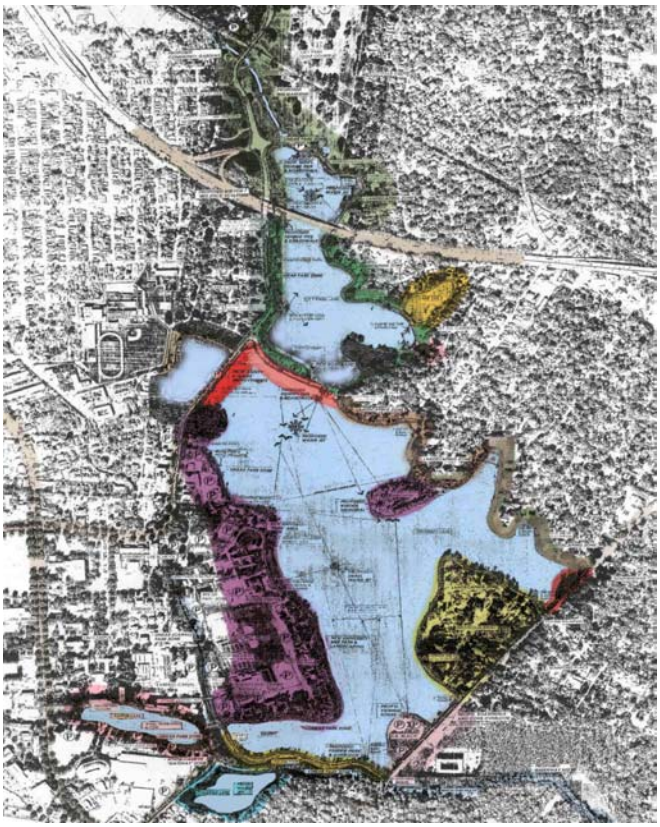
The Lakes District
East Baton Rouge Parish, Louisiana

Preliminary Restoration Report

CAP 206 Eco-system



U.S. Army Corps of Engineers
New Orleans District
6 February 2004

Date: 6 February 2004

Division: Mississippi Valley
District: New Orleans

Section 206 Preliminary Restoration Plan (PRP), Lakes District, Eco-system Restoration, East Baton Rouge Parish, Louisiana

1. Project Introduction:

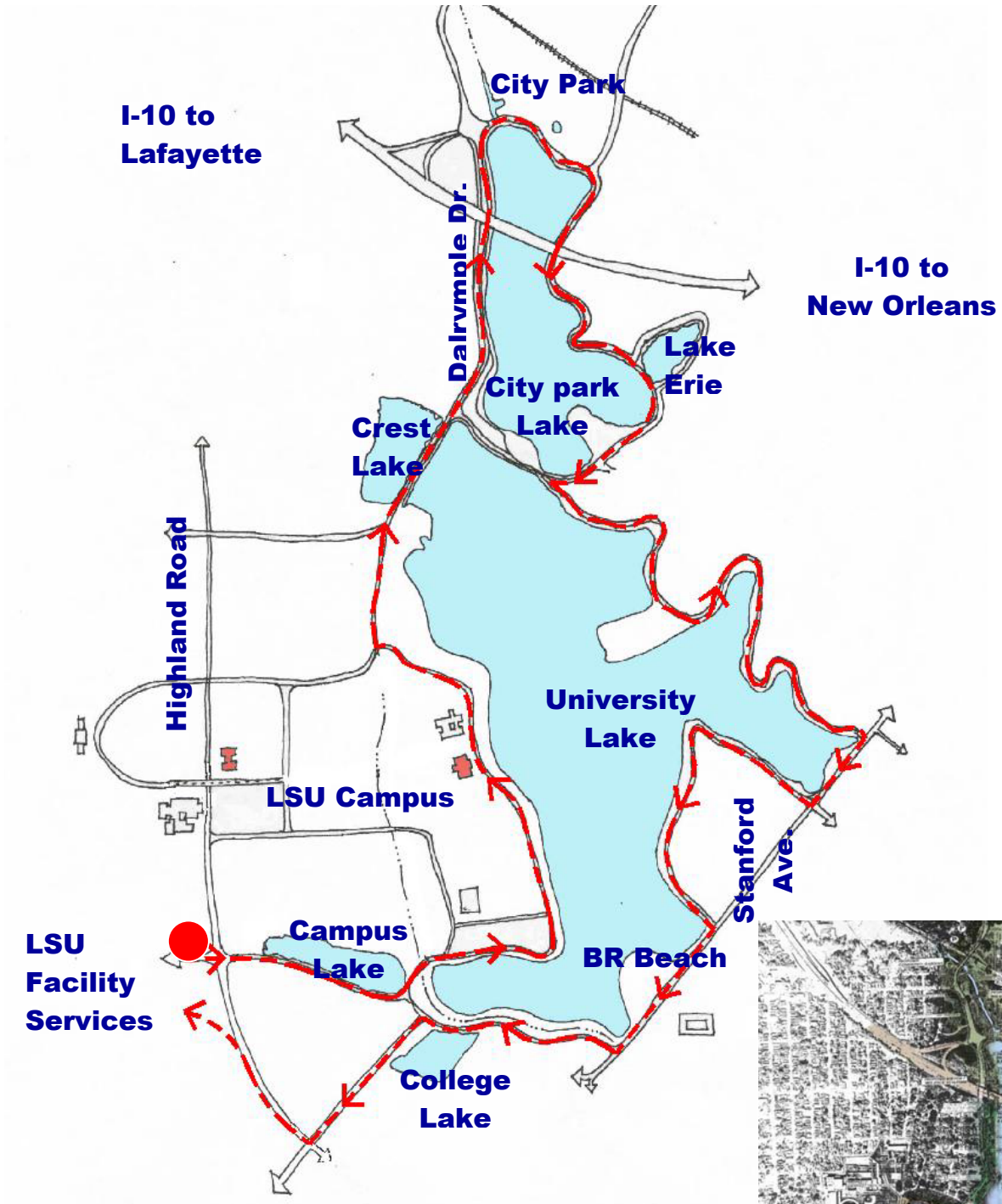
The purpose of the proposed project is to enhance an estimated 300 acres of existing lakes near the Louisiana State University (LSU) campus located in the City of Baton Rouge, East Baton Rouge Parish, Louisiana (Figure 1). The Lakes District System (Figure 2) consists of six urban lakes ranging in size from 3 to 195 acres with approximately 300 acres in total. The man-made lakes were formed in the 1930's when cypress swamps were timbered and dammed. Expansion of residential development and the LSU campus surrounding the lakes led to the rapid development of infrastructure and drainage systems, which further subdivided the original lake into its present configuration of six lakes. The aquatic ecosystem has undergone hydrologic modifications in past years due to unintentional (community development and expansion) human intervention. These activities and others have resulted in limited freshwater inflow and circulation, eutrophication, sewage infiltration, stagnation, limited exchange of nutrients, sedimentation, collapsing drainage infrastructure, retreating bank edges, lack of depth and other factors that limit the performance and health of the aquatic ecosystem. This project seeks to determine if feasible plans can be developed to enhance the lake system.

The Lakes District Aquatic Eco-system PRP has been developed and hereby reported in this document in accordance with Section III, Paragraph F-25, of ER 1105-2-100, dated 22 April 2000. Plan development has included coordination with the potential local sponsor (City of Baton Rouge, East Baton Rouge Parish, Louisiana), LSU Office of Facility Development, the Recreation and Park Commission for the Parish of East Baton Rouge (BREC), Louisiana State University environmental specialists as well as several team meetings with applicable MVN offices including; Project Management, Engineering (H&H), Environmental, Economics, and Real Estate. A post restoration report was completed by Louisiana State University in 1991, and was used for existing data and plan formulation. The "most probable plan" is described in paragraph 7 (Plan Formulation). The nature and scope of the ecosystem restoration features are also described in paragraph 7. The potential Local Sponsor is in full support of the project and has provided the letter of intent to participate (Appendix A) and understands their future obligations and commitments towards project planning, design, construction, and operation and maintenance (paragraph 14). A letter of support from BREC has also been included in Appendix A.

2. Authority: Section 206 of the Water Resources Development Act of 1996.

3. Location: The Lakes District is located near the Louisiana State University in the City of Baton Rouge, the capital of the state of Louisiana, and is located on the East Bank of the Mississippi River. Baton Rouge is located approximately 80 miles northwest from the New Orleans Metropolitan Area and approximately 60 miles east of Lafayette, Louisiana. This area is shown on Figure 1, vicinity map.

Figure 1. Vicinity Map



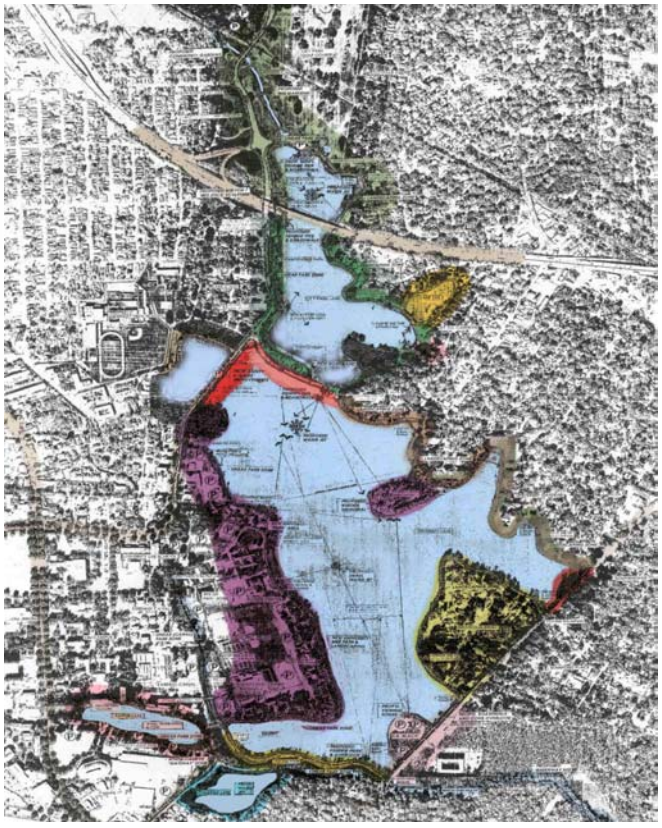


Figure 2. Photograph of University Lakes

4. Brief Project Description:

The man-made Lakes District system was formed in the 1930's. In 1977, a restoration effort was initiated by the United States Environmental Protection Agency, the State of Louisiana, the City of Baton Rouge, and East Baton Rouge parish with the idea of deepening the lakes by dredging to remove phosphorus-laden sediments, increase retention times in the lakes and to increase water depths in an effort to improve oxygen levels in the lake that were severely impacted due to the decomposition of organics in the sediments. In an effort to reduce fecal coliform levels in the lakes, sewer system problems identified through smoking of the lines by the parish resulted in the repair of damaged and broken lines during the original project. Limited dredging of four of the six lakes (University Lake, City Park Lake, Campus Lake, and College Lake) took place in 1983, and the remaining restoration efforts were completed by 1984. Since the completion of the 1983 restoration efforts, recreational use of the lakes increased in the form of boating, bird watching, bicycling, jogging, and fishing. Although the restoration was considered successful, the water quality data collected during the post-restoration period indicated that efforts to improve water quality must be continued to secure the future of the lakes. Despite local efforts, the lakes are currently in very poor condition and require further action to maximize environmental and secondary outputs.

Fecal coliform levels, though reduced from pre-restoration conditions, were still very high during post-restoration monitoring performed in 1990 (Malone et al. 1991). The lakes are presently in non-attainment of their primary and secondary contact recreation and fish and wildlife propagation designated uses because of high fecal coliform levels and other suspected constituents in the system.

"Fish kills" are not as common of an occurrence since the 1983 restoration efforts; however, they still occur occasionally, mostly in the summer months. The declining fish population has impacted many species of wildlife that depend on fish as a food source. The decrease in habitat may be contributed to water quality issues, including low dissolved oxygen levels.

Bank erosion at the lakes is causing dangerous road/recreational trail conditions for users in the Baton Rouge area. The lakes' edges have eroded enough to begin undermining the adjacent parish owned and related infrastructure. These areas are used heavily by the Baton Rouge community and visitors on a daily basis.

The primary purpose of the proposed project is to enhance all 6 lakes to acceptable water quality conditions, increase wildlife and fisheries habitat in and around the lakes, and ensure safe conditions are made available to the users of the Baton Rouge area. A project benefit will be to use the dredged material to offset the ongoing erosion in the study area as well as to mitigate further damage to public infrastructure. As a consequence, public safety will benefit.

5. Existing Conditions:

Climate – The climate is subtropical with average winter daily maximum and minimum temperatures of 65 degrees F and 43 degrees F, respectively, and summer averages of 91 degrees F and 71 degrees F, respectively. Summers are long and hot with an average relative humidity of 73 percent. The predominant influence on the climate in the area is the maritime tropical air

mass associated with the Gulf of Mexico. Major rainstorms in the study area are associated with tropical disturbances in summer and early fall, with frontal activity and extratropical cyclones in late fall, winter, and spring. Convective thunderstorms produce intense but localized rain in late spring and summer. Total annual precipitation averages about 62.46 inches. The wettest month is July with a monthly average of 6.75 inches, while October is the driest with a monthly average of 2.8 inches.

Hydrology – The Lakes District System consists of six lakes located approximately 1.25 miles east of the Mississippi River and 2.5 miles southeast of downtown Baton Rouge. Baton Rouge is in a subtropical climate zone with a 30-year normal precipitation of 155 cm (61 inches) (Ruley, 2002). The six man-made lakes are located on the former site of "old Perkins swamp" (Malone et al., 1985). Creation of the lakes began in the early 1920s with the damming of Bayou Duplantier, which flooded the old cypress swamp. The total surface area of the lakes is approximately 300 acres. The watershed of the six-lake system is approximately 1,200 acres of gentle, rolling topography that was historically part of the Mississippi River floodplain prior to the levee system. There is approximately 36 feet of relief from lake bottom to the hills north and west of the University Lakes (Malone et al., 1985). **Table 1** provides a breakdown of the current land use within the watershed and **Figure 3** delineates these areas. Single-family residential homes make up approximately 35 % of the total area while the lakes make up approximately 25 %. There are approximately 140 outflows entering the lakes from storm drains of the watershed. When the lakes were originally created in the 1920s and 1930s, Corporation Canal was built to reroute runoff from the urban area of Baton Rouge around the lakes (Malone et al., 1985). The canal is located on the west and south sides of University Lake and drains into Bayou Duplantier downstream of the lake system. Two of the six lakes, Campus and College Lake, drain into Corporation Canal and are not connected to the other lakes. The remaining four lakes are connected through a series of culverts and risers with ultimate outflow from University Lake into Bayou Duplantier through a spillway.

The northernmost lake, City Park Lake, is approximately 50 acres and receives approximately 50% of the total inflow to the lakes from an approximate 500-acre watershed. Most of the inflow enters the lake from the upstream Bayou Duplantier through City Park. The lake has an average depth of 3 feet with a mean hydraulic retention time (HRT) of approximately 56 days (Malone et al., 1991).

Crest Lake is approximately 9 acres in size with limited runoff inflow from an approximate 7-acre drainage basin. The lake does receive wind-driven flows through culverts from University Lake when winds are out of the south. The lake has an average depth of 4 feet with a theoretical HRT of 561 days (Malone et al., 1985).

University Lake is the largest lake of the system at approximately 195 acres in size. The watershed is approximately 1047 acres and includes the City Park Lake, Crest Lake, and Lake Erie watersheds. The lake has an average depth of 1.5 feet with some areas as low as 0.5 feet and a HRT of approximately 50 days (Malone et al., 1985).

Lake Erie is a small arm of City Park Lake that is approximately 3 acres in size. The watershed is approximately 95 acres and the lake has an average depth of 2 feet with an average HRT of 14 days (Malone et al., 1985).

Campus Lake is located on the southern end of the system and is approximately 8 acres in size. The watershed is approximately 103 acres of the Louisiana State University campus. The lake has an average depth of 1 to 2 feet with an average HRT of 50 days (Malone et al., 1985).

College Lake is southeast of Campus Lake and is approximately 3.5 acres in size. The lake has an average depth of 4 feet and an average HRT of 40 days (Malone et al., 1985). Again, College Lake and Campus Lake are not hydraulically connected to the other lakes. They drain into the Corporation Canal, which drains into Bayou Duplantier downstream of the outflow of the University Lake.

Land Use	Basin: City Park Acres	City Park %	Erie Acres	Erie %	Crest Acres	Crest %	University Acres	University %	Campus Acres	Campus %	College Acres	College %	Total Acres	Total %
Streets	54	11.5	12	12.4	1	6.3	35	7.6	9	8.1	8	12.1	119	9.7
I-10	12	2.5	7	7.2									19	1.6
Rail Road	3	0.6											3	0.2
Single Family	210	44.6	70	72.2	4	25.0	159	34.3			30	45.5	473	38.6
Apt/Mul Family	3	0.6	1	1.0	1	6.3	21	4.5	20	18.0	1	1.5	47	3.8
Institutional	11	2.3					26	5.6	68	61.3	20	30.3	125	10.2
Commercial	11	2.3	4	4.1									15	1.2
Repair/Manf.	1	0.2											1	0.1
Park/Open	99	21.0			1	6.3	27	5.8	6	5.4	2	3.0	135	11.0
Other Open	14	3.0									1	1.5	15	1.2
Lake	53	11.3	3	3.1	9	56.3	195	42.1	8	7.2	4	6.1	272	22.2
Total	471	100	97	100	16	100	463	100	111	100	66	100	1224	100

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Table 1.

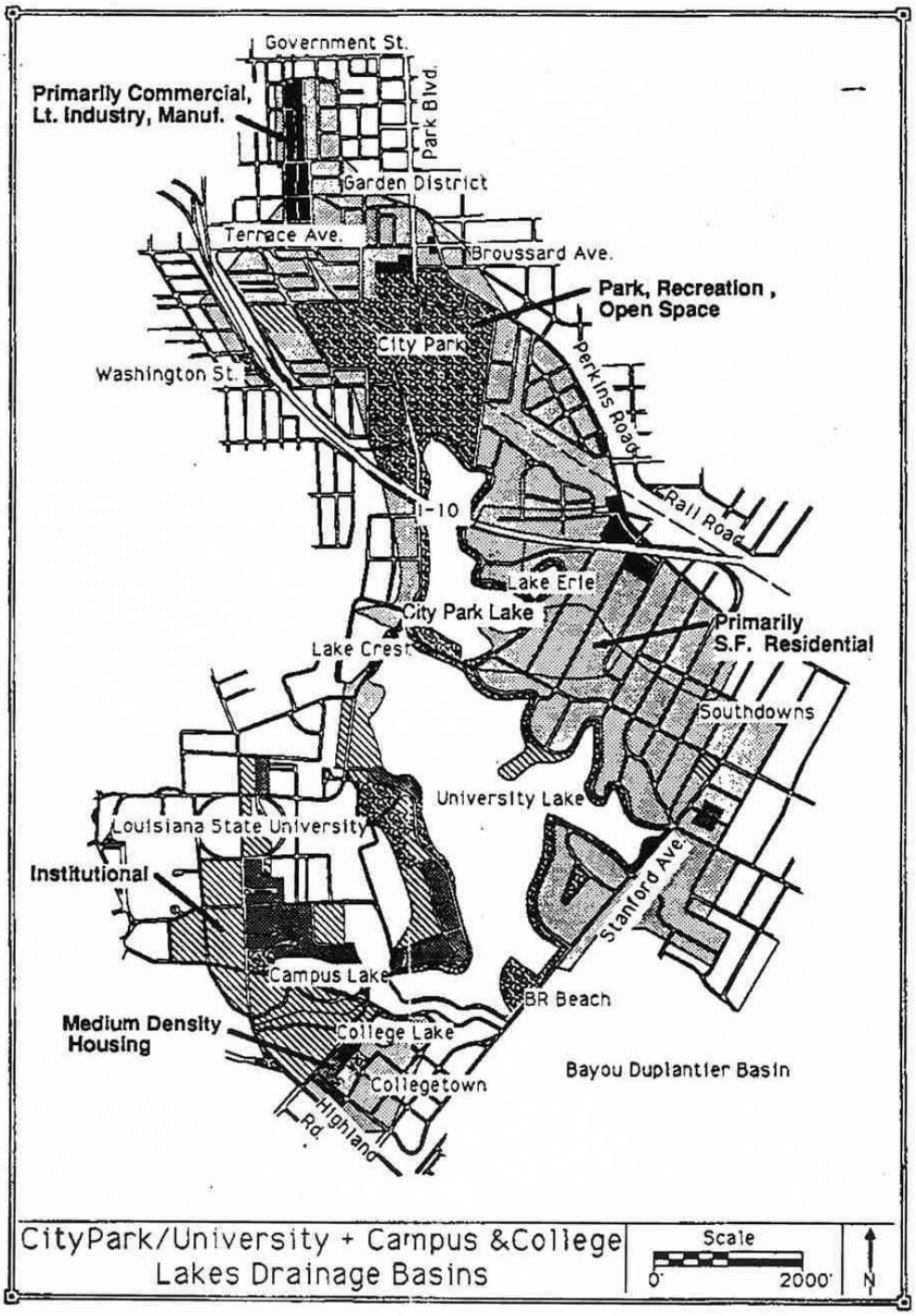


Figure 3. Generalized Land Use

Vegetation – The Lakes District System before its creation in the 1930s was originally a low-lying cypress/tupelo swamp. The swamp was viewed by the public as a mosquito problem and a hindrance to development in the area thereby resulting in its logging, damming and subsequent lake formation. Over time these lakes were further subdivided through the expansion of Louisiana State University's campus to the west and rapid residential development to the east along with the associated causeways and drainage systems that occurred with this development. The lakes still maintain a few bald cypress (*Taxodium distichum*) trees along the shoreline and in the shallow parts of the lake. Large live oaks (*Quercus virginiana*) and water oaks (*Quercus nigra*) are also found along the banks of the lakes along with sugarberry (*Celtis laevigata*), red maple (*Acer rubrum*), black willow (*Salix nigra*) and various pine species along the more forested sections of the shoreline. Emergent vegetation consists predominately of elephant ear (*Colocasia antiquorum*). No submerged vegetation was observed in the lakes. The majority of the ground cover around the lakes consists of Bermuda and bahaia grasses.

Water Quality – The six-lake system of the University Lakes is considered by the Louisiana Department of Environmental Quality (DEQ) as part of the water quality subsegment LA040201, Bayou Manchac-Headwaters to the Amite River. This subsegment is listed in the 2002 Water Quality Inventory, Section 305(b) Report as not supporting the designated uses of primary contact recreation (PCR), secondary contact recreation (SCR), and fish and wildlife propagation (FWP). These are defined by DEQ as:

- *Primary contact recreation (PCR)* is defined by DEQ as any recreational activity that involves or requires prolonged body contact with the water, such as swimming, water skiing, tubing, snorkeling and skin-diving.
- *Secondary contact recreation (SCR)* is defined as any recreational activity which may involve incidental or accidental body contact with the water and during which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading and recreational boating.
- *Fish and wildlife propagation (FWP)* is defined as including the use of water for preservation and reproduction of aquatic biota such as indigenous species of fish and invertebrates, as well as reptiles, amphibians, and other wildlife associated with the aquatic environment. This also includes the maintenance of water quality at a level that prevents contamination of aquatic biota consumed by humans.

The suspected causes of impairment include total fecal coliform, phosphorus, nitrogen as ammonia and nitrite, chlorides, sedimentation/siltation, sulfates, total dissolved solids, dissolved oxygen, and total suspended solids. The suspected sources of impairment include on-site treatment systems, sanitary sewer overflows (SSOs), land development, and other unknown sources. The University Lakes may be considered part of the headwaters for Bayou Manchac, therefore, contributing to the impairments previously stated for LA040201. A successful restoration effort for the lakes was conducted in the late 1970s to early 1980s by LSU. Conditions improved with respect to dissolved oxygen and chlorophyll a. However, nonpoint source pollution from the urban watershed of the lakes and relatively high internal loadings from nutrient-laden sediments continue to play roles in degrading the water quality of the lakes and in turn degrading the downstream water quality conditions. The City of Baton Rouge has made great strides in helping to control illegal sewer connections (to stormwater systems) and

wastewater collection system failures. However, Baton Rouge faces a situation that is not uncommon to other similar sized communities across the nation. Wastewater infrastructure across the nation is becoming outdated and subject to breaks and overflows. SSOs in the watershed of the Lakes District system continue, although less frequently, to contribute to fecal coliform counts in excess of water quality criteria. Nutrients and suspended sediments, which are common constituents of non-point source runoff from urban areas, are also contributing to the degradation of the water quality in the lakes. Subsequently, the combination of the shallow lake depths, the high temperatures in the summer months, and the nutrient loading to the lakes causes severe drops in the dissolved oxygen concentration. This has historically caused fish kills, which were more common around the time of the first restoration effort. Other potential contaminants of concern within the lakes would probably include metals, oil and grease, and PAHs due to the Interstate 10 crossing over City Park Lake. LSU has an on-going research program characterizing the constituents of the runoff from the overpass.

Problems associated with each lake are shown below:
City Park Lake receives high nutrient loadings, experiences high fecal coliform, and experiences summer outbreaks of suspended and floating algae.

Crest Lake receives minimal stormwater discharges; however, it does receive flow from University Lake when wind blows out of the south.

University Lake receives high nutrient loadings, experiences high fecal coliform, and experiences summer outbreaks of floating algae in shallow areas.

Lake Erie is hydraulically connected to City Park Lake, therefore, experiences similar water quality problems. It experiences high nutrient loading and has some of the highest fecal coliform counts of the six lakes.

College Lake and Campus Lake, as stated earlier, are not hydraulically connected to the other four lakes. However, they also experience high nutrient loadings, high fecal coliform counts, and summer outbreaks of suspended and floating algae.

Fisheries - Historically, largemouth bass, crappie, and other sunfish were stocked in the lakes and fishing was a common recreational activity (City-Parish of Baton Rouge, 1977). As the fisheries habitat in the lakes deteriorated the resident fish species progressively moved from a game fish to 'trash fish' population primarily made up of threadfin shad. Reasons for this decline are poor water quality and habitat deterioration. Low dissolved oxygen resulting from decaying sediments already in the system and organics entering the system in the form of fertilizers, detergents, and grass and leaf litter from residential and golf course lawn maintenance along with decaying algae blooms produce an oxygen level throughout the water column that approaches 0 at night. These conditions therefore favor fish adapted to low oxygen conditions resulting in the above-mentioned species shift. In shallow water habitats with low flow, water temperatures are at the mercy of ambient air temperatures and greatly influenced by the amount of the water body exposed to sunlight. Water temperatures are especially high during the summer months when the days are longer, air temperatures are high and sunlight penetration is at its highest. With little deep-water habitat in the lakes, there exists no thermal refuge for resident

fish populations. The deep holes that do exist are overused and crowded resulting in their oxygen depletion and the subsequent reduction in fish populations until a sustainable population is reached for the available oxygen existing there. Various lakes within the Lakes District System periodically experience fish kills during the summer months.

Wildlife – The Lakes District system provides a large amount of wildlife habitat for birds and fish and an urban refuge for wildlife populations. The forested portions on the edge of the lakes provide habitat for a wide variety of migratory songbirds such as the American robin, Carolina chickadee, tufted titmouse, mockingbird and yellow-rumped warbler. Various waterfowl using the lakes include mallards, wood ducks, ring-neck ducks, gadwalls and assorted domestic ducks also occur within portion of the study area. Belted kingfishers and wading birds such as the great blue heron, snowy egret, great egret, little blue heron, and white ibis forage for small fish in the shallow portions of the lakes. The American white pelican and double-crested cormorant also frequent the lakes to forage and rest.

Amphibians expected to occur within the riparian zone include the three-toed amphiuma, Gulf Coast toad, eastern narrow-mouth toad, green treefrog, cricket frog, bronze frog, and bullfrog. Reptiles likely found in the project area include red-eared turtle, painted turtle, Mississippi mud turtle, stinkpot, various snapping turtles, green anole, broad-headed skink, alligator, western ribbon snake, speckled kingsnake, western cottonmouth, and various water snakes.

Game mammals occurring in the project area include eastern cottontail, gray squirrel and fox squirrel. Furbearers include nutria and raccoon. Other land mammals in the area include various species of bats, rodents, opossum and the nine-banded armadillo.

Recreation – Recreational opportunities currently existing in the lakes include sail boating, canoeing, electric powered boats, bird watching and fishing. Along the bank line and on adjacent roads are a series of narrow bike/walking paths that do not meet FHWA standards, bank fishing areas, a beach area, picnicking opportunities and areas for tailgating prior to football games, and passive aesthetic relaxation areas with benches and grass lawns. It is noted that much of the green space is located immediately adjacent to the road and highway system, creating a less than ideal condition.

6. <u>Future without Project:</u>

If no efforts are made to improve the conditions of the Lakes District system, the fisheries within the project area and the wildlife dependant on these fish as a food source will continue to decline. The lakes will continue to fill in from the sediment influxes into the system and will eventually convert into a swamp habitat. Increasingly shallow water and continual nutrient influx will result in the rising frequency of fish kills as the system seeks a sustainable population based on suitable fisheries habitat and available oxygen. Fish production will decline and the system will continue on its trend toward a non-game 'trash' fisheries. The banks of the lakes will continue to erode as the lake persists in its natural progression toward a swamp system with the effects on infrastructure along the lake system being the loss of the recreational paths and road shoulders and reoccurring problems when attempting maintenance of existing roads. The lakes would continue to receive runoff from the adjacent communities and surrounding urban areas, without Best Management Practices (BMPs) and pretreatment mechanisms in place such as sediment

traps and wetland treatment buffer zones. As stated earlier, the six-lake system of the Lakes District is considered by the Louisiana DEQ as part of the water quality subsegment LA040201, Bayou Manchac-Headwaters to the Amite River. This subsegment is listed in the 2002 Water Quality Inventory, Section 305(b) Report as not supporting the designated uses of PCR, SCR, and FWP. Without the proposed project, the FWP designation will continue to not be supported within the lakes system. The high nutrient loading combined with the high temperatures and shallow waters will continue to degrade the aquatic habitat. The PCR and SCR designations are more dependent on efforts by the City of Baton Rouge to correct problems with the surrounding wastewater collection system. Until then, fecal coliform levels will continue to be high and prevent the waters to safely be used for recreation purposes by the local community. Recreation boating use within University Lake will continue to experience the un-safe condition of intercepting numerous stumps partially exposed in low water conditions. Also in low water conditions a shallow sewer pipe becomes exposed limiting boating to the southern portion of the lake, restricting boaters access into the northern portion.

7. Plan Formulation:

Objectives – The objectives of this study are to develop potential plans to enhance the Lakes District to a less degraded system, provide improved habitat for many forms of fish and wildlife, and improve water quality. Secondary benefits seek to use dredged material beneficially to protect public infrastructure and provide necessary green space.

Alternatives – The alternatives considered are listed below. It may be worthy to consider a combination of alternatives in future study phases to maximize outputs. Alternatives should consider the assimilation of fecal coliform, and nutrients (nitrogen and/or phosphorus), reduction of sediment loads to the deep-water areas of the lakes, optimization of hydraulic connections between the lakes and the surrounding water bodies, and improvement of dissolved oxygen levels. See Section 9 for a detail description of alternatives.

Alternative 1.

- Increase water depth of the Lakes District
- Beneficial use of dredged material
- Manage sediment
- Hydraulic and Hydrologic Modification
- Use aeration to increase dissolved oxygen
- Stump Removal from bottom of lakes
- Relocations

Alternative 2. No action.

Other Alternatives

Any number of combinations of the above elements considered as part of Alternative 1 including the additional consideration of the following:

- Convert individual lakes and/or large portions to swamp
- Beneficial use of dredged material

- Disposal locations
- Additional diversions of flow
- H&H Management
    - Limiting inflow
    - Manipulate water levels
- Investigate Sanitary Sewer I&I
- Investigate runoff from I-10
- Best Management Practices (BMP)

8. <u>Feasibility Phase Analysis:</u>

Data Collection - In order to evaluate these alternatives, data collection and analysis will be required during feasibility (project management, engineering, environmental, economics, real estate). The following activities are not all-inclusive, but provide an example of the level of detail required during feasibility:

- **Project Management-**
    - Study Management
        - Development of Feasibility Report
        - Development of Project Management Plan
        - Development of Project Cooperation Agreement Package
    - Public Involvement/Education –
        - Public Involvement Program
        - Meetings
        - Presentations
    - Sponsor Participation –
        - Sponsor Involvement
        - Financial Capability and Assessment
        - Letter of Intent
- **Engineering** –
    - Surveys
    - H&H modeling and analyses
        - Water Quality Analysis and Sediment Evaluation
        - Hydrology
        - Hydraulics
    - Geotechnical
    - Waterways
    - Structural (control structures, etc.)
    - Relocations
    - Right of Way Maps
    - Cost
- **Environmental** –
    - Document existing conditions
    - Document future with project
    - Document future without project
    - Prepare environmental assessment

- Prepare draft FONSI
- Resource agency coordination

- **Economics** –
  - Incremental cost analysis
- **Real Estate** –
  - Determine ownership
  - Land Appraisal
  - Determine estates required
    - Obtain right of entry
    - Develop REP
- **Operation and Maintenance**
  - Develop Operation and Maintenance Costs

9. <u>Detailed Project Description of Alternatives:</u>

<u>Alternative 1.</u>

Implementation of Alternative 1 would improve the lake's fisheries habitat, making it once again a popular fishing spot for game species such as bass, blue gill and crappie. Fish kills would become a thing of the past as the retention time in the lakes is increased and oxygen levels return to an acceptable level for fish survival. The principle feature in promoting this environment results from deepening the lakes system. Dredging via hydraulic means would be completed to establish average depths of 4-feet in Campus Lake (25,000 cubic yards removed), 4-feet in City Park Lake (80,000 cubic yards removed) and 5-feet in University Lake (1,300,000 cubic yards). Other dredging means such as bucket dredging and reshaping by dozer upon lake dewatering would be considered during the feasibility phase. A large number of stumps located in University Lake would be removed under this alternative and beneficially used in targeted locations as fish habitat structures as well as possibly a recycled material such as cypress mulch.

Dredged material would be used beneficially to create wetlands, bank stabilization and structure for aquatic habitat within the lake system. Created wetlands would serve as a filtering mechanism for nutrients and sediments entering the system as well as encourage the break down of fecal coliform bacteria before it enters the deeper waters of the lakes. These benefits would reach beyond the University Lakes system and provide water quality benefits to downstream segments of the watershed. This proactive approach in environmental stewardship would assist the State's efforts to improve surface water quality conditions and could be used to educate and promote assimilation techniques to the public at the local, state and national level. Wetlands were considered for development within Campus, City Park and University Lakes (See Appendix B). Besides development of wetlands, dredged material could be positioned to offset the on going erosion adjacent to public infrastructure and could also be used to support recreational opportunities and green space development. It is anticipated that additional disposal areas would be required outside the Lakes System. Approximately 200 acres of pasture land currently owned by LSU within a 2-mile radius of lakes would be required. In addition LSU owns considerable levee batture along the Mississippi River (approximately six miles of green space) that should be considered during feasibility.

Maintainable sediment traps would serve to sustain the depths of the lakes over time as this material is removed from the traps and possibly used beneficially within the system for constructed wetlands creation. Managed wetland areas would provide new wildlife habitat for resident and migratory species as well as an increased opportunity for education about the nation's wetland systems and additional recreational opportunities around the lakes. Widened rights of way and bank stabilization would provide for decreased infrastructure maintenance, pedestrian safety as well as increased recreational opportunities. Improved water quality would work towards bringing these lakes into attainment of their designated uses of PCR, SCR and FWP.

Another plan feature of Alternative one includes Hydraulic and Hydrologic management. During feasibility, modification to the existing hydraulic connections should be considered. Specifically this alternative specifies improvements to existing connections between:

Campus Lake and Corporation Canal (modify one outlet structure);
Crest Lake and University Lake (modify two outlet structures);
City Park Lake to University (modify one outlet structure);
City Park Lake and University Lake (modify structure to discharge from University Lake to Corporation Canal); and
University Lake (modify structure discharging to Corporation Canal)

These modifications would result in optimizing the hydraulic connections of the system to achieve the desired water quality conditions year round. Mechanical aeration will also be considered for two of the smaller lakes (College and Erie) in order to improve dissolved oxygen concentrations.

Alternative 2. No action. This is a no-action alternative that would provide no environmental benefits to the lake and allow the continued degradation of the ecosystem. (See section 6 on Future without project)

Other Alternatives. Due to the limited resources allowable during this phase this effort focused on the above alternatives. It is appreciated that a number of alternatives could be developed through a combination of features as described in section 7. These features will be developed into various alternatives during feasibility to determine the optimal solution.

10. Cost:
The estimated feasibility study is $600,000 (Table 2), Plans and specifications are estimated at a cost of $424,000, LERRD's cost will be $991,000, S&A cost will be $318,000, and construction cost is estimated to be $5,300,000 (Table 3). These costs will be reexamined during feasibility and will likely be revised to reflect modifications to the most probable plan.

11. Plan Effectiveness:
Implementation of all of the action alternatives would improve the lake's fisheries habitat making it once again a popular fishing spot for game species such as bass, blue gill and crappie.

Fish kills would be reduced as the retention time in the lakes is increased and oxygen levels return to an acceptable level for fish survival. Dredged material would be used beneficially to create wetlands within the lake system or be deposited in upland disposal areas owned by LSU thereby removing phosphorus-laden sediments that contribute to poor water quality from the lake bottoms. Created wetlands would serve as a filtering mechanism for nutrients and sediments entering the system as well as encourage the break down of fecal coliform bacteria before it enters the lake. These benefits would reach beyond the University Lakes system and provide water quality benefits to downstream segments of the watershed. This proactive approach in environmental stewardship would assist the State's efforts to improve surface water quality conditions. Maintainable sediment traps would serve to sustain the depths of the lakes over time as this material is removed from the traps and possibly used beneficially within the system for further wetlands creation. Created wetland areas would provide new wildlife habitat for resident and migratory species as well as an increased opportunity for education about the nation's wetland systems and additional recreational opportunities around the lakes. Widened rights of way and bank stabilization would provide for decreased infrastructure maintenance, pedestrian safety as well as increased recreational opportunities. Improved water quality would work towards bringing these lakes into attainment of their designated uses, primary and secondary recreational and fish and wildlife propagation (PCR, SCR and FWP uses). Total benefits include: improvement of habitat for fish, migratory waterfowl, songbirds, wading birds, mammals, reptiles and amphibians; an improvement in water quality that would support primary and secondary recreation and fish and wildlife propagation (PCR, SCR, and FWP uses); a reduction of infrastructure maintenance around the lakes; an increase in recreational opportunities around the lakes; and the aesthetic enhancement of the lakes. Those acres affected by the improvement of the lake's water quality, fisheries habitat and the creation of wetland habitat provided by this project would be measured by HEP models. The total number of average annual habitat units (AAHUs) cannot be projected at this stage of study, but would be projected in the feasibility stage when the acres of created habitats and the units of the various life requirements could be measured. The project would create approximately 50 acres of bottomland hardwood and freshwater swamp.

12. Conclusion and Overall Project Benefits:

With the implementation of the proposed project, the lakes' wildlife and fisheries habitats would be enhanced and water quality in the project area would be improved producing higher quality fish and wildlife habitats and allowing the use of the lakes for their designated uses (PCR, SCR, and FWP). The project is anticipated to yield primary benefits to the degraded ecosystem while providing secondary benefits to the public infrastructure and recreation. Primary benefits include, but are not limited to, fish and wildlife habitat improvement, nutrient management, and increased oxygen to the aquatic ecosystem. In addition to primary benefits, secondary benefits will be obtained by protecting public infrastructure and providing green space and other recreation opportunities through the use of dredged material. Created wetlands, sediment traps and bank stabilization would work towards the sustainability of the project by limiting the influx of materials into the system that caused these lakes to degrade originally.

13. Real Estate:

The Lakes District system encompasses approximately 300 acres in six lakes. Campus Lake and its adjoining land and University Lake and land up to elevation 22.8 are owned by Louisiana

State University. City Park Lake is owned by the East Baton Rouge City/Parish. The other lakes are a mixture of public and private ownership, with ownership to be determined during the Feasibility stage. All bank stabilization work and newly created recreation areas will be constructed primarily on LSU owned property in addition to public owned right-of-way. There is also a TEA-21 through LADOTD (LSU is the local sponsor) of which a portion will run adjacent to Campus Lake along the southern and eastern edge. Dredged material not utilized within the Lakes system will be disposed on 200 acres of pasture owned by Louisiana State University. The only relocation anticipated at this time is a 30-inch diameter force main sewer line located in University Lake. There will be no URA relocations. A Federal project located in the area is the Dalrymple Drive Bicycle Path, TEA-21. It is sponsored by the Federal Highway Administration, and is currently being designed. Some of the private owners around the lakes have expressed a willingness to cooperate and to provide lands needed for the project. Total real estate costs are estimated to be $991,000. This includes an estimate of the market value of sponsor-owned lands contributed to the project and administrative costs associated with obtaining a right of entry for construction from the non-federal sponsor, crediting, appraisals, and title research. For the disposal area, a temporary disposal easement for a period of 5 years was utilized. It is also assumed that the dredged material will not contain any hazardous materials that could adversely affect the market value of the property. A full Real Estate plan will be completed during the Feasibility phase.

14. Views of the Non-Federal Sponsor:

The East Baton Rouge Parish Government fully supports these efforts. The Corps has met with the potential local sponsor throughout the project. The Non-Federal sponsor has been briefed on the roles and requirements of the local sponsor. The Parish government has expressed a willingness to partner with the Corps in this project through the attached letter of intent, dated 25 November 2002, in Appendix A. The Parish government is in full support of maintaining and revitalizing the University Lakes, which are so essential to the ecosystem as well as the lifestyle and heritage of southern Louisiana.

15. Views of the Federal, State and Regional Agencies:

Although the PRP does not afford much time and resources, contacts were made with the Louisiana State University Facility Services office, BREC, the potential local sponsor (East Baton Rouge Parish Government, EPA, LDEQ, DHH, USFWS. All agencies are in support of such projects. Additionally, similar projects have been implemented in the state of Louisiana that required the support of Federal (EPA, USGS, USFWS, USACE, others), State (DEQ, DNR, LAWLF, others) and regional agencies. Extensive coordination will be completed with these agencies and others during the feasibility phase.

16. Status of Environmental Compliance:

An environmental assessment and associated documents addressing the proposed project will be completed during the feasibility phase. Personnel from CEMVN responsible for compliance with the National Environmental Protection Act (NEPA) will prepare these documents. Coordination with Federal and state resource agencies will be initiated and continue for the duration of the project.

17. Schedule:
It is expected that the feasibility would take 12 months, P&S would take 8 months, and construction would take 24 months. The tentative schedule based upon capability is shown in **Table 2**.

Table 2

Phase	Start	Finish
Feasibility Study	**Apr 04**	**Apr 05**
CEMVD Review and Approval	Apr 05	July 05
Preparation of Plans and Specifications	July 05	Mar 06
Project Cooperation Agreement Executed	Mar 06	Apr 06
Contract Solicitation	Apr 06	June 06
Construction	June 06	June 08

18. Supplemental Information:
Post-construction monitoring should be considered during feasibility. All inspections and maintenance will be the responsibility of the local sponsor.

19. Financial Data:
The estimated cost for the feasibility phase is $600,000 (see **Table 3**), the estimated total cost for the project, is $7,633,000 (see **Table 4**), Operation and Maintenance cost are estimated to be $30,000/yr and are the responsibility of the local sponsor. The total required Federal and non-federal contributions are shown in **Table 5**.

Environmental, engineering, real estate, and economics evaluation is required for water quality, geology, geotechnical, structural design, hydrology and hydraulics, sedimentation, HTRW, cultural impacts, and right of entry. The study team believes that the cost of feasibility is justified in that it will substantially reduce the risks of project failure and likely will substantially reduce the cost of construction.

Table 3
Total Feasibility Study Costs

Office	Feasibility Cost
Project Management	$75,000
Engineering Division	$300,000
Environmental Branch	$175,000
Real Estate Division	$25,000
Economics	$25,000
Total cost of Feasibility	$600,000

A cost estimate breakdown (in thousands) by fiscal years for the proposed project is as follows:

Table 4
Project Life Cycle Cost Share Distribution

Phase	**Estimated Project Costs**			**Federal Funding Needs**				
	Totals	**Non-Fed**	**Fed**	**FY 04***	**FY 05**	**FY06**	**FY 07**	**FY 08**
Feas. Report	600		600	200	400			
P&S 8% of Const. Cost	424		424		50	374		
S&A 6% of Const. Cost	318	111.3	206.7			206.7		
Const.	5,300	1,601.75	3,698.25			500	1,599.13	1,599.12
LERRDS	991	991	0					
Totals	**7,633**	**2,704.05**	**4,928.95**	**200**	**450**	**1,080.70**	**1,599.13**	**1,599.12**

*****Above schedule reflects capabilities.

The feasibility study costs are initially federally financed, and costs are distributed as part of the non-federal share of the project costs during implementation. These project costs are based upon costs for similar projects and preliminary estimates for several features of this project. Cost effectiveness and incremental analysis would be used to determine the alternatives that would provide the greatest net benefit.

Table 5
Total Required Contributions

Total Project Cost	Non-Fed Share 35%	Fed Share 65%
$7,633,000	$ 2,704,050	$ 4,928,950

20. <u>Federal Allocations to Date:</u>

Preliminary Restoration Plan: **$10,000**
Feasibility Report: **$0**
Plans and Specifications: $0
Implementation (Construction) $0

21. <u>Project Manager:</u>
Kasey Couture (504) 862-1556

REFERENCES

City-Parish of Baton Rouge, October 1977. Lakes Restoration Project Report. City of Baton Rouge/Parish of East Baton Rouge Department of Public Works. Baton Rouge, Louisiana, 298 pp.

Malone, Ronald F. et al. 1985. "The Final Report of the University Lakes Restoration Project: Volume 1". Louisiana State University.

Malone, R.F., Smythe, E.D., Theegala, C.S., 1991. University Lakes Post-restoration Continuing Monitoring Program Final Report. City of Baton Rouge/Parish of East Baton Rouge Deportment of Public Works. Baton Rouge, Louisiana.

Ruley, J.E., Rusch, K.A., 2002. An assessment of long-term post-restoration water quality trends in a shallow, subtropical, urban hypereutrophic lake. Ecological Engineering 19, 265-280.

Reich Associates, Applied Technology Research Corporation, Dan Earle, Rod Emmer, and Rodi & Songy, Inc. April 1991. Draft City-Park/University Lakes Management Plan (Project No. 90-MP-EPA-0066).

Appendix A

Sponsor's Letter of Intent to Participate

Office of the Mayor-President

City of Baton Rouge
Parish of East Baton Rouge

222 St. Louis Street
Post Office Box 1471
Baton Rouge, Louisiana 70821

225/389-3100
Fax 225/389-5203

BOBBY SIMPSON
Mayor-President

November 25, 2002

Colonel Peter J. Rowan
District Engineer
U. S. Army Corps of Engineers
New Orleans District
Attn: CEMVN-PM-W
P. O. Box 60267
New Orleans, LA 70160-0267

Re: Baton Rouge Lakes District

Dear Colonel Rowan:

The Baton Rouge Lakes District comprises seven man made lakes that are an important focal point of the Baton Rouge community. The lakes, totaling near 300 acres in surface area, are an important recreational and cultural feature, offering a variety of opportunities for our citizens and valuable habitat for wildlife and fisheries.

The Lakes District is experiencing degradation, as the lake's water quality continues to decline for a variety of reasons, including severe eutrophication, sedimentation, sewage infiltration, collapsing drainage infrastructure, retreating bank edges, lack of depth, and high nutrient loads. Additionally, use of the lakes is hampered by dangerous conditions where roads and recreational trails exist in narrow areas. In many areas, the lake edges have eroded to the point where roads are in danger of being undermined. The lakes receive tremendous daily use from all of our citizens throughout the Baton Rouge Area, as they engage in activities such as biking, walking, jogging, bird watching, school field trips, picnicking, painting, kayaking, canoeing, sailing, fishing, sight seeing, sun bathing, photography and other users. Additional facilities to safely accommodate these users is urgently needed.

Therefore, I request that the U. S. Army Corps of Engineers, New Orleans District, undertake an investigation of the Lakes District problems, including the watersheds, under the authority of Section 206 of the Water Resources Development Act of 1996, as amended. The City of Baton Rouge and Parish of East Baton Rouge (City/Parish) hereby expresses our willingness to serve as the study sponsor.

We understand that the initial investigations would be Federally financed. If studies indicate a viable solution, our objective will be to proceed with construction. We are capable of fulfilling our financial obligations for further study, design construction, operation and maintenance: in general providing a minimum of thirty-five percent (35%) of the total project costs, including furnishing lands, easements, right-of-way, relocations, and disposal areas. We are also aware that the Corps' and our responsibilities will be delineated in the Project Cooperation Agreement (PCA), which both parties will execute before construction commences.

Should you need additional information, please contact Mr. Fred E. Raiford III, Director of the Department of Public Works at 225-389-3158.

Sincerely,

Bobby Simpson
Mayor-President

BS/dmc
cc: Mr. Mark A. Emmert, Chancellor - Louisiana State University
Mr. Paul Thompson, Chief Administrative Officer
Mr. Fred E. Raiford III, Director - Department of Public Works

** TOTAL PAGE.03 **

Recreation & Park Commission
for the Parish of East Baton Rouge
3140 N. Sherwood Forest Drive
P.O. Box 15887, Baton Rouge, Louisiana, 70895
Tel. (225) 272-9200
Fax (225) 273-6404
brec.org

February 4, 2004

Col. Peter J. Rowan, District Engineer
U.S. Army Corps of Engineers
New Orleans District
Attn: Kasey Couture
7400 Leake Ave.
New Orleans, LA 70118-3651

Dear Col. Rowan:

This letter is to confirm BREC's intent to participate in the Lakes District project. BREC is committed to partnering in this project to help restore the ecological health of this important resource for Baton Rouge. The lakes, which are easily accessible to the citizen of East Baton Rouge Parish, are one of the most used recreational features of the parish. Without efforts to improve the lakes area, their ecological health will continue to decline with negative effects to the quality of life for the 600,000 citizens who live in the Baton Rouge metropolitan area.

Sincerely,

Mark Thornton
Superintendent

MT/cm

Appendix B

Cost Estimates for Dredging
Maps for Disposal within Lakes System and Dredging Vicinities

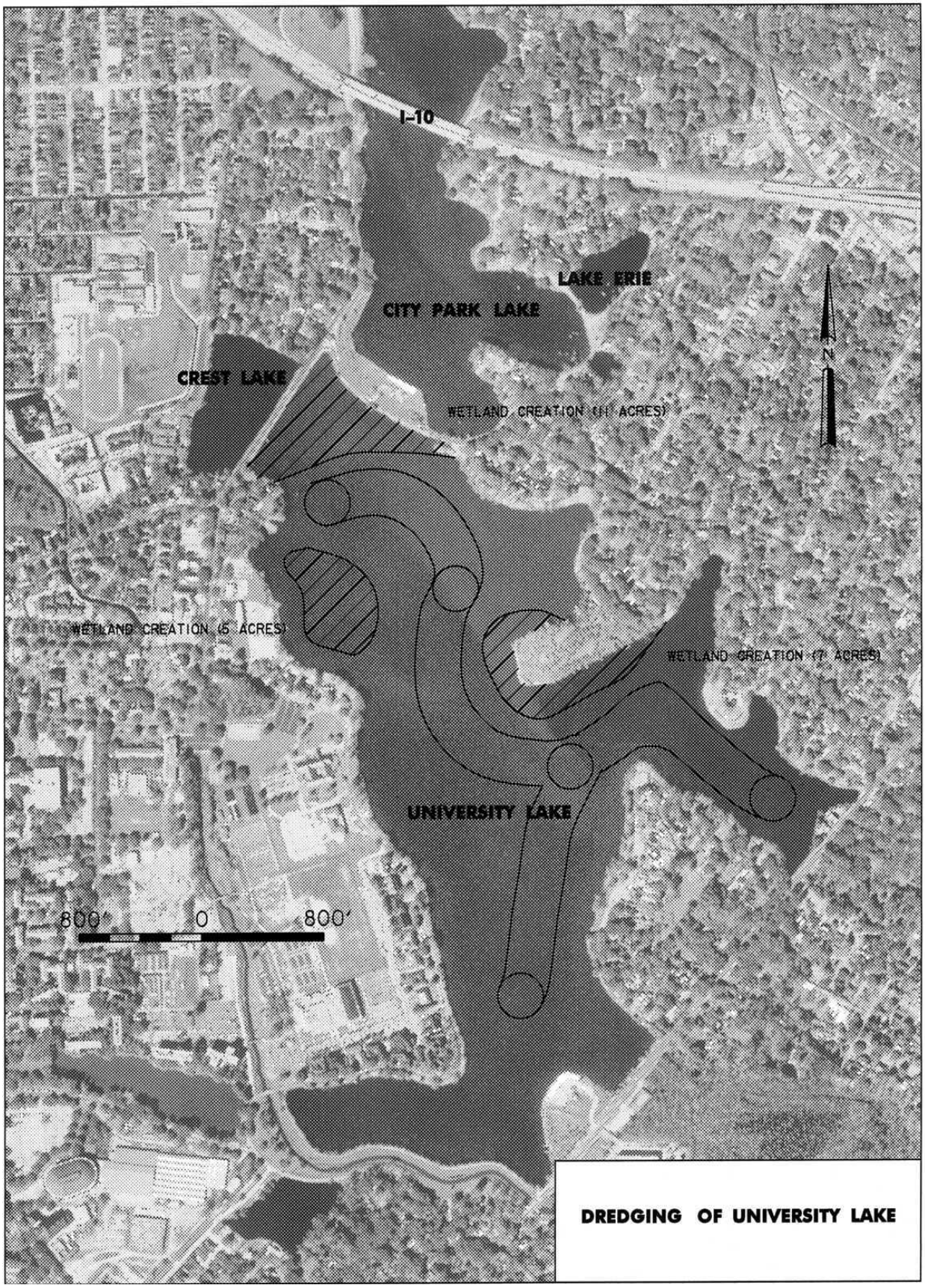
LSU LAKES - UNIVERSITY LAKE

FEATURE 02: Dredge University Lake Place Material @ 3 Spots in Lake RECONNAISANCE LEVEL COST ESTIMATE			Date: Estimator: Designer:	5-Feb-02 Binet Binet
Item	Unit	Quantity	Unit Price	Total
mobilization and demobilization	LS	1	$125,000.00	$125,000
snag cypress and haul out of lake	ACRE	45	$15,000.00	$675,000
flotation access to spoil area use 3000lf	CY	50,000	$4.00	$200,000
dredging	CY	300,000	$5.00	$1,500,000

Assumptions: Bucket dredge access to lake.
stiff clay

Campus Lake area = 205 acres, wetland creation sites = (11 + 7 + 5) acres, net area = 182 acres

subtotal	$2,500,000
25.00% contingencies	$625,000
TOTAL	$3,125,000


I-10
LAKE ERIE
CITY PARK LAKE
CREST LAKE
WETLAND CREATION (11 ACRES)
N
WETLAND CREATION (5 ACRES)
WETLAND CREATION (7 ACRES)
UNIVERSITY LAKE
800'
0
800'
DREDGING OF UNIVERSITY LAKE

LSU LAKES - CITY PARK LAKE

FEATURE 01: Dredge City Park Lake South of I-10 Place Material North of I-10 to Create Wetlands on Rim RECONNAISANCE LEVEL COST ESTIMATE			Date: Estimator: Designer:	5-Feb-02 Binet Binet
Item	Unit	Quantity	Unit Price	Total
mobilization and demobilization	LS	1	$125,000.00	$125,000
snag cypress stumps	ACRE	15	$15,000.00	$225,000
flotation access to spoil area north of I-10 use 1000lf	CY	20,000	$4.00	$80,000
dredging	CY	80,000	$5.00	$400,000

Assumptions: Bucket dredge access to lake. Clearance for barge and small boat under I-10. stiff clay

	subtotal	$830,000
25.00%	contingencies	$207,500
	TOTAL	$1,037,500

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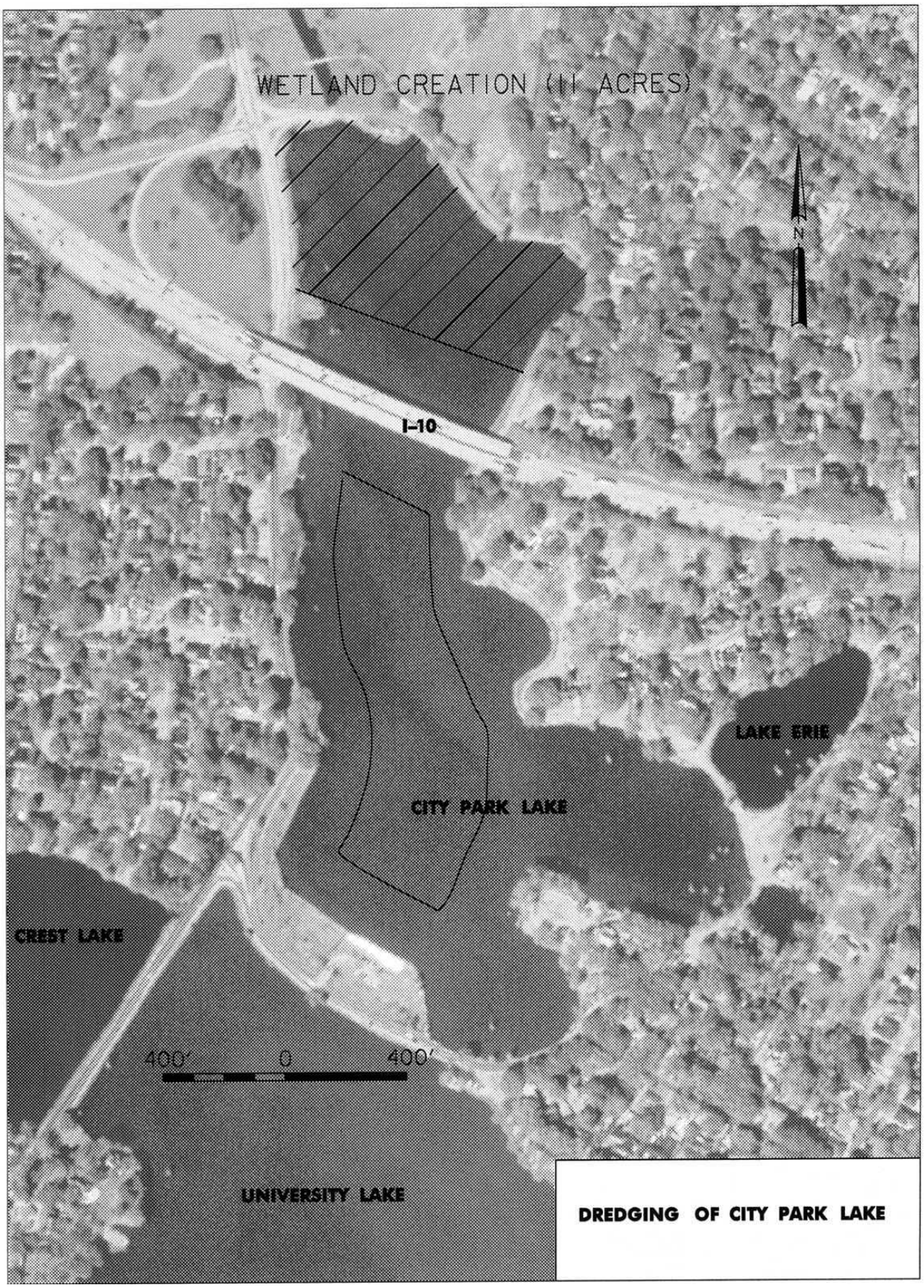
WETLAND CREATION (11 ACRES)
N
I-10
LAKE ERIE
CITY PARK LAKE
CREST LAKE
400'
0
400'
UNIVERSITY LAKE
DREDGING OF CITY PARK LAKE

LSU LAKES - CAMPUS LAKE

FEATURE 02: Dredge Campus Lake Place Material West on Lake Rim RECONNAISANCE LEVEL COST ESTIMATE				Date: Estimator: Designer:	5-Feb-02 Binet Binet
Item	Unit	Quantity	Unit Price	Total	
mobilization and demobilization	LS	1	$125,000.00	$125,000	
snag cypress stumps	ACRE	7	$15,000.00	$105,000	
flotation access to spoil area north of I-10 use 200lf	CY	3,500	$4.00	$14,000	
dredging	CY	25,000	$5.00	$125,000	

Assumptions: Bucket dredge access to lake.
stiff clay

Campus Lake area = 9 acres, wetland creation site = 2 acres, net area = 7 acres

subtotal		$369,000
25.00% contingencies		$92,250
TOTAL		$461,250

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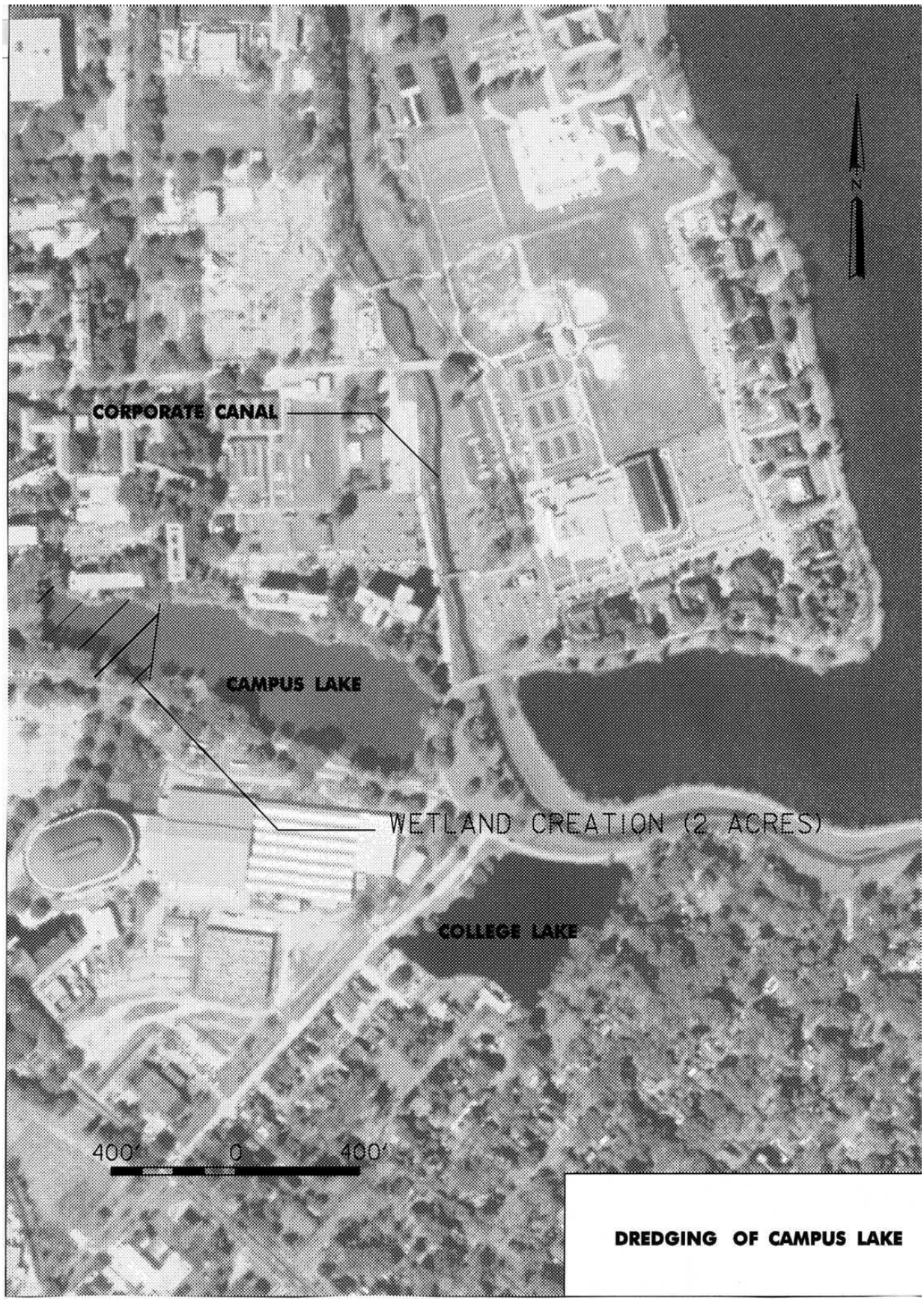
N
CORPORATE CANAL
CAMPUS LAKE
WETLAND CREATION (2 ACRES)
COLLEGE LAKE
400'
0
400'
DREDGING OF CAMPUS LAKE