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A Lake Restoration Plan for Furman Lake

Lake Restoration Task Force

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Submitted by:

The Lake Restoration Task Force

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The Lake Restoration Task Force:

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I. Overview:

The environmental quality of Furman Lake and its environs has been declining for several years. Excessive nutrients enter the lake from surface runoff, stormwater discharge, and denuded feeder creeks, stimulating the growth of unsightly algae. Waterfowl populations also exceed sustainable levels, and their waste adds nutrients and bacteria to the lake. The surrounding lawns are strewn with waterfowl feces, and offensive odors foul the air on hot summer days. In this proposal, we present a series of recommendations that should, if completed, correct these problems and improve the environmental quality of the lake and surrounding landscape.

Two major themes are emphasized throughout this proposal. The first theme is the *environmental context* of the lake. It is critically important to realize that the lake system does not end at the shoreline. Rather, the lake is the *lowest point* in a local watershed, collecting water from the North Village Dorm Complex, Lakeside Housing, the Dining Hall and Student Center, and the associated parking lots, lawns, and creeks. Restoring the environmental quality of the lake and maintaining those improvements over time will require that we address issues throughout this entire watershed in order to reduce the amount and rate of water, nutrient, and sediment inputs into the lake.

The second theme is *pedagogy*. Restoration will provide an extraordinary opportunity to re-create the lake as a teaching resource. Signage, trail guides, and teaching aids can describe the plants, animals, and processes important to the lake environment. In addition, newly constructed filtration wetlands, rain gardens, and nature walks all provide teaching opportunities consistent with Furman's educational mission and environmental commitment.

In this way, the lake restoration project will not only improve the environmental health of the lake, but it will improve the environmental quality of the entire watershed. In addition, the lake can also be an important learning resource and a more valuable asset for the Furman and greater Greenville communities.

To achieve these goals, we recommend the construction of a master plan for the restoration effort. The lake is a very important element of the university, and the restoration plan must improve environmental quality while also complementing the aesthetics of the university. We recommend a landscape design firm that we believe has the appropriate skills to create a master plan that meets the environmental, educational, and aesthetic requirements of this project.

II. Furman Lake - Current Status and How We Got Here:

Furman Lake is a 28 acre artificial impoundment, constructed in 1953-4 by damming a tributary of the Reedy River below the confluence of two small streams. With its Bell Tower and surrounding apron of manicured lawns and ornamental trees, Furman Lake is now the signature visual element of Furman University's beautiful campus. The lake has always been heavily used by the Furman and Greenville communities for walking, running, bicycling, and relaxing. In the past, the lake was also used for swimming and light boating (canoes, kayaks, and a pontoon boat), but water quality no longer meets EPA standards for recreational waters.

Furman Lake currently supports excessive populations of macroalgae and coliform bacteria. Coliforms can exceed 50x the EPA limit for recreational waters[1]. There are several factors that probably contribute to these problems:

1. Nutrient loading from surface runoff. It is well known that unimpeded surface runoff can significantly increase nutrient loading in lakes and streams.[2,3] Until very recently, the entire lakeshore has been mown to the water line, and the banks of tributary streams were mown or sprayed to remove stream-side vegetation. Water from precipitation or sprinklers carries nutrients from mown, decaying vegetation, fertilizers, and animal waste directly into the lake and tributary streams. Also, the conversion of forest to lawns during the development of the Amphitheatre and the North Village Dorm Complex, and the denuding of the North Village stream bank, probably caused a dramatic increase in nutrient and sediment loading in that stream and the lake.

2. Direct storm water discharge. It is also well known that storm water collected from roads, parking lots, lawns, and rooftops contributes nutrients and sediments to lakes and streams.[4,5] All of the parking areas and roadways in the lake's watershed have storm drains that empty directly into the lake or the two tributary streams. There are also storm drains in the lawns that surround the lake, and these empty directly into the lake, as well. These drains have been constructed in part because using the lake as a stormwater retention facility has helped Furman earn LEED points for new building construction. Retaining stormwater on site is certainly an ecologically appropriate behavior. However, transferring it directly to the lake and stream has probably had a dramatic negative effect on these habitats. Storm drains allow water to bypass the normally slow transit through the soil to the water table. Instead, water collected over huge areas is rapidly transferred through drainpipes or channels. This huge volume of water, traveling

quickly under high pressure, erodes the lakeshore or stream bank at the point of entry, and contributes nutrients and sediments to the lake and streams. Again, the stream from North Village provides an example. Approximately 50 yards north of the bridge by the Asian Garden, a large drainpipe emerges from the hillside and deposits stormwater from the A-C parking lot and rooftops directly into the stream. The stream bank is badly eroded. Fifty yards south, the retention pools on either side of the bridge are full of sediment; in fact, the sediment emerges above the water. When this stream is flooded and running fast, it transports that sediment and associated nutrients to the lake.

3. An overpopulation of waterfowl. Large populations of waterfowl can contribute to the nutrient and bacterial loading of lakes.[6,7] Furman lake is home to a large population of resident Canada Geese and domestic ducks. They are fed liberally by an adoring public, but they foul the water and lawns with their feces. On 3 July 2006, there were 362 waterfowl on 28-acre Furman Lake[8]; six times the appropriate density for a lake this size.

4. High water temperatures. High water temperatures stimulate algal and bacterial growth.[9] At Furman Lake, the lack of vegetation along the lakeshore probably contributes to unnecessarily high water temperatures, especially because the lake is very shallow, near the shoreline. Another potential source of heat loading is the stone retention wall that surrounds approximately 50% of the lake. Heat absorbed in the afternoon sun may transfer to the lake.

5. Groundwater discharge that may be rich in nitrogen and phosphorus. Water also enters the lake through the water table, percolating through the soil from the surrounding watershed. This transfer may occur from the immediate surroundings or from farther up in the watershed, even beyond Furman's property. The North Village stream originates in the wooded patch between Old Buncombe Rd and Poinsett Highway, so there's potential for any development in that area, such as the planned retirement community, to influence the lake. Of course, these changes in the landscape may also be contributing nutrients and sediments to the streams in surface runoff.

All of these factors are probably contributing to the eutrophication of Furman Lake. Unfortunately, many of the past decisions that Furman has made in the lake watershed have maximized the transport of sediment and nutrients to the lake. However, this also means that we might stop additional transport and improve the lake by simply reversing or changing what we have done.

III. Where We Go - A New Vision for the Furman Lake Watershed:

A. Introduction:

Furman Lake is a simplified human-made system. Essentially, it is a pool of water surrounded by a static wall and structurally simple, low diversity lawns. Inputs to the lake are best thought of as pipes (most actually ARE pipes), rather than structurally and biologically complex streams. It should be no surprise that this simple, human-made system does not function like a complex natural system. It doesn't filter the water well, it doesn't buffer flooding dramatically, and it doesn't provide habitat for much wildlife besides the human-fed waterfowl. As a consequence of its simplicity, it does not *function* correctly and it is not very *interesting*…. but it is *pretty* (from a distance).

We envision a very different Furman Lake. We envision a lake that *acts* more like a natural system because it *is* more like a natural system. In other words, we envision a Furman Lake that has high biological diversity, high structural complexity, and high physical complexity. We envision a Furman Lake that is integrated with the surrounding watershed, rather than simply acting as a collection basin for the watershed. We envision a lake that improves water quality before sending it on to the Reedy River. And we envision a lake that, because of its complexity, is *functional*, *interesting*, and *beautiful*. Further, we suggest that such a lake will have the added value of being an extraordinary teaching resource for Furman and the Greenville community.

The primary goal of the Lake Restoration Plan is to improve the environmental quality of Furman Lake, and reduce or eliminate the problems of excessive algae and bacteria. To do this effectively, we must think in the appropriate *environmental context*, reducing nutrient and sediment transport from throughout the watershed, and increasing the ability of the lake community to absorb and use what it receives. We present these recommendations first. Then, we present a list of other design elements that would allow the lake to be used in new ways, and would recognize the important place and potential of the lake to Furman University. These are design elements that we recommend for inclusion in a lake master plan. Finally, we describe how the lake would be used as a living, learning, and teaching facility.

B. Improving the Environmental Integrity of the Lake Watershed

To restore a more natural level of ecosystem function, we recommend three major initiatives. First, appropriate vegetation must be planted in the lake and on the surrounding landscape to absorb nutrients added to the lake. Second, the inputs to the lake (streams and storm drains) must be naturalized so that water, nutrients, and sediments enter the lake in a natural, regulated manner. Lastly, waterfowl populations must be reduced to decrease nutrient and bacteria concentrations in the lake. Here is a summary of the direct and indirect benefits that these initiatives will provide:

1. Plant vegetation in the lake and on the surrounding border

a. Create wetlands where the streams enter the lake
- Absorb nutrients and sediments entering the lake from the streams
- Create a beautiful array of flowering aquatic plants
- Create a habitat for herons and egrets
- Create a nursery area for juvenile fish

b. Revegetate the lake border within the perimeter of the jogging trail
- Absorb nutrients in runoff
- Reduce shoreline erosion and sediment transport to water
- Cool the shallows and reduce the rate of algal and bacterial growth
- Discourage geese and ducks
- Provide habitat for a wide array of songbirds
- Plantings that provide good seed sources (e.g. sunflowers and thistles) will increase the abundance and diversity of seed-eating birds.
- Create a more colorful, beautiful flowering border, emphasizing native species and minimizing the use of potentially invasive exotic plants
- Create a habitat for butterflies
- Discourage children from entering (or falling into) the lake
- Focus access on particularly appropriate viewpoints

2. Naturalize lake inputs (streams and storm drain runoff)

a. Revegetate the stream banks
- Reduce surface runoff and siltation of the stream and lake
- Shade the water and reduce water temperature
- Stabilize stream banks to prevent undercutting
- Increase nutrient absorption
- Riparian zones have a dramatic positive effect on ecosystem health and resident populations of fish and invertebrates.

b. Create filtration wetlands where the large storm drains occur (such as the site on the "North Village" stream.)
   - Absorb nutrients entering the lake from the streams
   - Create a beautiful array of flowering aquatic plants
   - Create a habitat for herons and egrets
   - Slow the water from the storm drain and reduce sediment transport to the lake

c. Create smaller "rain gardens" between parking lots and the lake
   - Smaller "rain gardens" can be used where ever runoff needs to be collected and added slowly to the lake.
   - Absorb nutrients entering the lake from the streams
   - Create a beautiful array of flowering aquatic plants
   - Create a habitat for a wide array of herons and egrets
   - Slow the water from the storm drain and reduce sediment transport to the lake

3. Reduce waterfowl populations (see approved Waterfowl Management Plan)
   - Reduce feces in surrounding lawns
   - Reduce nutrient loading in the lake
   - Reduce bacteria concentrations in the lake
   - Potentially increase waterfowl diversity

4. Possible additional steps
   - Some dredging may be necessary, including to cut channels in the wetland areas to maximize water flow
   - Aerators might be necessary to reduce algal populations

C. Additional Design Elements to Create a Multi-Purpose Facility:

The changes that are proposed above would dramatically change the look of Furman Lake. Parts of the bays on either side of the Bell Tower would be wetlands with aquatic plants. The border of the lake would be vegetated with thick rushes in some places, and flowering plants in others. There would be fields of wildflowers where the distance between the jogging trail and lake permit. These changes would limit human access to the lake. This is beneficial on one hand, because it would reduce erosion and also reduce feeding of the waterfowl. However, because people are naturally drawn to water, it would be nice to provide other design elements that would allow people to access the water in limited and appropriate ways. Likewise, the presence of more varied wildlife (butterflies, songbirds, and perhaps a wider variety of less abundant migratory ducks) might necessitate the construction of different types of viewing opportunities. In addition, many of these design elements would provide excellent naming opportunities for donors. Here are some design elements that we think might be exciting and useful:

***1. Sites for picnickers*:** The picnic shelter and its environs could be upgraded. In addition, a couple of picnic tables could be positioned around the lake at particular viewpoints, or at a focal picnic area (perhaps near the rest rooms).

2. An observation deck extending into the lake, and boardwalks across or near the wetlands: These will provide excellent viewing opportunities for watching wading birds, songbirds, butterflies, and dragonflies. It could also provide an ideal site for photographing the Bell Tower. A permanent blind for birdwatching could also be constructed.

3. A jogging/walking/biking trail: The existing jogging trail should be kept, but the paved surface could be replaced by a graded trail, or a pavement with a porous surface to reduce erosion from runoff.

4. A nature trail: A nature trail along the back of the lake might meander through the wildflowers, cross the wetlands on boardwalks, and connect to the observation deck. The nature trail could also have a tree map for the trees already identified in the arboretum. In addition, there could be observation stations positioned around the lake, with the permanent 'binocular stations'. Bat boxes, bluebird boxes, birdfeeders, and hummingbird feeders would attract wildlife.

5. Educational signage: This can point out particular species, describe ecological principles (succession, nutrient cycling, water cycle, etc.), and also describe how particular elements of the lake restoration project are designed to achieve particular objectives.

6. Furman's "Rails to Trails" Station: A tramline is likely to link Travelers Rest to Greenville in the future, using the railroad line that runs right along the western boundary of Furman Lake. There will certainly be a "stop" or "station" on the FU campus. If this is near the lake, we will need to consider how to manage foot and bike traffic and minimize impact on the lake itself. The old "doughboy" location might be good for several reasons. First, there is easy road access to the rail line; passengers could be dropped in the small traffic circle that surrounded the doughboy, and the parking by the university center is close by. Second, it is just past the lake itself; in a sense it is just "downstream" from the lake so activity would be less likely to affect the lake directly. However, after disembarking from the tram, visitors would have the classic view up the entire lake, with Paris Mountain rising behind the Bell Tower.

11. A renovated parking area near the UC: This parking area is very large, and ugly spillways enter directly into the lake. A watershed master plan should include suggestions for

modifying this parking lot. Lanes could easily be narrowed without reducing the number of parking stalls. Water should not run directly off the parking lot and into the lake. The surface could be replaced with a pervious surface to allow percolation. And, strips of vegetation could be positioned in the parking area, and runoff could flow to these islands. Or, a rain garden could be developed along the strip of land between the lot and the lake. If Furman pays a stormwater fee, this might be reduced if we mitigate runoff through wetlands or eliminate it all together.

12. A microturbine in the lake outflow: There are very small hydroelectric generators that can generate power from a head as shallow as five feet. The head on the lake is approximately 30 feet, and it is a very constant flow. The turbine could be used to power footlights along the jogging trail, or streetlights to the tram station.

13. Ropes course: We will need to address how the ropes course fits in; Kim Keefer is the person to talk to.

14. Canoe/kayak rental: When water quality improves, it might be appropriate to allow limited access to the lake surface. A canoe/kayak rental could be orchestrated from facilities services or the bookstore.

15. Fishing: When water quality improves, we could also allow fishing on the lake. A limited number of day permits could be issued, and fishing could be limited to particular areas to limit trash and trampling.

16. Southern Living Home / Sustainability Center: Located next to the lake, the environmental sustainability center would be a natural place for a lake nature center. There could be a pictorial history of the restoration project, and educational information about what decisions were made and why.

D. The Lake As Pedagogy:

The restoration of Furman Lake will provide extraordinary educational opportunities in ecology, botany, zoology, natural resource management, ornithology, entomology, microbiology, hydrology, biogeochemistry, sediment transport and deposition, GIS, and environmental science. First, students and faculty can become involved in implementing parts of the plan. Second, students and faculty will be involved in measuring the effects that the restoration efforts have on the water quality and health of the environment. Faculty from the Biology and Earth and Environmental Sciences departments have already submitted a grant application to the

Associated Colleges of the South to purchase equipment to conduct a baseline survey of present lake conditions.

The naturalized lake will become a destination for field trips by local schools and nature groups. The constructed wetlands would be particularly interesting to some in our community. The nature trail would have an accompanying pamphlet, highlighting particular sites at stations along the way. In addition, a nature guide could be written that would be more complete than a pamphlet, and might form the foundation for curricular ideas for teachers. It could also suggest some projects or comparisons that could be performed at the lake.

The lake will become a living example of restoration ecology. Businesses, colleges, or municipalities with similar shallow impoundments will be interested in visiting Furman and studying the progress we have made. This restoration will become a model for other universities interested in environmental sustainability.

IV. How We Get There - Constructing a Master Plan:

At first glance, it may seem that these changes are fairly simple to achieve. We stop mowing the grass at lakeside and natural vegetation grows. We stop spraying the stream banks and they revegetate. We relocate the geese and the bacteria concentrations drop. Surely, this is a project that can be handled internally, isn't it?

Unfortunately, it is not. Landscape restoration is a highly specific discipline; it requires a knowledge of botany, hydrology, and landscape design. Although we have all of these independent skills at Furman, we do not have expertise in understanding how these disciplines interact and can be applied to specific situations. We do not have the skill set or experience to know what plants to introduce in a given place to achieve a particular environmental objective. In keeping with our liberal-arts tradition, our faculty are not experts in applied fields such as horticulture and landscape design. Conversely, the horticulturists and landscape designers from Furman's Facilities Service department are not experts in wetlands restoration.

The lake is the visual heart of the university, and the importance of making the right decisions cannot be overemphasized. The restoration must be done efficiently, and with the foresight that only experience provides. The restoration plan must also complement the aesthetic sensitivity of the greater Furman landscape. And, the restoration plan may extend across a number of years. For these reasons, we recommend that the university contract with a landscape

design firm to create a "master plan" for the lake. This master plan would identify key design elements, locate them in space in a manner that maximizes their utility and visual appeal, and construct a timeline that maximizes the chances for success. The central importance of the lake demands that this restoration be done correctly, and with forethought.

We believe that EarthDesigns brings a skill set that is ideally suited to this project. They have experience in wetlands restoration. Their president, Rick Huffman, is the president of the Upstate Chapter of the South Carolina Native Plant Society and has the botanical expertise with native plants that this project will require. In addition, Rick worked at Furman in the 1980's; so he understands the Furman aesthetic very well.

In conclusion, we believe that a major lake restoration plan is necessary to improve the environmental quality of the lake. By revegetating the lake and its surrounding landscape, by managing inputs to the lake more effectively, and by reduce the waterfowl populations, we believe that the quality of the lake will improve. However, this restoration also provides an ideal opportunity to rethink how the university and community use this resource. We believe that with some additional design elements included, the lake can become a unique and valuable educational resource for the Furman and Greenville communities. We also believe that, given the importance of the lake to the university, this restoration should be planned by a professional landscape design firm with the necessary expertise in wetlands restoration, and preferably a working familiarity with Furman's landscaping aesthetic. Based on these criteria, we recommend EarthDesign. We have attached their proposal to create a "master plan" for Furman Lake.

V. Literature Cited:

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Brief Project Description: Lake Landscape Restoration

Located in northern Greenville County, South Carolina, the Furman University Campus is home to one of the nations leading Liberal Arts Universities. With a beautiful lake, mountain vistas, and developed amenities such as rose gardens, nature trails, and expansive landscaping, the Campus of Furman University provides an inspiring learning environment for students, and a serene setting for visitors and the community. The 28-Acre Furman Lake is the heart of the campus providing a picturesque amenity inviting students, visitors and community folks to stroll its shores. However, the seemingly harmonious relationship between people, wildlife, land and water is not as ecologically sound as it seems upon casual observance. With extensive habitation from a variety of waterfowl, mowed and fertilized lawns to the waters edge and upland runoff from on and off site sources, the ecological health and balance of the lake is in trouble. The significant compounding factor is the lack of vegetative buffers that allow fecal matter, sedimentation, and nitrates from chemical fertilizers to enter the water virtually unchecked. While everyone enjoys the managed access to the water's edge, these expansive practices have gradually deteriorated the ecological health of the lake and pose potential health risks to the public. Plants such as indigenous marginal aquatics, sedges and upland grasses can filter and reduce the amount of sediments and pollutants entering the water while absorbing and processing fecal matter, nitrates and algae present in the marginal areas of the lake. The optimum height (18-24") of these plants and plantings should also help reduce or isolate the presence of waterfowl around the lake and change the wildlife value toward songbirds and butterflies. The upland feeder creeks also suffer visually and ecologically from a lack of indigenous plant community based vegetation. In addition to improving the health of the lake and creeks, these ecological plant communities can provide educational and intrinsic values while reducing maintenance over time. The University initiative to promote environmental stewardship and responsibility begins here by setting an example of awareness and sustainability.

The Earth Design team is honored to present our special skills into this project helping to bring the vision and philosophy of environmental stewardship to reality for Furman University. Earth Design's basic scope of services at this time is to perform master planning, landscape restoration and ecological design services for the lake shoreline, upland buffers, and creeks around the lake. These are to include but are not limited to activity structures, nature trails, seating/gathering places, bioengineering design,

educational signage, and native plantings based on plant communities. Earth Design will work closely with Landscape Planning Director Randy Eggenspiller and campus committees to achieve design concepts that meet the functional and aesthetic goals of Furman University.

The first task of the project is to conduct a complete and comprehensive inventory and analysis of the existing site features of the property in order to identify problem areas and areas that are significant aesthetically, socially, and ecologically. Through this process, the unique site constraints and design program opportunities will become apparent. This knowledge when used as a design development tool will ensure that design programs and plans for the lake will progress in the most logical, aesthetic, and environmentally sensitive manner. Furman University representatives shall collect inventories of existing relative elements and provide accurate site maps in AutoCad format to Earth Design. Representatives of Furman University shall also provide additional information or data relevant to the success of the project to Earth Design. Earth Design will analyze data and site maps to determine site constraints and opportunities that shall effect design decisions. As a result of these combined efforts the design program will become apparent and designs can proceed logically.

The second task is to develop a design program that is realistic and meets the goals and objectives of Furman University. After the design program is set, then preliminary designs will be developed such that all parties are part of the process ensuring that the designs proceed logically and meet desired goals. The preliminary plans once agreed upon will be developed into a comprehensive rendered Master Plan based on the design program providing a workable road map illustrating the aesthetic and ecological goals of Furman University. The Master Plan and design process shall acknowledge and respect the inherent opportunities and constraints, and propose a landscape development that restores the ecology of the lake and watershed while preserving and enhancing the serene beauty of the Furman University Lake. In addition to the Master Plan document and illustrative sketches, a developed power point presentation can assist to convey design intent to the public.

The third task shall be to produce working planting plans and general construction drawings and documents from which phased implementation can be successfully accomplished. Earth Design shall develop these plans in concert with the Furman University representatives and staff to determine the most logical and cost effective approach to reaching the desired objectives.

Proposed Services

PHASE 1

Task 1a Project Kick –Off Meeting/Program Development

The project will begin with a conference between Earth Design key personnel, and representative's of Furman University. During the meeting the following agenda will be undertaken:

- Review of Scope of Work and discussion of project approach and project deliverables
- Review and agree on a draft project schedule
- Discuss issues and objectives for Furman University as related to natural features, current and future conditions
- Review and transmittal of existing site data/information currently available from Furman University.
- Discuss the anticipated recreational program for Furman University based on four possible recreational types- active, passive, educational, and social.
- Discuss schedule of payment or contract issues

*Relevant materials available from Furman University should be sent to Earth Design as soon as possible after the conclusion of the Kick-Off meeting and/or acceptance of this proposal.

Task 1b Acquisition of Support Data

- Earth Design will acquire the most relevant and current support data available for the Furman University lake area. The primary resource for this data will be Furman University. From this data and site maps, Earth Design will develop the site base map(s), which will be used in the development of the preliminary design's and Master plan and the final working documents of the project.

PHASE 2

Task 2a Conduct Site Analysis

Earth Design will receive resource data, inventories and maps of existing conditions around the Lake Area and watershed from representatives of Furman University. Earth Design will review and analyze the information for landscape needs and opportunities, potential routes and /or sites suitable for new foot trails, educational nodes, observation decks and boardwalks. Earth Design will analyze and evaluate existing areas and features around Furman's lake under the following categories as they relate to the landscape restoration and development:

- Views, Visual Relationships and Landscape Patterns
- Topography (grading drainage, and slope issues)
- Vegetation (trees, shrubs, plant communities)
- Circulation (drives, paths, and their relation to potential future access routes)
- Structures (existing/proposed, walls, boardwalks, foundations)
- Water Features (natural drainage courses, marsh access, recreation/educational opportunities, aquatic & stream ecosystems)

PHASE 3

Task 3a Compile Site Data/Produce Basemaps

Upon Completion of ***PHASE 1*** and ***PHASE 2*** of the project, Earth Design will compile and normalize the data collected in these two phases. The compilation of this datum will provide the basis for producing site base maps from which Earth Design will develop Preliminary Designs, a rendered Master Plan and Final Landscape Restoration Plans. Earth Design will organize this data into separate layers which when mapped separately, or when combined with other layers can be used to illustrate site characteristics or features more clearly. All Site Base maps will be drawn to scale and will clearly illustrate the existing site conditions.

Task 3b Preliminary Design Development

Earth Design will begin Preliminary Design of the site following completion of ***PHASE 1***, ***PHASE 2***, and ***Task 3a*** of the project. This preliminary design will incorporate the findings of these phases as well as comments received during any correspondence or meetings with Furman University representatives. Earth Design may use rough sketches, bubble diagrams, or written correspondence to convey ideas to Furman University representatives regarding the intent of the design or for comment, and/or approval. Once a consensus is achieved on the basic direction of the design, Earth Design will produce the Preliminary Design drawings as either Autocad and/or Arcview drawings. The Preliminary Design drawings are drawings that should be interpreted as working plans, which convey ideas, shapes and the scope of the project, and should not be interpreted as complete drawings. Earth Design will work closely with Furman University representatives during this phase to develop design alternatives that are financially feasible,

functional, and maintain the highest regard for the natural, social, and aesthetic qualities of the Furman University lake area.

Task 3c Presentation of Preliminary Design
The Earth Design project team will present Preliminary Landscape Restoration Plans to representatives of Furman University for discussion and approval. Comments or suggestions conveyed during this meeting will be documented and addressed on the Illustrative Master Plan and Final Landscape Restoration Design Phase of the project. A refined approach to the site design will be the outcome of these meetings.

Task 3d Additional Client Review
If needed, Earth Design will provide additional copies of the Preliminary Landscape Restoration Plan to Furman University representatives for review. During this period representatives may review the drawing(s) for accuracy and intent and will communicate to Earth Design specific areas or elements, which may need further study or design. Earth Design will incorporate these findings and comments into the Illustrative Master Plan and Final Landscape Restoration Plan.

Task 3e Interim Progress Report
At the completion of the Preliminary Design Phase Earth Design will provide Furman University representatives with an Interim Progress report which reflects project status, percent completion of tasks, project scheduling, and identifies any relevant issues or changes to the original contract scope of work. In addition, copies of any correspondence between Furman University or its representatives and Earth Design during this phase of the project will be attached.

PHASE 4

Task 4a Illustrative Master Plan
Earth Design will develop the Illustrative Master Plan based on the cumulative interpretation of all site data, site analysis and inventory, project meetings, client comments, project direction, and current environmental regulations as identified in the previous phases of the project. The Illustrative Master Plan will be drawn to scale and will clearly represent the design purpose and intent. The Earth Design team shall deliver a rendered master plan with (5) sketches and a CD with all documents for additional reproductions. Earth Design can provide additional full-sized or reduced copies of the plan(s) to Furman University representatives as needed. Changes to the completed Final Landscape Restoration Plan will be billed as extra, and hours for any revisions will be negotiated with Furman University representatives before proceeding with any additional work.

Task 4b Presentation of Final Illustrative Master Plan Design
The Earth Design project team will present the Final Illustrative Master Plan on-site to representatives of Furman University. After the presentation, Earth Design will provide Furman University representatives with digital copies of all support data, final presentation board(s), CD's and any documentation associated with the conclusion of the Illustrative Master Plan Phase. Earth Design may also assist with any public presentations as necessary.

Task 4c Progress Report
Earth Design will at the completion of the Illustrative Master Plan Phase provide Furman University representatives with a progress report which reflects project status, percent completion of tasks, project scheduling, and identifies any relevant issues, or changes to the original contract scope of work. In addition, copies of any correspondence between Furman University or its representatives and Earth Design during this phase of the project will be attached as needed**.**

PHASE 5

Task 5a Final Landscape Restoration Design Development
Earth Design shall follow the design directions depicted in the illustrative master plan to develop working landscape restoration plans that shall be detailed as needed to ensure successful implementation. These design development plans shall be area specific and include site amenities and plantings. The site-specific areas maybe part of a phased approach toward implementation

Task 5b Construction Documents
Earth Design will provide general layout, cross sections, planting plans; budgets, and materials list as needed to implement the designed landscape and amenities.

Task 5bc Construction Details of Site Amenities
Earth Design will provide construction drawings and/or specification as needed for various constructed or purchased elements such as Signage, Shelters, Benches, Planters, Lighting, and/or temporary Irrigation on a as need basis.

PHASE 6

Task 6a Construction Observation and Consulting
Earth Design will provide on site layout and construction observation and supervision as needed for successful implementation of landscape and amenities.

In Summary Earth Design will:

Conduct Design Analysis of data and base information provided by Furman University and its representatives. Follow up with on site confirmation of data and take digital photographs.

Create base maps from the University provided site maps and collected data from which to develop Preliminary Designs, Illustrative Master Plans, and Final Design Development Landscape Restoration Plans

Assist in developing the design program for amenities and landscape.

Produce Preliminary Landscape Restoration Design drawing(s) and sketches that clearly illustrate the design intent of Furman University and Earth Design.

Present Preliminary Landscape Restoration Plan and Sketches to Furman University representatives

Address comments and changes for inclusion into the Illustrative Master Plan and Final Design Development Landscape Restoration Plan(s)

Produce rendered illustrative master plans, sketches, CD and power point presentations

Provide presentation boards, copies and compact disk (CD) for future reproduction

Produce detailed plans, budgets, and specifications for implementation of the landscape, amenities and educational components and interpretation.

Provide implementation services as needed such as on site supervision/observation, material acquisition, and installation and educational components. **(To be contracted separately)**

Compensation

Design Fees
Furman University and its representatives agree to pay Earth Design Inc. for design services and anticipated expenses as set forth in the previous section entitled "**Proposed Services**" for the total sum of **$28,650.00**.

Time & Expense Breakdown

Phase 1	5 hours	$100.00/Hour	$ 500.00
Phase 2	5 hours	$100.00/Hour	$ 500.00
Phase 3	120 hours	$100.00/Hour	$12,000.00
Phase 4	80 hours	$100.00/Hour	$8,000.00
Phase 5	40 hours	$100.00/Hour	$4,000.00
Phase 6	20 hours	$100.00/Hour	$2,000.00
GPS			$500.00
Reproductions			$300.00
Project overhead			$850.00
		Total	**$28, 650.00**

Retainer Fee
Earth Design requires a retainer fee of **$7,162.50**, which will be applied to the first invoice.

Progress Payments
Project shall be invoiced according to the following payment schedule:
Retainer Fee 25 %
Upon completion of Phase 3 – 25%
Upon Completion of Phase 4 – 25%
Upon Completion of Phase 5 - 25%

Time of Completion
Earth Design will work diligently and in a reasonable and timely manner to perform services as needed to meet client's timetables. Timetables to be determined at Kick-Off meeting.

Notes/Addendum:
This is an estimate based on an anticipated number of hours and expenses per phase (See Time & Expense Breakdown). Earth Design retains the right to pass along cost over runs as they may occur in each phase. However, Earth Design agrees to notify clients verbally and/or in writing for approval to proceed prior to accruing any overages.
Any significant modifications to the design services as set forth in any section of this contract shall require a written change order signed by Earth Design Inc. and Furman University representatives, and shall become incorporated into, and become part of the contract.
Phase 6 hours will only apply to construction observation for implementation performed by entities other than Earth Design.
Receipt of the retainer fee and authorized signature indicates acceptance of this design contract.

Earth Design Inc. Authorized Signature_____Date_____

Client Authorized Signature_____Date_____