this report will be 1) monitoring data and analyses of effects of power generation on dissolved oxygen levels, 2) recommendations for continued monitoring or additional measures to address dissolved oxygen, and 3) any other support documents including documentation of consultation with the Water Quality Technical Review Committee and summary of the other water quality monitoring results that have been completed outside of the license.

6.0 MONITORING AND CONSULTATION MEASURES - ANNUAL LAKE WATER QUALITY

6.1 Monitoring Parameters and Locations

Appalachian will monitor, or arrange for the annual monitoring of, water quality on Smith Mountain and Leesville lakes.

Currently, the SMLA and the LLA conduct water quality monitoring on the lakes. Appalachian has utilized information from the SMLA and LLA programs to develop a plan that would be implemented in the event that these organizations elect to no longer participate in the annual monitoring. The following will be the monitoring that will be completed on Smith Mountain and Leesville Lakes as it relates to the Appalachian's responsibilities under its license.

Smith Mountain Lake: Sampling for total phosphorus, chlorophyll-a and secchi depth will be conducted at the following sites: M0, M1, M3, M5, CM1, CM1.2, C4, C5, R7, R9, R11, R13, R15, R17, R21, R25, R30, CR 25, SCB10, B10, B12, B14, B16, B18, B22 and G13. A map showing these locations is included in Appendix A of this plan.

Sampling for bacteria (E. coli) will be conducted at the fourteen (14) sampling sites identified in the 2008 SMLA Water Quality Monitoring Plan.

Leesville Lake: Sampling for total phosphorus, dissolve oxygen and secchi depth will be conducted at the following sites: Tailwater of Smith Mountain (16), Pigg River near its mouth (13), Downstream of Toler Bridge, Mile Mark 9, Mile Mark 6 and at Leesville dam. In addition, chlorophyll-a will be sampled at the following sites: Downstream of Toler Bridge, Mile Mark 6 and at Leesville dam. A map showing these locations is included in Appendix A of this plan.

Sampling for bacteria (E. coli) will be conducted at the following sites: Pigg River near its mouth (13), Downstream of Toler Bridge, Mile Mark 9, Mile Mark 2, Tri-County Marina, Pitstop Marina and Leesville dam.

6.2 Timing and Frequency of Monitoring

Smith Mountain Development: Sampling will occur on a monthly basis between June 1st and September 30th for a total of four sampling events per year.

Leesville Development: Sampling will occur on a monthly basis between May 1st and September 30th for a total of 5 sampling events per year.

6.3 Methods to be Used

The methods that will be used for monitoring are contained in the Standard Operating Procedures Manual for the Department of Environmental Quality, Water Quality Monitoring and Assessment Program. This manual can be found at VDEQ's website: http://www.deq.virginia.gov/watermonitoring/pdf/guidancemanual/wqmsop.pdf.

6.4 Standards to be Met

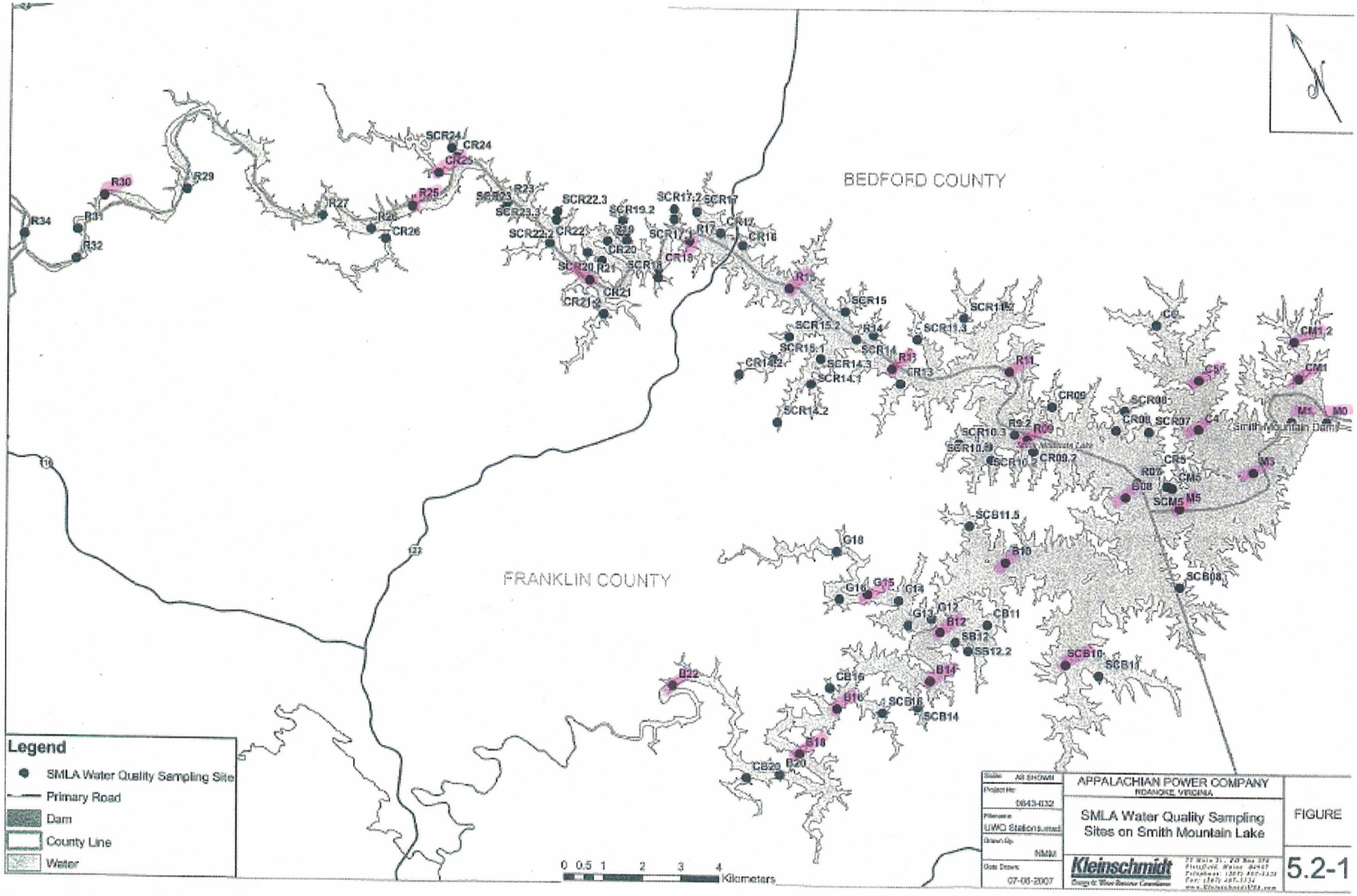
The results of the water monitoring efforts will be compared to the Virginia's water quality standards in the final report. The standards that will be used are those that are approved at the time of the monitoring. The current standards can be found on the state's website, at http://www.deq.virginia.gov/wqs/documents/WQS_eff_1FEB2010.pdf .

6.5 Reports and Consultation

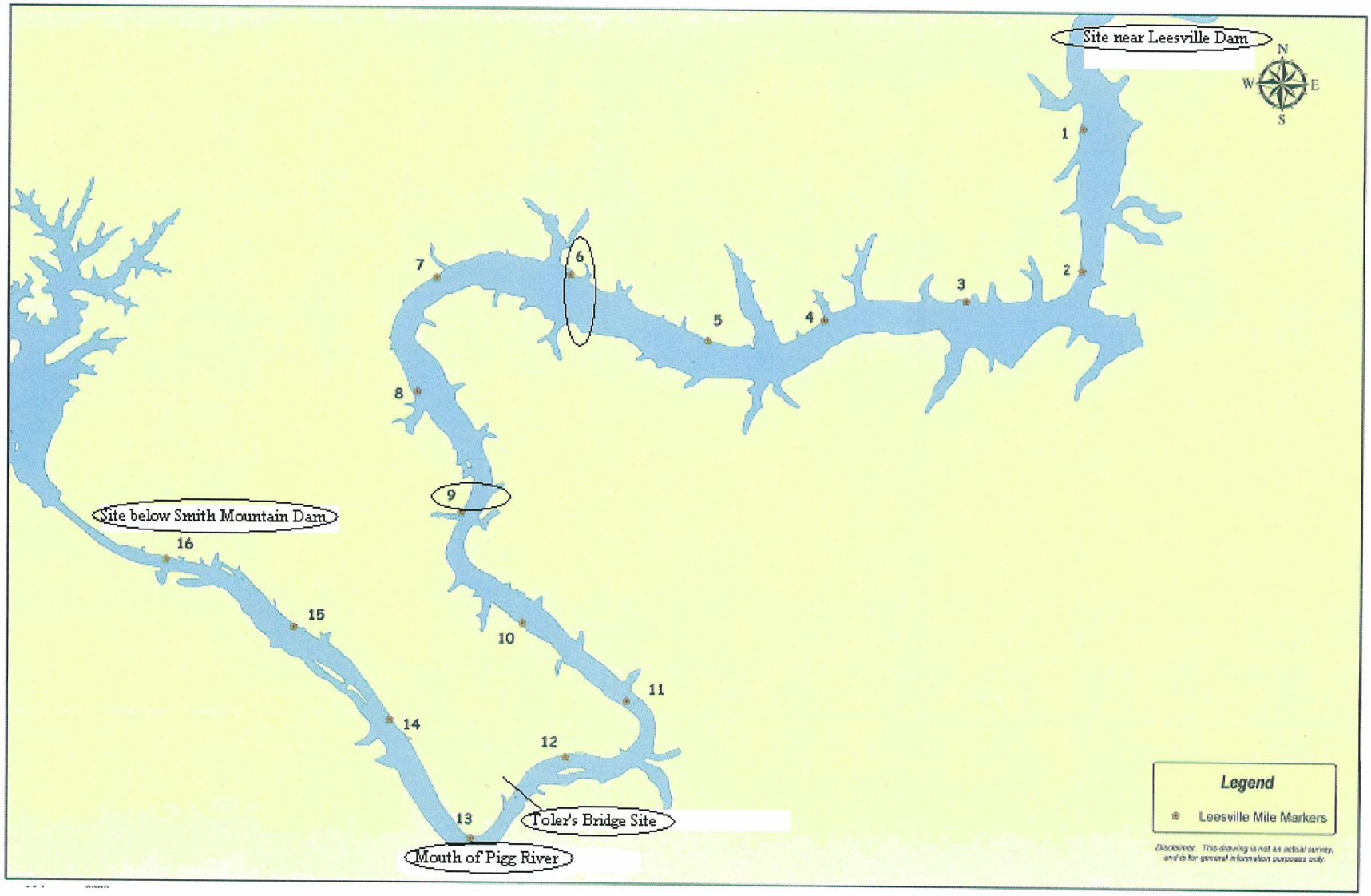
Appalachian will provide an annual report outlining the monitoring results from the previous year to the Water Quality Technical Review Committee for review and comment no later than March 30th each year. The Committee will be given thirty (30) days for review and comment.

A revised report will then be compiled for submission to the Federal Energy Regulatory Commission. Included in this report will be 1) monitoring data and analyses, 2) recommendations for continued monitoring or revisions to the following year's monitoring plan, 3) identification of monitoring efforts that have been completed that have been completed outside of the license and 4) support documents including documentation of consultation with the Water Quality Technical Review Committee.

Appendix A
Water Sampling Locations for Smith Mountain and Leesville Lakes



Sites to be monitored shown in pink.


Site near Leesville Dam
N
W
E
S
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Site below Smith Mountain Dam
Toler's Bridge Site
Mouth of Pigg River
Legend
Leesville Mile Markers
Disclaimer: This drawing is not an actual survey, and is for general information purposes only.