



M E M O FOR RECORD

DATE: March 11, 2016

SUBJECT: PI080000003 University of North Texas – Aquatic Macrophyte Restoration Project

This is a Interlocal that was taken to council by department. It was Amendment number 9 that extended the contract by three years and added 150,000 to the contract. The RCA gives a total not to exceed contract amount of 795,000 however 205,000 was utilized prior to the coming to purchasing. Current total threshold that shows in advantage is 590,000 plus the 205,000 they used prior gives us the total council has approved 795,000. (Note that the Original amount of 175,000, Amendment no. 1 10,000, and Amendment no. 2 20,000 where never sent to purchasing. Purchasing started with Amendment no. 3 at 110,000.)

Georgia Billela
Buyer II

**NINTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Ninth Amendment to the Interlocal Agreement ("Agreement") is made by and between the University of North Texas ("UNT") and the City of Austin ("the City"), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the "Original Agreement"); and


WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The scope of services is amended to add task 11, as specified in the attached Exhibit A.
- B. The total contract amount is increased by \$150,000.00 (\$50,000 per year), for a total not-to-exceed amount of \$795,000.00.
- C. The term of the Original Agreement is extended for an additional 36 months and the new expiration date is December 31, 2018.
- D. All other provisions of the Original Agreement remain in effect.

WHEREFORE, this Ninth Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: 
Sue Edwards
Assistant City Manager

Date: 12/9/15

UNIVERSITY OF NORTH TEXAS

By: **Janet Waldron**
Janet Waldron
Vice Chancellor for Finance

Digitally signed by Janet Waldron
DN: cn=Janet Waldron, o=UNT
System, ou=Vice Chancellor for
Finance,
email=janet.waldron@untsystem.
edu, c=US
Date: 2016.02.03 17:35:32 -06'00'

Date: _____

APPROVED AS TO FORM:


By: 
City of Austin
Law Department

Exhibit A

to Ninth Amendment to the Interlocal Agreement between the City of Austin and UNT for Aquatic Macrophyte Restoration Project,

Project proposal
prepared by
Lynde L. Dodd and Aaron Schad
University of North Texas, Institute of Applied Sciences
and
Sam Atkinson
University of North Texas, Director of the Institute of Applied Sciences
and
Gary Owen Dick (Technical Advisor)
USACE Engineer Research and Development Center

Objectives

The purpose of this proposal is to continue providing technical assistance in support of a City of Austin program to manage and restore aquatic vegetation in Lake Austin and Lady Bird Lake, Texas. This work is being coordinated with ongoing efforts conducted by the Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility (LAERF) and by University of North Texas researchers.

Objectives of the proposed work are to assist the City of Austin in the following areas:

- Continued development of restoration strategies for Lake Austin and Lady Bird Lake;
- Project implementation, monitoring and evaluation of aquatic plant growth; Provide reports and other information on status of plant establishment

Background

The Lower Colorado River has suffered frequent and heavy disturbances over the last 100 or so years. Notable among these disturbances have been the construction of dams and resultant alterations of water flow and water levels. In addition to impoundment, the riverine ecosystem has been impacted by considerable inputs of nutrients and pollutants. Although an aquatic plant community reportedly developed in Lake Austin following impoundment, aquatic vegetation had apparently declined by the early 1960's, leading to intentional introduction of a non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*), for improvement of waterfowl habitat. Unfortunately, Eurasian watermilfoil was a poor choice to meet the goal of its introduction, and improvements in waterfowl habitat were never realized. Additionally, Eurasian watermilfoil is recognized as a poor habitat basis for centrarchids and other fish species. A second exotic species, Hydrilla (*Hydrilla verticillata*), was first reported in the lake in 1999, which by 2002 had spread to cover over 320 acres (May 2002 survey, Texas Parks and Wildlife Department), greatly limiting water-based recreation, contributing to additional flooding, disrupting water supplies, and interfering with hydropower production. Insufficient amounts of competing native vegetation (and drawdown-managed Eurasian watermilfoil) present in the lake did little to prevent invasion by hydrilla.

The City of Austin, LCRA, and Texas Parks and Wildlife Department (TPWD) reached an agreement to stock grass carp (*Ctenopharyngodon idella*) for hydrilla control in the lake beginning in 2004. Positive results have been reported to date: Hydrilla coverage was reduced to less than 40 acres by 2006 (TPWD surveys) and remained at low levels through 2009, although a resurgence of Eurasian watermilfoil did occur during that time. Recovery of Hydrilla in 2011 and 2012 has triggered additional grass carp stocking in an effort to reduce its recovery in the lake.

At the same time efforts were initiated to manage hydrilla, the City of Austin contracted with the LAERF to promote establishment of desirable native aquatic vegetation in the lake with the goal of producing a balanced aquatic ecosystem.

Native aquatic plant founder colonies have been installed in Lake Austin to help ensure that native plant propagules will be available for natural spread in the lake once exotic species growth is suppressed. These colonies are well protected from grass carp and/or consist of species less palatable to the fish than Hydrilla, increasing likelihood of spread even while the fish remain in the lake. Because complete elimination of aquatic plants from Lake Austin could seriously affect the centrarchid fishery, efforts to restore native aquatic plants in conjunction with those to reduce exotic species should serve to maintain nursery habitat necessary for a healthy fishery. An additional benefit to establishing native aquatic vegetation is its ability to reduce future hydrilla and Eurasian watermilfoil infestations by occupying niches left open by grass carp feeding and drawdowns.

As part of the vegetation management project, LAERF has also installed native aquatic plant founder colonies in Lady Bird Lake, just downstream from Lake Austin. This lake has historically supported only limited amounts of vegetation, with small patches of Eurasian watermilfoil and a few native species occurring. Although hydrilla has yet to become established in the lake, there is a potential for fragments from Lake Austin to gain a foothold in Lady Bird Lake, leading to problems similar to those occurring in Lake Austin. Founder colonies should ensure development of native plant communities that will not only provide better habitat for fish and other aquatic wildlife, but also help resist invasions by hydrilla and other nuisance species in the lake.

Planting was initiated in 2004, and by the end of 2007, both lakes supported viable native plant founder colonies at ten or more sites (on each lake) that have begun to spread outside protected areas. In 2008, an additional ten founder colony sites were set up on each lake, with each site consisting of eight ring cages in shallow water; deeper plantings were made at appropriate sites to put native plants at depths more likely to be infested with hydrilla (including one site planted in six feet of water in Barton Creek). These new founder colonies have provided the immediate benefit of additional habitat and increased the quantity of propagules produced, shortening the time required for significant spread to other areas.

In 2008 larger-scale protection was added to a number of sites in each lake, permitting additional growth of plants and increasing propagule production in both lakes. This effort continued from 2010 through 2012. Although founder colonies on both lakes were surviving and spreading beyond protective cages, herbivory outside exclosures continued to affect sustained spread and natural development of new colonies. For the most part, herbivory was attributed to non-native swans and basking turtles in Lady Bird Lake and a combination of domestic waterfowl, fish, and turtles on Lake Austin. While plants persisted within the small exclosures, growth outside of cages was intermittent. This new growth was often decimated by herbivores, resulting in a cycle of growth and decline outside of cages. Combined with periodic but significant fluctuations in water levels (e.g., drawdowns in Lake Austin), many plants in the founder colonies were in a constant mode of recovery, not spread, during much of the growing season. Increasing the protected area of existing founder colonies has improved productivity: greater biomass production has increased spread outside of exclosures and propagule production, bettering the chances of new colony development. Larger colonies also appear to be able to withstand periods of low water. In our initial tests, plants inside the pens had spread well beyond growth documented at sites without pens after only one month. Between 2009 and 2012, we expanded installation of larger exclosures in both lakes and noted improvements in founder colony coverage and spread in both.

We also began addressing deeper water areas in which plants had not yet established. Several tests were conducted during between 2009 and 2012 to develop methods for deeper plantings of wild celery (*Vallisneria spiralis*). By 2012, we concluded that large containerized plants (14-inch diameter x 4-inch deep) could be placed in cylindrical cages and set on the bottom of either lake to depths up to 6-ft with good establishment at selected test sites.

An initiative in 2008 involved addressing the issue of shoreline erosion on Lake Austin. Existing colonies of the emergent species American bulrush (*Schoenoplectus pungens*) were observed establishing in erosion-prone areas in the lake, and it was proposed that planting well-rooted plants in other eroding areas could speed up the process of natural establishment and protect these fragile shorelines. In September 2008, plantings were made at existing founder colony sites that included eroding sandy banks. Additional tests were conducted in 2009 by incorporating coir logs and plantings for immediate and long-term erosion management. Results of these studies (evaluated most recently in 2012) indicated that coir logs provide short-term substrate protection from wave action, and even trap sediments. At the same time, plants installed in coir logs established more rapidly and fully, and were able to take over coir log erosion control function once coir logs degraded.

An initiative begun in 2011 included LAERF assistance in evaluating the need for management of nuisance riparian species, including giant cane, elephant ear, and other. LAERF provided recommendations to the City for herbicide application of giant cane, and conducted tests to ascertain which herbicide and application technique was suitable for combined elephant ear removal and restoration of native emergent species. This work will continue through the end of 2012.

To address erosional problems in Lake Austin, LAERF assisted in the installation of coir logs along ~2,000' of shoreline and subsequently planted emergent aquatic vegetation behind the logs. This effort was a significant expansion of previous coir log installation efforts and was based on the successes previously observed and documented. Evaluations of vegetation cages in 2013-2015 for Lakes Austin and Lady Bird found that the cages continue to sustain a large variety of desired aquatic plants. In 2015, we installed 9 new, large pens in Lake Austin. The purpose of the work was two-fold. First, we sought to continue expanding the extent of founder colonies in the reservoir. And second, we build the pens side-by-side utilizing two different mesh sizes (2" x 4" and 2" x 2") so we could evaluate herbivore access. The hypothesis being that vegetation contained in the smaller mesh cages will be better protected from small fish and turtles that may consume the vegetation. Persistence and spread of vegetation within the cages will continue to be monitored over a year period and findings will inform future cage building material choices in the reservoirs.

Tasks

Tasks 1 through 9 have been completed. Task 10 is in progress. Task 11 is a new task.

Task 1. Test plantings (2004)

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake. Work completed.

Task 2. Founder colony development (2005-2006)

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques. Work completed.

Task 3. Barton Springs Pool restoration—add-on task (2006)

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat. Work completed.

Task 4. Monitoring founder colonies (2007)

Objective: Monitor and evaluate founder colony sites. Work completed.

Task 5. Founder colony improvement (2008)

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes. Work completed.

Task 6. Founder colony improvement and shoreline erosion control (2009)

Objectives: Build on success of efforts in 2008 and 2009 by extending use of larger herbivore exclusion structures (pens) as appropriate. Continue monitoring and planting (as needed) of all existing sites (20 per lake). Continue planting of three-square bulrush as shoreline erosion control as appropriate. Quarterly reports on the progress of the project will be provided during this period. Work completed.

Task 7. Founder colony improvements (2009)

Objectives: Conduct tests incorporating aquatic plants and coir logs to manage shoreline erosion issues occurring in Lake Austin. Work completed.

Task 8. Founder colony maintenance and improvements (2010-2012)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Work completed.

Task 9. Managing nuisance riparian species in Lady Bird Lake (2011)

Objectives: Provide invasive riparian species management plan and conduct field demonstrations of combined elephant ear control and native species restoration. Work completed.

Task 10. Founder colony maintenance and improvements; riparian plantings (2013-2015)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Additionally, selected areas will be planted with riparian species at the discretion of the City of Austin and UNT. *Total Funding for Task 10 is not to exceed \$120,000 over the three year funded period.*

Task 11. Founder colony monitoring and maintenance; deeper planting; riparian plantings (2016-2017)

Objectives: Continue monitoring aquatic plant founder colonies. Install additional pens where appropriate. Expand revegetation efforts where non-native species are removed and along erosional shorelines. UNT and/or the City may request proposals for additional specific tasks and/or restoration efforts separately from Task 11. Funding for these efforts will be provided by the City and will be managed within this project as new tasks.

Total Funding for Task 11 is not to exceed \$150,000 over the three year funded period.

Proposed 2016 through 2018 Work under Task 11

- A. **Native aquatic plant establishment and protection:** Monitoring and maintenance are required for long-term establishment of founder colonies and is being continued past the installation/expansion phases. Because of the success provided by larger pens, it is proposed that in addition to monitoring and replanting in existing sites, additional pens should be constructed at remaining appropriate sites in each lake. These pens will serve to increase founder colony area coverage and propagule (seeds, fragments, etc.) production. Founder colony productivity should increase to levels needed to overcome natural establishment limitations in both lakes. In turn, this would hasten spread to unprotected areas in both lakes.
- The pilot project initiated in 2008, plantings of emergent species (primarily American bulrush) for shoreline protection at the founder colony sites, will be expanded to all appropriate sites (typically sandy banks) as a mechanism for minimizing shoreline erosion on Lake Austin.
 - Deeper water plantings will also continue in both lakes. Additional deeper water plantings of wild celery will be made; tests for planting other species (Illinois pondweed, bulltongue, etc.) in deeper water will also be conducted.

- B. Riparian plantings: The City has requested assistance with additional plantings of riparian area in Lady Bird Lake. Establishing desirable native plants in areas in which other activities have reduced or prevented plant community development, including the Mexican free-tailed bat viewing area near the Congress Street bridge that has been recently cleared of trees to improve viewing. LAERF will plant this area with low-growing native shrubs and herbaceous species to ensure that erosion problems do not begin to occur. Riparian and aquatic plantings of Auditorium shores and similar small-scale plantings will also be included under this proposal. LAERF will provide specific plans for each area to the City for approval before implementing each planting.

Additionally, the City may require restorative work in areas beyond the water's edge where nuisance species such as giant cane have been controlled. LAERF will monitor these areas and provide recommendations to the City regarding restoration. Implementation of restorative plantings by either LAERF or other contractors will require additional funds.

UNT Point of Contact

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**EIGHTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Eighth Amendment to the Interlocal Agreement (“Agreement”) is made by and between the University of North Texas (“UNT”) and the City of Austin (“the City”), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the “Original Agreement”); and


WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The term of the Original Agreement is extended for an additional 35 months and the new termination date is December 31, 2015.
- B. The scope of services is amended to add task 10, as specified in the attached Exhibit A.
- C. The total contract amount is increased by \$120,000, for a total not-to-exceed amount of \$645,000.00.
- D. All other provisions of the Original Agreement remain in effect.


WHEREFORE, this Eighth Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: 
Sue Edwards
Assistant City Manager

Date: 12/12/12

UNIVERSITY OF NORTH TEXAS

By: 
~~Geoff Gamble~~ *BA*
~~Vice President for Research~~
Terry Pankrat
Vice Chancellor Finance

Date: 12/20/12

APPROVED AS TO FORM:


By: 
City of Austin
Law Department

Exhibit A

to Eighth Amendment to the Interlocal Agreement between the City of Austin and UNT for Aquatic Macrophyte Restoration Project,

Objectives

The purpose of this proposal is to continue providing technical assistance in support of a City of Austin program to manage and restore aquatic vegetation in Lake Austin and Lady Bird Lake, Texas. This work is being coordinated with ongoing efforts conducted by the Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility (LAERF) and by University of North Texas researchers.

Objectives of the proposed work are to assist the City of Austin in the following areas:

- Continued development of restoration strategies for Lake Austin and Lady Bird Lake
- Project implementation, monitoring and evaluation of aquatic plant growth
- Provide reports and other information on status of plant establishment

Background

The Lower Colorado River has suffered frequent and heavy disturbances over the last 100 or so years. Notable among these disturbances have been the construction of dams and resultant alterations of water flow and water levels. In addition to impoundment, the riverine ecosystem has been impacted by considerable inputs of nutrients and pollutants. Although an aquatic plant community reportedly developed in Lake Austin following impoundment, aquatic vegetation had apparently declined by the early 1960's, leading to intentional introduction of a non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*), for improvement of waterfowl habitat. Unfortunately, Eurasian watermilfoil was a poor choice to meet the goal of its introduction, and improvements in waterfowl habitat were never realized. Additionally, Eurasian watermilfoil is recognized as a poor habitat basis for centrarchids and other fish species. A second exotic species, hydrilla (*Hydrilla verticillata*), was first reported in the lake in 1999, which by 2002 had spread to cover over 320 acres (May 2002 survey, Texas Parks and Wildlife Department), greatly limiting water-based recreation, contributing to additional flooding, disrupting water supplies, and interfering with hydropower production. Insufficient amounts of competing native vegetation (and drawdown-managed Eurasian watermilfoil) present in the lake did little to prevent invasion by hydrilla.

The City of Austin, LCRA, and Texas Parks and Wildlife Department (TPWD) reached an agreement to stock grass carp (*Ctenopharyngodon idella*) for hydrilla control in the lake beginning in 2004. Positive results have been reported to date: hydrilla coverage was reduced to less than 40 acres by 2006 (TPWD surveys) and remained at low levels through 2009, although a resurgence of Eurasian watermilfoil did occur during that time. Recovery of hydrilla in 2011 and 2012 has triggered additional grass carp stocking in an effort to reduce its recovery in the lake.

At the same time efforts were initiated to manage hydrilla, the City of Austin contracted with the LAERF to promote establishment of desirable native aquatic vegetation in the lake with the goal of producing a balanced aquatic ecosystem.

Native aquatic plant founder colonies have been installed in Lake Austin to help ensure that native plant propagules will be available for natural spread in the lake once exotic species growth is suppressed. These colonies are well protected from grass carp and/or consist of species less palatable to the fish than hydrilla, increasing likelihood of spread even while the fish remain in the lake. Because complete elimination of aquatic plants from Lake Austin could seriously affect the centrarchid fishery, efforts to restore native aquatic plants in conjunction with those to reduce exotic species should serve to maintain nursery habitat necessary for a healthy fishery. An additional benefit to establishing native aquatic vegetation is its ability to reduce future hydrilla and Eurasian watermilfoil infestations by occupying niches left open by grass carp feeding and drawdowns.

As part of the vegetation management project, LAERF has also installed native aquatic plant founder colonies in Lady Bird Lake, just downstream from Lake Austin. This lake has historically supported only limited amounts of vegetation, with small patches of Eurasian watermilfoil and a few native species occurring. Although hydrilla has yet to become established in the lake, there is a potential for fragments from Lake Austin to gain a foothold in Lady Bird Lake, leading to problems similar to those occurring in Lake Austin. Founder colonies should ensure development of native plant communities that will not only provide better habitat for fish and other aquatic wildlife, but also help resist invasions by hydrilla and other nuisance species in the lake.

Planting was initiated in 2004, and by the end of 2007, both lakes supported viable native plant founder colonies at ten or more sites (on each lake) that have begun to spread outside protected areas. In 2008, an additional ten founder colony sites were set up on each lake, with each site consisting of eight ring cages in shallow water; deeper plantings were made at appropriate sites to put native plants at depths more likely to be infested with hydrilla (including one site planted in six feet of water in Barton Creek). These new founder colonies have provided the immediate benefit of additional habitat and increased the quantity of propagules produced, shortening the time required for significant spread to other areas.

In 2008 larger-scale protection was added to a number of sites in each lake, permitting additional growth of plants and increasing propagule production in both lakes. This effort continued from 2010 through 2012. Although founder colonies on both lakes were surviving and spreading beyond protective cages, herbivory outside exclosures continued to affect sustained spread and natural development of new colonies. For the most part, herbivory was attributed to non-native swans and basking turtles in Lady Bird Lake and a combination of domestic waterfowl, fish, and turtles on Lake Austin. While plants persisted within the small exclosures, growth outside of cages was intermittent. This new growth was often decimated by herbivores, resulting in a cycle of growth and decline outside of cages. Combined with periodic but significant fluctuations in water levels (e.g., drawdowns in Lake Austin), many plants in the founder colonies were in a constant mode of recovery, not spread, during much of the growing season.

Increasing the protected area of existing founder colonies has improved productivity: greater biomass production has increased spread outside of exclosures and propagule production, bettering the chances of new colony development. Larger colonies also appear to be able to withstand periods of low water. In our initial tests, plants inside the pens had spread well beyond growth documented at sites without pens after only one month. Between 2009 and 2012, we expanded installation of larger exclosures in both lakes and noted improvements in founder colony coverage and spread in both.

We also began addressing deeper water areas in which plants had not yet established. Several tests were conducted during between 2009 and 2012 to develop methods for deeper plantings of wild celery (*Vallisneria spiralis*). By 2012, we concluded that large containerized plants (14-inch diameter x 4-inch deep) could be placed in cylindrical cages and set on the bottom of either lake to depths up to 6-ft with good establishment at selected test sites.

An initiative in 2008 involved addressing the issue of shoreline erosion on Lake Austin. Existing colonies of the emergent species American bulrush (*Schoenoplectus pungens*) were observed establishing in erosion-prone areas in the lake, and it was proposed that planting well-rooted plants in other eroding areas could speed up the process of natural establishment and protect these fragile shorelines. In September 2008, plantings were made at existing founder colony sites that included eroding sandy banks. Additional tests were conducted in 2009 by incorporating coir logs and plantings for immediate and long-term erosion management. Results of these studies (evaluated most recently in 2012) indicated that coir logs provide short-term substrate protection from wave action, and even trap sediments. At the same time, plants installed in coir logs established more rapidly and fully, and were able to take over coir log erosion control function once coir logs degraded.

An initiative begun in 2011 included LAERF assistance in evaluating the need for management of nuisance riparian species, including giant cane, elephant ear, and other. LAERF provided recommendations to the City for herbicide application of giant cane, and conducted tests to ascertain which herbicide and application technique was suitable for combined elephant ear removal and restoration of native emergent species. This work will continue through the end of 2012.

Tasks

Tasks 1 through 8 have been completed. Task 9 is in progress. Task 10 is a new task.

Task 1. Test plantings (2004)

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake. Work completed.

Task 2. Founder colony development (2005-2006)

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques. Work completed.

Task 3. Barton Springs Pool restoration---add-on task (2006)

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat. Work completed.

Task 4. Monitoring founder colonies (2007)

Objective: Monitor and evaluate founder colony sites. Work completed.

Task 5. Founder colony improvement (2008)

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes. Work completed.

Task 6. Founder colony improvement and shoreline erosion control (2009)

Objectives: Build on success of efforts in 2008 and 2009 by extending use of larger herbivore exclusion structures (pens) as appropriate. Continue monitoring and planting (as needed) of all existing sites (20 per lake). Continue planting of three-square bulrush as shoreline erosion control as appropriate. Quarterly reports on the progress of the project will be provided during this period. Work completed.

Task 7. Founder colony improvements (2009)

Objectives: Conduct tests incorporating aquatic plants and coir logs to manage shoreline erosion issues occurring in Lake Austin. Work completed.

Task 8. Founder colony maintenance and improvements (2010-2012)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Work completed.

Task 9. Managing nuisance riparian species in Lady Bird Lake (2011)

Objectives: Provide invasive riparian species management plan and conduct field demonstrations of combined elephant ear control and native species restoration. In progress.

Task 10. Founder colony maintenance and improvements; riparian plantings (2013-2015)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Additionally, selected areas will be planted with riparian species at the discretion of the City of Austin and UNT. New task.

Proposed 2013 through 2015 Work under Task 10

- A. Founder Colonies: Continued monitoring and long-term maintenance of founder colonies past the installation/expansion phases. Construction of additional pens at remaining appropriate sites in each lake.

The pilot project initiated in 2008, plantings of emergent species (primarily American bulrush) for shoreline protection at the founder colony sites, will be expanded to all appropriate sites (typically sandy banks) as a mechanism for minimizing shoreline erosion on Lake Austin.

Deeper water plantings will also continue in both lakes. Additional deeper water plantings of wild celery will be made; tests for planting other species (Illinois pondweed, bulltongue, etc.) in deeper water will also be conducted.

- B. Riparian Plantings: Additional plantings of riparian area in Lady Bird Lake including the Mexican free-tailed bat viewing area near the Congress Street bridge that has been recently cleared of trees to improve viewing. LAERF will plant this area with low-growing native shrubs and herbaceous species to ensure that erosion problems do not begin to occur. Riparian and aquatic plantings of Auditorium shores and similar small-scale plantings will also be included under this proposal: LAERF will provide specific plans for each area to the City for approval before implementing each planting.

Additionally, the City may require restorative work in areas beyond the water's edge where nuisance species such as giant cane have been controlled. LAERF will monitor these areas and provide recommendations to the City regarding restoration. Implementation of restorative plantings by either LAERF or other contractors will require additional funds.

COA Point of Contact

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**SEVENTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Seventh Amendment to the Interlocal Agreement ("Agreement") is made by and between the University of North Texas ("UNT") and the City of Austin ("the City"), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the "Original Agreement"); and

WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The scope of services is amended to add task 9, as specified in the attached Exhibit A.
- B. The total contract amount is increased by \$30,000.00, for a total not-to-exceed amount of ~~\$~~525,000.00.
- C. All other provisions of the Original Agreement remain in effect.

WHEREFORE, this Seventh Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: Sue Edwards
Sue Edwards
Assistant City Manager

Date: 5.31.11

UNIVERSITY OF NORTH TEXAS

By: Vish Prasad
Vish Prasad *bp*
Vice President for Research

Date: 5/16/11

APPROVED AS TO FORM:

By: Mitzi Cobb
City of Austin
Law Department

Exhibit A

to Seventh Amendment to the Interlocal Agreement between the City of Austin and UNT for the Aquatic Macrophyte Restoration Project

Objectives

Assessment and management of invasive riparian plants along Lady Bird Lake, Austin, TX.

Background

Invasive riparian plants have not been well documented along Lady Bird Lake, Austin, TX. They include but are not limited to *Arundo donax* (giant cane), and *Colocasia esculenta* (wild taro or elephant ear), which dominate certain areas of the riparian zone. The City of Austin has requested assistance from UNT in evaluating the infestations, providing guidance on management techniques and, where appropriate, initiating restoration with native aquatic and emergent plants. The City of Austin has an initiative to address these riparian species and reintroduce native plant species. This initiative will focus on giant cane.

Tasks

Tasks 1 through 8 have been completed or are in progress under the Interlocal Agreement between UNT and the City of Austin, as amended. Task 9 represents additional work proposed for 2011, added as amendment 7 to the Interlocal Agreement.

Task 1. Test plantings (2004)

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake.

Task 2. Founder colony development (2005-2006)

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques.

Task 3. Barton Springs Pool restoration---add-on task (2006)

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat.

Task 4. Monitoring founder colonies (2007)

Objective: Monitor and evaluate founder colony sites.

Task 5. Founder colony improvement (2008)

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes.

Task 6. Founder colony improvement and shoreline erosion control (2009)

Objectives: Build on success of efforts in 2008 and 2009 by extending use of larger herbivore exclusion structures (pens) as appropriate. Continue monitoring and planting (as needed) of all existing sites (20 per lake). Continue planting of three-square bulrush as shoreline erosion control as appropriate. Quarterly reports on the progress of the project will be provided during this period.

Task 7. Founder colony improvements (2009)

Objectives: Conduct tests incorporating aquatic plants and coir logs to manage shoreline erosion issues occurring in Lake Austin.

Task 8. Founder colony maintenance and improvements (2010-2012)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Introduce the native biocontrol agent *Euhrychiopsis lecontei* (milfoil weevil) to control excessive growth of Eurasian watermilfoil in Lake Austin; re-introduce *Hydrellia* flies in combination with City of Austin grass carp stocking.

Task 9. Assessment and management of invasive riparian plants along Lady Bird Lake, Austin, TX

Objectives: Assess invasive species, especially giant cane, develop management guidance document, initiate restoration of areas, and conduct a demonstration project removing wild taro.

Proposed 2011 through 2012 work under Task 9

- A. RECON- Assessment and general mapping of giant cane along the shoreline and riparian area of Lady Bird Lake. Giant cane is the primary invasive plant of interest for the City of Austin. All giant cane stands will be mapped and entered into GIS. Habitat description will be documented. Additional invasive species (wild taro, tree-of-heaven, chinaberry, yellow iris, etc.) will be noted
- B. Guidance document for proper management will be developed.
- C. Restoration – Native aquatic and emergent plants will be introduced to giant cane areas along river's edge after treatment. UNT will also provide plant species selection recommendations for restoration at higher elevations.
- D. Wild taro (elephant ear) demo - A demonstration study will evaluate several herbicide(s) and application techniques for maximum control of wild taro. Additionally, native plant introduction will be used to replace wild taro.

Deliverables

- A. An interim guidance document including invasive species mapping and recommendations for control of giant cane will be provided by July 2011
- B. Periodic reports and updates to the guidance document will be provided.

UNT Point of Contact

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972-436-2215 (230)
lyndedodd@laerf.org

UNT Technical Advisors

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972-436-2215 (235)
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Dr. Gary Owen Dick
Lewisville Aquatic Ecosystem Research Facility
201 E. Jones Street
Lewisville, TX 75057
972-436-2215 (225)
garydick@laerf.org

**SIXTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Sixth Amendment to the Interlocal Agreement ("Agreement") is made by and between the University of North Texas ("UNT") and the City of Austin ("the City"), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the "Original Agreement"); and

WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The Term of the Original Agreement is extended for an additional 36 month period and the new termination date is February 1, 2013.
- B. The scope of services is amended to add task 8, as specified in the attached Attachment A.
- C. The total contract amount is increased by \$105,000.00, for a total not-to-exceed amount of 495,000.00.
- D. All other provisions of the Original Agreement remain in effect.

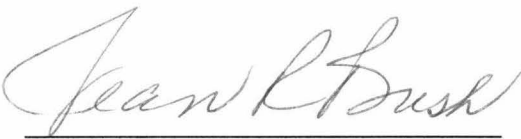
WHEREFORE, this Sixth Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: 
Sue Edwards
Assistant City Manager

Date: 12/16/09

UNIVERSITY OF NORTH TEXAS

By: 
Jean Bush, Acting Senior
Associate Vice President for Finance

Date: 12/3/09

APPROVED AS TO FORM:


By: 
City of Austin
Law Department

Exhibit A

to Sixth Amendment to the Interlocal Agreement between the City of Austin and UNT for the Aquatic Macrophyte Restoration Project

Project proposal
prepared by
Gary Owen Dick and Lynde L. Dodd
University of North Texas, Institute of Applied Sciences
and
Sam Atkinson
University of North Texas, Director of the Institute of Applied Sciences

Objectives

The purpose of this proposal is to continue providing technical assistance in support of a City of Austin program to manage and restore aquatic vegetation in Lake Austin and Lady Bird Lake, Texas. This work is being coordinated with ongoing efforts conducted by the Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility (LAERF) by University of North Texas researchers.

Objectives of the proposed work are to assist the City of Austin in the following areas:

- Continued development of restoration strategies for Lake Austin and Lady Bird Lake
- Project implementation, monitoring and evaluation of aquatic plant growth
- Provide quarterly reports on status of plant establishment

Background

The Lower Colorado River has suffered frequent and heavy disturbances over the last 100 or so years. Notable among these disturbances have been the construction of dams and resultant alterations of water flow and water levels. In addition to impoundment, the riverine ecosystem has been impacted by considerable inputs of nutrients and pollutants. Although an aquatic plant community reportedly developed in Lake Austin following impoundment, aquatic vegetation had apparently declined by the early 1960's, leading to intentional introduction of a non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*), for improvement of waterfowl habitat. Unfortunately, Eurasian watermilfoil was a poor choice to meet the goal of its introduction, and improvements in waterfowl habitat were never realized. Additionally, Eurasian watermilfoil is recognized as a poor habitat basis for centrarchids and other fish species. A second exotic species, hydrilla (*Hydrilla verticillata*), was first reported in the lake in 1999, and at one time spread to cover over 320 acres (May 2002 survey, Texas Parks and Wildlife Department), greatly limiting water-based recreation, contributing to additional flooding, disrupting water supplies, and interfering with hydropower production. Insufficient amounts of competing native vegetation (and drawdown-managed Eurasian watermilfoil) present in the lake did little to prevent invasion by hydrilla.

The City of Austin, LCRA, and Texas Parks and Wildlife Department (TPWD) reached an agreement to stock grass carp (*Ctenopharyngodon idella*) for hydrilla control in the lake beginning in 2004. Positive results have been reported to date: hydrilla coverage was reduced to less than 40 acres by 2006 (TPWD surveys) and remained at low levels through 2009, although a resurgence of Eurasian watermilfoil did occur and some recovery of hydrilla has since occurred. At the same time, the City of Austin contracted with the LAERF to promote establishment of desirable native aquatic vegetation in the lake with the goal of management to produce a balanced aquatic ecosystem.

Native aquatic plant founder colonies have been installed in Lake Austin to help ensure that native plant propagules will be available for natural spread in the lake once exotic species growth is suppressed. These colonies are well protected from grass carp and/or consist of species less palatable to the fish than hydrilla, increasing likelihood of spread even while the fish remain in the lake. Because complete elimination of aquatic

plants from Lake Austin could seriously affect the centrarchid fishery, efforts to restore native aquatic plants in conjunction with those to reduce exotic species should serve to maintain nursery habitat necessary for a healthy fishery. An additional benefit to establishing native aquatic vegetation is its ability to reduce future hydrilla and Eurasian watermilfoil infestations by occupying niches left open to grass carp feeding and drawdowns.

As part of the vegetation management project, LAERF has also installed native aquatic plant founder colonies in Lady Bird Lake, just downstream from Lake Austin. This lake has historically supported only limited amounts of vegetation, with small patches of Eurasian watermilfoil and a few native species occurring. Although hydrilla has yet to become established in the lake, there is a potential for fragments from Lake Austin to gain a foothold in Lady Bird Lake, leading to problems similar to those occurring in Lake Austin. Founder colonies should ensure development of native plant communities that will not only provide better habitat for fish and other aquatic wildlife, but also help resist invasions by hydrilla and other nuisance species in the lake.

Planting was initiated in 2004, and by the end of 2007, both lakes supported viable native plant founder colonies at ten or more sites (on each lake) that have begun to spread outside protected areas. In 2008, an additional ten founder colony sites were set up on each lake, with each site consisting of eight ring cages in shallow water; deeper plantings were made at appropriate sites to put native plants at depths more likely to be infested with hydrilla (including one site planted in six feet of water in Barton Creek). These new founder colonies have provided the immediate benefit of additional habitat and increased the quantity of propagules produced, shortening the time required for significant spread to other areas. In 2009 larger-scale protection was added to a number of sites in each lake, permitting additional growth of plants and increasing propagule production in both lakes.

Although founder colonies on both lakes are surviving and spreading beyond protective cages, herbivory outside exclosures continues to affect sustained spread and natural development of new colonies. For the most part, herbivory has been attributed to non-native swans and basking turtles in Lady Bird Lake and a combination of domestic waterfowl, fish, and turtles on Lake Austin. While plants persist within the small exclosures, growth outside of cages has been intermittent. This new growth often decimated by herbivores, resulting in a cycle of growth and decline outside of cages. Combined with periodic significant fluctuations in water levels (e.g., drawdowns in Lake Austin), many plants in the founder colonies are in recovery, not spread, mode during much of the growing season. In 2008, we began testing a second level of protection (larger pens built from safety-cap covered T-posts and 2-in x 4-in PVC-coated welded wire) in which existing founder colonies were provided protection over a larger area. Increasing the protected area of existing founder colonies has increased productivity: greater biomass production has increased spread outside of exclosures and propagule production, improving the chances of new colony development. Larger colonies also appear to be able to withstand periods of low water. In our initial tests (July 2008), plants inside the pens had spread well beyond growth documented at sites without pens after only one month. In 2009, we expanded installation of larger exclosures in both lakes and noted improvements in founder colony coverage within one growing season.

A new initiative in 2008 involved addressing the issue of shoreline erosion on Lake Austin. Existing colonies of the emergent species three-square bulrush (*Schoenoplectus americanus*) were observed establishing in erosion-prone areas in the lake, and it was proposed that planting well-rooted plants in other eroding areas could speed up the process of natural establishment and protect these fragile shorelines. In September 2008, plantings were made at existing founder colony sites that included eroding sandy banks. Additional tests were conducted in 2009 by incorporating coir logs and plantings for immediate and long-term erosion management.

Proposed 2010 through 2012 Work

Native plant establishment and protection: Monitoring and maintenance are required for long-term establishment of founder colonies and will be continued past the installation/expansion phases. Because of the success provided by larger pens in 2008 and 2009, it is proposed that in addition to monitoring and replanting in existing sites, additional pens should be constructed at remaining appropriate sites in each lake. These pens will serve increase founder colony area coverage and propagule (seeds, fragments, etc.) production. Combined with increased numbers of founder colony sites installed in 2008 and 2009, founder colony productivity should increase to levels needed to overcome natural establishment limitations in both lakes. In

turn, this would hasten spread to unprotected areas in both lakes. Additionally, pens would be constructed more robustly than ring cages alone, making them more difficult to vandalize.

Sites qualifying for addition of pens must meet several criteria, including gradual lakebed slope, adequate water depth, navigation safety concerns, and adjacent land use. To ensure navigation safety, the depth of pen construction will be limited to 2-ft deep and less. Other hazard notification (buoys, etc) will be installed as needed per City of Austin Parks and Recreation guidelines.

A pilot project in 2008, plantings of emergent species (primarily three-square bulrush *Schoenoplectus americanus*) will be expanded to all appropriate sites (typically sandy banks) as a mechanism for minimizing shoreline erosion on Lake Austin.

Quarterly reports on the progress of the project will be provided during this period.

Eurasian watermilfoil management: Although not considered as problematic as hydrilla in Lake Austin, much of the area previously occupied by hydrilla becomes dominated by Eurasian watermilfoil when hydrilla is suppressed by grass carp feeding and low temperatures. Topped out canopies of this species can impede flow and water resource uses (e.g., boating) much as hydrilla does. In years past, the presence of Eurasian watermilfoil and efforts to manage the species in Lake Austin led to scheduled (approximately every two years) winter drawdowns, which was sufficient to reduce canopy development for periods of time but may have contributed to spread (not introduction) of hydrilla in the lake by leaving open niches, especially in deeper water areas.

We propose small-scale introduction of a beetle species, the milfoil weevil (*Euhrychiopsis lecontei*) to the lake in order to reduce Eurasian watermilfoil canopy development and therefore its problematic nature. While reduction of watermilfoil may benefit hydrilla in the lake, the City of Austin anticipates additional grass carp stocking in response to increasing hydrilla observed during 2009. Additionally, if needed, we will re-introduce hydrilla-specific biocontrol agent *Hydrellia* flies to the lake to further damage hydrilla canopies. A combination of plant-specific herbivory (grass carp and flies on hydrilla; milfoil weevils on Eurasian watermilfoil) should serve to reduce nuisance canopy development in the lake while at the same time permit native plants to thrive.

Tasks

Tasks 1, through 7 have been completed or are in progress under an existing contract between the City of Austin and UNT. Task 8 represents additional work proposed for 2010.

Task 1. Test plantings (2004)

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake.

Task 2. Founder colony development (2005-2006)

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques.

Task 3. Barton Springs Pool restoration---add-on task (2006)

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat.

Task 4. Monitoring founder colonies (2007)

Objective: Monitor and evaluate founder colony sites.

Task 5. Founder colony improvement (2008)

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes.

Task 6. Founder colony improvement and shoreline erosion control (2009)

Objectives: Build on success of efforts in 2008 and 2009 by extending use of larger herbivore exclusion

structures (pens) as appropriate. Continue monitoring and planting (as needed) of all existing sites (20 per lake). Continue planting of three-square bulrush as shoreline erosion control as appropriate. Quarterly reports on the progress of the project will be provided during this period.

Task 7. Founder colony improvements (2009)

Objectives: Conduct tests incorporating aquatic plants and coir logs to manage shoreline erosion issues occurring in Lake Austin.

Task 8. Founder colony maintenance and improvements (2010-2012)

Objectives: Continue maintaining aquatic plant founder colonies, including installation of additional larger herbivore exclosures where appropriate. Introduce the native biocontrol agent *Euhrychiopsis lecontei* (milfoil weevil) to control excessive growth of Eurasian watermilfoil in Lake Austin; re-introduce *Hydrellia* flies in combination with City of Austin grass carp stocking.

Funding: FY 2010 - 2012 (31 January 2010 – 1 February 2013) --- \$105,000

Total Funding for Task 8 is not to exceed \$105,000 over the three year funded period

Site visits will be made every six to eight weeks during the contract period. Project reports will be provided to the City of Austin quarterly each year.

UNT and/or the City of Austin may request proposals for additional specific tasks and/or restoration efforts separately from Task 8. Funding for these efforts will be provided by the City of Austin and will be managed within this project as new tasks.

COST SECTION

Indirect Cost Rates:

Because funding for this project is coming from another State Agency, the Predetermined Indirect Cost Rate for this contract shall be 10.0% of total direct costs for the grant period of 1 January 2010 – 1 February 2013. Budgets for additional tasks will be provided when funding is provided by the City of Austin.

Budget (Task 8) - \$105,000.00

Term of Contract

The sixth amendment extends the original contract term 36 months; the agreement terminates on 1 February 2013.

THE UNDERSIGNED CONTRACTING PARTIES do hereby certify that: (1) the services specified above are necessary and essential for activities that are properly within the statutory functions and programs of the affected agencies of State Government; (2) the proposed arrangements serve the interest of efficient and economical administration of the State Government, and (3) the services, supplies or materials contracted for are not required by Section 21 of Article 16 of the Constitution of Texas to be supplied under contract given to the lowest responsible bidder.

PERFORMING AGENCY further certifies that it has the authority to contract for the above services by authority granted in Article 4413 (32e) V.C.S. and Chapter 105 of the Texas Education Code.

RECEIVING AGENCY further certifies that it has the authority to perform the services contracted for by authority granted in Article 4413 (32e) V.C.S.

UNT Points of Contact

Dr. Gary Owen Dick or Lynde L. Dodd
Lewisville Aquatic Ecosystem Research Facility
201 E. Jones Street
Lewisville, TX 75057

972-436-2215

garydick@laerf.org
lyndedodd@laerf.org

**FIFTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Fifth Amendment to the Interlocal Agreement ("Agreement") is made by and between the University of North Texas ("UNT") and the City of Austin ("the City"), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the "Original Agreement"); and

WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The scope of services is amended to add task 7, as specified in the attached Attachment A.
- B. The total contract amount is increased by \$15,000.00, for a total not-to-exceed amount of 390,000.00.
- C. All other provisions of the Original Agreement remain in effect.

WHEREFORE, this Fifth Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: Sue Edwards
Sue Edwards
Assistant City Manager

Date: 9.03.09

UNIVERSITY OF NORTH TEXAS

By: Vish Prasad

Date: 10/5/09



Vish Prasad,
Vice President for Research

APPROVED AS TO FORM:

By: [Signature]

City of Austin
Law Department

ATTACHMENT "A"

TASK 7

Scope of Work, Task 7; Assessment of shoreline erosion management using herbaceous wetland plants in Lake Austin, Texas

Proposed Funding Amount: \$15,000

Point of Contact: Lynde Williams, LyndeWilliams@laerf.org, 972-436-2215 x230, University of North Texas

Technical Advisor: Dr. Gary Owen Dick, garydick@laerf.org, 972-436-2215 x225, U.S. Army Corp of Engineers, Lewisville Aquatic Ecosystem Research Facility (LAERF)

Background: The City of Austin has requested assistance from (LAERF) in evaluating the application of native aquatic vegetation as a mechanism for erosion control in lieu of installation of hard structure (e.g., metal bulkheads) in Lake Austin. Ongoing erosion problems in the lake are due to a combination of excessive wave action (boats and wind) and runoff down steep banks. Much of the lake shoreline is currently protected with solid bulkheads, exacerbating the problem by reflecting, rather than absorbing, wave energy back into the system. Additionally, bulkheads provide limited habitat for fish and other aquatic wildlife, whereas vegetation will simultaneously stabilize shorelines, provide valuable aquatic habitat, and improve water quality by absorption of nutrients such as phosphorous and nitrogen.

Objective: The objective of this project is to develop procedures for establishing native wetland vegetation in a manner that will reduce wave energy to prevent undercutting of banks while at the same time trap sediments carried into the lake with runoff. This study will evaluate several shoreline planting strategies along undeveloped shoreline.

Approach: LAERF has developed techniques for establishing native aquatic vegetation in Lake Austin, and these will be modified to meet the goals of establishing significant stands of shoreline species that can withstand wave action in the lake. The approach will include use of containerized plants distributed at moderately high densities (2- or 3-ft on center), initial protection from waves (coir logs), species selection based upon prevalent conditions (wave action, water level pulsing due to power generation), and protection from herbivory (principally through selection of species not palatable to herbivores known in the lake). Four planting treatments will be evaluated:

- 1) No planting---evaluate shoreline condition without action taken
- 2) Planting without coir logs---evaluate plant establishment and shoreline condition without protection from waves
- 3) Planting with coir logs---evaluate plant establishment and shoreline condition with protection from waves; evaluate longevity of soft protection offered by coir logs
- 4) Planting with planted coir logs---evaluate plant establishment and shoreline condition with protection from waves; evaluate ability of plants to extend the protective benefits of coir logs

Each of the four treatments will be evaluated at four sites in the lake, two represented by steep slopes, and two represented by gradual slopes. Site selection will be the responsibility of the City of Austin. Plants will include those least likely to require protection (e.g., water willow, spikerushes, water hyssop, etc.). Doubled rows of coir logs will be installed and the inner log planted with herbivore-resistant species most likely to survive bareroot planting (currently being evaluated at LAERF).

ATTACHMENT "A"
TASK 7

Plantings will be made in late summer 2009 and evaluated concurrently with assessments made on other plantings in the lake, approximately every six weeks during the growing season, through summer of 2010. Metrics will include vegetation establishment success (species survival, area coverage, etc.), longevity of coir logs, and estimates of erosion (via readings from metered stakes).

Report Delivery Schedule: An interim report detailing efforts to date and plant establishment progress will be provided to the City by December 2009; a final report will be provided by December 2010.

**FOURTH AMENDMENT TO THE
INTERLOCAL AGREEMENT BETWEEN
THE UNIVERSITY OF NORTH TEXAS AND THE CITY OF AUSTIN
FOR AQUATIC MACROPHYTE RESTORATION PROJECT**

This Fourth Amendment to the Interlocal Agreement ("Agreement") is made by and between the University of North Texas ("UNT") and the City of Austin ("the City"), a home-rule municipality and political subdivision of the State of Texas, acting by and through its duly authorized City Manager, or designee.

W I T N E S S E T H:

WHEREAS, UNT and the City entered into an Interlocal Agreement pursuant to the provisions of the Interlocal Cooperation Act, Texas Government Code Section 791.001 et seq. on March 2, 2005 (the "Original Agreement"); and

WHEREAS, UNT and the City have amended the Original Agreement several times in the past and desire to again amend the Original Agreement;

NOW THEREFORE, in accordance with Section III. B. of the Original Agreement, the parties agree as follows:

- A. The term of the Agreement is extended for an additional 12 month period and the new termination date is January 31, 2010.
- B. The scope of services is amended to add task 6, as specified in the attached Exhibit A.
- C. The total contract amount is increased by \$60,000.00, for a total not-to-exceed amount of 375,000.00.
- D. A new Section I. C. is added to read as follows:
 - C. UNT shall appoint one staff person (Dr. Samuel F. Atkinson) as its Principal Investigator for work performed under this Agreement. If the Principal Investigator is removed from employment at UNT for any reason, the parties shall mutually agree to the Principal Investigator's replacement by other UNT personnel.

- D. Section IV. A. is amended to change the invoice frequency from monthly to quarterly and to change the address for remittance to:

Office of Research Services,
University of North Texas
1155 Union Circle #305250
Denton, TX 76203-5017


- E. Section V. D. is amended to change the address for notice to UNT to:

Kristi Lemmon
Director of Sponsored Projects
Office of Research Services
University of North Texas
1155 Union Circle #305250
Denton, TX 76203-5017
Kristi.Lemmon@unt.edu

- F. All other provisions of the Original Agreement remain in effect.

WHEREFORE, this Fourth Amendment to the Interlocal Agreement is executed to be effective the date of the last party to sign.

CITY OF AUSTIN

By: 
Sue Edwards
Assistant City Manager

Date: 1-29-09

UNIVERSITY OF NORTH TEXAS

By: 
Andrew M. Harris
Vice President for Finance & Administration

Date: 9 FEB 09

APPROVED AS TO FORM:

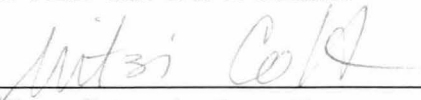
By: 
City of Austin, Law Department

EXHIBIT A

To the Fourth Amendment to the Interlocal Agreement between the City of Austin and UNT for the Aquatic Macrophyte Restoration Project

Project proposal
prepared by
Gary Owen Dick and Lynde D. Williams
University of North Texas, Institute of Applied Sciences
Michael Smart
Lewisville Aquatic Ecosystem Research Facility
and
Sam Atkinson
University of North Texas, Director of the Institute of Applied Sciences

OBJECTIVES

The purpose of this proposal is to continue providing technical assistance in support of a City of Austin program to restore desirable native aquatic vegetation in Lake Austin and Lady Bird Lake, Texas. This work is being coordinated with ongoing efforts conducted by the Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility (LAERF) by University of North Texas researchers.

Objectives of the proposed work are to assist the City of Austin in the following areas:

- Continued development of restoration strategies for Lake Austin and Lady Bird Lake
- Project implementation, monitoring and evaluation of aquatic plant growth
- Provide quarterly reports on status of plant establishment

BACKGROUND

The Lower Colorado River has suffered frequent and heavy disturbances over the last 100 years. Notable among these disturbances have been the construction of dams and the resultant alterations of water flow and water levels. In addition to impoundment, the riverine ecosystem has been impacted by considerable inputs of nutrients and pollutants. Although an aquatic plant community reportedly developed in Lake Austin following impoundment, aquatic vegetation had apparently declined by the early 1960's, leading to the intentional introduction of a non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*), for improvement of waterfowl habitat. Unfortunately, Eurasian watermilfoil was a poor choice to meet the goal of its introduction, and improvements in waterfowl habitat were never realized. Additionally, Eurasian watermilfoil is widely recognized as poor habitat basis for centrarchids and other fish species. A second exotic species, hydrilla (*Hydrilla verticillata*), was first reported in the lake in 1999, and at one time spread to cover over 320 acres (May 2002 survey, Texas Parks and Wildlife Department), greatly limiting water-based recreation, contributing to additional flooding, disrupting water supplies, and interfering with hydropower production. Insufficient amounts of competing native vegetation (and drawdown-managed Eurasian watermilfoil) present in the lake did little to prevent invasion by hydrilla.

The City of Austin, LCRA and Texas Parks and Wildlife Department (TPWD) reached an agreement to stock grass carp for hydrilla control in the lake beginning in 2004. Positive results have been reported to date: hydrilla coverage was reduced to less than 40 acres by 2006 (TPWD surveys) and remained at low levels throughout 2008, although a resurgence of Eurasian watermilfoil did occur. At the same time, the City of Austin contracted with the LAERF to promote establishment of desirable native aquatic vegetation in the lake with the management goal of producing a balanced aquatic ecosystem.

Founder colonies of the desirable vegetation have been installed in Lake Austin to help ensure that native plant propagules will be available for natural spread in the lake. These colonies are well protected from grass carp and/or consist of species less palatable to the fish than hydrilla, increasing likelihood of spread even while carp remain in

the lake. Because complete elimination of aquatic plants from Lake Austin could seriously impact the centrarchid fishery, efforts to restore native aquatic plants in conjunction with those to reduce noxious exotic species should serve to maintain nursery habitat that is necessary for a healthy fishery. An additional benefit to establishing native aquatic vegetation is its ability to reduce future hydrilla and Eurasian watermilfoil infestations by occupying niches left open to grass carp feeding and drawdowns.

As part of the vegetation management project, LAERF has also installed founder colonies in Lady Bird Lake, just downstream from Lake Austin. This lake has historically supported only limited amounts of vegetation, with only small patches of Eurasian watermilfoil and a few native species occurring. Although hydrilla has yet to become established in the lake, there is a potential for fragments from Lake Austin to gain a foothold in Lady Bird Lake, leading to problems similar to those occurring in Lake Austin. Founder colonies will ensure development of native plant communities that will not only provide better habitat for fish and other aquatic wildlife, but also help resist invasions by hydrilla and other nuisance species.

By the end of 2007, both lakes supported viable native plant founder colonies at ten or more sites per lake that have begun to spread outside protected areas. In 2008, an additional ten founder colony sites were set up on each lake, with each site consisting of eight ring cages in shallow water; deeper plantings were made at appropriate sites to put native plants at depths more likely to be infested with hydrilla (including one site planted in six feet of water in Barton Creek). These new founder colonies have provided the immediate benefit of additional habitat and increased the quantity of propagules produced, shortening the time required for significant spread to other areas.

Although founder colonies on both lakes are surviving and spreading beyond protective cages, herbivory outside exclosures continues to affect sustained spread and natural development of new colonies. For the most part, herbivory has been attributed to non-native swans and basking turtles in Lady Bird Lake and a combination of waterfowl, fish, and turtles on Lake Austin. While plants persist within the small exclosures, growth outside of cages has been intermittent. This new growth is often decimated by herbivores, resulting in a cycle of growth and decline outside of the cages. In 2008, testing of a second level of protection (larger pens built from safety-cap covered T-posts and 2-in x 4-in PVC-coated welded wire), in which existing founder colonies were provided protection over a larger area. Increasing the protected area of existing founder colonies will increase productivity: larger biomass will result in greater spread, reducing the impacts of herbivory outside of exclosures, and propagule production will increase, improving the chances of new colony development. In initial tests (July 2008), plants inside the pens had spread well beyond growth documented at sites without pens after only one month.

A new initiative in 2008 involved addressing the issue of shoreline erosion on Lake Austin. Existing colonies of the emergent species three-square bulrush (*Schoenoplectus americanus*) were observed establishing themselves in erosion-prone areas in the lake. It was proposed that planting well rooted plants in other eroding areas will speed up the process of natural establishment and protect these fragile shorelines. In September 2008, plantings were made at existing founder colony sites that included eroding sandy banks.

PROPOSED 2009 WORK

Monitoring and maintenance are required for long-term establishment of founder colonies exist past the installation/expansion phases. Because of the success provided by larger pens in 2008, it is proposed that in addition to monitoring and replanting in existing sites, additional pens should be constructed at all appropriate sites in each lake. These pens will be constructed more robustly than ring cages alone, making them more difficult to vandalize, and will increase founder colony area coverage and propagule (seeds, fragments, etc.) production. Combined with increased numbers of founder colony sites installed in 2008, founder colony productivity will increase to the levels needed to overcome natural establishment limitations in both lakes. In turn, this will hasten spread to unprotected areas in both lakes.

Sites qualifying for addition of pens must meet several criteria, including gradual lakebed slope, adequate water depth, navigation safety concerns, and adjacent land use. To ensure navigation safety, the depth of pen construction will be limited to 2-ft deep and less. Other hazard notification (buoys, etc) will be installed as needed per City of Austin Parks and Recreation guidelines.

The pilot project begun in 2008, planting- of emergent species (primarily three-square bulrush *Schoenoplectus americanus*) will be expanded to all appropriate sites (typically sandy banks) as a mechanism for minimizing

shoreline erosion on Lake Austin.

Quarterly reports on the progress of the project will be provided during this period.

TASKS

Tasks 1, through 5 have been completed under an existing contract between the City of Austin and UNT. Task 6 is a new task proposed for 2009.

Task 1. Test plantings

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake (2004).

Task 2. Founder colony development

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques (2005-2006).

Task 3. Barton Springs Pool restoration---add-on task

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat (2006).

Task 4. Monitoring founder colonies

Objective: Monitor and evaluate founder colony sites (2007).

Task 5. Founder colony improvement

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes (2008)

Task 6. Founder colony improvement and shoreline erosion control (2009)

Objectives: Build on success of efforts in 2008 by extending use of larger herbivore exclusion structures (pens) as appropriate. Continue monitoring and planting (as needed) of all existing sites (20 per lake). Continue planting of three-square bulrush as shoreline erosion control as appropriate. Quarterly reports on the progress of the project will be provided during this period.

Site visits will be made every six to eight weeks during the contract period. Project reports will be provided to the City of Austin quarterly each year.

UNT and/or the City of Austin may request proposals for additional specific tasks and/or restoration efforts. Funding for these efforts will be provided by the City of Austin and will be managed within this project as new tasks.

COST SECTION

Indirect Cost Rates:

Because funding for this project is coming from another State Agency, the Predetermined Indirect Cost Rate for this contract shall be 10.0% of total direct costs for the grant period of 1 December 2008 – 31 January 2010. Budgets for additional tasks will be provided when funding amounts/availability are provided by the City of Austin.

Total Budget (Task 6) - \$60,000.00

UNT Point of Contact

Dr. Gary Owen Dick
Lewisville Aquatic Ecosystem Research Facility
201 E. Jones Street
Lewisville, TX 75057
972-436-2215 ext 25
garydick@laerf.org



Amendment No. 3
to
Original Purchase Order No. PC630EX000216
for
between
The University of North Texas
and the
City of Austin

- 1.0 The City hereby amends the scope of work of this contract by adding a Task 5, as per the attached Scope of Work
- 2.0 The total contract amount is increased by \$110,000 from \$205,000 to \$315,000.
- 3.0 All other terms and conditions remain the same.

BY THE SIGNATURES affixed below, Amendment No. 3 is hereby incorporated into and made a part of the above-referenced contract as of February 1, 2008.

Signature:

A handwritten signature in black ink, appearing to read "A. M. Harris".

Andrew M. Harris
Vice President for Finance & Administration
University of North Texas
Denton, Texas 76203

Signed:

A handwritten signature in black ink, appearing to read "Roy Rivers".

Roy Rivers, Buyer II
City of Austin
Purchasing Office

Date

14 MAR 08

Date

3/17/08

SCOPE OF WORK

**Amendment No. 3
to
an Interlocal Agreement between
The University of North Texas (UNT)
and
The City of Austin (City)
for
Aquatic Macrophyte Restoration Project**

1.0 Scope of Work, Addition of Task 5

Task 5. Founder colony improvement

- 5.1 Objectives: Add new founder colonies (minimum ten (10) per lake) and expand existing founder colonies in both lakes.
- 5.2 UNT and/or the City may request proposals for additional specific tasks and/or restoration efforts separately from Task 5. Funding for these efforts will be provided by the City of Austin and will be managed within this project as new tasks.

2.0 Schedule: 1 February 2008 – 31 January 2009

Site visits shall be made quarterly during the amendment contract period. Project reports shall be provided to the City of Austin semi-annually.

3.0 Cost

- 3.1 The total cost to the City for this project amendment shall be \$110,000.
- 3.2 UNT and/or the City of Austin may request proposals for additional specific tasks and/or restoration efforts separately. Funding for these efforts will be provided by the City of Austin and will be managed within this project as new tasks.
- 3.3 The Predetermined Indirect Cost Rate for this contract shall be 10.0% of total direct costs.

4.0 Term

The scope of work under this amendment shall begin on 1 February 2008 and shall terminate on 31 January 2009, or at such time as the Scope of work described herein has been completed and accepted by all parties.



City of Austin

Financial and Administrative Services Department

Purchasing Office

P. O. Box 1088, Austin, TX 78767

(512) 974-2500

February 15, 2008

Mr. Andrew M. Harris

Vice President for Finance & Administration

University of North Texas

Denton, TX 76203

Re: Interlocal Agreement

Aquatic Macrophyte Restoration Project

Dear Mr. Harris:

The Austin City Council has approved the execution of Amendment No. 3 with the University of North Texas for the above-referenced item as follows:

Responsible Department:	Watershed Protection & Development Review Dept.
Department Contact Person:	Donna Lee Bliss
Department Contact Email Address:	donna-lee.bliss@ci.austin.tx.us
Department Contact Telephone:	512-974-2530
Project Name:	Aquatic Macrophyte Restoration Project
Contractor Name:	Mr. Andrew M. Harris/University of North Texas
Contract Number:	PI080000003
Contract Period:	February 1, 2008 thru January 31, 2009
Dollar Amount	\$110,000
Extension Options:	N/A
Requisition Number:	6300- PI080000003
Solicitation Number:	Interlocal Agreement
Agenda Item Number:	72
Council Approval Date:	January 31, 2008

Attached is a copy of all contract terms and conditions. Thank you for your interest in doing business with the City of Austin. If you have any questions regarding this contract, please contact me at (512) 974-6434.

Sincerely,

Roy Rivers, Buyer II

Purchasing Office

Finance and Administrative Services Department

Enclosure

*The City of Austin is committed to compliance with the Americans with Disabilities Act.
Reasonable modifications and equal access to communications will be provided upon request.*

Scope of Work

Aquatic Macrophyte Restoration Project, City of Austin, Texas

Project proposal

prepared by

Gary Owen Dick and Lynde D. Williams

University of North Texas, Institute of Applied Sciences

Michael Smart

Lewisville Aquatic Ecosystem Research Facility

and

Sam Atkinson

University of North Texas, Director of the Institute of Applied Sciences

January 2008

Objectives

The purpose of this proposal is to continue providing technical assistance in support of a City of Austin program to restore aquatic vegetation in Lake Austin and Town Lake, Texas. These efforts are being coordinated with ongoing efforts conducted by the Corps of Engineers' Lewisville Aquatic Ecosystem Research Facility (LAERF) by University of North Texas researchers.

Objectives of the proposed work are to assist the City of Austin in the following areas:

- o Continued development of restoration strategies for Lake Austin and Town Lake
- o Project implementation, monitoring and evaluation of aquatic plant growth
- o Provide semi-annual reports on status of plant establishment

Background

The Lower Colorado River has suffered frequent and heavy disturbances over the last 100 or so years. Notable among these disturbances have been the construction of dams and resultant alterations of water flow and water levels. In addition to impoundment, the riverine ecosystem has been impacted by considerable inputs of nutrients and pollutants. Although an aquatic plant community reportedly developed in Lake Austin following impoundment, aquatic vegetation had apparently declined by the early 1960's, leading to intentional introduction of a non-native species, Eurasian watermilfoil (*Myriophyllum spicatum*), for improvement of waterfowl habitat. Unfortunately, Eurasian watermilfoil was a poor choice to meet the goal of its introduction, and improvements in waterfowl habitat were never realized. Additionally, Eurasian watermilfoil is widely recognized as poor habitat basis for centrarchids and other fish species. A second exotic species, hydrilla (*Hydrilla verticillata*), was first reported in the lake in 1999, and at one time spread to cover over 320 acres (May 2002 survey, Texas Parks and Wildlife Department), greatly limiting water-based recreation, contributing to additional flooding, disrupting water supplies, and interfering with hydropower production. Insufficient amounts of competing native vegetation (and drawdown-managed Eurasian watermilfoil) present in the lake did little to prevent invasion by hydrilla.

The City of Austin, LCRA and Texas Parks and Wildlife Department (TPWD) reached an agreement to stock grass carp for hydrilla control in the lake beginning in 2004. Positive results have been reported: hydrilla coverage was reduced to less than 40 acres by 2006 (TPWD surveys) and remained at low levels throughout 2007, although a resurgence of Eurasian watermilfoil did occur. At the same time, the City of Austin contracted with the USACE Lewisville Aquatic Ecosystem Research Facility to promote establishment of desirable native aquatic vegetation in the lake with the goal of management to produce a balanced aquatic ecosystem.

Fourteen founder colonies have been installed in Lake Austin to help ensure that native plant propagules will be available for natural spread in the lake as hydrilla declines due to grass carp activity. These colonies are well protected from grass carp and/or consist of species less palatable to the fish than hydrilla, increasing likelihood of spread even while carp remain in the lake. Because complete elimination of aquatic plants from Lake Austin could seriously impact the centrarchid fishery, efforts to restore native aquatic plants in conjunction with those to reduce exotic species should serve to maintain nursery habitat necessary for a healthy fishery. An additional benefit to establishing native aquatic vegetation is its ability to reduce future hydrilla and Eurasian watermilfoil infestations by occupying niches left open to grass carp feeding and drawdowns.

As part of the vegetation management project, LAERF has also installed founder colonies in Town Lake, just downstream from Lake Austin. Town Lake has historically been nearly devoid of vegetation, although small patches of Eurasian watermilfoil and a few native species do occur. Although hydrilla has yet to become established in the lake, it is probably just a matter of time before fragments from Lake Austin begin to produce significant colonies, potentially leading to problems similar to those occurring in Lake Austin. Founder colonies should ensure development of native plant communities that will not only provide better habitat for fish and other aquatic wildlife, but also help resist invasions by hydrilla and other nuisance species.

Both lakes now support viable native plant founder colonies that have begun to spread outside protected areas, but most plants are growing in relatively shallow water (three feet deep and less). Deeper plantings at these colonies and installation of new colonies in selected areas around both lakes will provide the immediate benefit of additional habitat and increase the quantity of propagules produced, shortening the time required for significant spread to other areas. Additionally, deeper plantings will put native plants at depths more likely to be infested with hydrilla. Monitoring and maintenance are required for long-term establishment of founder colonies and will be continued past the installation/expansion phases.

Tasks

Tasks 1, 2, 3, and 4 have been completed under an existing contract between the City of Austin and UNT.

Task 1. Test plantings

Objective: Evaluation of native plant species suitability and need for protection in both lakes; install a minimum of ten founder colonies in each lake (2004).

Task 2. Founder colony development

Objective: Expansion of founder colonies using results obtained during Task 1 with focus on successful native plant species, protective devices, and planting techniques (2005-2006).

Task 3. Barton Springs Pool restoration---add-on task

Objective: Establish native aquatic vegetation in Barton Springs Pool for improvement of endangered salamander habitat (2006).

Task 4. Monitoring founder colonies

Objective: Monitor and evaluate founder colony sites (2007).

Task 5. Founder colony improvement

Objectives: Add new founder colonies (minimum 10 per lake) and expand existing founder colonies in both lakes.

Funding: FY 2008 (1 February 2008 – 31 January 2009) --- \$110,000

Total Funding for Task 5: \$110,000

Site visits will be made quarterly during the contract period. Project reports will be provided to the

City of Austin semi-annually (June and November) each year.

UNT and/or the City of Austin may request proposals for additional specific tasks and/or restoration efforts separately from Task 5. Funding for these efforts will be provided by the City of Austin and will be managed within this project as new tasks.

COST SECTION

Indirect Cost Rates:

Because funding for this project is coming from another State Agency, the Predetermined Indirect Cost Rate for this contract shall be 10.0% of total direct costs for the grant period of 1 January 2008 – 31 December 2008. Budgets for additional tasks will be provided when funding amounts/availability are provided by the City of Austin.