

133 FERC ¶ 62,147
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Appalachian Power Company

Project No. 2210-198

ORDER MODIFYING AND APPROVING REVISED
EROSION MONITORING PLAN

(Issued November 12, 2010)

1. On June 28, 2010, Appalachian Power Company, licensee for the Smith Mountain Hydroelectric Project No. 2210, filed a revised Erosion Monitoring Plan (Plan) pursuant to Article 402 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 402, as amended,² requires, within 90 days of the effective date of this license, the licensee to file with the Commission, for approval, a final erosion monitoring plan that addresses erosion monitoring and remediation, as appropriate, at the Smith Mountain Project. The plan shall include the provisions of the proposed *Erosion Monitoring Plan*, filed July 15, 2008, with, at a minimum, the following revisions:

- (a) a provision to monitor shoreline locations that represent a full range of scarp heights;
- (b) monitoring to be conducted, and a report to be filed, every 5 years; and
- (c) a provision to file, for Commission approval, any measures proposed in the reports to address project-related effects of erosion.

3. The revised erosion monitoring plan shall be prepared in consultation with the Virginia Department of Game and Inland Fisheries (VDGIF), the Virginia Department of Environmental Quality (VDEQ), the Virginia Department of Conservation and Recreation (VDCR), the Tri-County Relicensing Committee (TCRC), the Smith Mountain Lake Association (SMLA), and the Leesville Lake Association (LLA). The

¹ 129 FERC ¶ 62,201 (2009).

² On September 16, 2010, the Commission issued an Order on Rehearing and Clarification, 132 FERC ¶ 61,236, which revised Article 402 by adding subparagraph (c).

licensee shall include with the erosion 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.

4. The Commission reserves the right to require changes to the revised erosion monitoring plan. Implementation of the erosion 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 Plan includes four sections: Monitoring of Erosion, Demonstration Projects for Erosion Control, Reporting, and Coordination with Other Management Plans and Implementation Schedule. The Monitoring of Erosion section includes: the methods for monitoring reservoir erosion, methods for downstream erosion monitoring, a list of locations to be monitored, the frequency of monitoring surveys, and the procedures for comparing to previous data. The Demonstration Projects for Erosion Control section discusses the development of two demonstration projects utilizing natural stabilization methods. The Reporting section discusses the frequency of monitoring reports and the contents of the reports. The Coordination and Implementation section details the procedures for Technical Review Committee reviews and an implementation schedule.

6. As proposed, the method for the monitoring of erosion along the reservoir will be to perform detailed topographic surveys at each monitoring location, including GPS data and photographs. The collected data will be used to produce a two-foot contour map of the erosion occurring at the monitored locations. Monitoring of erosion downstream will consist of photographic documentation and GPS data collection. The areas to be monitored at Smith Mountain Lake include: COSMOS Location S1, COSMOS Location S3, COSMOS Location S4, Location S5 (Birds Island), and Location S6 (Middle Island). The areas to be monitored at Leesville Lake include: COSMOS Location L1 and Wave Location L1. Additionally, ten sites between Leesville Dam and Altavista, as shown in Appendix B of the Plan, will be monitored. The first survey will be completed within two years of the Commission's approval of the Plan and additional surveys will be conducted every five years thereafter.

7. The Demonstration Projects for Erosion Control section states the licensee is developing two erosion control projects, in consultation with the VDGIF under the

licensee's Habitat Management Plan, which will utilize natural stabilization methods.³ The licensee proposes to begin consultation with the VDGIF within one year of Plan approval and implement the first demonstration project within three years. The second demonstration project will be implemented in the fourth year following Plan approval. The locations for the two demonstration projects are shown in Appendix C of the Plan.

8. The Reporting section restates the Licensee's intention to complete the first survey within two years of Plan approval and then to complete additional surveys every five years. The survey reports will include:

- Locations of the reservoir monitoring sites
- Locations of the downstream monitoring sites
- Results of Appalachian's detailed topographic survey of monitoring sites
- Comparisons of survey data to previous survey results for all sites listed above
- An assessment of the impacts of erosion in these areas
- Identification of any project related impacts
- Proposed actions to be taken to address project-related effects should they be identified
- Implementation schedule for any proposed actions
- Consultation with stakeholders listed in Section 1.b of the Plan
- Consultation with VDGIF regarding demonstration projects and details of proposed projects for Commission review and approval
- Updated monitoring plan with a schedule that identifies the next anticipated survey

9. The Coordination and Implementation section states the Licensee will prepare a draft report and provide it to the Aquatic Vegetation Technical Review Committee, Habitat Technical Review Committee, Recreation Technical Review Committee, and Water Quality Technical Review Committee. The committees will be given 30 days to provide comments on the draft. A second draft report based on comments received will be prepared and then provided to the Erosion/Sediment Technical Review Committee, the Staunton River Watch, and Citizens for the Preservation of the River for another 30-day comment period. The Erosion/Sediment Technical Review Committee will be comprised of representatives from the VDGIF, VDEQ, VDCR, TCRC, SMLA, the local Soil and Water Conservation Districts, the counties' Sediment and Erosion Control Departments,

³ The Habitat Management Plan was modified and approved under Article 406 of the project license, 129 FERC ¶ 62,201 (2009).

and Ferrum College. The Licensee will then prepare a final report and file it with the Commission within six months of the surveys.

Consultation

10. On March 28, 2010, the licensee forwarded copies of the revised plan to the VDGIF, VDEQ, VDCR, TCRC, SMLA, and LLA for a 30-day review period. Comments were received from the VDGIF on April 14, 2010, and the SMLA on April 27, 2010. No other agencies provided comments on the plan.

11. The VDGIF stated it had no comment on the Plan. The SMLA stated the Plan is updated in accordance with FERC direction and is consistent with new license requirements, but it will do nothing to reduce erosion. They also noted the demonstration projects were thoughtfully selected but the natural stabilization methods could not be applied to areas with a high rate of erosion.

Discussion and Conclusion

12. The proposed plan did not include a provision to file, for Commission approval, any measures proposed in the reports to address project-related effects of erosion.⁴ Any proposed action to be taken within the project boundary to address project-related effects of erosion should be filed for Commission approval.

13. The purpose of the plan is to monitor erosion at the Smith Mountain Lake, Leesville Lake, and downstream of the project. The licensee's plan was developed in consultation with the relevant agencies and all comments provided are adequately addressed or incorporated in the plan. This plan is consistent with the requirements of Article 402 and, therefore, is approved, as modified.

The Director orders:

(A) Appalachian Power Company's Erosion Monitoring Plan, filed June 28, 2010, pursuant to Article 402 of the Smith Mountain Hydroelectric Project license, as modified by ordering paragraph (B), is approved.

(B) The licensee shall file, for Commission approval, all proposed measures to address project-related effects of erosion to be taken within the project boundary.

⁴ The Plan was filed prior to the addition of this required provision by the Order on Rehearing and Clarification, 132 FERC ¶ 62,236, which revised Article 402 by adding subparagraph (c).

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(C) 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 FPA, 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.

M. Joseph Fayyad
Engineering Team Lead
Division of Hydropower Administration
and Compliance

**Appalachian Power Company
Smith Mountain Project No. 2201**

Erosion Monitoring Plan

March 2010

Background:

The Erosion Study prepared for the relicensing of the Smith Mountain Project identified areas and severity of bank erosion on Smith Mountain Lake and Leesville Lake. Mapping in the Erosion Study provides information on the shoreline's geomorphology, material classification, and an assessment of shoreline protection that is in place. Scarp height was mapped and was defined as the observed height of a vertical bank face along the shoreline. This includes areas that exhibit signs of active erosion ('fresh' bank face and/or newly eroded material associated with the bank) and inactive ('older' bank face showing long term stability; vegetation on face). Actively eroding bank height was classified as a subset of the scarp height classification to filter out banks where active erosion was not observed. For Smith Mountain, a scarp height of 2 to 3 feet was most common, and this reflected the removal of topsoil and saprolite from the underlying bedrock in most cases. Where natural shoreline was visible, bedrock was most commonly noted at the shoreline-lake interface. The study summarizes that it is likely that much of this erosion took place during the early phases of the project and is taking place at a lower rate now that most wave action is against a more resistant underlying rock. However, these bedrock faces are in direct contact with the water, are generally steep and clear of vegetation, so they were classified as actively eroding, even though the present rate of bank retreat may be low.

While the natural shoreline on Leesville Lake had proportionately more shoreline identified with active erosion than on Smith Mountain Lake, erosion rates are thought to be much lower. The fluctuating water levels on Leesville Lake commonly cause steep, vegetation-free bank faces around the shoreline, however, these are not necessarily actively eroding or may be eroding at very low rates of retreat. While the shoreline faces may be bare, there is much less wave energy around the shoreline of Leesville for removal of materials and the exposed faces on some areas of Leesville serve to dampen the effects of water level fluctuation on bank erosion. A scarp height of 4-5 feet (15% of shoreline) was most common, however, the majority of shoreline (36.3%) has a scarp height of less than 4 feet and 28.3% of the shoreline is not actively eroding. Resistant bedrock outcrops were the dominant material at the toe of slope on the shoreline, although much loose, clastic material was noted on the slope faces below the 613 foot elevation.

Numerical modeling showed that the effects of wind-wave and boat wake erosion were determined to be the dominant erosion mechanisms on both lakes. While operational water level serves to adjust the location of interaction between waves and the shoreline profile, the water level fluctuations from Project operations per se are not the cause of shoreline erosion. Water level variations on Leesville were found to expose a wide swath of bare shoreline, however low wave energy and relatively low boat activity have in turn led to historically lower rates of shoreline retreat than on Smith Mountain Lake.

The Erosion Study also assessed downstream erosion below Leesville Dam. Areas of accelerated erosion appears limited to the zone of fluctuating water level as a result of historic releases (peaking operations that occurred pre-1988) from Leesville Dam. On the whole, the banks of the Roanoke River appear much more stable than as identified in prior float trips (1973, 1974, 1975, 1989 by Appalachian to assess erosion downstream)

and the main reason for the more stable banks is thought to be the reestablishment of trees and riparian vegetation as a result of the changes to discharge regime instituted in 1988 (autocycle operations every two hours.) Appalachian is proposing as part of the new license to autocycle on an hourly basis to further decrease the water level fluctuations downstream.

The Erosion Study determined that it is not project operation that is currently causing shoreline erosion on the lakes. In addition, changes in project operation in the late 80's at the Leesville Development have greatly reduced downstream impacts. Therefore, Appalachian is proposing to conduct post licensing monitoring of specific sites along both shorelines and downstream of Leesville to document bank conditions over the term of the next license. This monitoring will document changes in erosion at various sites along Smith Mountain and Leesville Lakes, document changes in the river downstream of Leesville Dam, document the rate of erosion on the reservoirs and document any changes in shoreline at Leesville due to increased boating. Appalachian will be completing a downstream study that has an erosion monitoring component as part of its Virginia 401 Water Permit requirements and License Article 401. That study is separate from the monitoring proposed in this plan.

1. Monitoring of Erosion:

- a) The Erosion Monitoring Plan will be implemented within one year of the Commission's approval of the Erosion Monitoring Plan.
- b) **Methods for Monitoring Reservoir Erosion:** A detailed topographic survey will be conducted on the specified slope at each monitoring location. Data will be collected to provide full coverage of the bank from top to bottom. GPS data and photographs of each site will also be collected. The topographic survey will provide contour elevation data for the land surface in the area being mapped for comparison to previous surveys. Detailed topographic control elevation information (2 foot intervals) of the shoreline was obtained in 2006 as part of the relicensing efforts.
- c) **Methods of Monitoring Downstream of Leesville Dam:** Photographic documentation of areas between Leesville Dam and Altavista will be collected for comparison to the previous year's photos. GPS data will be collected to ensure that the same sites are monitored each year.

d) Locations to be Monitored:

Reservoirs: The Smith Mountain Relicensing Erosion Study (August 2007) found that areas of significant erosion tended to occur primarily in places facing a long fetch, particularly from westerly winds (Kleinschmit and Baird, 2007a). During relicensing, COSMOS modeling was performed at three locations on Smith Mountain and one location on Leesville Lake. These sites were selected to be representative of wide-ranging shoreline characteristics in the study areas and in areas determined to have high wind wave potential. They also represent areas of varying scarp height and boating traffic.

These same sites will continue to be monitored every five years and the observed profiles will be compared to the observed profiles from the 2007 relicensing study. Data at additional sites will also be collected and profiles generated for comparison. The sites to be monitored on the reservoirs include the following:

Smith Mountain: COSMOS Location S1
Smith Mountain: COSMOS Location S3
Smith Mountain: COSMOS Location S4
Smith Mountain: Location S5 (Birds Island)
Smith Mountain: Location S6 (Middle Island)
Leesville: COSMOS Location L1
Leesville: Wave Location L1

These sites represent areas of varying conditions. Maps showing these locations and photographs of the previously monitored sites from the 2007 study report are located in Appendix A. Also in Appendix A are the original profiles that were generating at Sites S1, S3, S4 and L1 and the Wind-Wave Height mapping for Smith Mountain and Leesville.

Downstream: Ten sites between Leesville Dam and Altavista as shown on the map in Appendix B will be monitored to document bank conditions. These are the same ten sites that were monitored in the Erosion Study completed as part of the relicensing efforts.

e) Frequency:

The initial survey will be completed within two years following the Commission's approval of the Erosion Monitoring Plan and then every five years afterwards.

f) Comparison to previous data:

Appalachian obtained detailed contour mapping in 2006 as part of the relicensing of the Smith Mountain Project. This contour mapping it at 2

foot intervals up to the 800 foot contour for Smith Mountain Lake and the 620 foot contour for Leesville Lake. Following the initial erosion survey, a profile of the shoreline at each site will be generated and a report will be developed that compares the current profile data to the 2006 data. The report will describe the erosion rates at each of the monitored sites. There will also be an assessment made regarding any project-related effects. Photographs of the shoreline at each monitoring site will be collected at the time of the survey to visually document the sites.

Photographic documentation of the monitoring sites downstream of Leesville dam will be compared to previous photographic documentation. There will be an assessment made regarding any project-related effects.

2. Demonstration Projects for Erosion Control:

Appalachian will be developing two demonstration projects utilizing natural methods for stabilizing eroding shoreline (one project on Leesville and one project on Smith Mountain.) These projects will be coordinated with the Virginia Department of Game and Inland Fisheries (VDGIF) under Appalachian's Habitat Management Plan (HMP). The intent is to utilize natural methods that provide erosion protection and also enhances the shoreline habitat. These sites will be monitored under the HMP to assess the effectiveness of natural methods. Once effective methods are established, they will be considered for other areas as part of the HMP. Details of effective methods will also be shared with others within the lake community.

Consultation with the VDGIF on the demonstration projects will begin within one year of the Commission's approval of the Erosion Monitoring Plan. A proposed plan detailing the demonstration projects will be provided to the Commission for review and approval prior to implementation. The first demonstration project will be implemented within three years. This site is located on Smith Mountain Lake along shoreline controlled by Appalachian in the Bull Run area of the lake. The second demonstration project will be implemented in the following year in order to take advantage of lessons learned at the first project. The location of the second demonstration project will be on Leesville Lake along shoreline adjacent to Appalachian's public picnic area below Smith Mountain dam. A map showing the areas for these two demonstration projects are included in Appendix C. Success of these demonstration projects to control erosion will be measured using methods analogous to and following the schedule for monitoring the unprotected sites listed in 1.d. above.

3. Reporting:

a) Reporting:

A report will be developed and filed with the Commission within six months of completion of the initial survey and after each subsequent 5-year survey. The report will include the survey results, photos and an

assessment of the erosion rates at the monitored sites. It will also contain input as provided from various Technical Review Committees as described in Section 4 below. This report will be provided to the Erosion /Sediment Technical Review Committee (Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation, Tri-County Relicensing Committee (or its successor), Tri-County Lake Administrative Commission, Smith Mountain Lake Associations, Leesville Lake Association, the local Soil and Water Conservation Districts, the counties' Sediment and Erosion Control Departments and Ferrum College), Staunton River Watch and Citizens for the Preservation of the River for review and comments. These stakeholders will be given thirty (30) days to review and comment on the report. Appalachian will then file a report with the Federal Energy Regulatory Commission which will include comments received from the above listed stakeholders and an updated monitoring plan.

b) Report Contents:

The Report will contain the following:

- Locations of the reservoir monitoring sites
- Locations of downstream monitoring sites
- Results of Appalachian's detailed topographic survey of monitoring sites
- Comparisons of survey data to previous survey results for all sites listed in Section 1.b. above.
- An assessment of the impacts of erosion in these areas.
- Identification of any project- related effects.
- Proposed actions to be taken to address project-related effects should they be identified.
- Implementation schedule for any proposed actions.
- Consultation with stakeholders listed in Section 3.a above and other Technical Review Committees as listed in Section 4 below.
- Consultation with VDGIF regarding demonstration projects and details of proposed projects for Commission review and approval.
- Updated monitoring plan with a schedule that identifies the next anticipated survey.

4. Coordination with Other Management Plans and Implementation Schedule:

Appalachian will prepare a draft report detailing the survey results, a comparison to previous survey data, an assessment of impacts of erosion, identification of any project related effects, identification of any proposed actions to be taken to address project-related effects and a proposed implementation schedule. This draft report will be provided to the Aquatic Vegetation Technical Review Committee, Habitat Technical Review Committee, and Recreation Technical Review Committee and Water Quality Technical Review Committee for review and input related to their respected areas. (Details regarding these Technical Review Committees can be found in the individual Management Plans.) These committees will be given 30 days to provide comments. Appalachian will then prepare a second draft report based on input from the various Technical Review Committee and provide that report to the stakeholders identified in Section 3.a. for their review and comment. The stakeholders will be given 30 days to provide comments. Appalachian will then prepare the final report as detailed in Section 3.b. above to the FERC.

The initial erosion survey under the management plan will occur within two years following Commission approval of the Erosion Monitoring Plan under the new license. An assessment will be made after the initial survey to determine the frequency of future monitoring based on the data collected. The report required by the management plan will be filed with the Commission within six (6) months following the survey.

Consultation on the demonstration projects will occur within one year of the Commission's approval of the Erosion Monitoring Plan under the new license. The first demonstration project will be implemented within three years following Commission approval. The second demonstration project will be implemented in the following year. The demonstration projects will be coordinated with the Habitat Technical Review Committee.

Appendix A: Smith Mountain and Leesville Monitoring Locations

Appendix B: Downstream Monitoring Locations

Appendix C: Map of Demonstration Project Areas

Kleinschmidt Associates, Baird Associates (Kleinschmidt, Baird). 2007a. Smith Mountain Project Erosion Study Report. Roanoke, VA. Prepared for Appalachian Power Company. Smith Mountain Project No. 2210.

**Appendix A: Smith Mountain and Leesville Erosion
Monitoring Locations**

Figure 13: COSMOS Detailed Site Models and STWAVE Summary Locations – Smith Mountain Lake

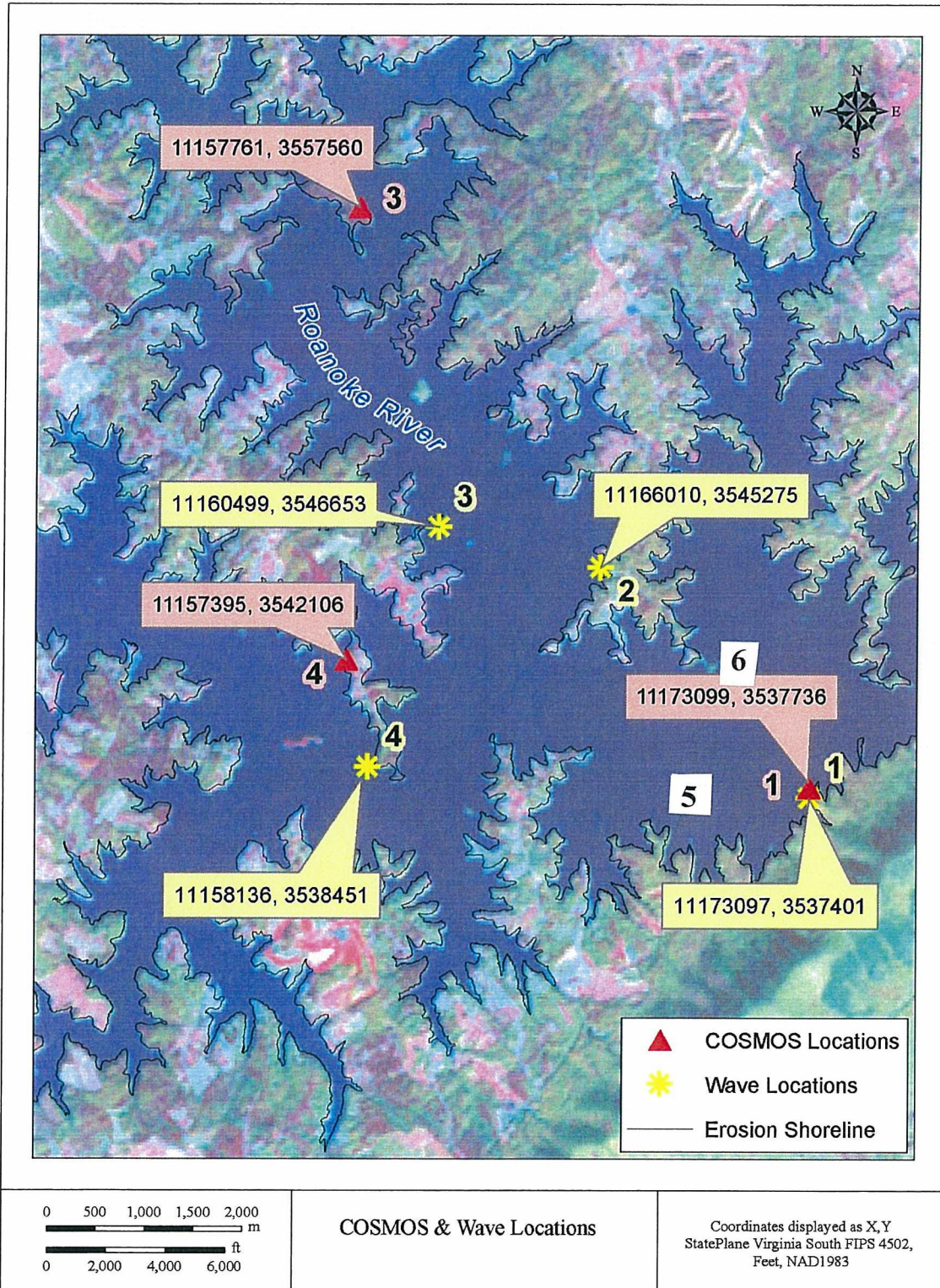


Figure 14: COSMOS Detailed Site Models and STWAVE Summary Locations – Leesville Lake

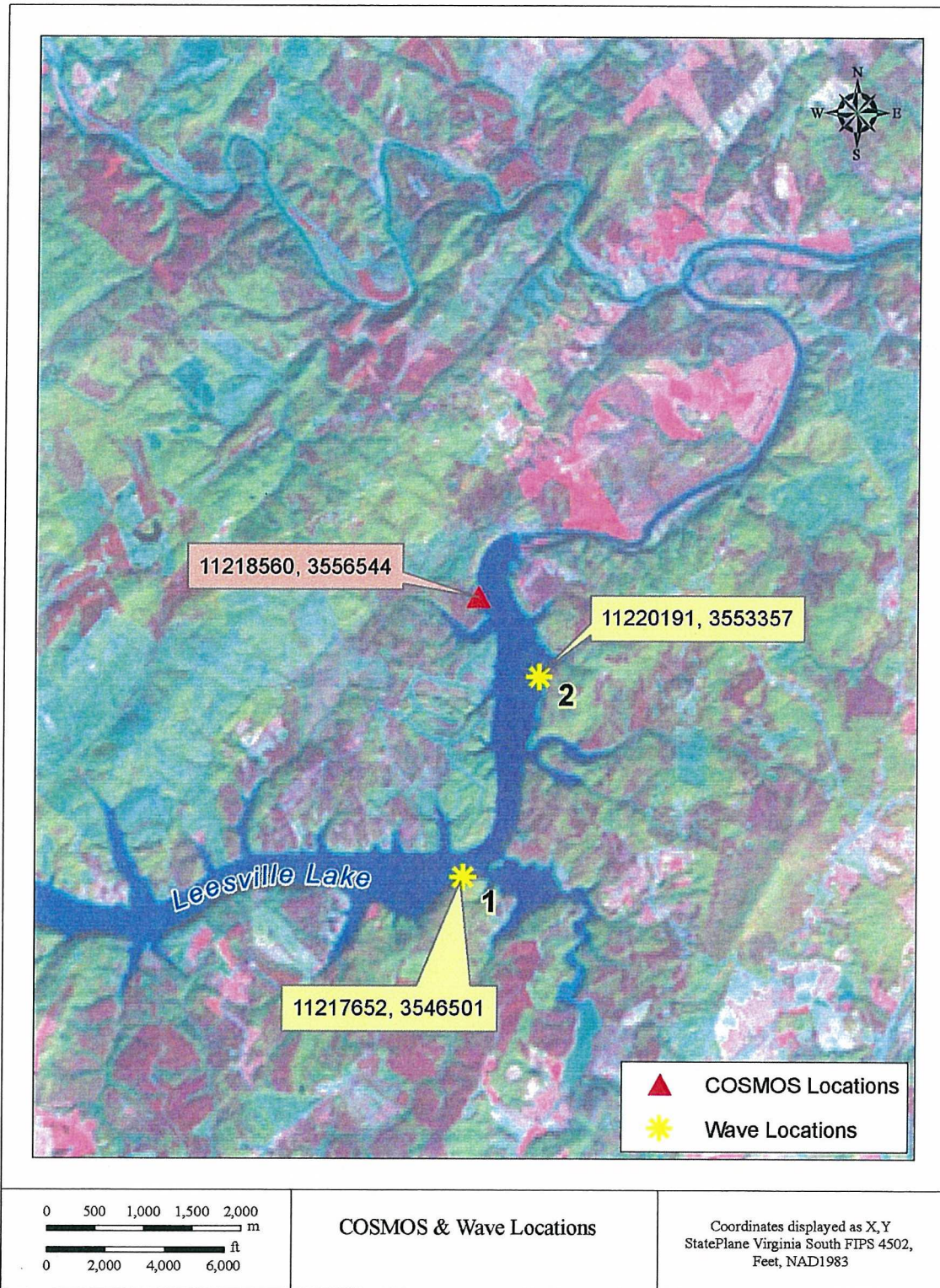


Figure 57: Wind-Wave Height (m) From a 25 m/s WNW Wind on Smith Mountain Lake

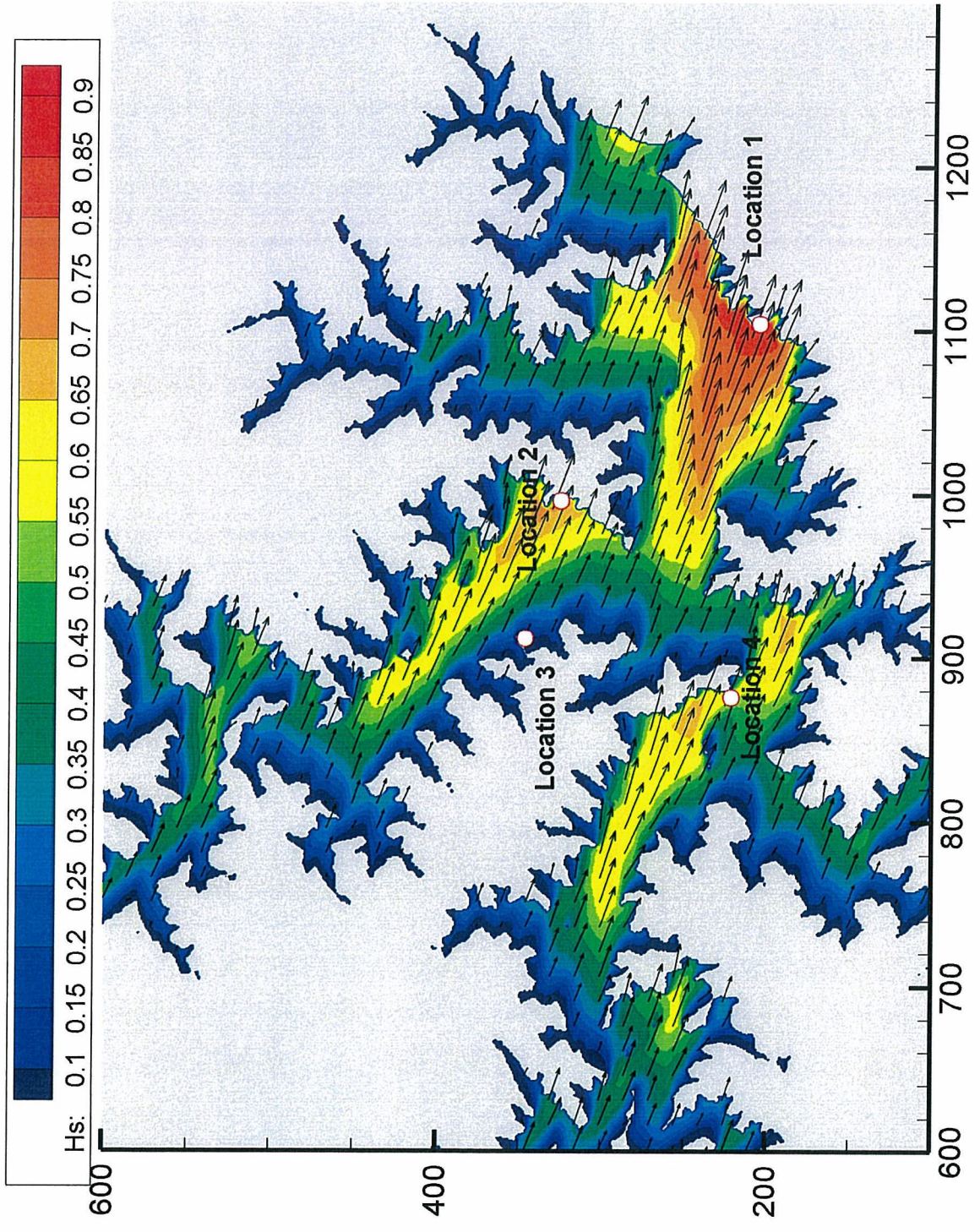


Figure 58: Wind-Wave Height (m) From a 25 m/s West Wind on Leesville Lake

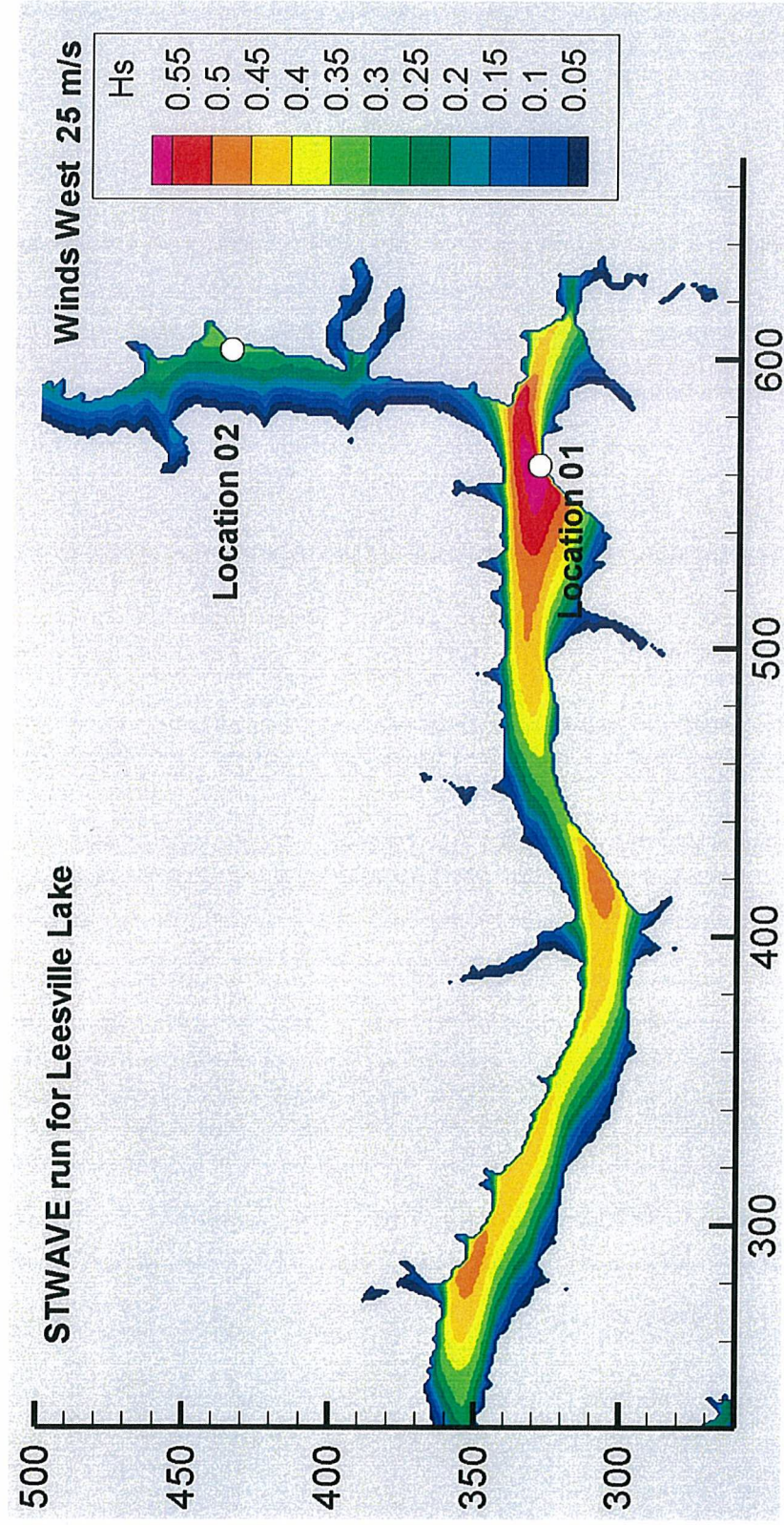


Figure 60: Detailed Site S1



Figure 61: Detailed Site S3



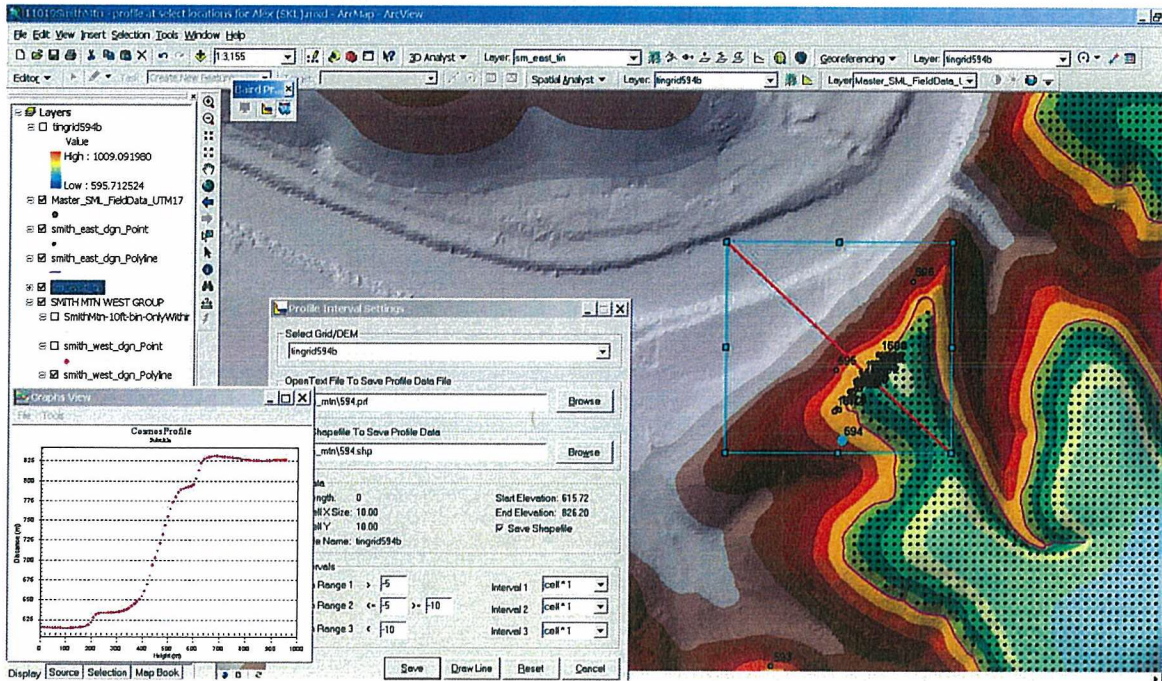
Figure 62: Detailed Site S4



Figure 63: Detailed Site L1



Figure 18: Detailed Location and Profile of Site S1, Smith Mountain Lake



Profile 1
Existing Profile (Bluff Toe Dist 183m)

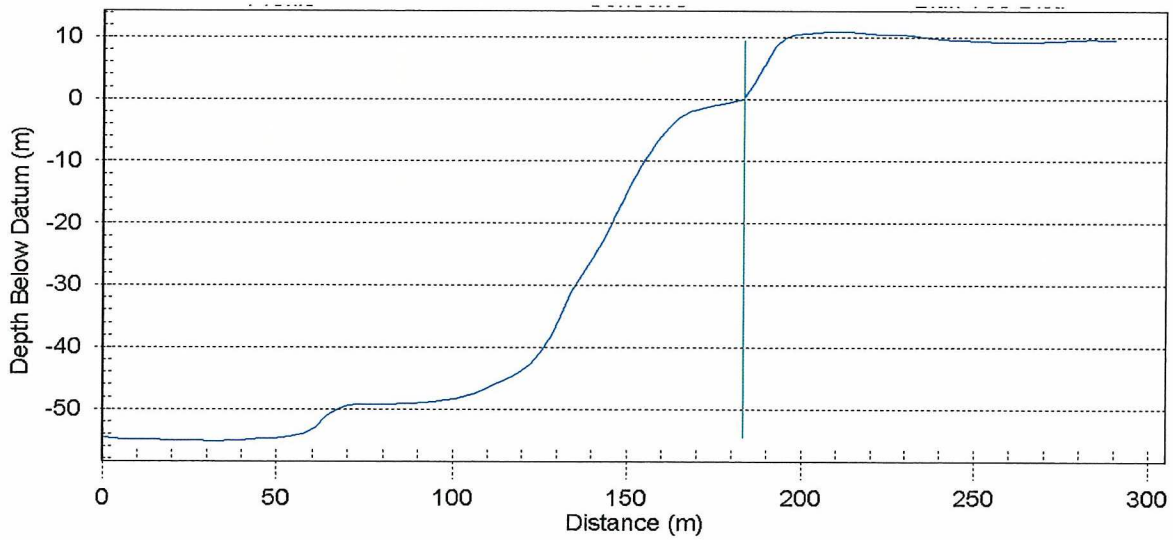
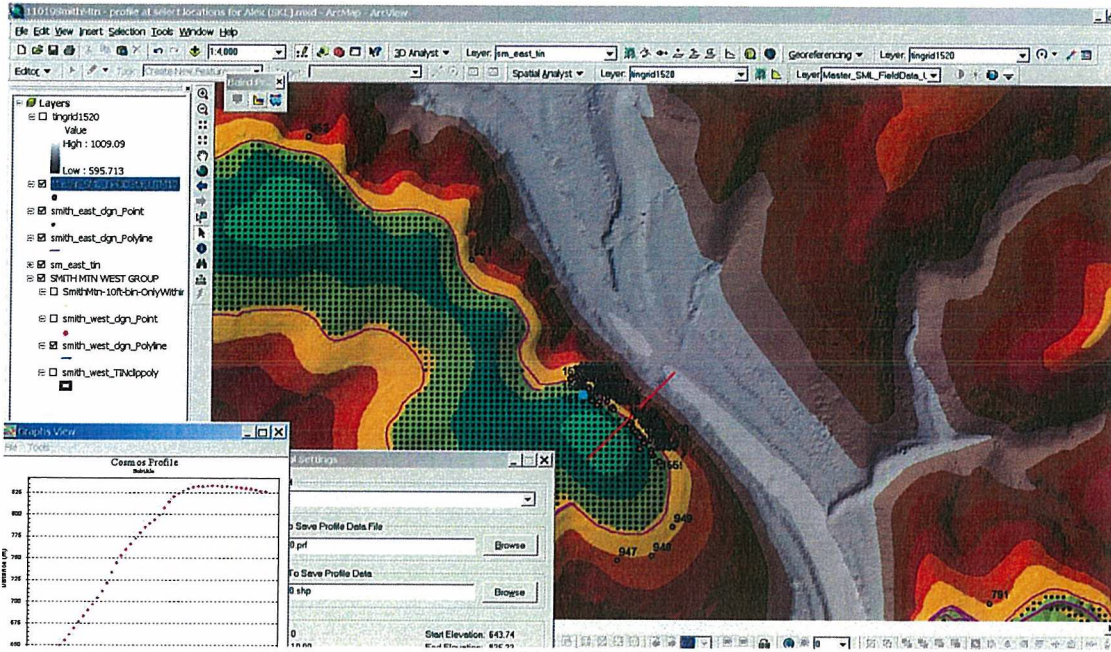


Figure 19: Detailed Location and Profile of Site S3, Smith Mountain Lake



Profile 3
Existing Profile (Bluff Toe Dist 83.25m)

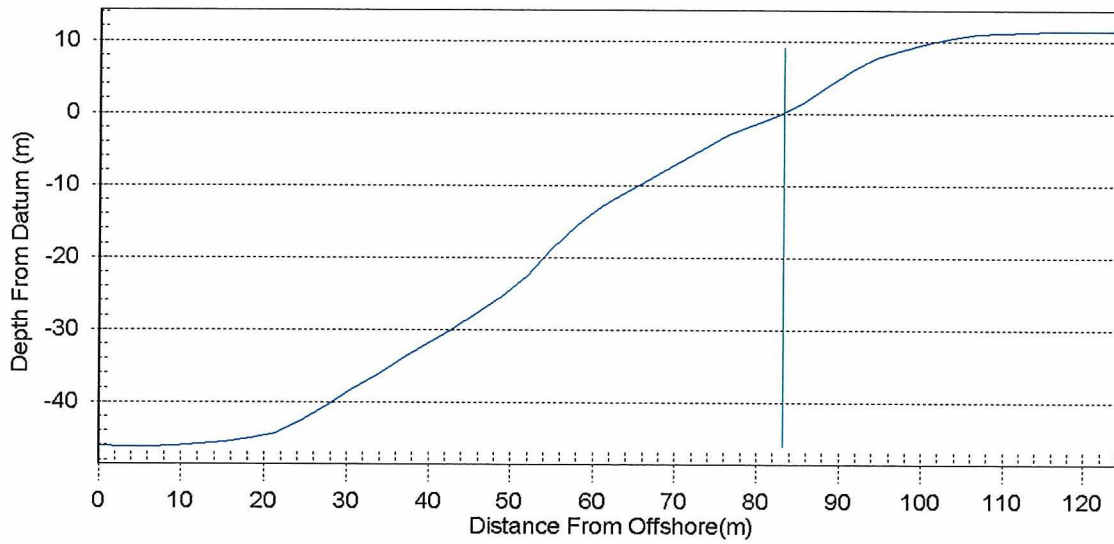
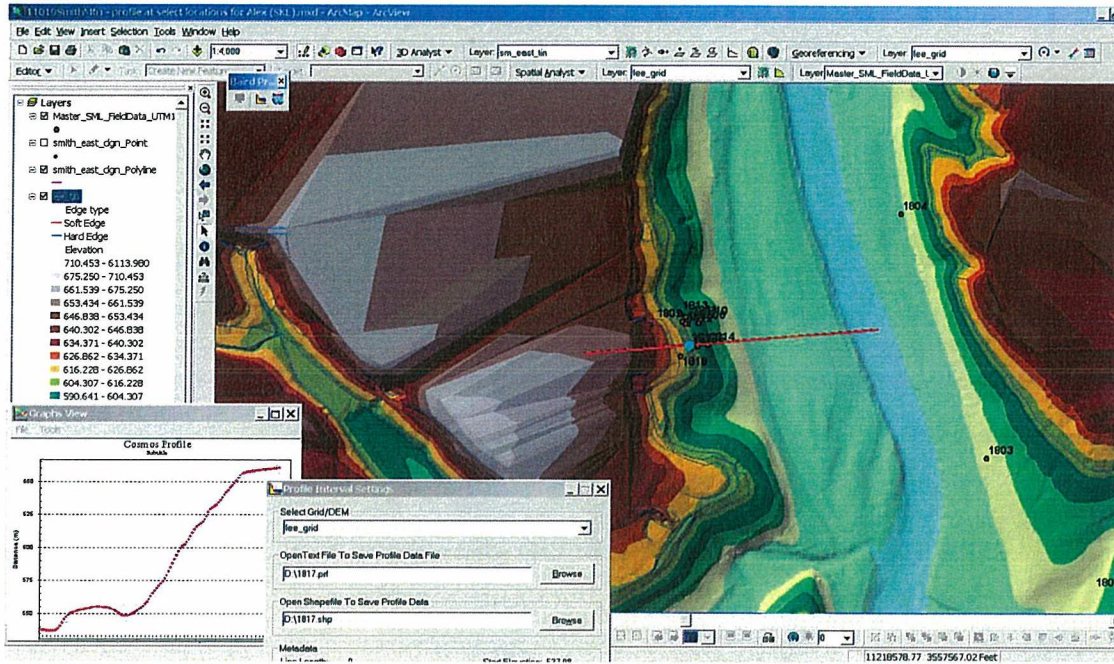
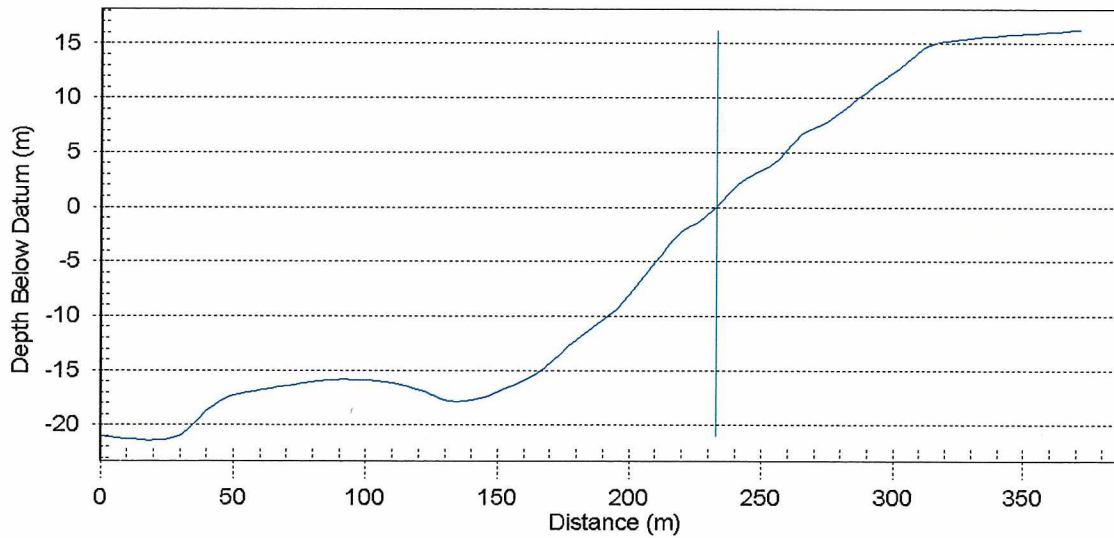


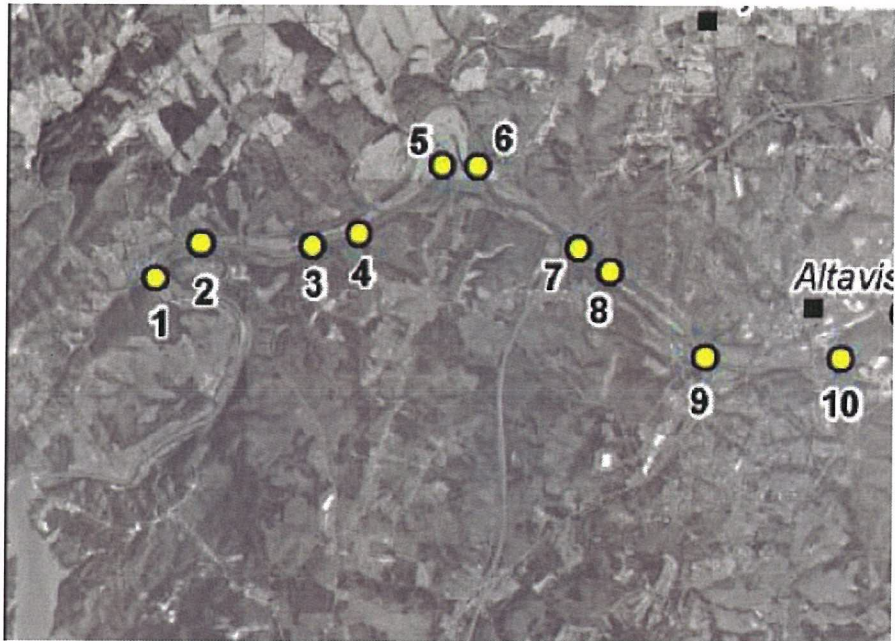
Figure 21: Detailed Location and Profile of Site L1, Leesville Lake



Profile 5
Existing Profile (Bluff Toe Dis 233m)



Appendix B: Downstream Monitoring Locations



Survey Point	Distance Downstream (Miles)	Description
1	3.45	Confluence with Goose Creek. Channel 90 feet wide; 3-5 ft deep. Sand deposition in Goose Creek backwater zone. Gravel bar downstream from bridge. Islands downstream. Sandy, steep banks 20 feet high both sides. Evidence of active erosion on bottom 2 feet. Exposed tree roots. Photos 2242-2245.
2	3.97	Channel 120-150 feet wide; 3 feet deep. Otherwise as point 1. Photos 2246-2247.
3	4.92	As point 2. Photos 2248-2249.
4	5.31	80 feet wide. Bed not visible, beyond probe depth – over 6 feet deep. Large woody debris protecting banks. Banks 20 ft high, steep, sandy, erosion over bottom 1-2 ft. Photos 2250-2251.
5	6.24	100 feet wide and 3 feet deep. Riffle downstream. Low sinuosity; moderate velocity and sediment load. Large woody debris. Overgrazed section – bank erosion by poaching (action of cattle) on both banks. Banks steep, sandy, sparse vegetation. Photo 2252.
6	7.71	Same as point 4. Photo 2253.
7	8.82	Same as point 6. Photos 2254-2255.
8	9.14	Pipe crossing – pipe exposed. Photo 2256.
9	10.21	Channel 150 feet wide and 3 ft deep. Moderate bedrock outcrops. Banks as before – erosion line 12-18 inches. Upstream from Alta vista. Photos 2257-2258.
10	11.38	70 feet wide and 1 ft deep. Riffle downstream from Alta Vista boat ramp. Sandy banks actively eroding on bend next to riffle – 20 feet high – slumping and block failure. Photo 2193.

Appendix C: Map of Demonstration Project Areas

Smoky Mountain Project – Habitat Enhancement Areas

