Final Environmental Assessment/Habitat Conservation Plan for Issuance of a Section 10 (a)(1)(B) Permit for Incidental Take of the Barton Springs Salamander (*Eurycea sosorum*) for the Operation and Maintenance of Barton Springs Pool and Adjacent Springs City of Austin, Texas

US Fish and Wildlife Service
Ecological Services
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and

City of Austin, Texas
P.O. Box 1088
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October 1998

Proposed Action: Issuance of an Endangered Species Act section 10 (a)(1)(B) permit for the incidental take of the endangered Barton Springs salamander (*Eurycea sosorum*) during the operation and maintenance of Barton Springs Pool and adjacent springs by the City of Austin, TX.

Unit of the U.S. Fish and Wildlife Service Proposing the Action: Regional Director, Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Legal Mandate for Proposed Action: Endangered Species Act of 1973, as amended, section 10(a)(1)(B), as implemented by 50 CFR 17.22.

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TABLE OF CONTENTS

APPENDIX A - Revised Surface Habitat Management Plan

APPENDIX B - Monthly Barton Springs Pool Survey Data (July 1993 - May 1998)

APPENDIX C - Experimental Pool Cleaning Data (March - May 1998)

APPENDIX D - Public Comments

APPENDIX E - Cost Analysis

EXECUTIVE SUMMARY

The City of Austin, Texas (Applicant) has submitted a 10 (a)(1)(B) permit application to the U.S. Fish and Wildlife Service (Service) to allow incidental take of a federally-listed endangered species. The activity to be authorized is the incidental take of the federally protected endangered Barton Springs salamander (*Eurycea sosorum)* that would result from the operation and maintenance of Barton Springs Pool and the adjacent springs. This document includes the City of Austin's proposed Habitat Conservation Plan (HCP) and the US Fish and Wildlife Service's NEPA documentation (Environmental Assessment) for the Federal action, issuance of a section 10(a)(1)(B) permit.

During the past 20 years, routine operation of the pool involved frequent lowering of the pool to remove silt and sediment. Areas of the pool that may be impacted by routine pool maintenance, including adjacent springs, provide habitat for the federally listed endangered Barton Springs salamander (*Eurycea sosorum*). The Service has determined that pool lowering and pool maintenance and recreational activities result in incidental take of the Barton Springs salamander. The purpose and need for the section 10 (a)(1)(B) permit is to ensure that incidental take resulting from the continued operation and maintenance of Barton Springs Pool and adjacent springs will not appreciably reduce the likelihood of survival and recovery of the species. The primary goal of the HCP is to ensure that the Applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking.

Take, as defined under the Endangered Species Act, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term incidental take refers to take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. In the case of this HCP, pool maintenance and recreational use would be "otherwise lawful activities".

The salamander occupies areas of Barton Springs Pool (also known as Parthenia), Eliza Spring (also known as the Elks Pit or Polio Pit), Old Mill Spring (also known as Sunken Garden or Walsh Spring), and Upper Barton Spring. These springs comprise the only known surface habitat of the salamander. Population estimates for the Barton Springs salamander are not available; the rocks, crags, and large surface area of the springs and inaccessibility of the aquifer make it impossible to obtain an accurate population estimate. The highest observed number in the main pool was recorded as over 150 individuals found on a two-hour dive in the main springs (Chippindale et al., 1993). The highest number reported in recent surveys was 71, as found by the City of Austin and the Service in 1998 (about 5 hours of effort). Surveys at Eliza Spring, not including drawdown information, have found a high count of 38. The highest number at Old Mill Spring was found to be 60 during a survey of half the spring pool. Surveys at Upper Barton Spring have reported a high count of 14.

Pool activities have the potential to adversely impact the salamander. Such activities include drawdowns, cleaning activities, and use by recreational swimmers. Analysis of recent experimental pool cleaning data (March through September 1998) and existing City of Austin

data (1993-1998) indicates that the salamander is found not only near the main springs, but also the shallow fissures and beach areas. As many as 19 salamanders were found in the fissures and, on one occasion during the experimental cleanings, 84 salamanders were found on the beach. The highest number found stranded in Eliza Spring was 17. Thus, it became clear that drawdowns have resulted in the stranding of salamanders in the fissures and beach areas as well as Eliza and possibly Old Mill during low flow conditions. In addition, it has become evident that the threat exists for a swimmer to accidentally crush a salamander in the fissures, beach, and Old Mill. In order to maintain and operate the pool and adjacent springs, the City needs a 10(a)(1)(B) permit to authorize take of the Barton Springs salamander. In this document, four management alternatives are presented: No Action, Maintenance Procedures Prior to Listing (May 1997), Preferred Alternative, and Reduction in the Frequency of Maintenance Procedures.

Under the No Action alternative, an incidental take permit would not be issued. This would result in the closing of the pool because the cleaning would not be allowed. The Maintenance Procedures Prior to Listing alternative would operate the pool with the level of maintenance used prior to the listing of the salamander as endangered (May 1997). Adverse impacts of this alternative are the stranding of salamanders during the drawdowns for the cleaning of the deep and shallow ends of the pool and increased siltation of habitat due to shallow end cleaning activities. In addition, a swimmer/wader could cause take by accidentally stepping on a salamander in the fissures, beach, and Old Mill Spring. Under the Preferred Alternative, the potential for take is associated with pool drawdown, cleaning, and use (wading and standing). This alternative proposes modifications to minimize and/or mitigate the potential take by swimmers/waders and adverse impacts of cleaning. Under the Reduced Level of Maintenance alternative pool cleaning would occur once per month. Impacts of this alternative include incidental take due to the stranding of salamanders during drawdown. In addition, salamanders may be crushed accidentally by swimmers/waders in the fissures and beach areas. Also, an increase in slippery and murky conditions could result in pool closures. Measures proposed in the Preferred Alternative (which includes the HCP) would substantially minimize and/or mitigate take. Such measures include lowering of the beach, restricting access to Eliza and Old Mill (Sunken Garden) springs, and minimizing drawdown. The HCP would allow for incidental take of salamanders from the operation and maintenance of Barton Springs Pool and the adjacent spring sites. The biological goal of this HCP is to improve salamander habitat, increase population size, and increase life history information over the term of the permit. Overall, the HCP should improve conditions for the Barton Springs salamander and a net increase in the number of individuals is expected. Under the Preferred Alternative, the City and the Service have agreed to the following measures for the mitigation of incidental take of the salamander as described in Section 6.0 of this document.

- Cleaning of the shallow end without lowering the entire pool
- Lowering of the beach
- Cleaning of the fissures, the new "beach" habitat, and adjacent springs using low-pressure hoses
- Installation of an underwater walkway and a stainless steel railing in the deep end
- Maintenance of 11,000 square feet of "beach" habitat

- Removal of sediment and debris from the shallow end of the pool during cleaning
- Removal of silt and sediment in non-habitat areas of the deep end using a combination vacuum system and high pressure hoses
- Modification of the gate system for the drawdown of Barton Springs Pool
- Modification of the bypass system to minimize the frequency of floods in the pool
- Professional supervision and staff training
- Installation of a pump system to provide spring water for maintenance
- Retention of water over the fissures in the event of drawdown
- Surveys for stranded salamanders in the event of a drawdown for cleaning and maintenance
- Prohibition of the deliberate disturbance of substrate in the primary salamander habitat
- Restricted access to Eliza and Old Mill (Sunken Garden) springs
- Placement of thin limestone slabs over fissures in shallow section of fissures area
- Lowering of the main pool for cleaning only with Service concurrence
- Restoration of habitat of Eliza and Old Mill springs
- Reduction in surface water runoff into Barton, Eliza, and Old Mill springs
- Dedication of a portion of Barton Springs Pool revenue to conservation efforts
- Public education
- Scientific research for the Barton Springs salamander
- Maintain a captive-breeding program for the Barton Springs salamander

In addition to this incidental take permit, the City is implementing a NPDES permit to protect the water quality of the Barton Springs Zone. Given the limited range of the salamander, the primary threat to the salamander is the degredation of water quality in the Barton Springs Zone. The City of Austin will implement measures set out in the federal National Pollutant Discharge Elimination System (NPDES) stormwater permit and the reasonable and prudent measures (Appendix A). This permit, issued by EPA, authorizes discharges from the City's Municipal Storm Sewer System (MS4) to waters of the United States. Under this permit, the City must reduce loadings of petroleum hydrocarbons, heavy metals and sediments to Barton Springs from current development and other activities located within the Barton Springs Zone, within the City limits, and subject to the City's jurisdiction.

1.0 Introduction

The City of Austin, Texas (Applicant) has submitted a permit application to the US Fish and Wildlife Service (Service) to allow incidental take of the federally-listed endangered Barton Springs salamander (*Eurycea sosorum*). The activity to be authorized is the incidental take of a federally protected endangered species that would result from the operation of Barton Springs as a public swimming and recreational facility. In addition, take would be authorized for the harassment and injury that may occur to the species at adjacent spring locations (Eliza, Old Mill, and Upper Barton springs) in Zilker Park.

This document serves two main purposes: it includes (1) the City of Austin's Habitat Conservation Plan, and (2) the US Fish and Wildlife Service's NEPA documentation (Environmental Assessment) for the Federal action, issuance of a section 10 (a)(1)(B) permit. This document addresses the operation of Barton Springs Pool as a public swimming and recreational area and associated possible impacts that may affect the federally listed endangered Barton Springs salamander. The cool, pristine waters of Barton Springs have attracted humans for centuries. Even though Barton Springs has been a popular swimming and recreational area since the 1800's, the current dam was not constructed until the 1920's. Since that time, Barton Springs Pool has remained one of the most popular attractions in Central Texas, second only to the State Capitol in terms of the number of annual visitors, with an average of approximately 250,000 visitors annually.

During the past 5 years, routine operation of the pool involved the frequent lowering of the pool to remove silt and sediment from the deep end of the pool. High-pressure water hoses were used to remove silt and algae from the deep end of the pool and abrasive mechanical roller brushes and high-pressure water hoses were used in the shallow end of the pool. Areas of the pool that may be impacted by routine pool maintenance, including adjacent springs, are habitat for the federally-listed endangered Barton Springs salamander (*Eurycea sosorum*). The Service has determined that the pool lowering and pool maintenance activities result in an incidental take of the Barton Springs salamander. The Applicant has submitted the necessary 3-200 form, Habitat Conservation Plan (see Section 6.0), and other necessary application materials for a permit under section 10 (a)(1)(B) of the Endangered Species Act (Act) for incidental take. The implementing regulations for section 10 (a)(1)(B) of the Act, as provided by 50 CFR 17.22, specify the criteria by which a permit allowing the incidental take of listed species pursuant to otherwise lawful activities may be obtained. The biological goal of this HCP is to improve salamander habitat, increase population size, and increase life history information over the term of the permit.

2.0 Purpose and Need for the Action

An application has been submitted for a permit to allow incidental take of the endangered Barton Springs salamander. The salamander occupies areas of Barton Springs Pool (also known as Parthenia), Eliza Spring (also known as the Elks Pit or Polio Pit), Old Mill Spring (also known as Sunken Garden or Walsh Spring), and Upper Barton Spring. These four springs are collectively known as Barton Springs and are the only known surface habitats of the Barton Springs salamander. The purpose and need for the section 10 (a)(1)(B) permit is to ensure that incidental take resulting from the continued operation and maintenance of Barton Springs Pool and adjacent springs will not appreciably reduce the likelihood of survival and recovery of the species. The primary goal of the HCP is to ensure that the Applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking.

3.0 Description of the Affected Environment

3.1 History of Human Use of the Springs

The only known surface habitats of the Barton Springs salamander are located in Barton Springs Pool, Eliza Spring, Old Mill Spring, and Upper Barton Spring (Figure 1).

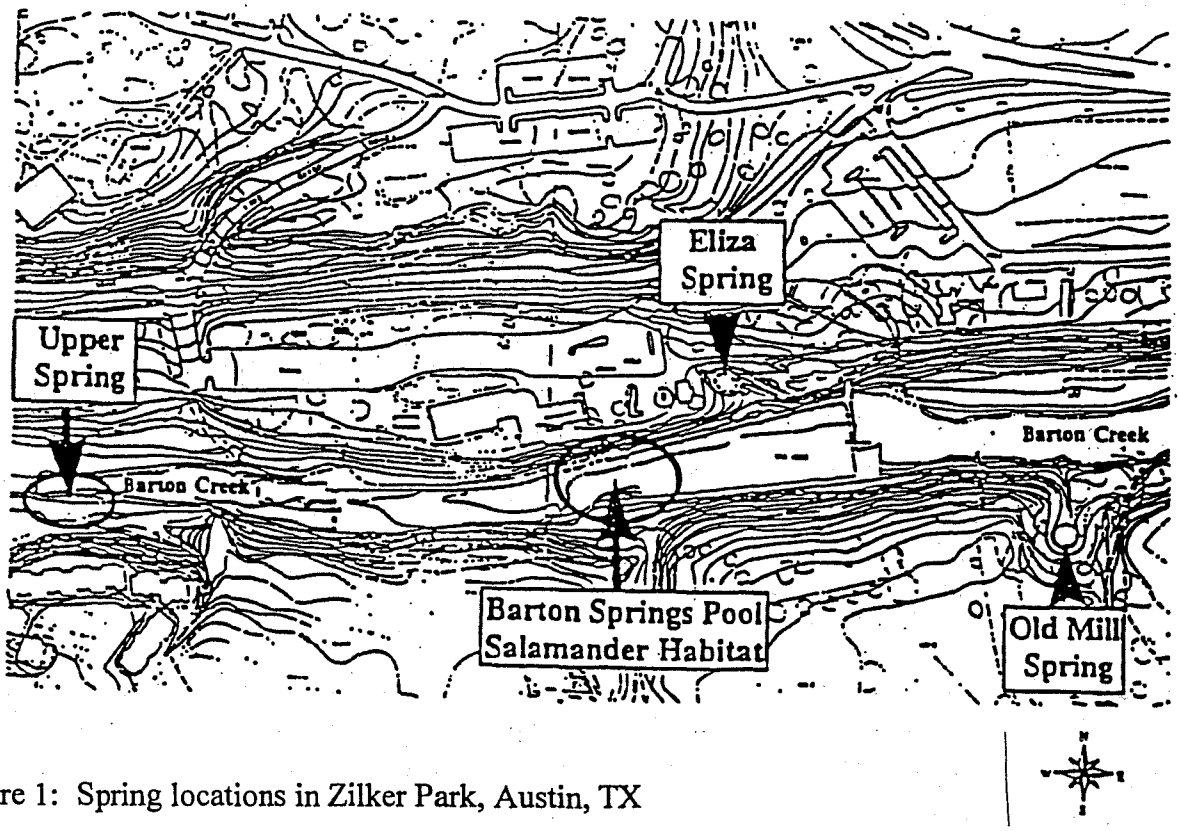

Figure 1: Spring locations in Zilker Park, Austin, TX

Barton Springs is the main discharge point for the Barton Springs segment of the Edwards Aquifer. Ninety percent of all water that discharges from this segment of the aquifer emerges at

Barton Springs, while the remaining 10 percent discharges at ancillary spring sites or is extracted by wells (Slade, et. al. 1985, 1986). The history of human activity near Barton Springs dates back at least 10,000 years, based on numerous archaeological sites located near the springs in Zilker Park (Voellinger, 1993). Various tribes of Native Americans, including the Lipan Apache, Comanche, and Tonkawa have inhabited the area around the springs in past centuries and records indicate that many of the Spanish expeditions of the 16th - 18th centuries passed by the springs. The first Anglo immigrants to settle at the springs arrived in 1837 when William Barton and his family moved to the abundant springs that today bear the family name. During subsequent decades the springs have been the site of a flour mill, a source of drinking water for many citizens, and a popular location for baptisms, family picnics, social gatherings, musical performances, fishing, and swimming.

The dam and many of the structural features that form the current Barton Springs Pool were built during the 1920's. Other major developments or modifications such as the bathhouse, upstream dam, and the skimmer drain were added during the following decades, and the Barton Creek bypass that flows under the sidewalk on the north side of the pool was constructed in 1974-1976. All of these projects have been designed either to enhance the aquatic and recreational use of the springs or to mitigate the impacts of surface water flow from Barton Creek.

During the early 1900's, Eliza Spring was modified to provide a naturally cooled meeting area specifically for the Elks Club. The original concrete enclosure was constructed around 1900 and the confined spring flow of Eliza was a major source of drinking water for Austin citizens during the drought of 1917. Since the original construction of the Elks Pit, a concrete bottom was installed with 15 centimeter (6 inch) diameter holes to allow for spring flow from the aquifer and an additional 0.5 - 1 meter (1.6 - 3.3 feet) of concrete was added to the top of the original concrete wall. For many years, Eliza Spring was open to the public and their pets for swimming and leisure. Public access is now restricted as restoration and enhancement projects are being considered.

Old Mill Spring (Sunken Garden), downstream of Barton Springs Pool, was the location of Austin's first ice factory. In 1935, Austin's first municipal sunken garden was designed by a local architect and constructed with labor provided by the National Youth Administration at this spring location. The purpose of the design was to provide a public, outdoor location for quiet meditation and family picnics. It has been a favorite swimming hole for many people and their pets in past years. During the 1980's an outfall pipe was installed to route spring flow directly from Old Mill Spring (Sunken Garden) underground to lower Barton Creek. During periods of moderate to high aquifer levels, water in Old Mill can reach a depth of 2.0 meters (6.6 feet) and there is abundant surface flow between the springs and the discharge point into lower Barton Creek. Under low flow conditions, surface flow from Old Mill Spring (Sunken Garden) will cease when all of the available spring flow is routed into the outfall pipe. Various sections of the original stone structure around the springs are in disrepair and much of the structure is in need of extensive restoration.

Upper Barton Spring is located approximately 100 meters (328 feet) upstream of Barton Springs Pool near the south bank of Barton Creek. This spring discharges from the Barton Springs

segment of the Edwards Aquifer but flows only when collective flows at Barton Springs are in excess of 1,414 liters/second (53 cfs). Local university professors have used this spring for field studies and limnology courses but only recently was it identified as a surface habitat of the Barton Springs salamander.

3.2 Endangered Species - Barton Springs salamander (*Eurycea sosorum*)

The Barton Springs salamander is totally aquatic and neotenic (it does not metamorphose into a terrestrial adult). The salamander is lungless and relies on a pair of conspicuous red gills located behind the head for efficient gas exchange. The Barton Springs salamander is found only at four spring locations in Zilker Park, near downtown Austin, Texas. Bryce C. Brown and Alvin Flury (Chippendale, et. al. 1993) first collected specimens of the salamander in 1946. Various field notes from the 1970's and 1980's indicate that the salamander was commonly found amongst the leaves of macrophytes or submerged leaves in the bottom of the springs (Sweet, 1978, 1984; Reddell, pers. communication). In the main pool, City of Austin surveys indicate that salamanders are found primarily near the spring outlets, the fissures area west of the diving board, and the beach area on the north side of the pool. Salamanders are also found at Eliza Spring, Old Mill Spring (Sunken Garden), and Upper Barton Spring.

Much speculation exists concerning the distribution of the Barton Springs salamander. To date, no evidence exists to determine to what degree the range of the salamander extends into the aquifer. In describing the Barton Springs salamander as a separate species, Chippendale, et. al.(1993), concluded that the Barton Springs salamander "makes extensive use of surface spring habitat when given the opportunity. This species clearly is capable of living underground, and as Sweet has emphasized, it shows several morphological features that are associated with subterranean living in other members of *the Eurycea neotenes* species group. We suspect that *Eurycea sosorum* is predominantly a surface-dweller that also is able to live underground". Surface habitat and adequate spring flow provide the salamanders relatively constant water temperature and water quality under non-storm conditions, abundant prey base, and access to subterranean environments.

Salamanders are most frequently discovered around the main spring outflows, hidden within a 2-8 cm (0.8 - 3.1 inches) deep zone of gravel and small rocks overlying a coarse sandy or bare limestone substrate. These areas are noticeably clear of fine silt or decomposed organic debris near spring discharge points and appear to be kept clean by the briskly flowing spring water during medium to high aquifer levels. Abundant prey species for the salamander also inhabit these areas. Piles of woody debris in the vicinity of the main springs provide habitat for the salamander as well as its prey base. Salamanders are also found on the beach area and around minor spring outlets within the limestone fissures, just west of the diving board. Suitable habitat can increase or decrease depending on such factors as springflows, abundance of aquatic macrophytes, sedimentation rates, and frequency of floods.

In Barton Springs Pool, the current range of the salamander has been defined by SCUBA surveys and data from the experimental cleanings conducted March through September 1998. The SCUBA surveys were conducted during 1992-1998 by the City of Austin's Watershed Protection

Department (WPD) staff and by University of Texas biologists (Chippendale, et. al. 1993). Based on City of Austin monthly surveys (Appendix B) of the pool and experimental cleaning data (Appendix C), it appears that the main surface population in the pool is located near the main and side spring outlets, the section of gravel beach northeast of these springs, and the narrow fissures with springflow that traverse a portion of the shallow end of the pool.

City of Austin monthly survey counts since July 1993 in Barton Springs Pool have ranged from 1 to 45 individuals. These surveys sample the main surface population but are not a total count for the entire pool. The City of Austin monthly transect methodology covers approximately 185 square meters (2,000 sq. ft.) of this area. Included along these transects are all of the main spring discharges. In addition, biologists inspect the deep end and the beach area to note the presence/absence of salamanders. However, the large area of the beach makes this a difficult place to survey. During the transect surveys, City biologists document the number and size of salamanders, including salamander larvae and eggs, as well as the presence of aquatic fauna, flora, and substrate conditions. These monthly surveys include transects outside of the known habitat of the salamander to determine if the range of the salamander is increasing. Biologists also complete a general survey of plant species, fish and invertebrate species, and substrate conditions, including the presence/absence of sediment and algae along the beach area and throughout the deep end of the pool.

Additional survey data were gathered by the City of Austin and the Service during the experimental pool cleanings conducted March through September 1998 (Appendix C). Results from experimental pool cleanings indicate that salamanders can also be found on the shallow (depth of 1.3 meters) beach area along the north side of the pool. Intensive survey efforts have failed to locate salamanders in the shallow end upstream of the fissure area. An August 1998 SCUBA survey conducted by the Service and the City found 71 salamanders. Based on this information and several other comprehensive surveys conducted by the City of Austin and the Service, the number of salamanders inhabiting surface habitat in Barton Springs Pool is estimated to be approximately three to five times the number of individuals counted during the regular monthly surveys. Accurate population estimates for the Barton Springs salamander are not available and there are not good data for accurate assessments. It is impossible to obtain an accurate estimate because of the inability to obtain a reliable sample. The rocks, crags, large surface area of the springs, and inaccessibility of the aquifer make it impossible to obtain an accurate estimate.

The experimental pool cleanings were conducted to determine the impacts of the pool cleaning process on the salamander and its habitat. With the current gate system, the entire pool must be lowered 1.3 meters (4 feet) to clean the shallow end. During drawdowns, the shallow end, the fissures, and the beach become exposed. In addition, drawdowns may cause habitat at the adjacent springs to become exposed, depending on the aquifer level. During the experimental cleanings, all exposed areas were searched extensively for salamanders. The number of salamanders found in the fissures ranged from 0 to 19. No salamanders were observed in the shallow end, and the range observed on the Beach was 0 to 84. The number found stranded at Eliza ranged from 0 to 17. Although the water levels dropped at Old Mill Spring (Sunken Garden) no areas became exposed. It became clear from the experimental cleanings that current

drawdown methods may cause incidental take to a higher degree than was previously thought. This information also indicates that a swimmer may accidentally step on a salamander in the shallow fissures and beach areas.

During the course of the experimental pool cleanings the fissures became covered with sediment. Before this sedimentation occurred, salamanders were found in this area. No salamanders were found after the build-up of sediment. This information indicates that cleaning the habitat area may be beneficial to the species.

As part of the experimental cleanings, stranded salamanders were placed in aquaria, which were placed in the fissures. These salamanders were observed over a period of three days to determine the effects the stranding may have had on individual salamanders. Over the course of 7 Phase II Experimental Cleanings, a total of 32 salamanders (19 adults and 13 juveniles) were placed in aquaria. Of these, 12.5% were found dead: 2 adults and 2 juveniles. In addition, 2 salamanders were found dead on the beach after the area had been searched for hours; 1 was seen in the beak of a grackle; and 1 salamander was found dead the following day during a snorkel inspection of the habitat areas.

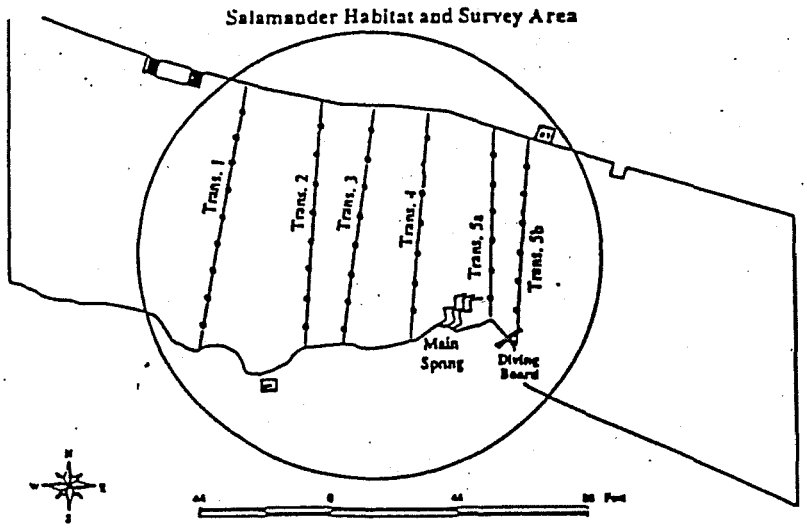

Figure 2: Monthly Transect Survey Area in the Main Pool

The occurrence of salamanders at Eliza Spring has been noted since the 1970's when "dozens or hundreds" of individuals were found at this spring location (Chippendale, et. al. 1993). Surveys during the past five years have shown a high degree of variability in numbers of salamanders with no individuals being observed between December 1993 and May 1995 (COA and USFWS unpublished data). The highest number observed during a survey was 38. Possible sources of adverse impacts to the salamanders during the survey period include increased accumulation of silt and sediment in the bottom of Eliza Spring and the infiltration of diesel and other petroleum byproducts associated with operation of the train concession, directly uphill of the springs. In January and February 1997, salamander mortality in Eliza Spring resulted from the lowering of Barton Springs Pool. During low aquifer conditions (flow < 53 cfs measured at the USGS monitoring well upstream of Barton Springs Pool), when the pool is drawn down, Eliza Spring

ceases to flow and salamanders become stranded as the spring rapidly drains and aquatic habitat is no longer available. In March 1997, 188 salamanders were found stranded. Recent attempts by the City of Austin to maintain aquatic habitat (short-term) by pumping spring water from Barton Springs into Eliza Spring during pool lowerings have resulted in dramatic increases in the number of salamanders observed during population surveys. As in the main springs, areas of appropriate salamander habitat, principally composed of cobble and healthy aquatic macrophytes, have decreased in recent years due to the deposition of silt and sediment in the bottom of the spring enclosure. Moreover, the loss of habitat is not solved by the short-term pumping.

Salamanders have been found sporadically in the bottom of Old Mill Spring (Sunken Garden) and in the surface flow from Old Mill Spring to the mainstem of lower Barton Creek. Regular salamander surveys in Old Mill Spring have been difficult to implement due to the deep layer of large rocks that covers the bottom of the springs. The highest observed was 60 during a survey of half the spring pool.

Surveys conducted in 1995 and 1996 at Upper Barton Spring failed to detect the presence of salamanders. However, in April 1997, a survey conducted by City of Austin and Service staff resulted in the discovery of 14 adult salamanders at Upper Barton Spring. This additional site has been added to the list of sites monitored on a regular basis by City of Austin biologists. Various attempts to locate salamanders at Cold Springs, Campbell's Hole, and Backdoor Springs have failed to locate salamanders. No salamanders have been found in the Barton Springs segment of the Edwards Aquifer outside of Zilker Park, Austin, Texas.

Little is known concerning the reproductive biology of the species in the wild and Barton Springs salamander eggs have not been found during surveys at the four spring locations. Recent studies with captive individuals indicate that salamander eggs are 1.5 - 2.0 mm (0.06 - 0.08 inch) in diameter when they are deposited. Young larvae develop and hatch in approximately 25 - 35 days (L. Ables, Dallas Aquarium, pers. comm.). We have no information that relates the percentage of juveniles to adult survivorship. Barton Springs salamander larvae have been found year round in the wild, and juveniles can represent up to 50 percent of the total number of individuals found at a site (see Data Appendix). It has been estimated that sexual maturity can occur when the salamander reaches a length of 2 cm (0.8 inch), (Chippendale, et. al. 1993). Juveniles have been found at all four sites. At the pool, juveniles and gravid females have been found in many areas of the pool, such as the beach, fissures, and the main spring.

The Barton Springs salamander is impacted by the quality of water in the Barton Springs Zone. The salamander has a very restricted range. The majority of pollutants that enter the Barton Springs Segment of the Edwards Aquifer must exit the aquifer by passing salamander habitat. The primary threats to the Barton Springs salamander are degradation of the quality and quantity of water that feeds Barton Springs due to urban expansion over the Barton Springs watershed.

Barton Springs receives groundwater inflows generated from the Barton Springs Zone. Periodically, surface waters overflow from Barton Creek into Barton Springs Pool during flooding events. The Barton Springs Zone consists of the Recharge Zone where rainfall and

surface water enter the Edwards Aquifer and the Contributing Zone that lies upstream of the recharge zone from which stormwater runoff enters the recharge zone. The limits of the Barton Springs Zone are defined as those portions of the Barton, Bear, Little Bear, Onion, Slaughter, and Williamson Creek watersheds that lie on or upstream of the Edwards Aquifer Recharge Zone. The Barton Springs Zone extends over several jurisdictional boundaries.

To protect the water quality of the Barton Springs Zone, the City of Austin will implement measures set out in the federal National Pollutant Discharge Elimination System (NPDES) stormwater permit and its reasonable and prudent measures (Appendix A). This permit, issued by EPA, authorizes discharges from the City's Municipal Storm Sewer System (MS4) to waters of the United States. Under this permit, the City must control the quality of stormwater discharged from the MS4. This includes implementation of best management practices to reduce pollutants to the maximum extent practicable in areas such as roadways; new development; significant redevelopment; structural controls; pesticide, herbicide, and fertilizer application; illicit and improper discharges; construction site run-off; and spill prevention and response.

3.3 Flora and Fauna

During the 1960's and 1970's the deep-end of Barton Springs Pool was covered with lush, aquatic macrophytes. Reported plant taxa include *Cabomba, Sagittaria, Ludwigia*, and *Potamogeton* (Maguire, UT-Austin, pers. comm.). During the 1980's and early 1990's the majority of the aquatic macrophytes disappeared from Barton Springs Pool, resulting in an underwater scenario of unvegetated limestone substrate and sediment. The disappearance of the aquatic macrophytes in the deep end of the pool appears to have resulted from the combined effects of flooding, dredging, and the mechanical dragging of the deep end with chains for sediment removal. In 1992, the most common surviving aquatic plant in the pool was *Amblystegium riparium*, an aquatic bryophyte ubiquitous in Central Texas springs.

In 1993, efforts were initiated by the City of Austin to reintroduce endemic plant species in Barton Springs Pool. At that time, aquatic vegetation in Barton Springs Pool was limited to two small patches of *Potamogeton*, one patch of *Sagittaria* in the far deep end of the pool, and areas of *Amblystegium* near spring discharge points. City staff interviewed past and present pool managers, along with long time users of the pool, to determine which taxa of plants were historically found in the pool. Based on this information, City staff harvested *Sagittaria* and *Ludwigia* from Town Lake and purchased 100 *Cabomba* plants from a retail supplier. These additional plants were planted in Barton Springs Pool in June 1993. An additional revegetation effort occurred in the fall of 1994. At the time of the initial revegetation effort, an Asian grass carp was identified in Barton Springs Pool. The presence of this large non-native fish may account for a low success rate with the initial revegetation effort and the complete disappearance of the *Cabomba* transplants. The Asian grass carp disappeared after the floods in October 1994. These efforts to restore aquatic vegetation to Barton Springs Pool have resulted in an estimated aquatic macrophyte coverage of 7 percent of the deep end of the pool. Aquatic macrophytes currently found in Barton Springs Pool include *Sagittaria, Ludwigia*, and *Potamogeton. Amblystegium* is also common on limestone surfaces in the general vicinity of the main springs and various side springs.

Taxa lists for the fauna of Barton Springs Pool include 20 species of fish, 3 species of turtles, 1 species of salamander, and numerous families of invertebrates. Fish species reported in Barton Springs Pool during the past 5 years are native and non-native and range from large schools of thousands of Mexican tetras (*Astyanax mexicanus*) to single specimens of Asian grass carp (*Ctenopharyngodon idella*) and American eel (*Anguilla rostrata*). Other large fishes found in Barton Springs Pool include channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictus olivaris*) and gray redhorse sucker (*Moxostoma congestum*). Major predatory fishes include green sunfish (*Lepomis cyanellus*), bluegill sunfish (*Lepomis macrochirus*), redbreast sunfish (*Lepomis auritus*), longear sunfish (*Lepomis megalotis*), spotted sunfish (*Lepomis punculatus*), spotted bass (*Micropterus punctulatus*), largemouth bass (*Micropterus salmoides*), and Guadalupe bass (*Micropterus treculi*). Many of the smaller sized fishes found in Barton Springs are representatives of the following species: central stoneroller (*Campostoma anomalum*), red shiner (*Cyprinella lutrensis*), blackstripe topminnow (*Fundulus notatus*), mosquito fish (*Gambusia affinis*), greenthroat darter (*Etheostoma lepidum*), and the Texas log perch (*Percina carbonaria*).

Herpetofauna in and around Barton Springs include three species of turtles and the Barton Springs salamander. The turtle species found in the pool are the red ear slider (*Trachemys scripta*), Texas cooter (*Pseudemys texana*), and snapper (*Chelydera serpentina*). Species of frogs that are common in the area include the Gulf Coast toad (*Bufo valliceps*), Woodhouse's toad (*Bufo woodhouseii*), Blanchard's cricket frog (*Acris crepitans*), spotted chorus frog (*Pseudacris clarkii*) and the Rio Grande leopard frog (*Rana berlandieri*).

Aquatic invertebrate species range from crayfish to blind isopods. The common species of crayfish found in the pool is *Procambarus clarkii*. This species has been reported to be extremely abundant at times with an apparent "crayfish bloom" occurring in the spring of 1995 when thousands of crayfish were found throughout the pool. Other non-insect invertebrates found in the pool include ostracods, aquatic earthworms, triclad flatworms of the genus *Dugesia*, glossiphoniid leeches, the amphipod *Hyallela azteca*, the blind amphipod *Artesia subterranea* and blind isopods. Snails and limpets found at Barton Springs include members of the Physidae, Lymnaeidae, Planorbidae, and Hydrobiidae.

Stygopyrgus bartonensis is a small, strictly aquatic hydrobiid gastropod (snail) described in 1986 by Herschler and Longley. Little is known concerning the distribution and ecology of this gastropod, but to date, specimens have only been collected at Barton Springs Pool.

Representatives of at least 6 orders of aquatic insects have been collected in Barton Springs Pool. The recorded specimens include the genus *Argia*, a coenagrionid odonate, the plastron breathing hemipteran, *Criphocricus*, and the psephenid beetle larvae commonly known as "water penny". Larvae of baetid and heptageniid mayflies are quite common, and burrowing nymphs of *Hexagenia* have been found in the sediments downstream of the main spring discharge. And at least four families of aquatic beetles have been collected in Barton Springs Pool. Snail-case caddisflies of the genus *Helicopsyche* are also often found in large numbers in the cobble and along the sides of Barton Springs Pool.

3.4 Water Resources and Wetland Determinations

Water resources include upper Barton Creek (upstream of Barton Springs Pool), lower Barton Creek (downstream of the pool), Barton Springs (Parthenia), Eliza Spring, Old Mill Spring (Sunken Garden), Upper Barton Spring, and various spring sites located along Barton Creek between Barton Springs Pool and the recharge and contributing zones of the Barton Springs segment of the Edwards Aquifer. The Barton Springs Zone has been the focus of numerous water quality and water quantity studies conducted by local, regional, state and federal agencies. In fact, the Barton Springs Zone may be one of the most extensively studied aquatic systems in the United States. Water quality and quantity data have been collected through the years by the City of Austin, the Barton Springs/Edwards Aquifer Conservation District, Travis County, the Texas Natural Resource Conservation Commission (formerly the Texas Water Commission), and the US Geological Survey.

The spring discharge and surface flows at all sites are dependent on the water level in the aquifer. Under low aquifer conditions, surface flow ceases in Barton Creek downstream of the recharge zone and many of the spring outlets become dry for extended periods of time. During the record drought of the 1950's, flow at Barton Springs was reduced to an all-time record low of 6.2 million gallons per day (272 l/s, 9.6 cfs). This represented an 80 percent reduction from the long-term average flow of 34 million gallons per day (1,501 l/s, 53 cfs). During the recent drought of 1995-6, both Eliza and Old Mill springs ceased to flow when Barton Springs Pool was lowered for routine maintenance. These recent events at the adjacent spring sites indicate the degree to which adjacent spring flow is dependent on the main spring discharge rate and the water level in Barton Springs Pool.

Due to the fact that Barton Springs Pool lies within the main channel of Barton Creek, the pool may be impacted periodically by flooding in Barton Creek. The degree of impact in the main pool is dependent upon the intensity and duration of the flood, as well as antecedent conditions in the contributing watersheds upstream of the pool. During past decades, the impact of floods in the main pool have varied from minor disturbance and sediment deposition, to major events that have the capacity to dislodge large concrete sections from the shallow end of the pool. Records of past floods indicate that flooding can result in significant damage to the main structure of the pool, removal of gravel from the beach area, removal of silt and plants from the main channel of the pool, and the deposition of gravel, sediment, and debris in the deep end of the pool. With rapid development and urbanization occurring upstream of the pool, it is anticipated that potential impacts due to flooding will increase.

In addition to the natural fluctuations in the surface and groundwater flows, numerous activities ongoing and proposed by the City of Austin and private entities have the potential to influence the quantity and quality of water resources at Barton and adjacent springs. For example, two projects are currently planned for the area adjacent to Eliza Spring. These projects include the installation of a new electrical transformer and trenching for underground lines as part of the electrical upgrade for the Barton Springs bathhouse and the SPLASH! exhibit, and the installation of drain lines and masonry sediment barriers to prevent runoff and sediment from

entering Eliza Spring. In addition, the Parks and Recreation Department has designed upgrades for the Barton Springs Pool and bathhouse in compliance with the Americans with Disabilities Act (ADA). These improvements include new ramps, stairs, and railings into Barton Springs Pool that are handicapped accessible. Obviously, work related to these projects has the potential to impact salamander habitat due to sediment and construction material runoff into Barton and Eliza springs, and mitigating measures must be provided to ensure that no impact occurs before or after construction. Any potential take from these projects would not be covered under this permit. Projects in areas of the Barton Springs Zone, outside of the immediate spring discharges and salamander habitat, have been reviewed as part of this EA/HCP to determine the potential impacts on the salamander and its habitat (see Cumulative Effects Section 5.5). Issues pertinent to the potential impacts on water quality and water quantity by development and urbanization in the Barton Springs Zone need to be addressed on a regional basis.

With respect to wetlands determinations, areas subject to jurisdiction under section 404 of the Clean Water Act include the zones that fall at or below the "plane of ordinary high water" of these waterways as defined by 33 CFR 323. No wetland areas have been identified as defined by the criteria established in the 1987 Corps of Engineers Wetland Delineation Manual.

3.5 Geology

The Edwards Aquifer is one of the most productive and permeable carbonate aquifers in North America. The Barton Springs Edwards Aquifer is comprised of the Georgetown Formation and Edwards Group (Rose, 1972). This segment of the Edwards Aquifer is divided into two distinct geographic components: the recharge zone, a surface outcropping of the Georgetown and Edwards limestones, and the contributing zone, the area upstream of the Recharge Zone that is underlain by the Glen Rose Formation. The recharge zone covers an area of approximately 90 square miles, while the contributing zone covers approximately 264 square miles. Recharge areas of the aquifer exhibit numerous recharge features such as caves, fissures, fractures, and dissolution voids. Since the Barton Springs segment of the Edwards Aquifer is a karst limestone aquifer with high permeability, water can move rapidly from recharge features to Barton Springs and other ancillary discharge points. This rapid or "conduit" transport of water does not allow for filtration or mitigation of pollutants and sediments that may be associated with point and nonpoint source pollution throughout the recharge and contributing zones. The Texas Natural Resource Conservation Commission has identified the Edwards Aquifer as one of the most sensitive aquifers in Texas (TWC 1989, TNRCC 1994).

3.6 Land Use

Land use on properties surrounding the endangered species sites has been restricted to public park land since the early 1900s when the land was deeded to the City of Austin. Barton Springs and the surrounding land was donated to the City of Austin by A. J. Zilker in 1918. In 1934, Mr. Zilker deeded 2 additional parcels of land to the City for a total of 146 hectares (360 acres) of parkland. The dam that forms the main swimming pool at Barton Springs was constructed in 1929. Upstream of Barton Springs Pool, development continues to occur outside of Zilker Park in the recharge and contributing zones of the watershed.

New development is occurring throughout the Barton Springs Zone. The Barton Springs Edwards Aquifer Ground Water model, developed at UT-Austin, concluded that changes to land use in the Barton Creek Zone will be most evident at Barton Springs Pool. Increased impervious cover throughout the Barton Springs Zone will result in a higher frequency of flood events that may adversely impact the water quality at Barton Springs. Therefore, the increased frequency of recharge events that produce higher levels of suspended solids and turbidity will lead to more frequent closing of Barton Springs Pool (Barrett, et. al. 1996) and increased rates of sedimentation in salamander habitat.

3.7 Air Quality

Air quality in the Austin metropolitan area is currently in full attainment for all air quality criteria of the Federal National Ambient Air Quality Standard. However, when designations are made in the year 2000 under the new Federal Ambient Air Quality Standard, it is likely the Austin metropolitan area will be declared in non-compliance.

3.8 Cultural Resources

An unknown number of archaeological sites are within the boundaries of Zilker Park and along the banks of Barton Creek. One assessment of the cultural resources states that Zilker Park lies "on top of layer upon layer of intact cultural strata representing perhaps 10,000 years of occupation," (Voellinger, 1993). Many cultural sites have been documented and cataloged along the upstream reaches of Barton Creek in both the recharge and the contributing zone. Artifacts found in and around Barton Springs represent the Early Archaic, Archaic, and Late Prehistoric eras, with younger artifacts remaining from the protohistoric period.

Through the years, the area now known as Zilker Park has been the site of numerous buildings and structures, including cabins, a flour mill, the State's first fish hatchery, various permanent bath house buildings, and concession stands. The oldest existing structure at Zilker Park is the concrete enclosure around Eliza Spring, commonly known as the Elks Pit. Other buildings and structures of historical significance include the bathhouse and the masonry walls surrounding Old Mill Spring.

4.0 Alternatives Including the Preferred Alternative

Pool activities have the potential to adversely impact the salamander. Such activities include drawdowns, the cleaning of the shallow and deep ends, and use by recreational swimmers. Analysis of recent experimental pool cleaning data (March through September 1998) and existing City of Austin data (1993-1998) indicates that the salamander is found not only near the main springs but also in the shallow fissures and beach areas (figure 3). In this document, four management alternatives are discussed: No Action, Maintenance Procedures Prior to Listing (May 1997), Preferred Alternative, and Reduction in the Frequency of Maintenance Procedures.

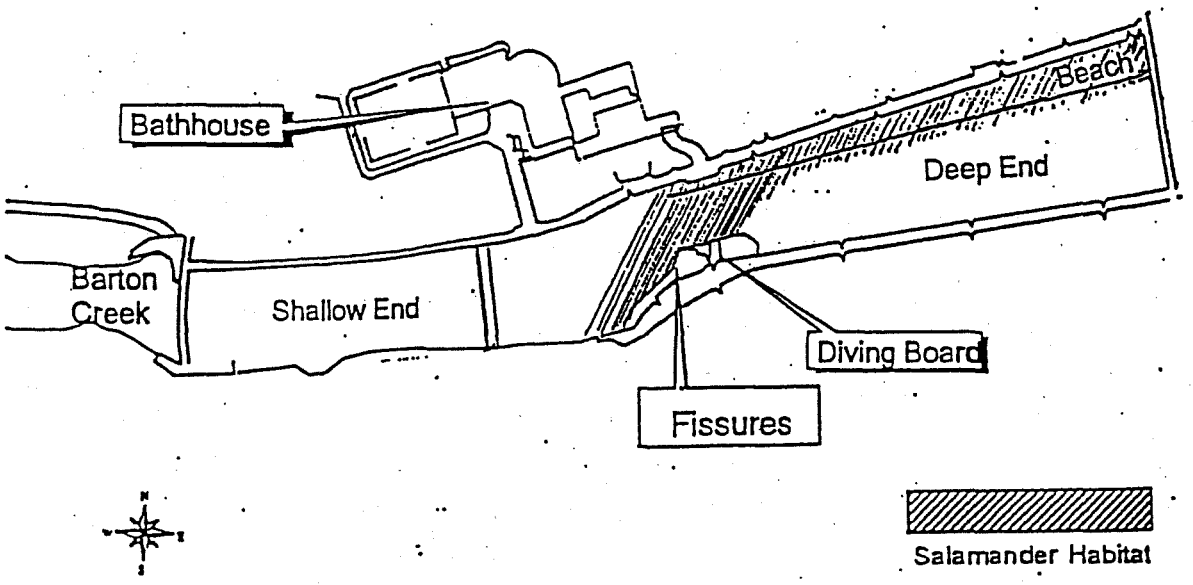

Figure 3: Areas of Salamander Habitat in Barton Springs Pool

Under the No Action alternative, an incidental take permit would not be issued. This would result in the closing of the pool. The cleaning would not be allowed because of adverse impacts on the salamander. This would also cause some salamander habitat to be buried in silt and organic debris from aquifer discharge and creek flooding. The Maintenance Procedures Prior to Listing alternative would operate the pool with the level of maintenance used prior to the listing of the salamander as endangered (May 1997). Adverse impacts of this alternative are the stranding of salamanders during the drawdowns for the cleaning of the deep and shallow ends of the pool and increased siltation of habitat due to shallow end cleaning activities. In addition, a swimmer/wader could cause take by accidentally stepping on a salamander in the fissures, beach area, and Old Mill Spring. Under the Preferred Alternative, the potential for take is associated with pool drawdown, cleaning, and use (wading and standing). This alternative proposes modifications to minimize and/or mitigate the potential take by swimmers/waders and adverse impacts of cleaning. Under the Reduced Level of Maintenance alternative pool cleaning would occur once per month. Impacts of this alternative include an increase in incidental take of salamanders due to habitat loss as well as slippery and murky swimming conditions that could result in pool closures. In addition, salamanders would become stranded during drawdowns and may be crushed accidentally by swimmers. While Barton Springs Pool is viewed as an ecosystem, the discussions below will divide the pool into sections in order to address in detail the various maintenance procedures.

4.1 Alternative 1 - No Action

Under this alternative, no incidental take permit would be issued. The pool would not be cleaned or lowered, and as a result of not cleaning, the pool would be closed for safety reasons. Algae, silt, and sediment would lead to slippery surfaces and reduced water clarity. The fissures, beach, and deep end would receive excess silt and sediment that would lead to increased embeddedness in salamander habitat areas. In addition, to minimize the possibility of incidental take, the adjacent springs, including Eliza, Upper Spring, and Old Mill Spring (Sunken Garden) would be

fenced off and swimming/wading would not be allowed. Maintenance activities at Barton Springs Pool would be minimal and resources would not be available to develop new, more efficient maintenance procedures. Maintenance of surface and spring habitats at Eliza, Old Mill, and Upper Barton springs would be limited to litter removal. The No Action alternative would not include enhancement and restoration of surface and spring habitats, or educational signage for public outreach. Under this alternative, Barton and adjacent springs would not be used for recreational activities and maintenance and management activities would be minimal.

4.2 Alternative 2 - Maintenance Procedures Prior to Listing (May 1997)

This action would continue the operation of Barton Springs Pool as an aquatic recreational facility with the level of maintenance used before the salamander was listed. Routine maintenance of the main pool would require the periodic lowering of the water level and the removal of silt and organic debris that result from the mechanical cleaning procedures in the shallow end of the pool. During the main swimming season (March through September) the pool would be lowered twice a week and only once a week during the remaining months of the year. The total number of cleanings would be 60 times per year. Maintenance at Eliza and Old Mill springs would be minimal with weekly litter removal and periodic habitat restoration. Maintenance activities would not include the additional action items contained in Section 6.0 of this document.

The experimental pool cleanings (see discussion of this in section 4.3) indicate that salamanders are utilizing the shallow fissures and beach areas. Thus, lowering the pool for cleaning would result in incidental take in these areas as well as Eliza and, during low aquifer conditions, Old Mill Spring (Sunken Garden) each time the pool is lowered. Also, a swimmer could cause incidental take by accidentally stepping on a salamander in the fissures, beach, and Old Mill Spring (Sunken Garden).

Under this alternative, the entire pool must be drawn down 1.3 meters (4 feet) to clean the shallow end. One day per week, the pool would be lowered all day for maintenance staff to remove the algae and sediment from the shallow end of the pool with a high-pressure fire hose and a small tractor equipped with a hydraulic rotary brush. The purpose of the brush would be to dislodge the algae, and the high-pressure fire hoses would be used to collect the algae, silt, and sediment against the single silt fence, where it would be pumped out into the bypass and, ultimately, into Barton Creek. This method of collecting and pumping silt is not 100 percent effective and some silt would migrate past the fence to the salamander habitat, causing an increase in embeddedness. In addition, while the pool is lowered, high-pressure sprayers would be used to clean algae off the stairs and side walls.

One evening per week, the pool would be lowered to remove accumulated sediment from the deep end of the pool with high-pressure fire hoses. The beach area would be dragged with a chain-link drag (or similar device) pulled by a small tractor to dislodge the algae and sediment; then the silt and organic debris would be moved into the deep end with high-pressure fire hoses. These high-pressure fire hoses would then be used to spray the debris out of the deep end and into the creek. Aquatic plants in the deep end of the pool would be flagged to ensure that pool

maintenance does not disturb the vegetation. In addition, while the deep end is lowered, high-pressure sprayers would be used to clean the steps, the side walls, as well as the bedrock areas directly downstream and upstream of the diving board.

During the off-season (October through February) the pool would be lowered once a week for routine maintenance of the shallow and deep ends. This weekly maintenance includes algae and sediment removal. In March, before the main swimming season begins, the pool would be lowered for two weeks for annual maintenance and cleaning. To ensure minimal impact to the salamanders at all of the spring locales, City staff would closely coordinate this major maintenance effort. A City staff biologist would be present to monitor before and during pool drawdown for maintenance procedures.

Swimmers would be prohibited from searching for and capturing salamanders or otherwise disturbing the gravel substrate within the salamander habitat in the pool by the posting of signs that discourage harassment of the wildlife that is found in the pool area. SCUBA diving or the use of any other equipment other than the usual recreational swimming gear (such as snorkels and underwater cameras) by anyone other than authorized City and Service staff would not be allowed without proper authorization. No animals (other than humans) nor any plant, fungus or other organism may be purposely introduced into Barton Springs Pool without the approval of City and Service biological staff.

There would be the potential for a spill or leak of petroleum products (gasoline, hydraulic fluid, or brake fluid) from the use of diesel and gasoline powered machinery in the pool area. This could result in the take of salamanders. The City would provide spill and response training for staff performing maintenance activities.

Under this alternative, historical and structural restoration at Eliza and Old Mill springs would be pursued using available grant funds and private donations. Maintenance at these adjacent springs as well as Upper Barton Spring would be minimal with litter removal and limited habitat restoration. In addition, the installation of a pump system would provide spring water at adjacent springs during low flow conditions. The main purpose of the pump system would be to provide spring water for routine pool maintenance. However, during low aquifer conditions the pump system would also be used to provide spring water to Eliza and Old Mill (Sunken Garden) springs while the main pool is lowered for cleaning. The pump system would only be used for this purpose when the drawdown of the pool causes spring flow to cease at these adjacent springs. The period of drawdown under these conditions would be usually limited to five to six hours for cleaning.

4.3 Alternative 3 - Preferred Alternative

Barton Springs Pool is a favored recreational area for swimming, and, with the implementation of measures discussed, recreational use and conservation of the salamander are compatible. The continued use of Barton Springs Pool as a recreational facility would provide people the opportunity to appreciate this rich natural resource and better understand the relationship between a healthy aquatic environment and water quality. Public education and public support

are vital for the long-term protection of the aquifer, Barton and adjacent springs, and the biological resources that depend on these spring systems. Measures in this alternative are designed to minimize and mitigate the impacts of pool activities on the salamander, enhance salamander habitat, as well as provide a safe recreational environment for swimmers.

The Preferred Alternative would allow the continued use of Barton Springs Pool as an aquatic recreational facility operated by the City of Austin. Structural and procedural changes would be initiated which would minimize and, in some cases, eliminate impacts of the cleaning of the pool. Under this alternative, the shallow end could be cleaned an unlimited number of times per year. There would be no incidental take associated with the regular cleaning of the shallow end, since the main pool would not need to be lowered. The deep end would be cleaned without lowering the pool using a combination of a vacuum system and fire hoses. This alternative also includes changes that would minimize the possibility of take by a recreational swimmer. The City would implement its Habitat Conservation Plan (HCP) (see section 6.0) to minimize and mitigate for any impacts caused by pool maintenance and recreational use.

No salamanders have been found in the shallow section (area "upstream" of the one-eighth mile marker) of the pool. A constant build-up of diatoms and algae on the limestone and concrete substrate causes slipperiness and a need for regular cleaning. Lowering the pool to clean the shallow end, however, has resulted in the stranding of salamanders in the fissures, beach, and Eliza Spring. In addition, under low aquifer conditions the reduction in outflow at Old Mill Spring could also cause stranding of salamanders. Under the HCP measures found in section 6.0, the City would clean the shallow end without lowering the main pool.

There would be a series of investigations to determine the most appropriate means of cleaning the shallow end. A temporary or permanent water control structure could be placed across the width of the pool between the shallow and deep ends. This would allow the draining of the shallow end without affecting the deep end of the pool or the adjacent springs. Any structure would contain gates to allow for the circulation of water in the shallow end. A water control structure would allow the lowering of the shallow end by draining water into the bypass or skimmer drains and into the creek. If this option were chosen, the shallow end would be cleaned with a rotary nylon brush mounted on a small tractor and high-pressure fire hoses. The purpose of the brush would be to dislodge the algae and diatoms that cause slipperiness. The high-pressure fire hose would be used to wash algae, silt, and sediment toward the water control structure, where this material would be pumped out and deposited in a designated area. Thus, a water control structure would provide two primary functions. It would allow the lowering of the shallow end only, thus, eliminating incidental take in the fissures and adjacent springs during drawdown for the cleaning of the shallow end. A water control structure would also ensure that silt and sediment accumulated during cleaning and debris dumped into the shallow end during flooding, do not migrate into the salamander habitat. This material could be collected and pumped out of the pool, a measure that would also enhance the swimming environment.

Other options for cleaning the shallow end would also be explored. One such option would be an underwater scrubber/vacuum of the type used at Sea World. This machine is used to collect debris from the bottom of large tanks. The effectiveness of this machine at Barton Springs has

not been tested. Another option to be considered would be a non-toxic paint that is used to retard the growth of algae. If an alternative method proved to be effective in Barton Springs, then there would not be a need for a water control structure. The sediment that accumulates in the shallow end would be vacuumed out without lowering the water level.

Given that salamanders are utilizing sections of the shallow fissures area, thin limestone slabs would be placed over parts of the shallow fissures so that a swimmer would not accidentally step into a fissure and crush a salamander. This would minimize the possibility of incidental take by swimmers in this section of the pool. To eliminate incidental take in the fissures from pool lowering for the purpose of cleaning the shallow end, the shallow end would be cleaned without lowering the main pool. In the event that the main pool is lowered which would require concurrence by the Service, a spring water supplied sprinkler system would be used on the fissures area to prevent stranding. In addition, the fissures area would be cleaned quarterly or as needed using a combination of low-pressure hoses and wire hand brushes.

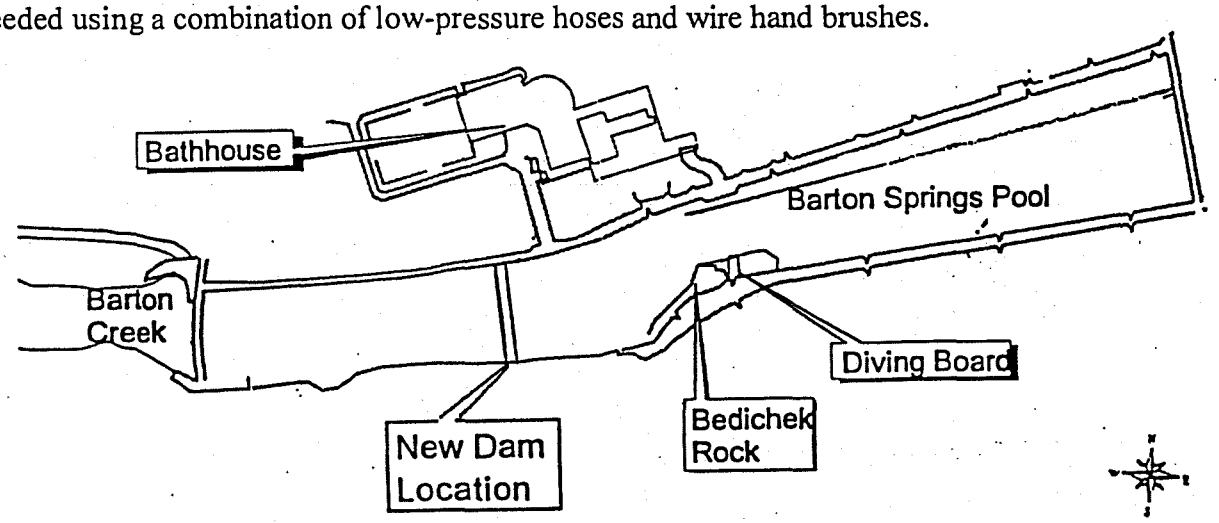

Figure 4: Location of proposed water control structure in Barton Springs Pool

Modifications will be made in the beach area to protect the salamander and provide for swimmer safety. The gravel/cobble beach would be moved toward the center channel and lowered so that the water depth over the beach area would be a minimum of 2 meters (6.5 feet); lowering the beach would prevent the accidental crushing of a salamander by a swimmer. The City would maintain approximately 11,000 square feet of habitat in this area. Gravel/cobble of appropriate size would be used to replace sections of habitat that are washed away. In addition, the beach would be replaced with walkways and wading areas made of exposed aggregate concrete, limestone, or other hardened surface. This surface would be installed at a depth of approximately 4-feet (depth of current beach) along the north wall between the lower dam and the main steps. A hand railing would be installed along the wall. This would provide a shallow place for swimmers to rest that is not salamander habitat.

Lowering the beach would have a short-term impact on the salamander, but, ultimately, this activity would result in the enhancement of habitat. Major construction activities have occurred in the pool in the past when the dams, bypass, skimmer drain, and beach were constructed. This

indicates that the salamander is resilient to short-term disruption. The proposed changes are designed to provide long-term benefits to the species.

Cleaning activities in the deep end would be conducted with the pool level full. The underwater sidewalk would be cleaned on an as-needed basis with pressure washers or other means approved by the Service. The salamander habitat would be cleaned with low-pressure hoses or other means approved by the Service. This cleaning would be done quarterly or as needed to keep the upper 2-3 inches of habitat from becoming embedded in sediment. The non-salamander habitat areas in the deep end would be cleaned quarterly or as needed with a combination of high-pressure hoses and a vacuum system. The steps in the deep end as well as the limestone area downstream of the diving board would be cleaned with pressure washers.

In addition, the City would plant appropriate vegetation that would provide habitat for salamanders and other aquatic organisms. This vegetation would also stabilize the silt and sediment and remove nutrients. Aquatic plants in the deep end of the pool would be flagged to ensure that pool maintenance does not disturb the vegetation.

The City of Austin could lower the entire pool, if necessary, a maximum of four times for cleaning, but only with Service concurrence. This lowering would not occur if it would cause Eliza Spring to go dry or if flow conditions are lower than 54 cfs. This latter measure would conserve water during low flow conditions. The existing gate system in the deep end would be modified to control the rate of lowering and the actual water level.

Swimmers would be prohibited from searching for and capturing salamanders or otherwise disturbing the gravel substrate within the salamander habitat in the pool by the posting of signs that prohibit harassment of the wildlife that is found in the pool area. SCUBA diving or the use of any other equipment other than the usual recreational swimming gear would not be allowed by anyone other than authorized City or Service staff. Snorkels and underwater cameras would be permitted and encouraged. No animals (other than humans) nor any plant, fungus or other organism may be purposely introduced into Barton Springs Pool without the approval of City and Service biological staff.

Diesel and gasoline powered machinery is used in the pool area and there is a potential for a spill or leak of petroleum products such as fuel, hydraulic fluid, or brake fluid which may also result in the take of salamanders. The City would provide spill and response training for staff performing maintenance activities.

To further reduce impacts due to flooding, the bypass system would be modified to decrease the frequency of floodwater flowing into the pool. The current design allows for the clogging of the grate during storms and results in more frequent topping of the dam. Modifications would increase the efficiency of the bypass system and should lower the frequency of pool flooding.

As previously noted, Barton Springs Pool may be impacted by flooding in Barton Creek. In the event of a flash flood warning, the pool would be prepared by moving items such as trash cans, sections of fence, and other items to higher ground. The City's Endangered Species Biologist

would be notified by pool management before the pool is lowered. The gates would not be pulled if the flows are less than 54 cfs or the Endangered Species Biologist states that the pool should not be lowered. If flooding of the pool does occur, the City and the Service will collaborate in the evaluation of the impact to the springs and the salamander. After the evaluation is completed, the City will pursue proper mitigation measures with the concurrence of the Service.

In addition to the measures above, the City would maintain a viable captive-breeding program for the Barton Springs salamander. The Service, in its final rule, listed the potential for catastrophic spill as one of the primary threats to the species. The City's captive breeding program would provide a replacement population if needed. Separate populations from adjacent springs would be kept to ensure the maintenance of genetic diversity.

At the adjacent spring sites, the City would restrict access to Eliza Spring and Old Mill Spring (Sunken Garden) to ensure no disturbance of salamander habitat at these areas. In addition, restoration and enhancement efforts would occur at both locales. These restoration efforts would include storm water runoff mitigation, enhancement of the gravel substrate near the spring outlets, removal of silt and organic debris in habitat areas, and planting of native (or removal of non-native types) of aquatic vegetation. In addition, a pump system would be installed to provide spring water for routine maintenance to clean out sediment that accumulates. During the period of time before measures are in place to clean the shallow end without lowering the entire pool, this pump system would be used to prevent Eliza and Old Mill springs from going dry due to drawdown. After the ability to clean the shallow end is in place, the pool would not be drawn down if it would cause the adjacent springs to go dry. Appropriate signage would be erected for public education and outreach at both Eliza and Old Mill springs. Access to Eliza and Old Mill springs would be restricted to ensure no disturbance of salamander habitat at these springs. In the past, inspections of Old Mill Spring have found a 30-gallon trash can, litter, disposable diapers, and exotic fish, as well as human disturbance of habitat areas.

Under the preferred alternative, the City and the Service agree to measures for the mitigation of incidental take of the salamander as described in Section 6.0 of this document. As part of this alternative, the Applicant proposes the following measures:

- Cleaning of the shallow end without lowering the pool
- Lowering of the beach
- Cleaning of the fissures, the new "beach", and adjacent springs habitats using low-pressure hoses
- Installation of an underwater walkway and a stainless steel railing in the deep end
- Maintenance of 11,000 square feet of "beach" habitat
- Removal of sediment and debris from the shallow end of the pool during cleaning
- Removal of silt and sediment in non-habitat areas of the deep end using a combination vacuum system and high pressure hoses
- Modification of the gate system for the drawdown of Barton Springs Pool
- Modification of the bypass system to minimize the frequency of floods in the pool

- Professional supervision and staff training
- Installation of a pump system to provide spring water for maintenance
- Retention of water over the fissures in the event of drawdown
- Surveys for stranded salamanders in the event of a drawdown for cleaning and maintenance
- Prohibition of the deliberate disturbance of substrate in the primary salamander habitat
- Restricted access to Eliza and Old Mill (Sunken Garden) springs
- Placement of thin limestone slabs over fissures in shallow section of fissures area
- Lowering of the main pool for cleaning with Service concurrence
- Restoration of habitat of Eliza and Old Mill springs
- Reduction in surface water runoff into Barton, Eliza, and Old Mill springs
- Dedication of a portion of Barton Springs Pool revenue to conservation efforts
- Public education
- Scientific research for the Barton Springs salamander
- Maintain a captive-breeding program for the Barton Springs salamander

4.4 Alternative 4 - Operating Barton Springs Pool with a Reduction in the Frequency of Maintenance Procedures

Under this alternative, the City of Austin would continue to operate Barton Springs Pool as an aquatic recreational facility but with a reduced frequency of maintenance. Maintenance, which would include drawdowns, would be scheduled once a month, for a total of 12 pool cleanings per year. Reduced frequencies of maintenance would result in increased sediment build-up and algae growth in the shallow end of the pool, which would lead to increased slipperiness and possibly some pool closures. In addition, silt and organic debris in the deep end would lead to reduced visibility, resulting in possible safety hazards.

The experimental pool cleanings (see discussion of this in section 4.3) indicated that individual salamanders are utilizing the shallow fissures and beach areas; thus, lowering the pool for cleaning would result in incidental take in these areas every time the pool is lowered. In addition, a swimmer/wader could accidentally step on a salamander, causing incidental take.

Under this alternative, the main pool must be lowered to clean the shallow end. The shallow end would be cleaned with a rotary nylon brush mounted on a small tractor and high-pressure fire hoses. The purpose of the brush is to dislodge the algae, and the high-pressure fire hoses would be used to collect the algae, silt, and sediment by washing against the double silt fence, where this material would be pumped out and deposited in a designated area. Although the silt fence catches the vast majority of the debris, some silt may migrate past the fence to the salamander habitat, filling in the habitat with silt and sediment. High-pressure sprayers would also be used to clean algae off the stairs and side walls.

The pool would be lowered to clean the deep end and the beach area would be dragged with a small tractor; high-pressure fire hoses would then be used to spray the algae, silt, and sediment into the deep end. The high-pressure fire hoses would then be used to spray the debris out of the deep end and into the creek. During the drawdown of the deep end, high-pressure sprayers would

be used to clean the steps and side walls as well as the bedrock area just downstream of the diving board.

Swimmers would be discouraged from searching for and capturing salamanders or otherwise disturbing the gravel substrate within the salamander habitat in the pool by the posting of signs that discourage harassment of the wildlife that is found in the pool area. SCUBA diving or the use of any other equipment other than the usual recreational swimming gear (such as snorkels and underwater cameras) by anyone other than authorized City and Service staff will not be allowed. No animals (other than humans), nor any plant, fungus or other organism may be purposely introduced into Barton Springs Pool without the approval of the City and the US Fish and Wildlife Service.

Additionally, when diesel and gasoline powered machinery is used in the pool area during cleaning there is the potential for a spill or leak of petroleum products such as fuel, hydraulic fluid, or brake fluid which may also result in the take of salamanders. The City would provide spill and response training for staff performing maintenance activities.

With regard to adjacent spring sites, the City would restrict access to Eliza Spring and Old Mill Spring (Sunken Garden). Restoration and enhancement efforts are currently proposed at both locales. These restoration efforts would include stormwater runoff mitigation, enhancement of the gravel substrate near the spring outlets, removal of silt and organic debris in habitat areas, planting of native or removal of non-native types of aquatic vegetation, and the installation of a pump system to provide spring water during pool cleanings under low flow conditions. The pump system would only be used at these springs when natural spring flow ceases during pool drawdown. In addition, attractive wrought iron fencing would be installed to limit public access, and appropriate signage would be erected for public education and outreach. This would protect Old Mill Spring from vandalism; recent inspections have found a 30-gallon trash can, litter, disposable diapers, and exotic fish, as well as human disturbance of habitat areas.

4.5 Alternatives Not Considered in Detail

Proposed alternatives not considered in detail in this document include: relocation of the salamander surface population, capping the adjacent spring locations in Zilker Park to prevent the salamanders from exiting the aquifer and establishing viable surface populations. Another proposed alternative not considered in detail is the demolition of the existing dam that forms Barton Springs Pool and the construction of a new dam and pool downstream of the spring outlets in the existing Barton Springs Pool.

The relocation of the salamander to alternate spring sites may remove a portion of the population of the species from the primary threats in this geographic area, but it would not guarantee the long-term viability and recovery of the species. New sites with similar physical and chemical characteristics would have to be identified and protected from the type of threats that currently endanger the long-term survival of the species in Zilker Park. In addition, the introduction of non-endemic species, whether or not by design, has shown to be problematic and potentially catastrophic from a biological and ecological perspective.

Another proposed alternative not considered in detail is the capping of adjacent spring sites where salamanders are found to prevent the animals from exiting or re-entering the aquifer. Proponents of this alternative argue that without surface dwelling salamanders at the adjacent spring sites, more frequent cleaning of Barton Springs Pool will be possible, regardless of spring flows and aquifer levels. This alternative was not considered in detail because capping the springs would have too great of an impact on the known surface population.

Finally, some advocates have proposed that the current pool be removed in order to return Barton Springs (Parthenia) to a more natural condition. Under this proposal, a new dam and pool would be constructed in lower Barton Creek downstream of the current location. This pool would still be predominantly spring fed but the actual pool would not encompass the main spring discharge points and salamander habitat. This proposal would require approval by State and local historical commissions, along with a major funding initiative for design and construction costs. The funding and time constraints make this alternative not viable at this time.

5.0 Environmental Consequences

The potential environmental impacts of the four alternatives include the disturbance of salamander habitat, stranding of salamanders during pool drawdown, and incidental take of salamanders during recreational activities. In addition, the loss of habitat due to siltation and sedimentation, and varying levels of algae growth and turbidity also vary by alternative. Analysis of the potential consequences of the four alternatives illustrates that all four alternatives will have a similar impact on land use, air quality, and cultural resources. In contrast, levels of potential environmental consequences on aquatic biota, aquatic vegetation, water resources, recreation, and lower Barton Creek (downstream of Barton Springs Pool) vary.

Effects of the alternatives on land use, air quality and cultural resources will not vary significantly. The City of Austin, Travis County, the State of Texas, and the federal government each have some level of regulatory responsibility over land use in the Barton Springs Zone. The City of Austin has development and environmental ordinances and City/County health department standards. Travis County has subdivision and sewage disposal ordinances and regulations and City/County health department standards. Various agencies within the State of Texas have some level of regulations and rules. The Barton Springs/Edwards Aquifer Conservation District, The Texas Natural Resources Conservation Commission, and the Texas Department of Parks and Wildlife have management practices, rules and regulations that are applicable to the watershed. In addition, various federal agencies have applicable regulations and policies. Since the preferred alternative focuses on management practices and habitat protection at spring sites within the boundaries of Zilker Park, it is anticipated that land use, air quality, and cultural resources will not be significantly affected by implementation of the preferred alternative.

In contrast, the areas that may be affected by at least one of the alternatives include aquatic biological communities, water resources, recreational activities, and portions of lower Barton

Creek downstream of Barton Springs Pool. The potential effects to each of these areas of concern will be discussed in detail in the individual analysis of the four alternatives.

It is not within the scope of the four alternatives to address two of the primary threats to the species, degradation of water quality and reduction of water quantity in the Edwards Aquifer. Nor do the alternatives directly address the impact of a potential catastrophic event in the recharge or contributing zones of the Barton Springs watershed. However, the NPDES permit does address these concerns. According to the conditions of the permit, the City must reduce loadings of petroleum hydrocarbons, heavy metals and sediments to Barton Springs from current development and other activities located within the Barton Springs Zone, within the City limits, and subject to the City's jurisdiction. This reduction in loadings will be achieved through the measures set out in the NPDES stormwater permit and its reasonable and prudent measures listed in Appendix A.

Continued use of the springs and the pool by swimmers and preservation of the aquatic biota both depend upon the non-degradation of water quality and water quantity and measures that will prevent a catastrophic event upstream of the springs. In fact, events that have resulted in the degradation of water quality and quantity during the past two decades have resulted in the restricted use of the pool by swimmers and at times a decrease in the available surface habitat for the salamander. Issues concerning non-degradation of water quality and quantity and the implementation of measures to prevent catastrophic events need to be addressed on a regional basis by the appropriate public and private agencies and councils. These effects are summarized under the Cumulative Effects Section 5.5.

5.1 Environmental Consequences of Alternative 1 - No Action

Under this alternative, Barton and adjacent springs would not be used for recreational activities and maintenance and management practices would be minimal. The pool would not be cleaned or lowered. Algae, silt, and sediment build-up would likely lead to slippery surfaces and turbid water conditions. Due to safety concerns and potential for take, the pool would be closed as a recreational facility. In addition, it is likely that excess silt and sediment would build up along the beach area and the deep end of the pool. At the adjacent spring sites, restoration and habitat enhancement efforts would not be pursued and public outreach programs would be minimal. Fences would be erected to restrict public access at the adjacent spring sites.

5.1.1 Effects of Alternative 1 on the Aquatic Biological Community

Under this alternative, maintenance and recreational activities at Barton and adjacent springs would cease. Silt and sediment would be allowed to build up in all areas of the springs and algal growth would not be removed. Analysis of City of Austin data (June 1993 - August 1998) and historical data indicates that the springs experience episodic events such as flooding, droughts, algae blooms, increased levels of silt and sediment, and rapid increases or declines in aquatic populations such as crayfish or fish. These episodic events, in combination with current baseline levels of sediment and nutrient loading, would result in habitat modification, as well as major changes in the ecology and population dynamics of the springs.

These episodic events can also lead to the introduction or removal of plant and animal communities. During the early 1990's, a large Asian grass carp was identified in the deep end of Barton Springs Pool. This large, exotic fish disappeared after major flooding occurred in the fall of 1994. Extensive flooding in 1997 resulted in removal of the majority of the fish species from the pool, as well as the introduction of numerous new plant species not previously documented in Barton Springs.

During the past five years, City of Austin staffs have documented major changes in the ecology of the pool and the adjacent springs. Areas of the pool have become covered with silt and debris deposited by creek flooding and sediment loading from the aquifer. The sediment in these areas often become devoid of oxygen and cease to provide suitable habitat for many of the aquatic organisms that inhabit the springs. As with most impoundment structures, it is anticipated that the pool will continue to fill in with silt and sediment resulting in a decrease of aquatic habitat. At Eliza Springs, the build-up of silt in the bottom of the spring has reached depths in excess of 0.3 meter (13 inches). City of Austin staffs have also documented algal blooms in the springs which have led to anoxic conditions in many areas of the pool. Under this alternative, the availability of suitable habitat for biological organisms will depend on the levels of sediment and nutrient loadings in the aquifer, as well as the frequency and intensity of episodic natural events.

5.1.2 Effects of Alternative 1 on Water Resources

No direct impact of surface water and groundwater resources will result from this action.

5.1.3 Effects of Alternative 1 on Recreational Activities

This alternative will result in the elimination of aquatic recreational activities at all of the spring sites.

5.1.4 Assessment of Take

No incidental take will occur under the No Action alternative. However, the habitat could become less suitable.

5.2 Environmental Consequences of Alternative 2 - Maintenance Procedures Prior to Listing (May 1997)

This alternative would continue the operation of Barton Springs Pool as an aquatic, recreational facility under the maintenance practices in place prior to the listing of the salamander. Routine maintenance of the main pool would require the periodic lowering of the water level and the generation of silt and organic debris from the mechanical cleaning procedures in the shallow end of the pool. During the main swimming season (March through September), the pool would be lowered twice a week, but only once a week during the remaining months of the year.

Under this alternative, the Barton Springs salamander would be impacted by the lowering of the pool under varying aquifer conditions. The fissures area becomes exposed when the pool is lowered, leaving salamanders, fish, invertebrates, and macrophytes subject to desiccation. The pool drawdown also exposes the beach area along the north side of the pool. Mortality of salamanders, fish, crayfish, and invertebrates has been documented during these conditions.

The maintenance procedures that would be employed in the pool generate a significant quantity of sediment and detritus. Silt fencing and sandbags would be utilized to prevent this material from entering the deep end of the pool where degradation of salamander habitat and water clarity may occur. In the past, pumping methods for removal of this material have not been 100 percent effective, and some of this detritus enters the deep end of the pool after the weekly pool cleaning is complete. This material, along with naturally occurring sediment that discharges from the aquifer, contributes to the accumulation of silt and sediment which has been a problem along the beach area and the deep end of the pool. The silt and sediment also clogs the interstitial spaces in the gravel and cobble, which is prime habitat for the salamanders and their invertebrate prey base. These organisms depend on the interstitial spaces for protection, habitat, and an abundant supply of well-oxygenated water.

In addition to these potential impacts in the main pool, maintenance procedures under this alternative may cause the springs at Eliza and Old Mill (Sunken Garden) to dry up when the pool is lowered. On two occasions in January and February 1997, before the Barton Springs salamander was listed as endangered by the Service, this activity resulted in the documented mortality of salamanders at Eliza Springs. During the experimental pool cleanings (March - September 1998), individual salamanders were found stranded during pool drawdown on five occasions in Eliza Spring.

5.2.1 Effects of Alternative 2 on the Biological Aquatic Community

This alternative would result in the incidental take of salamanders during operational hours and routine pool maintenance. Although most of the available habitat in the main pool for the Barton Springs salamander is associated with the areas of spring flow, salamanders have also been found along the beach area on the north side of the pool. During routine maintenance drawdown, individual salamanders may also become stranded in the fissures that traverse a portion of the shallow end of the pool. These fissures are suitable habitat for the Barton Springs salamander.

Wildlife will continue to inhabit all of the regions of Barton Springs and the available habitat at adjacent springs. Recreational activities in Barton Springs and pool drawdown and maintenance have the potential to adversely impact individual organisms. During the lowering process, various types of organisms may become stranded in the gravel and cobble. It is not uncommon to find snails, crayfish, and darters stranded in small pools or interstitial spaces in the beach area of the pool, along with various invertebrate species. And recent surveys have found salamanders in the beach and fissure areas. Fauna that inhabit the deeper areas of the pool, such as sunfish, bass, suckers, turtles, and salamanders appear to be unaffected by the lowering process. In Eliza Spring and Old Mill Spring (Sunken Garden), the flora and fauna may also be affected by pool maintenance procedures that occur during low flow conditions. These impacts will be minimized

with the installation of the pumping system that will provide spring water to both sites during pool drawdown under low aquifer conditions.

5.2.2 Effects of Alternative 2 on Recreational Activities

Under this alternative, pool maintenance procedures require closing the pool to recreational activities during the pool drawdown. The sediment that is generated by the pool maintenance can contribute to higher levels of turbidity throughout the pool. During the summer months when the pool has the greatest number of waders and swimmers, water clarity can drop significantly as silt and sediment are stirred up and suspended in the water column. If visibility drops below 1.8 meters (6.0 feet) the pool is closed to recreational activities due to safety concerns.

5.2.3 Effects of Alternative 2 on Water Resources

Management practices at Barton Springs Pool can affect water resources in two distinct ways. During the weekly cleaning of the shallow end of the pool, silt and sediment generated from the cleaning would be pumped into the bypass drain and discharged into lower Barton Creek. In the deep end, high pressure hoses would be used to suspend the sediment into the water column before the gates are opened to lower the pool. The suspended sediment would be washed into lower Barton Creek as the pool is lowered 1.5 meters (4.9 feet). This material may cover the stems and leaves of aquatic macrophytes in lower Barton Creek and also increase the amount of sedimentation that naturally occurs in this portion of the creek. Eventually this material would migrate into Town Lake and the main channel of the Colorado River. In addition, the lowering of the pool may also increase the encroachment of the bad water line (an area of high saline water that lies on the eastern edge of the aquifer), especially under low aquifer conditions.

5.2.4 Assessment Of Take

This action would result in the estimated incidental take of salamanders in the range of 520-7660 per year based on 60 cleanings per year. This estimated total for incidental take is based on 60 drawdowns per year and the highest number of salamanders observed for each major area of the pool during the experimental pool cleanings (March - September 1998). The range of 520-7660 includes an estimated annual take of 200 salamanders in Barton Springs Pool and 200 salamanders in Old Mill due to swimming and wading activities (see Table 1, next page):

Table 1: Estimated Incidental Take by area/activity for Alternative 2

Area/Activity	# Salamanders	x60 drawdowns	Total Take/Year
Beach	1-84	60-5040	60-5040
Fissures	0-19	0-1140	0-1140
Recreation	400	---*	400
Eliza Spring	0-17	0-1020	0-1020
Old Mill Spring	1	60	60
TOTAL(per year)			520-7660

* Not associated with pool drawdown

Unfortunately, little is known concerning the surface population of *Eurycea sosorum* at the Upper Barton Creek site. At present, it is difficult to assess the potential impact of activities at this location since neither the range nor distribution of the salamander population is fully known at Upper Barton Spring.

5.3 Environmental Consequences of Alternative 3 - The Preferred Alternative

The Preferred Alternative would allow the continued use of Barton Springs Pool as an aquatic recreational facility operated by the City of Austin. Under this alternative, the shallow end could be cleaned an unlimited number of times; the cleaning of the shallow end and cleaning of the deep end would be conducted without lowering the pool. There would be no incidental take associated with the cleaning of the shallow end or the cleaning of the non-habitat areas of the deep end. Measures proposed in this document are designed to minimize and mitigate adverse impacts of pool activities on the salamander, as well as enhance salamander habitat and provide a safe recreational opportunity for swimmers. The continued use of Barton Springs Pool as a recreational facility would ensure that people have the opportunity to appreciate this rich natural resource and better understand the correlation between a healthy aquatic environment and water quality.

5.3.1 Effects of Alternative 3 on the Aquatic Biological Community

The Preferred Alternative would minimize the impacts of pool drawdown and pool maintenance on the aquatic flora and fauna of the pool. The shallow end would be cleaned without lowering the main pool. The sediment and debris resulting from this cleaning would be pumped out of the pool. The deep end would be cleaned with the water level full. Since the cleaning will be conducted without lowering the pool, aquatic organisms will not be exposed as a result of pool maintenance. If necessary, the pool may be drawn down, with Service concurrence, a maximum of four times for cleaning. In addition, lowering of the beach area would ensure that organisms that inhabit this area would not be accidentally stepped on or exposed in the event of a pool drawdown.

In addition, the pool may be lowered in preparation for the potential flooding of Barton Creek. During the preparation process, moveable objects such as trash cans, fencing, and other items would be moved to higher ground. The gates in the dam could be moved in order to lower the

water level in the pool prior to anticipated flooding. The lowering of the pool may result in the stranding of fishes, invertebrates, and salamanders. The stranding of these animals may result in injury, or mortality of individual organisms. It is also anticipated that some of the aquatic macrophytes in the pool may also become exposed during drawdown. If flooding of the pool does occur, areas of the pool may become exposed during the period of time after the floods subside and prior to the reinstallation of the gates to refill the pool. This period of exposure may result in the same effects as described above for pool drawdown.

The Preferred Alternative includes efforts to increase aquatic vegetation in Barton Springs, Eliza Spring and Old Mill Spring (Sunken Garden). These plants stabilize the silt and sediment in the deep end of the pool, provide nutrient uptake from the water column, and offer suitable habitat for many species of fish, turtles, invertebrates and salamanders.

Wildlife will continue to inhabit all of the regions of Barton Springs and the available habitat at adjacent springs. As noted previously, recreational activity in Barton Springs Pool is assumed to have minimal impact on the fauna of the pool. However, during pool drawdown for maintenance, various types of organisms may become stranded in the gravel and cobble. It is not uncommon to find snails, crayfish, darters, and invertebrates stranded in small pools or interstitial spaces in the beach and fissure areas of the pool. And recent documentation from experimental cleanings indicates that salamanders may also be stranded along the beach area during drawdown. Fauna that inhabit the deeper areas of the pool which are not dewatered during drawdown, such as sunfish, bass, suckers, turtles, and the main surface population of salamanders appear to be unaffected by the lowering process. In Eliza Spring and Old Mill Spring (Sunken Garden), the flora and fauna may also be affected by pool drawdown, especially during low flow conditions. Thus, after the ability to clean the shallow end without lowering the main pool is in place, the pool will not be drawn down if the flow is lower than 54 cfs.

5.3.2 Effects of Alternative 3 on Water Resources

No direct impact of surface water and groundwater resources will result from this action.

5.3.3 Effects of Alternative 3 on Recreational Activities

The Preferred Alternative would continue the operation of Barton Springs Pool as an aquatic, recreational facility. Under this alternative, routine maintenance of the main pool would not require the periodic lowering of the water level in the entire pool, thus allowing swimmers to continue to benefit from the use of the springs even while the shallow end is lowered for maintenance. Routine maintenance in the shallow end would also provide a safe recreational area for waders and swimmers that use this area of the pool. This alternative would restrict access to Eliza and Old Mill springs.

5.3.4 Assessment of Take

See section 6.5.

5.4 Environmental Consequences of Alternative 4 - Operating Barton Springs Pool as a Recreational Facility with a Reduction in the Frequency of Maintenance Procedures

Under this alternative, the City of Austin would continue to operate Barton Springs Pool as an aquatic recreational facility with a reduced frequency of maintenance. Routine pool maintenance would be restricted to once a month. Less frequent pool cleaning would result in increased silt and algae in all areas of the pool and increased slipperiness in the shallow end.

5.4.1 Effects of Alternative 4 on the Aquatic Biological Community

Decreasing the frequency of routine maintenance would reduce the number of times the main pool is lowered to expose the shallow end for removal of silt and algae. As a result, levels of suspended solids and algae growth may increase not only in the shallow, but also the deep end of the pool. Higher levels of suspended solids would result in more turbid conditions throughout the pool. In the past, City of Austin biologists have documented the decline in the number of salamanders in the main pool due to increased sediment and the loss of appropriate habitat (City of Austin, unpublished data). City of Austin biologists have also observed a decline in aquatic macrophytes due to thick layers of silt and algae covering the leaves of the plants. At times, this layer effectively hinders the transmission of light and subsequent photosynthetic processes and normal plant growth.

This action would also include efforts to increase aquatic vegetation in Barton Springs Pool, Eliza Spring, and Old Mill Spring (Sunken Garden). These plants stabilize the silt and sediment in the deep end of the pool, provide nutrient uptake from the water column, and offer suitable habitat for many species of fish, turtles, invertebrates and salamanders.

Wildlife would continue to inhabit all of the regions of Barton Springs and the available habitat at adjacent springs. Recreational activity in Barton Springs Pool has minimal impact on the fauna of the pool. Under a reduced maintenance schedule, some areas of wildlife habitat may be lost due to increased levels of sediment and accumulations of algae growth. Fauna that inhabit the deeper areas of the pool that are not exposed due to drawdown, such as sunfish, bass, suckers, turtles, and salamanders appear to be unaffected by the lowering process but may be impacted by layers of algae and sediment. In Eliza Spring and Old Mill Spring (Sunken Garden), the flora and fauna are most affected by pool maintenance procedures that occur during low flow conditions. These impacts would be minimized by the reduced maintenance schedule and the installation of the pumping system that would provide spring water to both sites when the pool is lowered for cleaning under low aquifer conditions.

5.4.2 Effects of Alternative 4 on Recreational Activities

This alternative may result in increased slipperiness in the shallow end and increased silt and sediment in the deep end of the pool. Safety concerns may require the City of Austin to restrict access in the shallow end of the pool if it is deemed unsafe. Under periods of high use during the summer season, silt and sediment are suspended in the water column causing reduced visibility. This would become a safety concern that may result in restricted recreational use of the pool.

5.4.3 Effects of Alternative 4 on Water Resources

The operation and maintenance of the pool and springs may have an impact on surface and ground water quality and quantity. Lowering of the pool in and of itself would affect water levels in Eliza and Old Mill springs but this impact is most critical under low aquifer conditions. The reduction in the frequency of the pool maintenance would minimize the periods of lowered water levels at adjacent spring sites.

5.4.4 Assessment of Take

This action would result in the incidental take of salamanders in the range of 224-1652 per year. Incidental take may occur during recreational activities or maintenance periods even at reduced levels. The estimated incidental take under this alternative is in the range of 224-1652 salamanders based on 12 cleanings per year.

Table 2: Estimated Incidental Take by area/activity for Alternative 4

Area/Activity	# Salamanders	x12 drawdowns	Total Take/Year
Beach	1-84	12-1008	12-1008
Fissures	0-19	0-228	0-228
Recreation	200	---*	200
Eliza Spring	0-17	0-204	0-204
Old Mill Spring	1	12	12
TOTAL			224-1652

* Not associated with pool drawdown

5.5 Cumulative Effects

The proposed action is to issue a Permit for incidental take of the endangered Barton Springs salamander during the operation and maintenance of Barton Springs Pool and adjacent springs for a 15-year period. Incidental take includes direct and indirect loss of the Barton Springs salamander and its habitat due to otherwise legally permitted operation and maintenance practices of the Barton Springs swimming and recreational facility. Mitigation for potential take (Section 6.1) includes modification of potentially harmful operation and maintenance practices, public education and staff training, habitat restoration, species conservation, and research. The effect of the proposed permit action would be to allow the continued use of Barton Springs Pool as a recreational facility by the public, and to continue its operation and maintenance practices with modifications that increase protection for the Barton Springs salamander. The environmental consequences of the issuance of the Permit are considered under Section 5.0.

5.5.1 Cumulative Effects on the Aquatic Biological Community

The primary threats to the Barton Springs salamander are degradation of the quality and quantity of water that feeds Barton Springs due to urban expansion over the Barton Springs watershed.

The potential of the Edwards aquifer as a karst aquifer to rapidly transmit large volumes of water with little filtration makes it highly susceptible to pollution (Slade et al. 1986). Major potential sources of groundwater contamination have been attributed to leaking underground storage tanks, pipelines, septic tanks, accidental spills, pesticide and fertilizer use, and construction activities (TWC 1989, EPA 1990). Due to its quantity, sediment from soil erosion is the singularly greatest pollutant of surface waters and can carry most pollutants found in water bodies (Menzer and Nelson 1980). Barton Springs is believed to be heavily influenced by the quality and quantity of runoff, particularly in the recharge zone (Slade et al. 1986). Thus, increasing urban development over the area supplying recharge waters to the Barton Springs segment can threaten water quality. Increased demands on water supplies from the aquifer can reduce the quantity of water in the Barton Springs segment and at Barton Springs. The level of water in the aquifer regulates the volume of springflow. Spring discharge decreases as water storage in the aquifer drops (Slade et al. 1986). As urbanization in the outlying areas of Austin expands and reliance on groundwater supplies increases, the number of wells and the total volume of water withdrawal is also expected to continue to increase.

Survey information indicates that the Barton Springs salamander and its prey base are vulnerable to changes in water quality and quantity; in fact, individual salamanders have not survived certain impacts such as the dewatering of spring sites (USFWS 1997). One of the most immediate threats to the Barton Springs salamander is siltation of its habitat, owing primarily from construction activities in the Barton Creek watershed (Slade et al. 1986, City of Austin 1991). In addition to covering habitat, siltation may clog the gills of aquatic species, smother eggs, reduce the availability of spawning sites, fill and block recharge features and underground conduits, restrict recharge and groundwater storage and volume, reduce light transmission needed for photosynthesis, food production, and the capture of prey by sight feeding predators, and expose aquatic life to contaminants that readily bind to sediments (EPA 1986, Schueler 1987). In addition to these factors, the limited range of the Barton Springs salamander and the possibility of eliminating the entire species through chronic habitat degradation and/or one or more catastrophic events makes urban development over the Barton Springs watershed a significantly adverse impact.

The threat of spill, including potentially catastrophic ones, will increase as urbanization expands over the watershed. Pollutant loadings in receiving waters, particularly in areas that have little or no pollution controls, generally increase with increasing impervious cover (Schueler 1991). By the year 2040, the population in the City of Austin will experience a projected increase of more than 400% and undeveloped areas will decrease by 40%. The projected increase in population and impervious cover will result in an increased pollutant concentration by 214% and a decrease in the average spring flow by 6% (City of Austin 1998).

As a result of decreasing water quality in the aquifer, there is an increasing rate of sediment and toxin accumulation and algal blooms in Barton Springs Pool. The level of effort needed to maintain a safe environment for the salamander and swimmers and Barton Springs will likely intensify with increasing urbanization and declining water quality and quantity at Barton Springs.

5.5.2 Cumulative Effects on Recreational Activities

The increasing degradation of water quality and quantity will have an adverse impact for recreational users of Barton Springs Pool. Increased turbidity, nutrients, and algal blooms will make the pool a less desirable place to swim, as well as cause a higher frequency of closures for the health and safety of its users.

5.5.3 Cumulative Effects on Water Resources

Cumulative effects from increasing urbanization will degrade water quality and quantity for Barton Springs Pool as described in Section 5.5.1.

6.0 **Habitat Conservation Plan**

6.1 As part of the Preferred Alternative, the following Habitat Conservation Plan (HCP) has been developed to minimize and mitigate the potential take described in Section 5.3.4 (Assessment Of Take). This HCP as mandated by requirements of 50 CFR Part 17.22(b)(1)(iii) has been designed to ensure that the proposed action would not reduce the potential for survival and recovery of the salamander. The following measures will be implemented to minimize and/or mitigate the impacts of the Preferred Alternative. The biological goal of this HCP is to improve salamander habitat, increase population size, and increase life history information over the term of the permit.

1. The City of Austin will coordinate the management of salamander habitat areas and be responsible for maintaining information and scientific data on the Barton Springs salamander. The City of Austin will also be responsible for the timely transmittal of information and data to the Service. The City of Austin will submit an annual report to the US Fish and Wildlife Service, Austin Ecological Field Services Office, 10711 Burnet Road, Suite 200, Austin, Texas 78758. The annual report will address the status of the salamander, analysis of biological data, and a review of pool maintenance and management activities during the year. The City of Austin will be responsible for all measures in the HCP. In the annual report, each point of the HCP will be addressed. The permit and HCP will be for a period of 15 years. Copies of the annual report will also be submitted to the City Manager and City Council.

2. The City of Austin will make daily visual inspections of all habitat areas (spring sites) and note any problem conditions such as vandalism, trash and debris, introduction of exotic fish or animals, or disturbance of habitat.

3. When the pool is lowered for cleaning and maintenance, trained City of Austin staff will visually inspect all of the exposed areas of the pool for stranded salamanders before cleaning and maintenance activities begin. This visual inspection will also include Eliza Spring, Old Mill Spring (Sunken Garden), and Upper Barton Spring. Any stranded salamanders will be moved to permanent water. This measure will be in place upon the issuance of this permit.

Until the dam or comparable water control device is installed in the shallow e
minimum of four biologists will be present at drawdown to search for strande
After installation of the water control device, a minimum of two biologists wi
when the pool is lowered.

4. The City of Austin will modify the existing gate system on the lower dam fo
of the pool. The new gate system will be designed to control the rate of drawdown and the level of water in the pool. The current system is an all or nothing approach that does not allow control or manipulation of the drawdown process, which is most critical during low aquifer conditions. The new gate system will be in place within one year of the issuance of this permit. If low aquifer conditions (flows less than 54 cubic feet per second) occur during this one-year period, the City of Austin will modify or suspend pool maintenance procedures (in consultation with the Service), to minimize and mitigate incidental take of salamanders.

5. The City of Austin will install a pump system to provide spring water for pool maintenance. The pump system will also provide spring water for the fissures areas during pool drawdown. This pump would use spring water from the main pool. This measure will be in place within six months of permit issuance.

6. The City of Austin will clean the shallow end of Barton Springs Pool without drawdown of the entire pool. One option is to install a water control structure between the shallow and deep ends of the pool to create a permanent barrier between the cleaning operations and the main salamander habitat. The purpose of this water control structure is to eliminate the drawdown of the deep end during routine cleaning of the shallow end. This measure will be in place within six months of permit issuance. If the installation of the water control structure is not completed within the six month deadline due to construction delays or adverse weather conditions, the City of Austin will modify or suspend pool maintenance procedures (in consultation with the Service), to minimize and mitigate incidental take of salamanders.

7. The City of Austin will modify the beach area in Barton Springs Pool. Portions of the beach area will be replaced with walkways and wading areas made of exposed aggregate concrete, limestone or other hardened surface. The remaining beach area will be lowered to a minimum depth of 2 meters (6 1/2 feet) and additional salamander habitat will be created to mitigate for any loss of habitat. This measure will be in place within six months of permit issuance.

   a) The City of Austin may clean the walkway on an as needed basis (~ 1 per week) using pressure washers (underwater) or other agreed to means.

   b) The salamander habitat would be cleaned using low-pressure hoses or other agreed to means. This cleaning would be done quarterly or as needed to keep the upper 2-3 inches of habitat from becoming embedded with sediment.

c) The City of Austin will maintain 11,000 square feet of "beach habitat" for the salamander. Gravel or cobble or appropriate size will be used to replace sections of the habitat that get washed out.

d) The City of Austin will clean non-salamander habitat areas in the deep end of the pool quarterly or as needed using a combination of high-pressure hoses and a vacuum system.

8. The City of Austin will not drawdown the deep end of the pool if flow in the aquifer lower than 54 cfs. This measure will minimize the impact of low aquifer levels at the adjacent spring sites, as well as conserve water in the aquifer during low flow conditions.

9. The City of Austin will place thin limestone slabs over fissures in the shallow section of the fissures area to minimize impacts from recreational use.

10. The City of Austin will lower the water in the deep end of the pool, if necessary, for cleaning only with Service concurrence. The water in the deep end of the pool will not be lowered when the lowering would cause Eliza Spring to go dry. This measure will be in place after the water control structure is installed or an alternative is implemented.

11. The City of Austin will maintain water over the fissure area during pool drawdown in order to minimize the stranding of salamanders. The ability to retain water over the fissures will be in place at the time of permit issuance. The City of Austin will clean the fissure area quarterly or as needed, using a combination of low-pressure hoses and wire hand brushes or other agreed to means. In addition, until the water control structure is in place or the beach area is lowered, the City of Austin will use a spring water sprinkler system to keep the beach area wet during drawdown.

12. The City of Austin will control surface water runoff around Barton Springs Pool, Eliza Spring, Old Mill Spring (Sunken Garden), and Upper Barton Springs. During heavy rains, stormwater runoff can carry sediment and potential pollutants directly into Barton Springs, Eliza Spring, Old Mill, and Upper Barton Springs. Plans and schedules for the improvements, approved by the Service, will be complete within one year of the issuance of this permit. All of this work will be completed within two years of permit issuance. The City will also install temporary silt and erosion control measures in order to minimize adverse impacts due to surface water runoff. These measures will be in place upon issuance of the permit.

13. The City of Austin will modify Old Mill Spring (Sunken Garden) to restore the natural surface spring flow into Barton Creek. The pipe that currently drains the spring will be capped. This improvement will be in place within one year of the issuance of this permit.

14. The City of Austin will improve the efficiency of the Barton Creek bypass. As currently designed, the cleaning grate at the upstream end of the bypass quickly becomes clogged during storms. The clogging of the grate decreases the efficiency of the bypass and increases

the frequency of floods that affect Barton Springs Pool. A more efficient system will be in place within one year of the issuance of this permit.

15. The City of Austin will implement a program to increase public awareness and community support for the salamander and the Barton Springs portion of the Edwards Aquifer. The **SPLASH!** Exhibit at Barton Springs Pool will be a major focus of this effort.

16. Access to Eliza Spring and Old Mill Spring (Sunken Garden) will be restricted to ensure no disturbance of salamander habitat at these spring areas. These sites will be used as outdoor educational facilities for the study of the biology and ecology of Central Texas springs. These measures will be in place within one year of permit issuance.

17. Educational signs (kiosks) will be installed to enhance public awareness of the salamander and aquifer. Outdoor educational displays will highlight the biology and ecology of the Central Texas springs with emphasis on the Barton Springs salamander. These measures will be in place within one year of permit issuance

18. The City of Austin will set up a fund for conservation and research efforts for the Barton Springs salamander. The City will deposit $45,000 annually (for the term of the permit) into this fund from the revenues generated by Barton Springs Pool. This fund will also be open to donations from any group or private individual. A committee of technical representatives will decide the allocation of money from this fund. At a minimum, the committee will consist of one technical representative from the City and one technical representative from the Service. These technical representatives must be experienced in salamander biology. Other committee members could include State, County, University or other qualified biologists and karst aquifer hydrogeologists and swimmer/stakeholder representatives. The City and the Service would both retain veto power in deciding how the money is allocated. The funds will be used for study of salamander biology, captive breeding and refugia; watershed related research, improved pool cleaning techniques, education, and/or land acquisition. The committee will decide how the money will best be spent. The funding will be in place within six months of permit issuance.

19. The City of Austin will deposit $10,000 (in addition to the $45,000 mentioned above) into the conservation fund. This will mitigate for the incidental take that occurred as a result of cleaning the pool and operation from May 30, 1997 (listing effective date) to the date the permit is issued. The fund will be set up and the money deposited within 6 months of permit issuance.

20. The City of Austin will prohibit the use of high-pressure hoses in salamander habitat.

21. The City of Austin may remove woody debris by any methods approved by the Service. All debris will be visually inspected for salamanders before and after removal.

22. In the event of a flash flood or potential flash flood, it is necessary to prepare Barton Springs Pool area to limit damage. To prepare for such an event, sections of fence, trash cans,

railings and other items are moved to higher ground. The Endangered Species Biologist for City of Austin will be notified before Barton Springs is lowered. Barton Springs will not be lowered if the flow is lower than 54 cfs or if the City of Austin Endangered Species Biologist indicates that Barton Springs Pool should not be lowered.

23. The City of Austin may clean sediment and debris from the adjacent spring sites using low-pressure hoses or other agreed to means on an as needed basis.

24. The City of Austin will not allow the introduction of exotic plants or animals in any springs in Zilker Park.

25. The City of Austin will not move salamanders between spring sites.

26. The City of Austin may manually trim aquatic vegetation that reaches the surface of the water.

27. The City of Austin will not allow unauthorized SCUBA in any springs in Zilker Park.

28. The City of Austin will prohibit the deliberate disturbance of substrate in the primary salamander habitat. This measure will be effective upon the issuance of this permit.

29. Sediment and debris that is collected during routine cleaning of the pool will be removed from the pool and disposed of properly. This will be accomplished by pumping the material into a vacuum truck for disposal, irrigating the lawns or other agreed to means. The sediment and debris will not be dumped into Barton Creek as a means of disposal. This measure will be effective upon the issuance of this permit.

30. Since there is a seasonal rate of turnover in the staff involved in the pool cleaning process, the City of Austin will have professional supervisors direct and document all cleaning procedures at the pool. This measure will be in place upon the issuance of this permit.

31. The City of Austin will ensure that all people working at the pool (lifeguards and other staff) are knowledgeable about the salamander. Yearly training will be given to teach staff about the salamanders and the ecology of Edwards Aquifer springs. This measure will be in place upon the issuance of this permit.

32. The City of Austin will ensure that all people surveying for salamanders are properly trained. The survey work should be done under the terms and conditions of a current scientific permit issued to the City of Austin. This measure will be in place upon the issuance of this permit.

33. The City of Austin will provide yearly spill and response training for all that perform maintenance activities in and around the springs in Zilker Park. The annual training will address spill and response protocols, proper containment techniques, and remediation. An annual inventory of necessary containment and remediation equipment will be conducted

during the training session, and after the use of the equipment in response to any spill. This measure will be in effect upon the issuance of this permit.

34. Specific areas will be designated for the fueling and maintenance of equipment and vehicles used in maintaining the springs and the areas around the springs. These areas should be selected away from the springs to avoid the chance of impacts to the spring habitats. Absorbent pads will be used during all operation, fueling, and maintenance activities. This measure will be in effect upon the issuance of this permit.
35. The City, with concurrence of the Service, will develop a policy for silt and gravel removal in the deep end of the pool. In the past, silt removal in the deep end has been necessary after the pool has been flooded by Barton Creek, but the City does not have a policy that outlines when and how the removal of material should occur. The take estimate may change due to this policy but would probably be a minor amendment to the HCP. The new policy will be in place within one year of the issuance of this permit.

36. The City of Austin will, in concurrence with the Service, develop a catastrophic spill response plan for Barton Springs. The new plan will be in place within one year of the implementation of this permit. This plan will address spill prevention, containment, remediation, and salamander rescue.

37. Structural and habitat restoration will occur at Eliza Spring and Old Mill Spring. Habitat restoration will include enhancement of bottom substrate with clean cobble and gravel, and the establishment of native species of aquatic plants. Care will be taken to ensure that non-native invertebrates are not introduced. Old Mill Spring enhancement will include the restoration of full surface flow to the stream. All restoration efforts will be reviewed and approved by the Service before implementation. This work will be completed within two years of the issuance of this permit.

38. The City of Austin will continue to conduct monthly salamander surveys at all spring sites, in compliance with Federal and State Scientific Monitoring Permits.

39. The City of Austin will form an Advisory Committee of local and regional experts that will meet at least annually to discuss and refine pool maintenance activities. A variety of interests including swimmers, biology, and hydrogeology will be represented on this committee. In addition, this committee will review this HCP and make suggestions for needed amendments as deemed necessary. The Advisory Committee will also be responsible for refining the habitat conservation plan through adaptive management. Data collected will be used to adapt management actions. The City of Austin will be responsible for implementation of adaptive management changes.

40. The City of Austin must reduce loadings of petroleum hydrocarbons, heavy metals and sediments to Barton Springs from current development and other activities located within the Barton Springs Zone, within the City limits, and subject to the City's jurisdiction. This reduction in loadings will be achieved through the measures set out in the NPDES

stormwater permit and its reasonable and prudent measures listed in Appendix A of the EA/HCP.

41. The City of Austin will maintain a viable captive breeding population of Barton Springs salamanders. The City will designate a staff biologist and dedicate a minimum of $20,000 annually to the development and maintenance of this program. The purpose of this program is to provide a contingency plan for the species if a catastrophic event were to occur. Funding and design of the new program will be in place within six months of the issuance of this permit.

6.2 Amendment Procedure

It is necessary to establish a procedure whereby the section 10 (a)(1)(B) permit can be amended. However, it is extremely important that the cumulative effect of amendments will not jeopardize any endangered species or other species of concern. Amendments must be evaluated based on their effect on the habitat as a whole and whether incidental take or the effect of take would be increased above what is authorized in the permit. The Service must be consulted and concur on all proposed amendments. The types of proposed amendments and the applicable amendment procedures are as follows:

6.3 Minor Amendments to the HCP

Minor amendments involve routine administrative revisions or changes to the operation and management program and which do not diminish the level or means of mitigation. Such minor amendments do not alter the terms of the section 10 (a)(1)(B) permit.

Upon the written request of the City of Austin, the Service is authorized to approve minor amendments to the HCP, if the amendment does not conflict with the primary purpose of the HCP as stated in section 2.0.3.

6.4 All Other Amendments

All other amendments will be considered an amendment to the section 10 (a)(1)(B) permit, subject to any other procedural requirements of federal law or regulation that may be applicable to amendment of such a permit.

6.5 Assessment of Take for the Habitat Conservation Plan

Incidental take of the Barton Springs salamander may occur at Barton Springs Pool, Eliza Spring, Old Mill Spring, and Upper Barton Spring due to recreational activities and/or routine pool maintenance, depending on aquifer levels and spring discharges. However, minimizing pool drawdown, lowering the beach area, restricting public access to Eliza Spring and Old Mill Spring, and other HCP measures would substantially minimize the level of take. The following section is written assuming that the measures proposed in the HCP (Section 6.0) are fully implemented.

Take, as defined under the Endangered Species Act, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term incidental take refers to "take" that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. In the case of this HCP, pool maintenance and recreational use are "otherwise lawful activities." There are several actions involved with pool maintenance and recreational use that could potentially cause incidental take. Under the Preferred Alternative, pool drawdown, cleaning, and use (wading and standing) causes the incidental take. The definition of incidental take can be further broken down into "harass" and "harm".

The term "harass" in the definition of take means an intentional or negligent act or omission, which creates the likelihood of injury to wildlife, by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Pool drawdown is an intentional act, which creates the likelihood of injury to salamanders from stranding by disrupting normal feeding and sheltering. The Barton Springs salamander is a gill breathing aquatic animal. The stranding salamanders without access to water with oxygen, clearly constitutes harassment. The stranded salamanders must be moved to permanent water. This action, although necessary to prevent further injury, disrupts normal sheltering, and may impact normal feeding.

The term "harm" in the definition of take means an act, which actually kills or injures wildlife (50 CFR 17.3). In the case of pool drawdown, this would apply to any stranded salamander that was not found or which was killed or injured in any way. In the case of recreational use of the pool, this definition would apply to any salamanders that were stepped on by swimmers or waders and killed or injured.

Determining Anticipated Incidental Take Levels. In determining the amount of incidental take that will be authorized during the term of the permit, three factors must be determined: (1) the method for calculating incidental take; (2) the level of incidental take and related impacts expected to result from the proposed project activities; and (3) the level of incidental take that the section 10 permit will actually authorize (USFWS 1998).

Proposed incidental take levels can be expressed in an HCP in one of two ways. The first is in terms of the number of animals to be "killed", "harmed", or "harassed" if those numbers are known or can be determined. The second way to express incidental take is in terms of the amount or extent of habitat affected by a specified activity, in cases where the specific number of individuals is unknown or indeterminable.

idental take is expressed in terms of habitat area because precise numbers of ders are indeterminable. Data from the experimental pool cleaning gives some number of salamanders occupying the various habitats affected during pool ata also provide an indication of the general range of take anticipated in each the number of salamanders found stranded during any one pool cleaning varied from 1 to 101. It is not possible to accurately estimate the number of salamanders affected. Therefore, we chose to express and permit incidental take in terms of habitat areas and types of methods used rather than salamander numbers. The level of take that the permit will be authorized is defined by area of impact and proposed activity in Table 3.

Table 3. Incidental Take Authorized By Habitat Area and Activity.

Habitat Area	Approximate Square Feet	Activity for which incidental take of Barton Springs salamander is authorized.
Barton Springs Pool	90,000	Recreation, pool cleaning, flood management, and pool cleaning (Oct. 98 - Mar 99).
Beach Area	11,000	Sidewalk construction, habitat cleaning.
Fissure Area	3,500	Recreation, habitat cleaning, drawdown.
Upper Barton Spring	400	Recreation, habitat cleaning, drawdown.
Eliza Spring	800	Drawdown, cleaning, flood management, habitat improvement.
Old Mill Spring	1,700	Drawdown, cleaning, habitat improvement.

Barton Springs Pool – Recreational use (wading and standing) may cause incidental take of salamanders. Under the HCP, the beach area will be deepened and no take from recreational use is anticipated. The fissure area will be open to recreational use and incidental take from people may occur in this area. The placement of flat limestone blocks should adequately minimize this incidental take. Salamanders may stray into other areas of the pool where people could cause incidental take. These areas include the shallow end, the rocks around the diving board and the new sidewalk area. These areas are not considered salamander habitat but some level of incidental take may occur. Incidental take of Barton Springs salamanders from recreational use within Barton Springs Pool and Upper Barton Springs is authorized.

Under the HCP the pool would no longer be drawn down for routine cleaning. The shallow end would either be cleaned with underwater cleaning equipment or be located behind a dam. Little incidental take will be anticipated from shallow end pool cleaning. The deep end of the pool is not considered salamander habitat. The use of fire hoses and the underwater vacuum system should result in little incidental take in this area. The possibility of incidental take exists for any area in the pool. Therefore, incidental take of Barton Springs salamanders from shallow and deep end cleaning methods will be authorized. Two other areas of salamander habitat exist within the main pool; these are the beach and fissure areas. These two areas are discussed below.

Between the issuance of the permit and March 1999, the City of Austin will be allowed to clean the pool up to ten times using the current drawdown methods. This is to give the City time to try underwater pool cleaning techniques and/or construct a water control structure. Incidental take will be anticipated in the main pool and adjacent spring sites. This incidental take will be authorized.

Beach Area- A new sidewalk along the north wall of the pool will be constructed. Incidental take (harass, harm and kill), before and during construction, is anticipated because heavy equipment will be used to relocate the salamander habitat. The area will be searched and salamanders will be moved to permanent water. This will result in harassment. Not all salamanders will be found because the beach is so large (11,000 square feet) and salamanders are not easily found. Incidental take in the form of harm and kill is anticipated. This will be a one-time impact with expected long-term benefits. The new sidewalk would not be salamander habitat so little take is anticipated from underwater cleaning methods in this area. The salamander habitat will be moved over and deepened. The new salamander habitat will be cleaned using low-pressure hoses. Incidental take in the form of harassment is anticipated. This area must be cleaned because the build up of sediment would cause a loss of salamander habitat. Incidental take from the activity of cleaning salamander habitat will be authorized. In addition, the one-time incidental take associated with the sidewalk placement and relocation of salamander habitat will be authorized.

Fissure Area- The fissure area is known salamander habitat that is exposed when the pool is drawn down. Salamanders are stranded in this area when the pool is drawn down. Under the HCP, a pump/sprinkler system will be used to keep this area wet during drawdown. This would minimize the amount of incidental take associated with the drawdown. In addition, recreational use of this area will be allowed under the HCP. This recreational use may cause the incidental take of salamanders. Large, flat limestone blocks will be used to cover the portions of the fissure area where the probability of incidental take is the highest. This would minimize the amount of incidental take from recreational use. In addition, this area will be cleaned with low-pressure hoses and hand held wire brushes. Cleaning will maintain the areas as salamander habitat. Cleaning will prevent the build up of sediment that would cause a loss of salamander habitat. The incidental take from sidewalk construction, drawdown, and cleaning of the fissure area will be authorized.

500
20
10,000

Upper Barton Spring- Upper Barton Spring is located upstream of the main pool. It is a spring, which flows when the flow from Barton Springs exceeds 50 cfs. This is a known salamander habitat area. The level of the spring drops slightly when the pool is lowered. There is the possibility that incidental take of salamanders may occur from drawdown. The area is also used for recreational purposes, though this use is thought to be relatively light. Incidental take (harass, harm, and kill) may occur from the recreational use of this area. The remote location and small surface area (400 square feet) of salamander habitat afford Upper Barton Spring some level of protection. At this time it does not seem necessary to restrict this area from recreational use. This area has never needed to be cleaned to remove sediment. However, the need may arise during the term of the permit. The area will be cleaned with low-pressure hoses which would result in some incidental take (harass). Therefore, incidental take of Barton Springs salamanders at Upper Barton Spring from drawdown, recreational use, and cleaning is authorized.

Eliza Spring- Eliza Spring is heavily influence by the water level in the main pool. Drawdown of the pool causes the incidental take (stranding/harass) of salamanders. The configuration of this spring area, with steps, causes stranding to occur regularly with the lowering of the pool. Incidental take will be anticipated to occur each time the pool is lowered, including for flood management purposes. At an aquifer flow rate of about 50-cfs, drawdown of the pool causes Eliza Spring to go below the concrete surface of the spring. In the past a pump system has been used to lessen the impact of stranding on the salamanders. Under the HCP, drawdown would not be allowed when this condition would result. The build up of sediment in the spring site has made it necessary to clean this area to improve and maintain salamander habitat. This cleaning will be accomplished with low-pressure hoses and shovels to remove and redistribute sediment. This activity would cause incidental take (harass, harm, kill). Lethal take (harm, kill) will be anticipated to be very low.

Habitat improvement plans for Eliza Spring include removal of the concrete bottom, enhancement of gravel substrate, and the planting of native plants. Any of these activities may result in some incidental take (harass, harm, kill). Lethal take (harm, kill) will be anticipated to be very low. The project may have a short-term impact but should provide for better habitat conditions in the long-term. Recreational use will not be allowed under the HCP. Therefore, no incidental take from recreation is anticipated. Incidental take of Barton Springs salamander at Eliza Springs for drawdown, cleaning, and habitat improvement is authorized.

Old Mill Spring (Sunken Garden)- The effect of pool drawdown is much less severe at Old Mill Springs than at Eliza Spring. The "bowl" nature of this spring's basin and the lack of ledges greatly lessen the chance of stranding salamanders. Under the Preferred Alternative, drawdown would not occur when Old Mill Spring would go dry. Therefore no take is anticipated from drawdown. In the event that drawdown will be necessary during the period when it would impact salamanders at Old Mill Spring, incidental take is anticipated. This area has never needed to be cleaned to remove sediment. However, the need may arise during the term of the permit. The area will be cleaned with low-pressure hoses which would result in some incidental take (harass). Recreational use would not be allowed under the HCP. Therefore no incidental take from recreation is anticipated.

Habitat improvement plans for Old Mill Spring include the restoration of surface flow, enhancement of gravel substrate, and the planting of native plants. Any of these activities may result in some incidental take (harass, harm, kill). Lethal take (harm, kill) is anticipated to be very low. Incidental take at Old Mill Spring (Sunken Garden) of Barton Springs salamander from pool drawdown, cleaning, and habitat improvement is authorized.

Effects of take on the survival and recovery potential for the Barton Springs salamander.

We have presented the estimated range of salamander numbers that will be taken under the proposed alternative to illustrate the anticipated effects (Table 4). Barton Springs is a very complex and dynamic system. It is extremely difficult to predict precise numbers based on this complexity. Estimates are based on the actual numbers from our experimental pool cleaning results. In all cases, the lower end of the range is 0 or 1 because these are the actual results from the experiments. We do not anticipate that the maximum amount of take would occur each year. Rather we have presented the data to describe the range of probable impacts.

The assessment of take is based upon data collected by the City of Austin from 1993-1998 and data collected by the City of Austin and the Service during March through September of 1998. In addition, data collected by various researchers have also been reviewed. Appendices B and C include data used in the assessment of take.

Table 4: Estimated possible impact by Area/Activity. Incidental Take will be permitted based on area and activity, not on the estimated numbers. The purpose of these numbers is to illustrate the general range of take anticipated. All activities would not be expected to occur each year.

Area/Activity	**Number of Salamanders**	**x number of times Area/Activity**	**Total Take**
Beach/Habitat cleaning (Non-lethal/harass)*	1-84	x 4 cleanings	4-336/year
Fissures drawdown/cleaning (Non-lethal/harass)*	0-19	x 2 drawdowns x 4 cleanings	0-38/year 0-76/year
Eliza Spring (Non-lethal/harass)*	0-17 0-38	x 2 drawdowns x 1 cleanings	0-34/year 0-38/year
Old Mill Spring (Non-lethal/harass)*	0-5	x 2 drawdowns x 2 cleanings	0-10/year 0-10/year
Upper Barton Spring (Non-lethal/harass)*	0-2	x 2 drawdowns x 2 cleanings	0-4/year 0-4/year
Flood Preparation Fissures and Eliza Spring (Non-lethal/harass)*	0-36	x 5 Floods	0-180/year
Barton Springs Pool and Upper Barton Springs/Recreation (Lethal/harm, kill) (Non-lethal/harass)	20 100	x1 year	20/year 100/year
Total Non-lethal/harass	———	———	**4-654/year**
Total Lethal/harm, kill (Recreation)	———	———	**20/year**

* May include a minor amount of lethal incidental take (harm, kill)

In addition to the yearly impacts described above, there will be incidental take from the improvement projects that the HCP requires. These will be one-time activities that have short-term impacts but long-term benefits. These impacts are displayed in Table 5.

Table 5. One time range of impacts from improvements measures in the HCP. This take will be mostly non-lethal (harass) but would include very low lethal take (harm/kill).

Habitat Improvement Eliza Springs	0-80	1 project	0-80/one time
Habitat Improvement Old Mill Springs	0-55	1 project	0-55/one time
Beach Relocation	0-85	1	0-85/one time
Estimated Take Aug 98 – Mar 99 (includes dam construction, if necessary)	0-101	x 10 cleanings	0-1010/one time
Total One Time Take			**0-1230**

The take associated with recreational use would involve stepping on salamanders. In the Final Rule to List the Barton Springs Salamander as Endangered (Federal Register Volume 62, No. 83, 4/30/97), the Service stated that the use of the pool does not appear to pose any threat to the salamander. New information on the salamander distribution within the pool, suggests that incidental take from recreational use may occur. This take will be classified as harm. Our estimate of incidental take is based on the surface area available for these activities (about 40,000-sq. ft.) and the probability that salamanders will be using these areas (very low). Our incidental take estimate, from wading and standing, will be 20 salamanders per year (harmed/killed). In addition salamanders may be harassed by recreational use; our estimate of the number of salamanders harassed will be 100 salamanders per year. This would include any take at Upper Barton Springs. Because access to Eliza Spring and Old Mill Spring (Sunken Garden) will be restricted, no take from these sites is anticipated from recreation.

Under the Preferred Alternative, the pool will not be drawn down, after March 1999, without Service concurrence (except for in the preparation for a flood – see Flood Discussion below). For the purpose of estimating the incidental take involved with these drawdowns the Service will assume two drawdowns per year. While up to four drawdown could be allowed the Service does not expect this many drawdowns that are not in relation to floods. The pool will not be drawn down if the aquifer flows are less than 50 cfs or when the drawdown would cause Eliza Spring to go dry. The take associated with pool drawdown involves the stranding of salamanders. This incidental take, assuming that any stranded salamanders are found and returned to the water, will be harassment. Take (harm) from these activities may also occur if the stranded salamanders are not found. However, the possibility of missing a salamander exists and therefore the "harm" from these actions and any other actions (such as a bird eating a stranded salamander), which may cause harm, need to be included in the estimate of take. Under this alternative the pool is not drawn down when the shallow end is cleaned. There should be little take associated with cleaning the shallow end of the pool. The cleaning of the deep end of the pool will also be conducted with the water level full.

The salamander habitat on the beach area will be lowered and a sidewalk or other hardened surface will be placed adjacent to the wall. The new hardened surface (sidewalk) would not be habitat and no incidental take should occur in this area from the underwater cleaning. The salamander habitat will be moved over and deepened so that it is not exposed during pool drawdown and would not be impacted by swimmers and waders. This area of salamander habitat will be cleaned quarterly or as needed and may result in the "harassment" of salamanders. This would occur from the hosing of the habitat to keep the upper 2-3 inches free of sediment. Due to the nature of the pool and the way sediment builds up, this cleaning is necessary to maintain the salamander habitat. The activity of cleaning the 11,000 square feet of salamander habitat would cause harassment of any salamanders present.

There is a provision under this alternative that, if necessary (i.e. if flooding occurs), the pool will be drawn down, with concurrence of the Service. The number of drawdowns allowed per year, without amending the permit will be four. During drawdown, a pump system will be installed to keep a high volume/low pressure of water over the fissures during any drawdown. The pumping of springwater would alter the salamander habitat. The aquatic environment would change from

relatively stable water to flowing water. This will be like changing from a pond to a creek. The cleaning of the fissure area with low-pressure hoses also may cause take in the form of "harassment". We estimate that 19 salamanders could be harassed with each drawdown. Assuming two drawdowns per year, harassment of 38 salamanders is estimated in the fissure area. Cleaning of the fissures (about 4 times per year) would result in an estimated incidental take of 76 salamanders. The incidental take from drawdown and cleaning of the fissure area will be authorized.

In Eliza Spring, the City of Austin documented salamander mortality from dewatering and stranding of salamanders during pool drawdown under low aquifer conditions in 1997. The Preferred Alternative would not allow for drawdown to occur when Eliza Springs would go dry. On one occasion, during August of 1998, 17 salamanders were found stranded on the steps of the concrete enclosure when the pool was lowered for cleaning. The take at Eliza Spring associated with pool drawdown involves the stranding of salamanders. This "incidental take", assuming that any stranded salamanders are found and returned to the water, in a timely manner, will be harassment. Assuming two drawdowns per year, incidental take of 34 salamanders is estimated at Eliza Spring. Additional incidental take may occur during cleaning of sediment from Eliza Spring. We estimate harassment of 34 salamanders during two spring cleanings per year.

The effect of pool drawdown is much less severe at Old Mill Springs (Sunken Garden). The "bowl" nature of this spring's basin and the lack of ledges make the chance of stranding salamanders much less than in other sites. Under the Preferred Alternative, drawdown would not occur when Old Mill Spring would go dry. Therefore no take is anticipated from drawdown. In the event that drawdown would be necessary during the period when it would impact salamanders at Old Mill Spring, we estimate incidental take of 5 salamanders. Assuming that the pool is drawn down twice a year, the estimated number of salamanders harassed is 10 per year. The number of salamanders impacted may be higher for any one event. However, the Service does not expect this to happen more than once or twice during the term of the permit. Therefore, the number has been set lower to account for expected take over the term of the permit. Additional incidental take may occur during cleaning of sediment from Old Mill Spring. We estimate incidental take of 10 salamanders during two spring cleanings per year.

Habitat restoration is also proposed for Eliza Spring and Old Mill Springs (Sunken Garden). Service concurrence will be necessary for any proposed habitat improvement work. The majority of this incidental take should be harassment with temporary impacts. There should be a long–term benefit to the salamander population resulting from this work. The incidental take during these restoration efforts is estimated at 80 and 55 for Eliza Spring and Old Mill Spring, respectively.

The impacts of flood management will be authorized under the permit. It is very difficult to predict the amount of incidental take associated with future flooding. Impacts to salamanders in the fissure area and Eliza Spring will be expected. Incidental take could occur from stranding during flood preparation and after flooding (before gates are raised). For the purpose of estimating these impacts the Service will assume five floods per year. The number of salamanders impacted will be about 20 from the fissures and 17 from Eliza Spring. The total

estimated impact would be 185 salamanders per year. The incidental take of Barton Springs salamanders from flood preparation and after flooding (before gates are raised) will be authorized.

Included in the assessment of take is the take that will be allowed from the time that the permit is issued until the water control structure is installed or an alternative is devised and the beach area is lowered (October 98 – March 99). Current pool cleaning methods, including drawdown, will be used along with any improvements found during this period. The Service is authorizing 10 pool cleanings using these methods. A total amount of incidental take is estimated at 1010 salamanders for these ten pool cleanings.

Population estimates for the Barton Springs salamander are not available and there are no data for accurate estimates. It is impossible to obtain an accurate population estimate because of the inability to obtain a valid sample. The rocks, cracks, large surface area of the springs, and inaccessibility of the aquifer make it impossible to obtain a consistently accurate sample. Based on the experience of finding a much higher range of salamanders in the main pool during drawdown events as compared to SCUBA surveys, we believe that the population is probably 3 to 5 times higher than the highest observed numbers found during SCUBA surveys. SCUBA surveys, in three documented instances, have underestimated the number of salamanders by 55 to 85% (55, 75, and 85). These were cases where actual SCUBA counts were completed shortly before drawdown. The number from SCUBA counts was compared to the number found during drawdown.

Using SCUBA surveys, the following numbers have been documented. Chippendale reported the highest observed number in the main pool as over 150 individuals found on a two-hour dive in the main springs (Chippindale et al., 1993). The highest number reported in recent surveys (last five years) was 71, as found by the City of Austin and the Service in August of 1998 (about 5 hours of effort). The highest observed number at Eliza Spring, not including drawdown information, has been 38 salamanders. The highest observed number at Old Mill Spring has been 60 salamanders. At Upper Barton Spring the highest observed number of salamanders is 14.

During drawdown surveys the highest numbers observed in the main pool has been 84. The highest number reported for Eliza Spring is 188. We have not had surveys in Old Mill Spring or Upper Barton Spring when the aquifer was at a level where these springs could be affected.

The HCP would allow for incidental take of salamanders from the operation and maintenance of Barton Springs and the adjacent spring sites. The majority of the authorized take will be non-lethal harassment of salamanders. This will be from drawdowns (which are greatly reduced). The best salamander habitat in the main pool is located at the outflow from the main springs. This area has never been substantially impacted by pool drawdown and represents the highest density of salamanders in the pool.

There is also a very positive effect of the current pool cleaning techniques as opposed to the techniques that were used at the time of listing. Stranded salamanders that are found are returned to permanent water. Except for work at Eliza Spring when drawdown caused it to go dry, no one

was out looking for salamanders in areas that went dry during drawdown. Mortality of stranded salamanders was probably much higher under the previous methods.

The added protection for Eliza Spring and Old Mill Spring should also increase salamander numbers. The restoration of these two spring sites should provide additional habitat and enhanced habitat quality at these two sites. Within the pool itself, the lowering of the beach area and the protection of the fissure area should improve habitat conditions for salamanders compared to past use.

In addition, the conservation fund would focus on research that would include a better understanding of Barton Springs salamander population dynamics. The adaptive management strategy in the HCP (see Section 6.0) would allow for improvements to pool cleaning procedures as our knowledge of the species increases. This provision will ensure that we can further lessen management impacts during the term of the permit. The hazardous materials spill and response plan should also serve to reduce the threats to the population.

The amount of take should be more than offset by the improvements for the population. Overall, the HCP should improve conditions for the Barton Springs salamander and a net increase in the number of individuals is expected.

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APPENDIX A - NPDES Reasonable and Prudent Measures

APPENDIX B - Monthly Barton Springs Pool Survey Data (July 1993 - September 1998)

APPENDIX C - Experimental Pool Cleaning Data (March - September 1998)

APPENDIX D - Public Comments

APPENDIX E – Cost Analysis

Table One:Programs to Address Storm Water Discharges	Date Begin	Date Complete
Monitoring Programs		
1.0 Sediment Screening (Hot-Spot Screening)		
To be conducted in the watersheds located within both the Barton Springs Recharge Zone and the City of Austin Full Purpose City Limits.		
1.1 Barton Creek Watershed	Oct. 1998	Sept. 2000
1.1.1 Sampling to be conducted by ERM-WQM staff will consist of sediment collection in the study reach within the Barton Creek Watershed. Sampling Sites: Below major tributary or major storm sewer influent (36" or larger outfall pipe) Sample Frequency: Once during study Number of Samples: Based on number of identified major tributaries and/or storm sewer influences. Sample Parameters: PAH		
1.1.2 Supplemental samples will be collected at outfalls and subreaches showing significant contamination. Sampling Sites: Below outfalls which have been identified with a high potential for development impacts based on initial screening, land use maps, and location of commercial businesses; in subreaches near initial screening sites with high values. Sample Frequency: Once during study or as needed to identify potential source location. Number of Samples: Based on the number of sites identified in the initial screening as potential contaminant sources. Sample Parameters: PAH		
1.1.3 Subreaches identified as significantly impacted will be resampled and submitted to LCRA laboratory for analysis. Sampling Sites: Subreaches with high values Sample Frequency: Once during study. Number of Samples: Based on the number of sites identified as significant pollutant sources by initial and subsequent ELISA samples. Sample Parameters: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc; PAHs, Oil & Grease, TPH, Chlorinated Pesticides, PCBs; TOC; % Dry weight, Grain size		
1.1.4 Sampling to be conducted by ERM-WQM staff will consist of sediment collection at Barton Springs using LCRA laboratory for analysis. Sampling Sites: Barton Springs Pool Sample Frequency: Quarterly Number of Samples: 1 sample/sample event; 1 duplicate sample taken once annually Sample Parameters: NO2+NO3, TKN, NH3, TP, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Silver, Zinc; PAHs, Oil & Grease, TPH, Chlorinated Pesticides, PCBs, Chlorophenoxy Herbicides, Organophosphorus Pesticides; Acid Volatile Sulfides; TOC; % Dry weight, Grain size	Oct. 1998	Sept. 2003
1.1.5 Sampling to be conducted by ERM-WQM staff will consist of sediment collection at Barton Springs using LCRA laboratory for analysis. Sampling Sites: Eliza, Old Mill and Upper Barton Springs (where sediment accumulation allows) Sample Frequency: Annually Number of Samples: 1 sample/site/sample event Sample Parameters: NO2+NO3, TKN, NH3, TP, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Silver, Zinc; PAHs, Oil & Grease, TPH, Chlorinated Pesticides, PCBs, Chlorophenoxy Herbicides, Organophosphorus Pesticides; Acid Volatile Sulfides; TOC; % Dry weight, Grain size	Oct. 1998	Sept. 2003
1.1.6 Review sediment screening data and COA planning studies previously conducted for the Barton Springs Contributing Zone to identify potential retrofit sites or alternative solutions as warranted by the sources.		

Table One:Programs to Address Storm Water Discharges	Date Begin	Date Complete
2.0 Barton Creek Monitoring		
2.1 Barton Creek Mainstem in the Contributing Zone-Sampling in pools and riffle areas, within the contributing zone, and on mainstem of Barton Creek.	Oct. 1998	Sept. 2003
2.1.1 Baseflow water quality sampling, flow measurements, and algae surveys will be conducted at perennial pools along the mainstem of the creek.		
Sampling Sites: Stark, Shield Ranch, Paisano, Hwy 71, Ogletree, L. Johnson, Lost Creek & Recharge Pools; Barton Creek above Fin Bridge, below Barton Creek Blvd. & at Lost Creek		
Sample Frequency: Quarterly		
Number of Samples: 1 sample (3litres)/site; 1 Duplicate at 1 site		
Sample Parameters: Field - Temp, pH, Conductivity, TDS, Turbidity, DO; TSS, VSS; Fecal Coli; NO3, NO2, NH3, TKN, TP, Ortho-P; TOC(2 sites); Flow; % algae cover, Chlorophyll A, Identification of substrate		
2.1.2 Benthic macroinvertebrates will be monitored concurrent with sampling for water chemistry		
Sampling Sites: At riffle areas associated with Shield Ranch, Hwy 71, L. Johnson and Lost Creek pool sites		
Sample Frequency: Quarterly		
Number of Samples: 1 surber/site (Target # of 100 organisms); 1 replicate sample/site		
Sample Parameters: Identification to genus; Taxa richness; % contribution of dominant taxa; Community loss index; EPT index; Ratio of EPT to chironimidae abundance; Modified HBI; Field observations on habitat assessment recorded		
2.1.3 Stormwater monitoring at mainstem USGS-type stations at Hwy 71, Lost Creek, and Loop 360.		
Sampling Sites: Hwy 71, Lost Creek, Loop 360		
Sample Frequency: Hwy 71 & Lost Creek: 7events/year - 3 storm events and 4 baseflow; Loop 360: 6 events/year - 4 storm events and 2 baseflow		
Number of Samples:4-5 samples (storm events); 1 sample (baseflow)		
Sample Parameters: USGS Lab-Temp, pH, Conductivity, TDS, Turbidity, DO; TSS, VSS; Fecal Coli & Strep; NO3, NO2, NH3, TKN, TN, TP, Diss P; BOD, COD; Flow; Chlorophyll A (2 sites, 2 baseflow samples) ; 3 Heavy Metals		
2.2 Barton Creek Mainstem, Recharge Zone (above Barton Springs Pool)-Surface water, spring water and bioassessment sampling within the recharge zone above Barton Springs Pool.	Oct. 1998	Sept. 2003
2.2.1 Base flow water sampling will be conducted at two pools below the contributing zone and above Barton Springs Pool.		
Sampling Sites: Above pool between dams, Campbell's Hole, Backdoor Spring		
Sample Frequency: Quarterly		
Number of Samples:1 sample (3liters)/site; 1 Duplicate at 1 site		
Sample Parameters: Temp, pH, Conductivity, TDS, Turbidity, DO; TSS, VSS; Fecal Coli; NO3+NO2, NH3, TKN, TP, Ortho-P		
2.2.2 Benthic macroinvertebrates will be monitored concurrent with sampling for water chemistry.		
Sampling Sites: The most downstream creek site above the pool bypass.		
Sample Frequency: Quarterly		
Number of Samples:1 surber/site (Target # of 100 organisms); 1 replicate sample/site		
Sample Parameters: Identification to genus; Taxa richness; % contribution of dominant taxa; Community loss index; EPT index; Ratio of EPT to chironimidae abundance; Modified HBI; Field observations on habitat assessment recorded		

Table One:Programs to Address Storm Water Discharges	Date Begin	Date Complete
2.2.3 Flow and water quality will be monitored at a newly established USGS discharge measurement station. Sampling Sites: Just upstream of Barton Springs Sample Frequency: 7events/year; 3 storm events and 4 baseflow Number of Samples:4-5 samples (storm events); 1 sample (baseflow) Sample Parameters: USGS Lab-Temp, pH, Conductivity, TDS, Turbidity, DO; TSS; Fecal Colif & Strep; NO3+NO2, NH3, TKN, TN, TP, Diss P; BOD, COD, TOC; Flow; 3 Heavy Metals; Chlorophyll A (2 baseflow samples)		
2.3 Edwards Aquifer Springs, Barton Springs Pool-Sampling within Barton Springs Pool and associated springs of the Edwards Aquifer.	Oct. 1998	Sept. 2003
2.3.1 Barton Springs surface water quality will be sampled. Sampling Sites: Barton Springs Pool Sample Frequency: Biweekly Number of Samples: 1 sample (4 liters) Sample Parameters: TSS; NO3+NO2, NH3, TKN, TP, Ortho-P		
2.3.2 Barton Springs will be monitored. Sampling Sites: Barton Springs Sample Frequency: Semi-annually Number of Samples: 1 sample (7.5 liters)/spring Sample Parameters: TSS; Fecal Colif; NO2+NO3, NH3, TKN, TP, Ortho-P; TOC; Ions, Alkalinity; Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Silver, Zinc; Oil & Grease, TPH, Organophosphorus Pesticides, Chlorophenoxy Herbicides, Bromacil, Volatiles(including BTEX and MTBE), BNA Semi-volatiles(includes PAHs)		
2.3.3 Two other springs which discharge from the Barton Springs segment of the Edwards Aquifer will be monitored. Sampling Sites: Eliza Springs and Old Mill Springs Sample Frequency: Annually Number of Samples: 1 sample (7.5 liters)/spring Sample Parameters: TSS; Fecal Colif; NO2+NO3, NH3, TKN, TP, Ortho-P; TOC; Ions, Alkalinity; Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Silver, Zinc; Oil & Grease, TPH, Organophosphorus Pesticides,Chlorophenoxy Herbicides, Bromacil, Volatiles(including BTEX and MTBE), BNA Semi-volatiles(includes PAHs)		
2.3.4 A datalogger will be deployed at Barton Springs. Sampling Sites: Cave at bottom of Barton Springs Pool (within Barton Springs) Sample Frequency: Continual except for maintenance and data retrieval. Number of Samples: NA Sample Parameters: Day, Time, pH, Temperature, Specific conductivity, Turbidity, DO, Depth		
2.3.5 SPMD sampling to occur at Barton Springs. Sampling Sites: Cave at bottom of Barton Springs Pool (within Barton Springs) Sample Frequency: Once during the permit period Number of Samples: 5 samples (5 devices) Sample Parameters: TPH, PAHs, Organochlorides, Pyrethroids		

Table One:Programs to Address Storm Water Discharges	Date Begin	Date Complete
3.0 Environmental Integrity Index (EII)		
3.1 Provide an assessment of the Onion, Barton and Williamson Creek Watersheds found within both the BSZ and the permit area using the EII methodology. Sampling Sites: A minimum of three sites within each study area Sample Frequency: One sampling event at each EII site Number of Samples: NA Sample Parameters: 5 indices: Aquatic life (benthics, algae, habitat);Physical integrity(bank stability, erosion, channel shape); Water Quality; Sediment Quality; Contact/Non-contact recreation	Oct. 1998	Sept. 1999
3.2 Provide an assessment of the Slaughter, Bear and Little Bear Creek Watersheds located within both the BSZ and the permit area using the EII methodology. Sampling Sites: A minimum of three sites within each study area Sample Frequency: One sampling event at each EII site Number of Samples: NA Sample Parameters: 5 indices: Aquatic life (benthics, algae, habitat);Physical integrity(bank stability, erosion, channel shape); Water Quality; Sediment Quality; Contact/Non-contact recreation	Oct. 2000	Sept. 1999
Compliance, Inspection and Maintenance		
1.0 Stormwater Discharge Permit Program		
1.1 Focus Stormwater Discharge Permit Program efforts in the watersheds located within both the Full Purpose City Limits and the Barton Springs Recharge Zone; Barton Creek, Slaughter Creek and Williamson Creek Watersheds.	Oct. 1998	Sept. 2003
1.1.1 Identify all known permittable facilities with activities including motor rebuilding and repair, machine shop services, transmission rebuilding and repair, radiator repair, fuel storage and dispensing facilities.		
1.1.2 Conduct inspection of each identified facility to ensure compliance with City Codes to protect water quality, including proper waste storage, handling and disposal practices; plumbing connections to the storm sewer system; and maintenance activities.		
1.1.3 Recommend Best Management Practices and provide educational materials applicable to each operation.		
1.1.4 Issue a Stormwater Discharge Permit to all identified facilities.		
2.0 Underground Storage Tank Leak Prevention Program		
2.1 Focus the Underground Storage Tank Leak Prevention Program efforts in the watersheds located within both the Full Purpose City Limits and the Barton Springs Recharge Zone; Barton Creek, Slaughter Creek and Williamson Creek Watersheds.	Oct. 1998	Sept. 2003
2.1.1 Identify all known permittable facilities with underground storage tanks.		
2.1.2 Conduct inspections of each identified facility to ensure compliance with City Codes to protect water quality, including proper storage, monitoring and leak detection activities.		
2.1.3 Recommend Best Management Practices and provide educational materials applicable to each operation.		
2.1.4 Issue a Storage and/or Construction Permit to all identified facilities.		
3.0 Storm Water Management		
3.1 Conduct wet weather inspections of commercial and residential ponds in the BSZ.	Oct. 1998	Sept. 2000
3.2 Focus efforts of SWM Inventory Control Program to repair all non-functioning residential ponds within the BSZ by the end of the permit period.	Oct. 1998	Sept. 2003
3.3 Focus efforts to enhance compliance and enforcement of maintenance and repair requirements of commercial ponds in the BSZ.	Oct. 1998	Sept. 2003
3.4 Complete annual report including the inventory and condition of commercial and residential ponds in the BSZ; number of enforcement actions to be included.	Oct. 1998	Sept. 2003
4.0 Development Review and Inspection		
4.1 Dedicate inspectors to monitor construction activities within the Barton Springs Zone subject to inspection for erosion control standards.	Oct. 1998	Sept. 2003

Table One:Programs to Address Storm Water Discharges	Date Begin	Date Complete
Mapping and Identification of Resources		
1.0 Municipal Separate Sanitary Sewer System		
1.1 Mapping of the MS4 will be conducted for those areas where the sediment screening is performed by Watershed Protection Department staff within the Barton Creek Watershed.	Oct. 2000	Sept. 2001
2.0 Karst Features (Study design to be sent to Service for concurrence prior to initiation of study).		
Work on the invertebrate SOC will give the agency ESA coverage for effects of stormwater discharges on these species if they become listed.		
2.1 Map all karst features within the permit area known to be habitat for listed endangered cave invertebrates and other species of concern.	Oct. 1998	Sept. 2003
2.2 Identify and map drainage areas and conveyance systems within the drainage area contributing storm water to karst features.	Oct. 1998	Sept. 2003
2.3 Identify and map land uses within the drainage areas contributing run-off to each karst feature.	Oct. 1998	Sept. 2003
2.4 Identify karst features impacted by MS4 discharges and the need for mitigative measures.	Oct. 1998	Sept. 2003
3.0 Transported Hazardous Materials Study (Study design to be sent to Service for concurrence prior to initiation of study.)		
3.1 Identify and map all major arterial streets (at stream crossings) maintained by the City and located within both the Full Purpose City Limits and the Barton Springs Zone.	Oct. 2001	Sept. 2003
3.2 Identify and map the local roadway drainage and conveyance systems located in the immediate vicinity of the stream crossings.	Oct. 2001	Sept. 2003
3.3 Evaluate the potential for an acute hazardous materials spill event to occur at mapped locations, the potential impact to water resources resulting from a spill event and the need for structural control retrofit activities.	Oct. 2001	Sept. 2003
Community Education		
1.0 Barton Springs Watershed		
1.1 Storm drain inlet marking program activities at selected inlets.	Oct. 1998	Sept. 2003
1.2 Watershed identification signs located at borders of Barton Creek watershed at selected major thoroughfares.	Oct. 1998	Sept. 2003
1.3 Barton Springs Kiosk. Located at Barton Springs Pool, includes the history, geology, flora and fauna of Barton Springs Pool, Non-Point Source pollution and pollution prevention activities.	Oct. 1998	Sept. 1999
2.0 Other Watersheds within the Barton Springs Zone		
2.1 Storm drain inlet marking program activities at selected inlets.	Oct. 1998	Sept. 2003
2.2 Watershed identification signs located at borders of watersheds at selected major thoroughfares.	Oct. 1998	Sept. 2003
Additional Activities		
1.0 BMP and Retrofit Activities		
1.1 Dedicate funds for BMP and retrofit activities within the BSZ as indicated by the Sediment Screening and Master Plan findings analysis. Total expenditure not to exceed $100,000.00.	Oct. 1999	Sept. 2001
2.0 Land Conservation		
2.1 Purchase or acquire conservation easements or conservation land in the Barton Springs Zone up to 5,000 acres.	Oct. 1998	Sept. 2003

APPENDIX B

Monthly Salamander Survey Data Through September, 1998

City of Austin, Watershed Protection Utility - Environmental Resource Management

Station		TOTAL					
12/9/95	(24A,16J)	40					
11/1/95	(17A,10J)	27					
9/27/95	(17A,4J)	21			9/10/98	(31A,11J)	42
9/6/95	(19A,9J)	28			8/6/98	(19A,16J)	35
7/29/95	(11A,8J)	19			7/9/98	(21A,14J)	35
7/12/95	(20A, 6J)	26			5/13/98	(22A,12J)	34
6/13/95	(9A, 2J)	11			4/22/98	(18A,22J)	40
5/3/95	(10A,3J)	13			3/11/98	(22A,13J)	35
4/5/95	(2A,1J)	3			2/10/98	(17A,9J)	26
3/24/95	(9A,2J)	11			1/13/98	(14A,10J)	24
3/5/95	(2J)	2			12/5/97	(38A,6J)	44
2/1/95	(5A,1J)	6			10/22/97	(35A,7J)	42
1/4/95	(1A)	1			9/30/97	(15A,8J)	23
12/6/94	(3A,2J)	5			5/29/97	(4A)	4
10/28/94	(2A,1J)	3			4/27/97	(5A)	5
9/30/94	(7A,5J)	12			3/12/97	(9A)	9
9/28/94	(7A,5J)	8			1/30/97	(6A, 5J)	11
8/30/94	(3A,12J)	15			12/17/96	(8A,6J)	14
8/13/94	(5A,8J)	13			11/23/96	(11A,7J)	18
8/2/94	(8J)	8			10/26/96	(4A,3J)	7
6/25/94	(2A,13J)	15			9/27/96	(3A,5J)	8
5/27/94	(11A,16J)	27			9/10/96	(5A,3J)	8
5/4/94	(11A,17J)	28			8/22/96	(10A,5J)	15
3/30/94	(10A,8J)	18			8/3/96	(16A, 13J)	29
2/19/94	(15A,6J)	21			7/13/96	(19A, 20J)	39
1/26/94	(17A)	17			6/22/96	(6A, 18J)	24
12/31/93	(18A)	18			5/30/96	(11A, 8J)	19
11/6/93	(27A)	27			4/30/96	(16A, 18J)	34
10/23/93	(20A,3J)	23			3/30/96	(3A,10J)	13
9/4/93	(8A,3J)	11			3/15/96	(8A,3J)	11
7/21/93	(12A)	12			2/28/96	(8A,9J)	17
					1/30/96	(22A,23J)	45
					1/4/96	(26A,15J)	41

(Shaded dates are night dives)

APPENDIX C - Experimental Pool Cleaning Data

Table 1: Documented Take Associated with Pool Drawdown

DATE	TOTAL Salamanders	HOURS	Adults	Juveniles	Beach Area	Fissure Area	Eliza Spring
3/31/98	19	12	9	10	0	19	0
4/2/98	11	24	6	5	2	8	1
4/14/98	36	20	17*	19*	23	11	2
4/23/98	7	14	4	3	0	7	0
4/30/98	1	12	0	1	0	1	0
5/7/98	3	12	1	2	0	3	0
5/14/98	5	12	3	2	0	5	0
5/21/98	5	12	2	3	0	5	0
6/25/98	12	14	6	6	3	9	0
7/2/98	4	16	1	3	2	2	0
7/16/98	8	12	6	2	4	4	0
7/30/98	6	12	5	0	4	0	1
8/13/98	101	29	69	32	84	0	17
8/27/98	5	9	2	3	1	0	3
9/17/98	3	9	3	0	1	1	1

* On this date ten salamanders were not identified as being either adults or juveniles. For display purposes these have been added to the adults and juveniles (5 each).

DATE = The date of the pool cleaning experiment
TOTAL Salamanders = the total number of salamanders found during the experiment. Most were stranded out of water but some were still in the water and moved themselves to deeper water. All of the observed salamanders were included in the "take" numbers.
HOURS = the approximate total time spent searching for salamanders per pool cleaning experiment.
Adult = number of adult salamanders observed
Juvenile = number of juvenile salamanders observed
Beach Area = number of salamanders observed in the area of the pool known as the beach area
Fissure Area = number of salamanders observed in the area known as the fissures area
Eliza Spring = number of salamanders observed in Eliza Spring due to lowering of the water level.

Survival Rate Study

As part of the Experimental Pool Cleaning Phase II experiments, a limited number of salamanders were placed in clear acrylic tubes with netting secured over both ends to allow the flow of spring water through the tubes. For a period of 3 days the tubes were placed in an area of the fissures with sustained spring flow. The salamanders in the tubes were checked on a daily basis. Table 2 summarizes the study results.

Table 2: Survival Rates for Captured Salamanders

DATE	TOTAL Salamanders	Adult	Juvenile	TOTAL Surviving Salamanders	Survival Rate after Three Days
6/25/98	4	0	4	3	75%
7/2/98	3	1	2	2	67%
*7/9/98	5	0	5	5	100%
7/16/98	7	5	2	6	86%
7/30/98	2	2	0	2	100%
8/13/98	10	6	4	9	90%
8/27/98	3	2	1	3	100%
9/17/98	3	3	0	3	100%

*On this date, biologists captured five salamanders using SCUBA equipment and placed the salamanders in the acrylic tubes for three days. This experiment was not associated with pool drawdown.

DATE = the date the salamanders were collected and placed in the tubes.
TOTAL Salamanders = the total number of salamanders placed in the tubes.
Adult = number of adult salamanders placed in the tubes.
Juvenile = number of juvenile salamanders placed in the tubes.
TOTAL Surviving Salamanders = total number of salamanders alive in the tube after three days
Survival Rate after Three Days = percentage of salamanders alive in the tube after three days

Appendix D

HCP PUBLIC COMMENTS (July 15, 1998 - August 14, 1998)

1. WATERSHED CONCERNS

- **The permit focuses on pool activities and the impact of swimmers instead of the real threats.**
- **I'm disappointed that you are not addressing the problems of alteration of habitat because of upstream development.**
- **Focus on increased flooding and sedimentation and not pool cleaning.**
- **The HCP focuses too much on the spring and not on development upstream. Isn't the salamander endangered because of construction and development upstream?**
- **We are concerned that FWS fails to hold the City accountable for its direct impact to the water quality of Barton Springs and the degradation of salamander habitat. The HCP process would authorize the City to degrade water quality and quantity. This degradation has been documented to harm salamanders. Thus, issues concerning the City's degradation of water quality and quantity must be addressed in the HCP.**
- **We support measures to protect the salamander in the pool, even if it means modifying the pool. The evidence suggests that water quality be highly correlated to development and increasing impervious cover in the watershed. We would like to see alternatives considered before something so drastic is done.**
- **Discussions within the HCP regarding broader issues of water quality and quantity are inappropriate. The HCP authorizes the City's take of salamanders.**

The focus of this document is to minimize and/or mitigate incidental take of the species associated with operation of the springs and use of the springs as an outdoors aquatic recreational facility. The Service recognizes that construction and alteration of habitat in the watershed and increased urban development throughout the watershed pose a significant threat to the species. These watershed issues are being addressed in the recovery planning process and by the Service in negotiations with developers, businesses, environmental groups, municipalities, county and state agencies, and various federal agencies.

Can the City and FWS control problems in the watershed (Mopac, MUDs, and PUDs)?

The Service recognizes that a regional approach involving all the appropriate governmental, non-governmental, and business concerns will be required to successfully control watershed problems. The legal jurisdiction of the City of Austin covers less than 25% of the Barton Springs watershed.

This document contains less than 1/2 page of geology and a firm understanding of the geology of the region and the tendency for flash flooding in Barton Creek has to be considered thoroughly since floods will wash salamanders into turtles' mouths in Town Lake.

The purpose of the "Description of the Affected Environment" section of the EA/HCP is to provide background information and context for the proposed alternatives. Recognized experts in the

field of hydrogeology have reviewed the EA/HCP and their comments have been incorporated into the final document.

I support the HCP as developed and I like what you're doing. I think it's a good plan. Upstream pollution is the biggest threat to the salamander but we need to protect the salamander from physical harm from the swimmers. The HCP shows a balance between protection of the salamanders and swimming.

The Service believes that the proposed plan will benefit all users of the springs, including swimmers, waders, and salamanders.

I hope the developers go under the same rigorous review; in particular, I hope that every stormwater discharge, which may affect the salamander, is required to consult through the EPA with the USFWS. Every minute and dollar spent on the pool is not being spent on the recovery plan or addressing the effects of upstream pollution. The reason the salamander is endangered is not due to pool cleaning, but rather it cannot escape the effects of upstream pollutants that get funneled through Barton Springs. A further delay in addressing the pollution problem will seriously jeopardize the species. You should require the City to pursue activities that will remove grandfathered development rights.

The Service recognizes that numerous threats to the salamander exist and the Service has formed the Recovery Team comprised of local and regional experts to provide a Recovery Plan for the species. The Recovery Plan will address water quality and quantity issues on a regional basis. In addition, the Service is consulting with the Environmental Protection Agency in regard to the stormwater discharge permits for the City of Austin and the Texas Department of Transportation that will affect Barton Springs and the salamander.

Silt in the pool is telling us what is in the aquifer. If we had already effectively protected the watershed, a lot of this would not be necessary.

Silt that is deposited in Barton Springs can come from the aquifer, surface flow in Barton Creek, and surface runoff around the springs. Any impoundment such as Barton Springs Pool will trap some of the silt that occurs naturally due to erosion or that results from construction and development-related activities.

I understand that 100% of the salamanders being killed now are being killed by upstream conditions. Degradation of the surface habitat is sedimentation, nitrate and phosphate loading from upstream; the cleanings are required because of the upstream problems and that is what is killing the salamander. Extrapolate the problems from 10 years ago to what they are now to what they will be 10 years from now; maybe the pool will have to be cleaned every day because of upstream problems. The only long-term solution is to focus on upstream problems.

To date, the only documented take of salamanders is related to pool operation and maintenance or federally permitted scientific activities. The Service believes that protection of the salamander and the continued use of Barton Springs for recreational activities require safe, responsible maintenance of the springs as proposed in the HCP. In addition, a regional approach for protection of aquifer water quality and quantity is a necessary component of long-term protection.

Once you have resolved the pool cleaning issues, please take the same strong measures to protect the upstream resources of Barton Creek.

The Service believes that long-term protection of the upstream resources is necessary for the survival of the species and protection of the aquifer.

Swimmers are not the problem. Developers are the problem. The entire watershed has to be protected. This plan is very myopic since it does not address the real threats. I predict that Barton Springs will be closed in 30 years. It is ludicrous to restrict swimmers and not development upstream. A total plan for protection of the watershed is necessary.

The Service openly supports a regional plan for protection of the watershed. The purpose of the proposed EA/HCP is the continued operation and maintenance of Barton and adjacent springs for the protection of the salamander. The Service believes that safe, responsible use of the springs will increase public awareness of the springs and the need to protect the aquifer. The Service also recognizes the efforts of the City and its citizens to protect the aquifer and Barton Springs.

All of our focus is on a few square yards of the watershed and not the 364 sq. miles of the watershed. Algae don't naturally grow in our low nutrient streams so we need to take the proper steps upstream to protect the aquifer. We need to set up a preserve system in the watershed that restricts impervious cover to 5%.

Algae grow naturally in all aquatic systems. However, increased nutrients from leaking septic tanks, leaking sewer lines, lawn and garden fertilizers, and highway runoff can result in eutrophic conditions or increased algae blooms. The restriction of impervious cover in the watershed is beyond the scope of this document. The Recovery Team will be evaluating the current and future levels of growth on the aquifer.

- **Impose development restrictions.**

- **The City has made monumental and essential steps to stem the tide of development in the watershed. However, we can not ignore pollution from existing development. Pollution reduction measures should and must be mandated in the 10(a) permit.**

- **The real threat is the unchecked development; the State of Texas is actively promoting development in the area through new highway and road construction, the creation of MUDs, and so-called Water Quality Protection Zones. Until USFWS takes definitive action to reduce these and other threats, any attempts to regulate recreational activities at Barton Springs are largely meaningless.**

- **Restrictions aimed at swimmers are incomplete and ineffectual if you fail to consider the many other Austin residents and businesses that use the Barton Creek watershed. Upstream of the pool numerous developers and users of homes, shopping malls, golf courses, and office building complexes have been using the Barton Creek watershed as drainage for the last 20 years. I have witnessed the slow degradation of water quality and environment at the pool and surrounding springs.**

- **More attention should be placed on upstream development rather than on the pool itself. Stratus Properties (formerly FM Properties) is doing massive clear-cutting near Barton Creek under permit from USFWS. How can you permit this, but restrict swimming in Barton Springs. The permit was given because FM Properties donated some 4,000 acres for preservation. The City is purchasing 15,000 acres for preservation. Why do the 15,000 acres not count in the City's favor, but the 4,000 acres give FM Properties carte blanche?**

- **The salamander has only become endangered in recent years due to upstream development, not swimmers.**

❖ **If the population of the Barton Springs salamander is sufficiently high that FWS can afford to approve a plan that results in such a direct and substantial take as well as modification of the species' habitat, then the FWS should de-list the species.**

The threats to the species include not only degradation of the quality and quantity of water that feeds Barton Springs, but also maintenance and recreation activities that can result in harm to the salamander. The purpose of this document is to minimize or mitigate the incidental take associated with the pool operation and maintenance while promoting a regional approach for protection of the aquifer.

Change the application to emphasize the role that water degradation and catastrophic spills play. This will put the City and FWS in a stronger position to administer, interpret, and defend the permit in ways that protect the common interests of the salamanders and the swimmers.

The Service believes that the proposed permit will result in a net benefit to swimmers and salamanders. Protection of the aquifer and prevention of catastrophic spills are responsibilities that are shared by various local, state, and federal agencies, in addition to the City and USFWS. The Service believes that a regional approach is needed to adequately address these threats.

❖ **Retention ponds can be made and beavers can be introduced around Barton Creek. Their dams would slow erosion and sedimentation into the pool.**

❖ **A current backwater study should be performed to find out where the best places are to put detention ponds that would prevent flooding into Barton Pool.**

Effective flood mitigation would require large capacity ponds that would result in the flooding of areas upstream of the ponds that currently lie outside of the floodplain. Retention ponds throughout the Barton Creek watershed would probably have minimal impact on erosion and sedimentation rates at the springs. Beavers are native to this region of Texas but they tend to build dens or burrows in the banks of slower moving, intermittent streams of Central Texas. Their behavior will provide little or no erosion and sediment control.

To decrease the amount of algae in the pool, efforts should be made to prevent sewage and septic tank seepage into Barton Creek. The aquifer recharge zone/ creek watershed could be made a "fertilizer-free area".

Nitrogen isotope studies at Barton Springs indicate that sewage or effluent are not the main source of nitrogen at the springs. Responsibility for the designation of the Barton Springs watershed as a "fertilizer-free zone" would require the cooperative efforts of local, state, and federal governmental agencies and non-governmental institutions. This designation could be proposed as an amendment to TNRCC's rules for the regulation and protection of the Edwards Aquifer.

❖ **Focus should be placed on the recharge areas and the watershed. A moratorium should be placed on construction in the Barton Creek watershed.**

❖ **Drawing up a management plan for Barton Pool without including management of pollution entering the pool is simply inadequate. Much of the pollution entering the pool originates in the City's jurisdiction. The only pollution addressed is that brought in by homeless people and other "regular citizens".**

As stated above, the purpose of the HCP is the mitigation and minimization of incidental take associated with the operation and maintenance of Barton and adjacent springs in Zilker Park. Issues concerning the impacts of the City's municipal stormwater sewer system are addressed in the Service's

Biological Opinion pursuant to the issuance of the National Pollution Discharge Elimination System (NPDES) permit to the City of Austin (See Appendix A).

The City has set a double standard with a high bar set for the swimmers while developers have a much lower bar. This approach assures that the salamander will go extinct and that human use and enjoyment of the springs will be impaired. This must be reversed.

The City does not set standards for compliance with the Endangered Species Act. The Service believes that the proposed HCP will result in a net benefit for all users of the springs.

We support the preferred alternative discussed in the HCP. However, we would like to see emphasis placed on protecting areas upstream of the pool.

The purpose of this HCP is to provide the City of Austin with a permit, which will allow for the continued operation and maintenance of Barton and adjacent spring sites. The protection of areas upstream of the pool will be addressed in the Recovery Plan.

- **Hold developers responsible with "community give back programs."**

- **Work to gain respect for the Greenbelt with National Park Recognition**

- **I propose making the entire watershed a park and preserve. The long-term gains from such a park would be great and outweigh the short-term costs.**

The citizens of Austin recently passed a $65 million bond proposal for the purchase of approximately 15,000 acres in the Barton Springs watershed. This commitment will help protect the upstream habitat and water quality at the springs. Designation of the entire watershed as a park or preserve is beyond the scope of this permit.

Prevent development in the watershed. More research should be done to find the effects of development on water quality. Money in the conservation fund in the cost analysis should be increased to at least $100,000 a year. A part of this money should be used for daily monitoring of water quality and then compared to watershed development. Get UT involved.

During the past 20 years, the City has collaborated with the US Geological Survey, the Center for Research in Water Resources at the University of Texas - Austin, the Barton Springs/Edwards Aquifer Conservation District and various environmental consultants to study the impacts of development and stormwater on water quality. The City of Austin is recognized internationally for its water quality and stormwater monitoring programs. This monitoring will continue but is not specifically tied to this plan.

What is being asked of the swimming public is insignificant compared to what is asked of the landowner community. The ESA should be applied equally to all segments of the community.

The Service believes that the current proposed permit adequately addresses the need to minimize and mitigate for the incidental take from pool maintenance operations. The application of the ESA is a site and species specific task.

2. EXPERIMENTAL POOL CLEANING

- **The US Fish & Wildlife Service should permit the City an additional 15 cleanings for experimental purposes while a meaningful plan is drawn up to remove silt & algae from Barton Springs.**

- **There should be another plan that allows the City to do experimental cleanings for 5 years. This plan would allow the testing of various measures to determine their efficacy and whether or not they should be made permanent. Also it would give the City the authority to reopen the fissures and the beach unless there is evidence that normal human activity is harmful to the salamander. The City would be required to: take reasonable measures to clean and maintain the pool to minimize salamander take, keep a detailed log of cleaning activities, collect statistical data on salamander activity, particularly in view of cleaning procedures. Further research the biology of the salamander engage in a public information and education program develop a long term cleaning and management plan**

- **Salamander numbers were highest on a day when the pool was not lowered for several weeks. This could mean, if cleaning was stopped, then the population would spread over a larger area.**

Salamander survey data exhibit a high degree of variability in surface population numbers. Experimental pool cleaning data indicate that pool lowerings can result in the stranding of salamanders in the fissures and beach area and that frequent lowerings of the pool impact the surface population. This taking of salamanders will be minimized or mitigated under the proposed HCP.

In view of the pending lawsuit by Alan Hamilton, et al, the local Service is under pressure to look good in the forthcoming Court hearings scheduled for this coming spring. It may be prudent to continue the experimental period of cleaning and collecting more data under different flow conditions while the lawsuit is pending. I prefer a plan based on solid data to a plan hastily construed out of fear of the pending lawsuit.

The City has collected over five years of monthly survey data under varying aquifer conditions. In addition, the experimental pool cleanings have provided significant data while the aquifer flow has varied from 55cfs to 90 cfs. The Service believes that the currently available scientific information is adequate to develop a reasonable plan for the protection of the salamander.

3. INCIDENTAL TAKE

- **The estimated take of over 3000 salamanders per year following existing cleaning procedures is without any scientific foundation.**

- **The HCP needs to be scrapped. Data analysis for the 8 experimental pool cleanings is flawed since the worst case scenario is used. This error is repeated throughout the document with respect to take in all areas of the pool. A valid statistical analysis of the data would not inflate the take numbers as presented in the HCP. The assumptions in the baseline data are also flawed. The baseline should not be the conditions as they exist today. The City should be given credit for the changes that have been made in pool cleaning in past years. If the baseline is past conditions, then the City has complied with its obligations and is not required to make further improvements.**

This estimate of take is the direct result of scientific data collected during the experimental pool cleanings. A worst case scenario was used to illustrate the potential impact to the population and to describe the level of incidental take that would need to be permitted. Using an average would ensure that the permit would be violated.

Does the City need to advocate a position that will guarantee the growth of the population of the salamander or can we properly advocate a position that will guarantee the survival of the salamander in small areas?

The City is seeking an incidental take permit that will ensure that effect of spring maintenance and operation on the salamander will be minimized or mitigated. The long-term recovery of the species will be addressed in the Service's Recovery Plan for the Barton Springs salamander.

I would like to see the City consider taking an aggressive legal strategy to make the point that the salamander is adequately protected without doing anything different except letting the swimmers know that the creature is there and to treat the pool with the reverence it deserves.

Under the Endangered Species Act, the impacts of otherwise legal activities such as pool maintenance and recreational activities that may result in the incidental take of an endangered species must be covered under an Incidental Take Permit. The HCP and Permit must operate to the benefit of the salamander. Current pool maintenance procedures kill salamanders. Failure to comply with the ESA would result in the cessation of pool maintenance and possibly the closing of Barton Springs Pool. The City of Austin has proposed the HCP as their management plan for the next 15 years. The swimmers have a relatively small impact on the salamander. With regard to the activities in this plan, drawdown of the pool has the greatest potential to impact salamanders.

- **Alternative 1 should state that water degradation and catastrophic spills would result in incidental take of salamanders.**

- **The no action alternative needs to be re-worked to show that no action will result in the increase take of salamanders due to siltation, etc.**

Conditions at the spring sites are a function of aquifer levels, levels of sediment, nutrient loadings, and the frequency and intensity of episodic natural events. Under the no action alternative, the effects of natural events and activities throughout the watershed would determine habitat conditions. Catastrophic spills would not be considered incidental take that would result from the lack of pool cleaning.

I hope you will recommend Alternative 2, Maintaining Prior to Listing. The request for take should encompass the number sufficient to maintain current practices. The City is finding more salamanders now than ever, so if it ain't broke, don't fix it. By requesting any number less is likely to lead to the eventual closure of the pool to the public.

During the past six years, the City has made significant changes in the maintenance procedures at the spring sites to provide better habitat for the salamanders and swimmers. Although recent survey results indicate a higher number of salamanders at the springs, data from City of Austin surveys and the experimental pool cleanings indicate that pool drawdowns may result in the stranding of as many as 120 salamanders per drawdown. This number is a combination of the highest observed numbers in each area exposed during drawdown. It represents a worst case scenario. This level of take is considered unacceptable for maintaining the long-term survival of the population. The Service believes that the proposed HCP will provide protection for the salamander while maintaining a safe environment for swimmers.

The HCP fails to ensure that the incidental take resulting from the operation and maintenance of Barton Springs will be "adequately minimized and mitigated to the maximum extent practicable."

If the City complies with the provisions of the proposed HCP, if approved, then the Service believes that the take will be minimized and mitigated to the maximum extent practicable.

If approved, the pool cleaning would be the single greatest permitted incidental take of salamanders and presumably the primary threat to the species.

Under the proposed HCP, incidental take associated with pool cleaning will be minimized and mitigated so that it should not jeopardize the continued existence of the species. The Service believes that this is an acceptable level of take based on the results of the experimental pool cleanings.

The quantification of take in the plan is not in accordance with Federal guidelines as provided in the section 10 HCP Handbook, Page 3-10, 3-14.

The Service believes that the assessment of take is consistent with the Habitat Conservation Handbook (pages 3-10, 3-14), the ESA (Section 10(a)(2)(A)) and Federal regulation (50 CFR 17.22(b)(1), 17.32(b)(1), and 222.22).

The only known repeated take of the Barton Springs salamander is by the City in the operation and maintenance of the Pool.

It is true that the only documented cases of unnatural mortality occurred during the experimental pool cleanings and at Eliza Springs during pool drawdown under low aquifer conditions in January and February 1997, prior to listing. However, these data do not minimize the need to protect the water quality and quantity of the aquifer for future generations of humans and salamanders. The measures proposed would minimize risks in the future and should be a net benefit to the species.

Under Alternative 2, the City estimates the potential to kill 3100 salamanders per year. This number is substantial considering the species was listed after FWS repeatedly notes that the monthly surveys since 1993 indicate a population of 1 to 45 individuals. We encourage FWS to consider de-listing the species.

The actual population size is unknown. The responsibility of the Service is to make management decisions based on known information. The salamander was listed based on a small known population size (surface population) and threats to the continued existence of the species. These threats include a catastrophic spill, current and future water quality degradation to the aquifer, and management of the surface habitat. This plan addresses only the management of the surface habitat. Regardless of population size, the extremely limited distribution of the salamander (4 springs in Zilker Park) and the threats to it would warrant the listing as endangered.

Alternative 3 is an unacceptable alternative as it now includes constructing a dam. We question the logic used to determine that the construction of a second dam is the most appropriate action to minimize the take of the salamander and its habitat. The HCP states "As with most impoundment structures, it is anticipated that the pool will continue to fill in with silt and sediment resulting in a decrease of aquatic habitat." The HCP should explain how there would be no take in the construction of the dam.

The proposed HCP requires the City of Austin to minimize the number of times the deep end of the pool is lowered since this activity may cause the take of a significant number of salamanders. This goal may be accomplished by various solutions (including a temporary or permanent dam structure), and the Service will work with the City to ensure that the most cost effective means for minimizing and mitigating the incidental take is implemented.

The HCP estimates previous take levels of the Barton Springs salamander between 22 to 3100 salamanders. Given the information collected by the City, the City is responsible for an

estimated take of 3875 salamanders since 1997. The $10,000 that the City proposes for mitigation of these salamanders is inadequate.

The Service believes that the $10,000 dollars for mitigation is a reasonable figure. Before the experimental pool cleaning was conducted the extent of take was under estimated.

The HCP does not explain how the City will ensure that the number of salamander takes from recreational use of Barton Springs will decrease from 400 to 10 takes per year.

As described in the HCP, lowering of the beach area and the placement of limestone over the fissure area will minimize the incidental take due to recreational activities.

When the salamander was listed, the monthly surveys identified a population between 1 and 45. Now the HCP allows the take of more than 110 percent of the original population. The approval for such incidental take should warrant significant compensation and/or mitigation, and further question the grounds for listing the species.

The monthly survey information is not an estimate of the population. It provides information on trends in surface population abundance. Comprehensive survey results indicate the actual population numbers are higher. The approval of the permit is contingent on the implementation of the proposed HCP. Both the take level and the compensation have been re-examined and the Service believes that there is incidental take has been minimized and mitigated to the maximum extent practicable.

I have requested those documents relating to or describing the method of calculating the "take" in the plan. The City has refused to provide those documents claiming the litigation privilege, due to the "salamander" suit. This is an abuse of the open records law and denies me the ability to comment on the methods used to determine the critical "take" figures. If the "scientific" basis of the plan is a City secret, how can the public effectively participate in commenting on the US Fish & Wildlife Service? The plan should not be formulated while litigation is pending.

It is the responsibility of the Service to calculate the level of incidental take in the plan. The method of calculation is clearly spelled out in the document.

The total number of the species is unknown; therefore, actual numerical take calculations are not appropriate.

Incidental take calculations are based on the results of the experimental pool cleanings. These data are the best scientific information available. In the final HCP incidental take is permitted by area and activity and not by actual permitted numbers. The estimated numbers are displayed.

The Service has not publicly stated the incidental take levels that can be authorized consistent with section 10 issuance criteria, that is that will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

The Service believes that the proposed HCP and incidental take statement are consistent with the issuance criteria.

Nothing in the EA/HCP serves to mitigate the take of salamander from toxic materials in silt.

The Service does not have sufficient information to determine the extent of impact from toxic materials on the Barton Springs salamander.

There is no scientific justification for either the dam or alteration of the beach. There is no evidence to support that 400 salamanders a year are crushed.

Based on biologists' calculations, a total drawdown in Sunken Garden and Eliza will only strand a total of 3 salamanders. For this "estimated" mitigation the public is being asked to allow the permanent defacement of Barton Springs.

City of Austin data and experimental pool cleaning results indicate that a significant number of salamanders are stranded when pool drawdown occurs. These data are the basis for the take estimates in the HCP. Alteration of the beach area and a significant reduction in the frequency of lowering of the deep end of the pool would minimize and mitigate the level of incidental take due to maintenance and recreation activities.

4. SALAMANDER BIOLOGY

Use the water from the pool to provide constant flow below the dam to provide cover and food to salamanders below the dam.

Salamanders have not been found in the area directly downstream of the dam. As currently constructed, the springs do provide relatively constant flow to this area.

If the pool is not cleaned, will that hurt the salamander through build-up of sediment?

The level of sediment build-up in the pool is dependent on aquifer flow, sediment loadings throughout the watershed, and the frequency and intensity of flooding on Barton Creek. Spates, depending on their intensity, can have a scouring and/or depositional effect on the springs. Fast flowing waters can scour sediment from specific areas of the pool and carry this material downstream to the Colorado River. When deemed appropriate, City and Service staff will employ low impact measures to remove silt from areas of salamander habitat. If the pool were not cleaned at all, there would be a negative impact on salamander habitat.

The surveys for salamanders do not include other areas and I find it hard to believe that salamanders do not live in other places.

Biologists from the City and the Service have surveyed additional spring sites for the presence of salamanders. These spring sites include Cold Springs, Campbell's Hole, Backdoor Springs, and springs directly downstream of Lost Creek Drive. Salamanders have not been found at these sites. However, it wasn't until April 1997 that salamanders were discovered at Upper Barton Springs by City and Service biologists. Salamanders were not found during previous surveys at this site.

How do the salamanders live below multiple feet of sediment?

Salamanders have not been found living below multiple feet of sediment.

I feel the Barton Springs Salamander is an "ideal candidate for de-listing" based on dye studies, the preservation of thousands of acres, land development regulations and hazardous spill containment protocols.

The Service believes that the current threats have not been addressed sufficiently to propose de-listing at this time.

Information regarding how the population and distribution of the salamander responds to low flow versus high flow should be obtained.

City and Service biologists have studied the salamander under varying aquifer conditions for the past six years. Data results are contained in Appendix B of this document.

- **The HCP lacks biological standards, the baseline assessment of the species, and sufficient information on the reproductive biology of the species. Although the HCP provides survey data, there are no criteria associated with the numbers.**

- **The reproductive behavior of the salamander should be studied. If it reproduces in the aquifer only, then it makes no difference how many are taken in the pool since they are not part of the reproducing population.**

During the past four years, the City and the Service have collaborated with the University of Texas - Austin, University of Texas - Arlington, Dallas Aquarium, Midwest Science Center, and the San Antonio Zoo on captive breeding studies to better understand the reproductive biology of the species. In addition, results from surveys indicate that gravid females and newly hatched larvae are commonly found on the surface throughout the year at Barton, Old Mill, and Eliza springs. The presence of gravid females and newly hatched young at these sites indicate that the surface dwelling salamanders contribute to the population. The baseline assessment of the species is included in the NEPA document. Available data are not adequate to establish biological standards.

More needs to be known about the survivability of salamanders that leave the security of the fissures areas. I believe a scientific research role is what is needed rather than the role of a construction manager.

Studies concerning the survivability of salamanders that are stranded during pool drawdown at the fissures and beach area were a component of the Phase II experimental pool cleanings.

The HCP links the absence of salamanders to the accumulation of silt; also, FWS notes that the species is "clearly capable of living underground." This is inconsistent and contradictory.

"Clearly capable of living underground" refers to living in the aquatic environment of the aquifer.

The HCP indicates that "the number of salamanders inhabiting surface habitat in Barton Springs Pool is approximately two to four times the number of individuals counted during regular monthly surveys". This leads to two possible conclusions: the salamanders are more plentiful than indicated in the petition to list, or the pool operation and maintenance is more destructive than initially thought.

The estimate of the total surface population (two to four times the regular monthly survey number) is extrapolated from the percentage of the appropriate habitat that is surveyed during the regular monthly surveys. The level of take associated with pool operation and maintenance is calculated under the "Assessment of Take" section for each of the four alternative.

The Federal Register notice of listing did not identify pool cleaning as a threat to the species.

The final rule to list the salamander did address management of the surface habitat (which includes pool maintenance) as one of the threats that salamanders were facing. Barton Springs is a complex and dynamic system. Overall, the maintenance and operation of the pool may have an adverse impact on the species but the HCP has been designed to minimize and mitigate these impacts.

5. EDUCATION

Provide updates, education and community parks news at the now empty posting locations.

Informational posters for the existing kiosks are being updated to reflect the latest information concerning the springs and the salamander. New informational kiosks will be erected at both Eliza and

Old Mill Springs. Informational and educational postings at all of these sites will be updated periodically.

Educational signs should be made. Also, signs prohibiting disturbing the bottom of the springs should be made visible.

The Service agrees that educational signs need to be posted at all of the spring sites. This proposal is included in the HCP for Barton and adjacent springs.

Increase public awareness.

The Service believes that public awareness will be augmented through the implementation of the HCP. The Service supports the City in its efforts to develop the SPLASH! Into the Edwards Aquifer Exhibit, the Earth Camp program, and the various proposals to provide educational kiosks and signage at Barton and adjacent springs. The public hearings and meetings held during the public comment periods have also assisted in raising the public awareness of endangered species issues and protection of the Edwards Aquifer.

- **Create a salamander patrol: people who remind swimmers not to bother the salamanders or pick up rocks or aquatic plants.**

- **The fissures should not be roped off. Instead it should be opened with educational signs. A "salamander ranger" should be on duty during peak swimming hours.**

- **An environmental steward or "salamander ranger" could assist with both education and enforcement at all the spring locations.**

The Service believes that it would be useful for the City to train citizen volunteers to assist lifeguards and City staff with public education efforts at the springs. The current version of the HCP does not recommend roping off the fissures area to minimize take. Limestone slabs will be installed at selected fissure locations to minimize the potential for incidental take by waders and swimmers in the fissures area.

Bilingual signs at the entrance should be used to educate the public, including a waver of liability similar to wavers at ski resorts since swimming in natural waters can be dangerous.

The Service concurs that appropriate signage at the springs should be bilingual.

Even if it were true that people can harass or squish a salamander by stepping on it, an alternative to roping off areas is to educate every single person who comes to the pool. Erect an informational kiosk at the pool entrance. People can learn to swim without disturbing the bottom of the pool, just as people learn to swim but not touch coral around reefs. If necessary, create a staff position of Salamander Ranger to direct swimmers in proper behavior.

The educational provisions in the proposed HCP have been expanded to include some of the comments. The Service views the opportunity to use the salamander as an educational tool as vital to the survival and recovery of the species. The fact that we have an endangered species located just minutes from downtown Austin and the fact that swimmers and salamanders can co-exist should be focal points for the springs.

6. PUBLIC INVOLVEMENT

A swimmer representative and a pool staff person should be involved in development of silt and gravel removal policy, involved in the scientific advisory committee, and involved in refining the management plan.

During the past five years, City and Service staffs have worked closely with citizen user groups, various City department staff, and representatives of university and environmental groups in the development of pool maintenance procedures and efforts to protect the springs and the associated biota. The Service believes that this approach will be successful in the future during the implementation phase of the HCP.

- **Swimmers ask that they are involved in the review process of the annual report. Comments can be made separate from the report but attached to it for delivery to the City manager.**

- **We would like a swimmer representative and a pool staff person involved in the discussion concerning controlling surface runoff around the pool, and improving the efficiency of the Barton Creek bypass.**

The Service would welcome the participation of swimmers or any interested citizens. The advisory committee in the HCP will be open to swimmer representation.

We are used to hearing that a public hearing occurred and decisions will be made regardless of what we say.

As evidenced by the numerous changes in the current HCP, the Service values the public input process and the numerous public comments received from diverse user groups of Barton and adjacent springs.

Get more input from citizens and swimmers.

The Service and City representatives continue to meet with concerned citizens and swimmers on a regular basis.

You did not ask the advice of the people that swim there day after day looking at the pool and the population in the pool.

The Service has requested the input of swimmers and daily users of the pool on numerous occasions. Many of the comments presented during the public hearings and public comment period were received from regular users of the springs.

We know that the FWS/COA have been under pressure to develop a plan before the experimental cleanings are done. We are disappointed that the swimmers were not part of this process.

The Service and the City began development of the EA/HCP during the spring of 1997. The original EA/HCP and 10(a) permit application was submitted in January 1998. Public comments and additional information developed during the experimental pool cleanings have been incorporated into the current HCP. Swimmers and various concerned user groups have been involved throughout this process. The Service believes that the current HCP will minimize the incidental take of the salamander and provide a safe, recreational facility for the many users of the springs.

7. HCP AND PROPOSED MEASURES

We all know that swimming in and cleaning the pool kills salamanders. The only way to insure the salamander is properly protected is to not allow swimming or cleaning. If you issue a permit

to allow the City to kill this endangered species, it will show your prejudice in favor of the environmentalists. I see a double standard coming from the Federal agencies.

The purpose of this habitat conservation planning process and the proposed issuance of the incidental take permit is to authorize the City of Austin (applicant) to incidentally take Barton Springs salamanders (federally listed as endangered) during the operation and maintenance of Barton Springs Pool and the adjacent springs. Take, as defined by the Endangered Species Act, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct". In the 1982 amendments to the Act, Congress established a provision in section 10 that allows for the "incidental take" of endangered or threatened species. Under section 10(a)(1)(B) of the Endangered Species Act a provision was established to "where appropriate, authorize the taking of federally listed wildlife or fish if such taking occurs incidentally during otherwise legal activities".

The Habitat Conservation Plan (HCP) is a cooperative effort between the City and the Service to minimize and/or mitigate the effects of pool maintenance on the Barton Springs salamander. The basic goal of the plan is to reduce impacts to the salamander while allowing the City to operate and maintain Barton Springs pool and the adjacent springs. The Service does not believe that closing the pool is necessary.

The HCP fails to adequately explain the year delay to allocate funds to support the implementation of the HCP.

The impact of the delayed implementation (0-2 years) has been factored into our analysis. The proposed changes involve some extensive changes in operation, maintenance and structural characteristics of the pool. We believe that the timeframes are reasonable and prudent.

The City should withdraw the current plan, and resubmit a carefully developed plan based on publicly described parameters and professional, independent analysis, incorporating public input. The current plan is flawed in so many ways that a full detailed rebuttal of the legal, scientific, and statistical errors is beyond any individual's limited time and energy. Moreover, countless City and federal officials have said that the dam and alteration of the beach are "done deals".

The construction of the dam and alteration of the beach have never been described as "done deals" by City or Service officials. The City and the Service agree that the current information is adequate to provide the basis for the permit. The proposed plan has been developed in compliance with the guidelines set forth in the ESA and its implementing regulations. Public input and review have been and will continue to play a significant role in this process. The proposed plan has been designed to be flexible.

Consider more innovative technologies or realistic conservation measures to protect the Barton Springs salamander.

The Service believes that the conservation measures are realistic and the ability to explore innovative technologies is built into the current proposal.

The USFWS should take their time and collect more data. It is unclear who has the responsibility in this situation and the need is to focus on upstream development, not pool users and swimming. It is unclear who is proposing what in the document, USFWS or the City.

The Service believes that we have sufficient biological information to make a decision on the proposed permit. The document is a joint effort by the City and the Service; therefore some overlap exists within the document. The HCP (Section 6) is the City's proposal for management of the

salamander habitat. The analysis of take, effects of take, and the analysis of the alternatives are th responsibility of the Service.

We are concerned with the FWS response regarding development: "The Service may be force to implement measures, which could restrict growth in these areas, if there is not an adequate comprehensive approach to land use planning. " FWS' suggestion that it has sweeping authority to regulate land use is extremely troubling, and likely unconstitutional. The agency's role is simply to protect endangered species; in this case, its responsibility is only to ensure that non-federal parties do not commit unauthorized "takes" of the salamander. The charge of zoning and planning belongs to state and local agencies. The agency's threat to exercise such authority here distorts the Tenth Amendment.

The Service is responsible for ensuring the continued existence of the species. Zoning and planning are clearly the role of local governments. The Service will take necessary steps, within our authority to protect the species.

For the first two years of the HCP permit the City should find an independent compliance monitor to review and inspect the activities of the City under the HCP. Neither the Service nor the City should conduct this review.

The Service does not see a need for an independent monitor. The Service and the City are responsible for ensuring permit compliance.

The HCP is inadequate in its alternative analysis. Regarding Alternative 1, there is no documentation to support the claim that a cessation in pool cleaning activities will result in the decline of the species due to the accumulation of sediment.

The Service believes that an adequate range of alternatives have been analyzed. We do believe that a cessation of all pool cleaning activities would result in the degradation of salamander habitat.

The HCP fails to specify what type of training will be conducted to ensure workers have the skills to identify the Barton Springs salamander and what qualifications are necessary for the position that ensures that the species is protected.

The City of Austin has a valid scientific permit that would be used as the standard for working with salamanders. The type of training will be jointly worked out between the City and the Service. Different levels of training would be required depending on the role or position of the employee. A lifeguard would get different training than a person who surveys for salamanders.

The FWS should designate critical habitat for the Barton Springs salamander.

The Service declined to designate critical habitat for the species when the final rule to list the salamander was published. Critical habitat has not been proposed for the Barton Springs salamander. The Act requires that critical habitat be designated for a species at the time it is listed unless designation is not prudent or not determinable. Listing regulations at 50 CFR 424.12(a)(1) provide that critical habitat is not prudent if no benefit to the species is derived from its designation. Designation of critical habitat benefits a listed species only when adverse modification or destruction of critical habitat could occur without the survival and recovery of the species also being jeopardized. Because the Barton Springs salamander is restricted to one area that discharges water from the entire Barton Springs watershed, any action that would result in adverse modification or destruction of the salamander's critical habitat would also jeopardize its continued survival and recovery. Designating critical habitat would therefore not provide a benefit to the species beyond the benefits already provided by listing and subsequent evaluation of activities under the jeopardy standard of section 7 of the Act. Because jeopardy to the species and adverse modification of its critical habitat are

indistinguishable, the Service has determined that designation of critical habitat for the Barton Springs salamander is not prudent.

The FWS should not disregard the public comments that reference other listed species. The comparison to the warbler and the whooping crane provide examples as to what is required of private landowners in the form of conservation commitments.

The Service did not disregard public comments on the warbler and the whooping crane. The Service pointed out that each species is different, biologically unique, and must be evaluated separately. The Service believes that the City of Austin, through the implementation of the HCP, would minimize and mitigate incidental take to the maximum extent practicable.

The HCP fails to make sufficient positive contributions to the conservation of the salamander and its habitat. The proposal to build a dam fails to address the take associated with the construction. The HCP should provide some assurance that the City truly intends to protect and conserve the listed species

The construction of the proposed water control structure, if it were built, and the alteration of the beach would result in some take (short-term) but should result in an overall reduction in take for the term of the permit. This take is discussed under the Assessment of Take for the preferred alternative. The Service believes that the proposed HCP shows a very strong commitment from the City for the protection of the salamander. The proposed plan should improve habitat conditions for the salamander in three of the four spring sites.

The HCP seems to validate the City's existing operation and maintenance practices. The identification of Eliza Spring and Sunken Garden as reserve areas is insufficient mitigation for the damage to the population of salamanders within the pool area.

The Service believes that the changes proposed in cleaning methods are substantial and do not "validate" the City's existing operation. The restrictions to Eliza Springs and Old Mill Springs (Sunken Garden) are a portion of the overall mitigation. The reduction in drawdown should have a positive influence on the salamander population and habitat suitability.

The City should be forced to establish measurable standards and procedures to monitor the effectiveness of the HCP.

The City will be held to the terms and conditions of the HCP. The City would be required to document their compliance with each term and condition of the HCP annually. The Service is responsible for ensuring compliance.

Purpose of NEPA is not met in that the EA/HCP does not strive for or achieve harmony between human activity and the natural world.

The Service believes that the purpose of NEPA has been fully served. The proposed permit would ensure the continued operation of the springs for the term of the permit and minimizes the impacts of pool operation and maintenance on the salamander.

The City of Austin has received no mitigation or minimization "Credit" for discontinuation of spraying the habitat with high-pressure water hoses.

The City of Austin discontinued the direct spraying of salamander habitat with high-pressure hoses several years ago. The environmental baseline or the point of reference for the current permit is considered as the pool maintenance activities at the time of listing. The City has been addressing the needs of the salamander for over five years. The improved techniques have minimized the effects of pool cleaning. The HCP represents the City of Austin's proposal for the management of salamander

habitat for the next 15 years.

There is no specific monitoring plan that establishes reporting requirements or biological criteria for measuring the plan's success in removing silt and algae from Barton Springs Pool.

The City of Austin has presented a plan for removing silt and algae from the pool in the HCP. The Service believes that this plan is thorough and comprehensive. We do not have the information necessary to establish biological criteria for the effects of silt and algae on the salamander. Some level of silt and algae are necessary components of a functioning ecosystem. The Service believes that the current plan proposes adequate silt and algae removal for salamander habitat improvement and protection.

The section 10 issuance criteria has not been provided in a public manner, making comments and participating in plan evaluation impossible for the public.

The issuance criteria for a Section 10 permit under the ESA and its implementing regulations are clearly spelled out. The Act and the regulations are public documents and have been discussed in public meetings. The public has been given adequate information to evaluate the proposed activities.

- **Why wasn't the permit drafted before the listing, since the listing was anticipated, and why wasn't it submitted immediately to ask for the kind of take that has been happening over the last five years of pool cleaning?**

- **The City is deficient in not working plan up year and a half ago.**

- **FWS fails to address why the City delayed applying for a Section 10 permit. The same level of tolerance has never been afforded to the private sector.**

The first draft of the HCP was written before the listing took effect. The City and the Service have shared over ten separate draft versions of the proposed plan. The impact from cleaning operations before the listing was not deemed appropriate to ensure the survival of the species in the long-term. The Service has been working with the City since the listing to complete this HCP. New information gathered through the experimental pool cleanings, and the additional thirty-day public comment period, have necessitated the extended timeframe.

The same individuals developing the biological components of the plan will implement the plan, have established the plan's "take" survey's, methodology, and performed the calculations and respond to public comments. This is substantial conflict of interest and has resulted in creating a sense that those individuals have a personal stake in the plan beyond the scientific aspects of their responsibilities. The personal stake of the biologists involved has hampered the resulting process of public comment and informal plan negotiations. In short, the public has been addressing closed minds. This is not the 'good faith' required by law.

The Service believes that the individuals preparing the plan are the best ones to address the public comments. The changes from draft to final version of the EA/HCP clearly demonstrate that the process has been open and the plan has been substantially adapted based on the public comment.

The plan exceeds the legal standard needed for issuance of the 10a permit which is that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of incidental takings. The plan seeks to eliminate take. This standard is arbitrary.

The plan does minimize and mitigate, to the maximum extent practicable, for incidental take from the operation and maintenance of Barton Springs and the adjacent spring sites. The proposed HCP is the City of Austin's proposal for management of the salamander surface habitat for the next

fifteen years. The plan does not eliminate take because take is being authorized for operation and maintenance of the spring sites.

The HCP indicates that the City will postpone compliance with water quality standards in that the standards will be addressed on a regional basis and in a recovery plan. This response is unacceptable because the City is directly responsible for such impacts as re-suspending sediment during the cleaning process and other activities. These activities include lowering the water level in the pool; spraying high-pressure water in certain areas of the pool, and driving heavy equipment over identified salamander habitat.

The Service believes that the scope of the plan is appropriate for the proposed activities. It is true that larger watershed issues are not being addressed by this plan. This plan is limited to the effects of operation and maintenance activities on the salamander. Impacts from these activities are addressed in the proposed plan.

We have been told that the numbers (40 shallow and 4 deep cleans) are not set in stone. Our concern is that the placement of these numbers placed anywhere in the HCP/EA or the permit application itself may give cause for potential litigation against the City if numbers are changed later. We respectfully suggest that these numbers be removed.

The current HCP does not limit the number of deep or shallow end cleanings. Drawdown of the pool is limited because it has the greatest impact on the salamander. The plan incorporates an adaptive management process whereby minor changes are allowed with Service concurrence. Any major changes would be need subject to the amendment procedure as discussed under Section 6.4 of the EA/HCP.

Closing the pool serves only to deprive the City of Austin of a sizable chunk of income from the crowds who would normally begin a season of swimming there.

The purpose of this HCP is to provide the City of Austin with a permit, which would allow for the operation and maintenance of the pool, while minimizing and mitigating effects on the salamander. The income from pool operations would be available to the City under the preferred alternative.

8. POOL CLEANING AND MANAGEMENT

- **We have screwed up in so many ways in cleaning the pool (tractors, chlorine, copper sulfate, high-pressure water, oil spills, etc.) and the salamander is still alive so the salamander is not endangered.**

- **The City has cleaned the pool for 69 years. For 63, the cleaning was done with the aid of chemicals, and the salamanders have survived. Yes, mistakes have been made, such as the overuse of chlorine about 6 years ago, but the salamanders survived. How can they be called endangered species any more than the other wildlife in the pool because of the way the pool has been cleaned?**

The threats to the species are a critical factor in the listing process. Previous pool cleaning procedures had a detrimental impact on salamanders. The ability of the species to survive is not an indication of the level of impact. The current need is to minimize or mitigate the incidental take associated with pool cleaning operations and the operation and maintenance of the springs. Beneficial aspects of operation and maintenance will be maximized. Removing or minimizing other threats to the species and to the spring in general will be addressed during the recovery process.

The original petition to list the salamander as endangered did not identify cleaning as a threat to the species.

In the final rule to list the salamander as a federally protected endangered species, the Service recognized "impacts to the salamander's surface habitat" as a major concern. During the past five years, the City, the State, and the Service have worked jointly to evaluate the impact of pool maintenance procedures on the salamander and the biota of the pool and adjacent springs. These governmental entities, in conjunction with users and concerned citizens, have worked diligently to develop maintenance and operational procedures that will minimize the impact on the biota of the springs and will provide a safe, aquatic recreational facility for all users.

The plan, in effect, nullifies the very favorable ruling of U.S. District Judge Sparks who found that pool cleaning does not endanger the survival of the salamander.

In his ruling, U.S. District Judge Sparks noted those pool-cleaning procedures, especially the lowering of the pool, has a deleterious impact on the salamander. However, his ruling supported the experimental pool cleanings and the completion of the Incidental Take Permit process. Thus, Judge Sparks' ruling supports the development of the HCP and completion of the Incidental Take Permit process in order to minimize the impact on the salamander and the continued use of the springs by the citizens of Austin.

9. IMPACTS OF RECREATIONAL ACTIVITIES

Salamanders I have seen are not easily stepped on, so it is not necessary to rope off huge expanses of the beach.

Salamanders are often discovered in the areas under rocks and gravel. It would be easy for a wader or swimmer to step on rocks where salamanders hide without realizing that they have stepped on a salamander. Measures are contained in the HCP, which will minimize the potential for the incidental take of salamanders due to recreational activities in the springs. Under the current HCP, all areas of the pool will be open to recreational activity.

Any mortality that could be caused by recreational activities can be more than offset by creating a gravel bed in the center of the deep end to create more salamander habitat.

There is some opportunity to improve the existing habitat for the salamander and this is maximized under the HCP. Within the pool, several areas including the deep end, the beach, and the fissures will be improved to provide additional habitat for the salamander.

The proposed thin limestone slabs to cover the fissures look like a good solution. The impact on swimmers appears to be minimal while salamanders in the fissures enjoy full protection.

The Service agrees that this measure, in conjunction with efforts to educate the public as to the importance of preserving salamander habitat, will provide protection for the salamander in this area of the pool.

We have higher priorities than addressing the harassment of the salamander by swimmers.

The Service and the City are committed to the protection of endangered species and compliance with federal law. Failure to adequately address activities that have the potential to result in the incidental take of the federally protected salamander could result in the closing of Barton Springs. The Service and the City are committed to keeping Barton Springs open for swimming.

- **To cut people off from the fissures area will cut them off from the heart and soul of the pool. Put signs up to tell people to not touch the bottom.**

- **The closure of the fissures and the lowering of the beach are an extreme overreaction to the ESA.**

- **The fissure area near Bedichek Rock should not be roped off, especially with the historical significance of the area.**

The current HCP provides for educational signs and open access to the fissure area. The Service recognizes the historical significance of this area of the springs. The current HCP contains measures that will enhance educational opportunities in order to heighten the public awareness of this important historical site and provide for protection of the salamander.

Salamanders are smart enough to look out for themselves and they can get out of the way of swimmers so the beach area and fissures should not be roped off. The idea that swimmers can hurt salamanders is unbelievable.

The majority of salamanders are found under rocks and gravel. As such, the salamanders are unaware of approaching waders or swimmers that have the potential to step on them. The death of salamanders due to waders has been documented in Eliza Springs and Stillhouse Hollow (Jollyville Plateau salamander).

Any creature that can survive such extreme flooding can survive the light impact of swimmers in the water.

Flooding and recreational activities provide examples of two different types of impacts on the salamander. Flooding is a natural occurring activity that may disturb salamanders and their surface habitat. However, data indicate that floods have little direct physical impact on the areas of salamander habitat near the main springs. Salamanders are strong swimmers and individuals may be able to migrate away from areas with the highest flow velocity. In contrast, a high concentration of waders and swimmers along the beach area or fissure area create a high potential for the incidental take of salamanders.

- **I think the cones are a strange way to deal with preserving the environment Education of the public and guides would prevent people from unnecessarily disturbing the salamanders, if they were disturbed at all.**

- **No areas should be roped off. The reason the cones are up is preposterous. People don't hurt salamanders by walking. If salamanders are prey to the footsteps of a human, then they certainly will fall prey to the hungry claws of crawfish and aquatic predators.**

The cones are a temporary measure to remove the possibility of incidental take of salamanders. The City currently does not have the necessary permit to allow any incidental take. Without the ropes and cones as a temporary measure the pool would need to be closed. Under the current HCP, cones or ropes will not restrict access to areas of the pool. Since the majority of salamanders live under rocks and gravel, they are naturally protected from potential aquatic sight predators.

Is there a way to divide the pool into a salamander section and a people section? We have to compromise; the life of the salamander is more important than people having fun.

The Service believes that the current HCP provides a balanced approach for protection of the species while maintaining a safe recreational facility for people.

Large rocks that can be stepped on can be removed from the pool and grooves can be cut into large stable rocks to create new salamander habitat.

Rocks and gravel provide valuable surface habitat for the salamander. The Service believes that available surface habitat can be enhanced with the addition of rocks and gravel in the deep end along with more extensive revegetation efforts in the deep end.

Alternatives to keep water in the fissures during cleaning should be explored.

Under the current HCP, water will be maintained over the fissures area when the shallow end of the pool is cleaned or when the pool is lowered.

The fissure area should be a swim only area.

The Service believes that proposed measures in the HCP will provide for protection of the species, enhanced public awareness, and the opportunity for swimmers to appreciate this unique natural resource.

The fissures should not be closed since the place where the water leaves the ground holds a special attraction to humans and an educational lesson about the workings of an aquifer to our children.

The Service believes that the current HCP will provide this opportunity for many future generations.

- **I support roping off the fissures.**

- **Keep some of the ropes. They are not a big problem.**

Under the current HCP, the need to rope off areas of the pool has been minimized.

The best way to protect underwater nature is for people to see and appreciate what's there and to educate others.

The Service agrees with this comment. The current HCP contains numerous measures to increase educational efforts and enhance public awareness of this unique natural resource.

Regular divers in the springs know all of the fish, crayfish, etc. Divers have never bothered or hurt any of the life in the springs. These divers take care of the springs by picking up trash, etc. The idea that divers bother salamanders and fish is ludicrous.

Although many users of the springs work diligently to protect the springs and its biota, a few individuals have acted irresponsibly in the past. The Service believes that educational measures are the most effective way to increase the awareness and appreciation of the springs.

Many snorkelers disturb and harm the habitat so snorkeling should be restricted to surface areas.

The Service believes that snorkeling can be a valuable educational activity. With proper education and supervision, snorkelers can continue to enjoy the springs without disturbing salamander habitat.

Why can't we use underwater cameras?

The HCP contains no restrictions on the use of underwater cameras.

10. PROPOSED WATER CONTROL STRUCTURE (DAM)

There is no need to build a permanent dam in Barton Springs Pool.

Drawdown of Barton Springs Pool for maintenance and cleaning has been shown to have a significant impact on the aquifer, adjacent springs in Zilker Park, and the biota of Barton Springs. The City, with assistance from concerned citizens and state and federal governmental agencies, has been working to develop long-term pool maintenance strategies that will minimize the impacts of pool drawdown. The permanent dam is one of many proposals that will be evaluated as part of the Incidental Take Permit process.

An obstruction (the dam) blocking the view and the swimmers is unappealing. The height of an underwater berm could be minimized if topographical map of bottom of the pool could be produced and the need for water depth determined.

As noted above, the City will evaluate various proposals to minimize the frequency and impact of drawdown of the deep end of the pool. The Service supports the need to develop a detailed topographical map of the pool, with emphasis on the areas of spring discharge.

There is no scientific evidence that building any type of dam in Barton Springs is an effective means to minimize or mitigate take of salamanders, due to the build-up of silt as a result of reductions in pool cleanings.

Data collected during the past two years document the significant impact of pool drawdown on the salamander. A water control structure would facilitate the cleaning of the shallow end of the pool while minimizing the impact of drawdown on the aquifer and the salamanders in the deep end of the pool, and the adjacent spring sites. Silt and sediment can be removed from the pool with vacuums that do not require the lowering of the pool.

I support the temporary dam to aid in the cleaning of the shallow end.

The Service believes that a temporary dam is a viable option that needs to be evaluated by the City and its consultants.

Design "vanishing" dam for separation of shallow and deep ends. Consider placing at or near the current silt-fence location to allow for maximum cleaning area. The design of this system should be based upon the ability to manipulate the pool level with the redesigned gate system. The foundation of the "vanishing dam" could be a permanent fixture which would be virtually undetectable, with the full barrier fitted onto the permanent platform on those cleaning days. There is no need to build a 365 day-a-year barrier for 40-50 cleaning days per year.

The City has hired an environmental engineering firm to evaluate this option. The Service supports long-term solutions that address the needs of all users of the springs.

Swimmers and waders trying to traverse a dam would be a safety hazard.

The Service agrees that user safety is a necessary component in the evaluation of any type of water control device that may be installed at Barton Springs.

A dam will result in deposition of silt and sand during floods.

It is true that a dam directly upstream of the spring discharge will impound some of the silt and sediment related to flooding. Current cleaning methods can be used to remove this material from the shallow end as needed.

Are you going to have a pump at the low portion to run the water out of there for possible cleaning?

A drain would be installed into the bypass tunnel or skimmer drain to lower the water level in the shallow end if a water control structure is built.

You should take short steps at a time, rather than making many modifications at once. Rather than putting a three-foot high dam, just building a low-height structure (10-15 in. off the bottom) would do what needs to be done during drawdowns to clean the shallow end.

A low profile berm does not address incidental take during pool drawdown in the fissures area and the adjacent springs sites that are habitat for the salamander. A water control structure would minimize incidental take while allowing the City to clean the shallow end of the pool as often as needed.

Changes need to occur at the pool, e.g., the dam is a good idea for pool cleaning.

Evaluation of pool maintenance procedures is an on-going process. The Service supports the City's efforts to develop pool-cleaning procedures that are effective and minimize the incidental take of the salamander. The proposed water control structure would allow the City to clean the shallow end of the pool as often as desired while minimizing the impact to salamanders. The proposed structure would also allow wading and swimming to continue in the deep end of the pool while the shallow end is lowered for cleaning. The Service is not requiring that a water control structure be built. The HCP says that the City must be able to clean the shallow end of the pool without drawing down the deep end of the pool.

- **Building the dam is a very permanent feature and if it doesn't function properly then tearing it out will do more harm to the pool.**

- **Many measures in the HCP are good and supported by the community but the dam and deepening of the beach are measures that need better evaluation. The dam will cut the pool in half and render it unsightly and turn the shallow end stagnant. I urge you to support making the dam movable rather than a permanent structure.**

- **With the new proposed location of the dam, the dam must be removable or swimmers will be impeded. A permanent dam with wide spaces for passage of swimmers would not be effective. A logjam of swimmers frequently occurs at the proposed location of the dam with nothing there now. The new location is preferable to the 1/8-mile marker provided swimmers have unimpeded swim space. This location is preferable because more shallow area can be cleaned. However, an unimpeded swim space could only occur with a removable dam. Create a permanent "team" to install the dam and to remove it at cleanings. This team could be from Public Works or from PARD operations. Do not use lifeguards for this work. It should not be their job and if some other entity has the responsibility, then PARD should not object to a removable dam. The team could be funded from Barton Springs Pool revenue.**

The design and construction of the dam is an engineering task that can be accomplished, as evidenced by the upstream and downstream dams that form the existing pool. The permanent dam, if implemented, would be designed to facilitate water circulation in the shallow end of the pool. Circulation in the shallow end of the pool is determined by the capacity of the skimmer drain. The permanent water control structure is only one of various options that will be evaluated by the City of Austin and its consultants.

hat any type of water control structure should be positioned where it will be most cleaning activities. The City is currently evaluating various design options for a These options include a temporary membrane structure that will not impede ues.

Barton Springs has already been changed so much in the past fifty years that it is hardly recognizable as a natural bathing area. If you build the dam, you will forever change the beauty of the pool. The way to save the salamander is to let swimmers and the salamander co-exist and to not come in with bulldozers and start building walls to prevent the natural flow of water.

The Service agrees that the proposed plan should protect the salamander and allow for the continued use of Barton Springs by the citizens of Austin. The current pool configuration is the result of modifications that were deemed necessary by the previous stewards of the springs. The Service believes that the current HCP provides for long-term protection of the salamander and the continued recreational enjoyment of the springs.

The building of the dam should be done with extreme care and supervision as there exists the possibility of contaminants (lime, leaking fuel from trucks) getting into the spring.

All construction activities associated with the HCP will comply with the City's building and environmental codes.

We believe that structural modifications should be made one at a time and then evaluated before other modifications are made. We would like to see the least intrusive measures constructed first. We recommend that the gates be done first, then the beach and dam.

Scheduling of modifications and construction activities will be based on the recommendations of City engineers and the results of the feasibility study currently being prepared by a private engineering and environmental consulting firm.

Before any structural modification on the pool a topographical map should be made with a minimum of 6-inch contours. This is important for construction of a dam in the shallow end, the depth of the beach, and other structural controls now and in the future. The elevation of the surface of the water should be found as well.

The Service agrees that a detailed topographical map of the springs would be a very useful tool for activities associated with the springs.

11. BEACH MODIFICATIONS

The concrete sidewalk is totally unnecessary. The pool already has a shallow end to accommodate people who want to wade. The construction of this would take away from the naturalness that makes Barton Springs so special (much of the pool has a natural floor). Third, this would be a great frivolous waste of money on something that is not needed and has no merit. Fourth and most importantly, the construction of this could possibly contaminate the pool and therefore harm the salamanders. This would be more dangerous than the new dam, because it would be built on top of actual salamander habitat.

The current proposal for a hardened surface was added to the HCP in response to user comments received during the public comment period. The Service believes that the sidewalk is a viable solution that addresses the needs of all users of the springs. The Service also believes that implementation of this measure can be accomplished without danger of contamination of the springs.

Salamander take and mitigation associated with the construction of the sidewalk and creation of new salamander habitat have been included into the HCP.

I oppose deepening the beach, as the impact on the salamander is unknown for such an operation. Also, dredging will be needed to remove sedimentation.

Incidental take associated with the lowering of the beach area has been incorporated into the HCP. The installation of the sidewalk along the beach and the lowering of the remaining beach area will minimize the need for silt and sediment removal in this area of the pool.

If lowering the beach area turns out to be necessary, I suggest the positioning of large limestone blocks whose flat surface is at a depth of 4 ft. These could serve as safety islands for swimmers while their flat and smooth surface would not represent salamander habitat.

The installation of the hardened surface would provide safe areas for waders and swimmers. It will also be designed to withstand flooding. Limestone blocks are one of the alternatives being evaluated.

Since Barton Springs varies in flow rate, more data should be collected on the distribution of the population under varying conditions of low and high flow before cement is poured on the beach.

The City has collected more than five years of salamander population data under varying aquifer conditions, including low and high spring discharges. The Service believes that the current information from the experimental pool cleaning is sufficient to justify the proposed measures.

The beach population may be an anomaly due to unusually high flows of late 1997. The other possibility is that biologists planted the salamanders seeking to profit as agents of upstream developers and their attorneys. It is noteworthy that in over 8 years of research by the university and the City no population of salamanders was found on the beach.

The City's monthly monitoring protocol was developed to provide data concerning the size and distribution of the salamander population upstream and downstream of the springs. These data indicate a high degree of variability in the population size and distribution. However, only six square meters of beach area are surveyed during the monthly surveys. Under the experimental pool-cleaning program, surveys indicate that distribution of salamanders on the beach area is also highly variable. The highest number of salamanders found on the beach area, 84, occurred during the lowest flow conditions recorded during the experimental pool-cleaning period.

With the new gate system, most of the existing beach would not require lowering since the new gate system would allow the beach to remain submerged during partial drawdown of the pool.

This is true. However, the new gate system does not address incidental take associated with wader and swimmer activities on the beach area, on the fissure area, and in the adjacent spring sites.

The population of salamanders is likely to fall to zero in the winter, thereby reducing the need to modify the beach area to accommodate this sporadic seasonal population.

Barton Springs has a relatively constant temperature and salamanders are found throughout the year. There is no evidence to date that supports seasonal fluctuations within the population.

The beach should be protected from exposure during drawdown.

The Service agrees and this measure is part of the HCP. The HCP is designed to minimize incidental take associated with pool drawdown.

The beach should be cleaned minimally to maintain habitat while looking for alternative solutions.

The installation of the hardened surface and the lowering of the beach area will provide non-salamander habitat areas for the use of swimmers and waders while providing additional habitat for salamanders at a depth of two meters or greater. The salamander habitat would be cleaned as needed.

Use a sprinkler system to flush fresh water over the beach when drained.

This measure will be implemented during pool drawdowns that occur before the beach area is modified.

Under water piers could be used to give people access to the pool.

The proposed underwater-hardened surface (sidewalk) will provide access for waders and swimmers and minimize the incidental take of salamanders that may result from recreational activities.

There is no scientific evidence in the plan suggesting that removing the beach or paving the beach is an effective means to mitigate or minimize take due to the build-up of silt and algae in deeper waters.

The proposed underwater sidewalk will provide a safe recreational area that is not considered salamander habitat. This measure will minimize incidental take associated with wading in this area. The additional salamander habitat will provide mitigation for the salamander habitat that will be removed by the installation of the sidewalk. The new habitat will be created at a depth of two meters or greater and will be maintained on an "as needed" basis using low impact techniques such as low-pressure water hoses and the manual removal of filamentous green algae during blooms.

Common sense dictates that to protect an endangered species in a delicate habitat, you don't bring in heavy construction equipment to destroy the habitat. The construction would have a detrimental effect on the salamander nesting area. The argument that the City already threw bunch of gravel on the beach and the salamanders survived does not justify blasting out two feet of prime habitat.

Measures to minimize the incidental take of an endangered species may require the use of heavy equipment for habitat modifications that will provide for the long-term protection and survival of the species. The measures proposed in the HCP are designed to minimize incidental take associated with the operation, maintenance, and use of Barton and adjacent springs which are the only known habitats of the Barton Springs salamander. These improvements would have short-term impacts but long-term benefits for the salamander.

- **Lowering the beach unfairly discriminates against the elderly and infirm who use this area for water exercise. Furthermore, by making the deep end impossible to stand in, you crowd swimmers into a small area of the shallow part of the pool.**

- **Handicapped swimmers need beach access.**

- **Add gravel on the south side to improve habitat. If the beach were lowered, some elderly and disabled people would be excluded from the pool. I support the non-habitat walkway in the beach area.**

Based on user comments and input, the City has added the proposed hardened surface (sidewalk) along the beach area in order to provide a safe area for wading and exercise. The salamander habitat on the beach would be relocated and maintained. There would be no net loss of

salamander habitat. The proposed permit should be helpful in improving and protecting the use of the pool for recreational, therapeutic, and medicinal purposes.

Study the beach area after a major flood to see the impact. Is it fair to taxpayers to make them pay for all these changes just to protect 4 salamanders on the beach area? For safe swimming in Barton Springs, a shallow area is needed so swimmers can rest and relax.

The proposed sidewalk, in conjunction with the entire shallow end of the pool, will provide a safe area for waders and swimmers. The sidewalk will also provide an area of non-salamander habitat that will facilitate cleaning and maintenance after major floods. The Service considers the beach to be salamander habitat. The total number of salamanders in this area is not known. During the experimental pool cleaning, the highest count was 84 salamanders on the beach.

There is no plan for dealing with a major flood event; if the beach is removed, there will be no access for removal of sediment such as in past floods. How would the sediment be removed?

The City will address techniques for the removal of silt and sediment after major floods in the feasibility study currently under contract to a private engineering and environmental consulting firm.

It is a mistake to lower the beach too much below 6 ft. Put a sidewalk along the Beach.

The HCP proposes the installation of a nine-foot wide sidewalk along the beach area at a depth of four feet. Waders and swimmers can use this area while the incidental take of salamanders is minimized.

Devise new methods to clean the beach.

The proposed measures are designed to address incidental take associated with pool drawdown, beach cleaning techniques, and recreational activities. The proposed sidewalk along the beach will also provide a safe area for waders and swimmers while minimizing incidental take of the salamander.

Make the proposed concrete sidewalk narrower. Construct a limestone walkway/swimway to be somewhat narrower. Mitigate the addition of concrete with the removal of concrete so that there is no net gain of concrete in the pool. Also, remove the concrete in the shallow end of the pool.

The proposed width of the sidewalk is based on input from citizens, spring users, City engineers, and City department staff. The Service believes that decisions concerning the net gain or loss of concrete in the pool are the responsibility of the City.

12. DEEP END POOL LOWERING FOUR TIMES PER YEAR

- **The plan allows only 4 full pool cleanings per year. In the past, the pool was cleaned as needed but never less than 50 days per year. By picking a fixed, arbitrary number of cleanings per year, the plan puts the pool at risk for indefinite closure after floods.**

- **If the City tried to clean more than the fixed 4 times, they would be subject to more of the same lawsuit harassment, with the possibility of an unfavorable decision.**

- **The HCP does not say if the 4 cleanings will be equally space throughout the year, or will this give the City an excuse to have 4 cleanings at the summer and close the pool in the winter when the proceeds are low.**

❖ **Maintaining habitat requires maintaining the deep pool area. There is a problem in that we do not know how effective high water cleaning methods would be and the document assumes a worst-case scenario without sufficient data. Why do we need to say that we will clean the pool 4 times per year, can't we use common sense to decide when the pool should be cleaned?**

❖ **I'm concerned about the policy that they do not allow swimming if they cannot see the bottom. If the deep end is only cleaned 4 times per year, we will not be able to see the bottom, so they are not going to allow swimming.**

The HCP does not limit the City to only four full pool cleanings per year. The Service recognizes that Barton Springs and its contributing watershed is a dynamic aquatic system that will experience varying levels of flooding during the 15-year permit period. The Service will collaborate with the City to ensure that incidental take of the salamander is minimized when pool lowering is deemed necessary. Most cleaning can be accomplished without lowering the pool.

The City policy requiring a minimum level of visibility in the pool is designed to address the standard of care at the pool. Low visibility can be caused by flooding upstream of the pool or silt and sediment that is stirred up by swimmers and waders. In the past, a large amount of the silt and sediment on the beach area was due to techniques with limited effectiveness for removal of the sediment from the cobble beach. Under the proposed HCP, the concrete sidewalk along the beach will provide an area for swimmers and waders that can be effectively cleaned on a routine basis.

Limiting drawdown may reduce take but also may destroy salamander habitat due to siltation.

Data collected during the past two years indicate that pool drawdown is one of the major causes of take at Barton and adjacent spring sites. The HCP provides for the maintenance of salamander habitat using low impact techniques such as sediment removal using low-pressure water hoses.

Earlier in the swim season when the pool was not being cleaned, I had to crawl into the water in the diving board area because of slippery algae. Four times a year cleaning is not a tenth enough cleaning to render the pool safe for swimmers. Is this your intention, to turn the pool into a salamander habitat, no humans allowed?

The Service believes that implementation of the HCP will provide a safe habitat for all users of the springs, including humans and salamanders. Numerous measures in the HCP are designed to address maintenance and operational activities that are necessary to provide a safe recreational aquatic facility for waders and swimmers. The Service and the City believe that under the proposed HCP, waders and swimmers will continue to enjoy the cool spring waters of Barton Springs while incidental take of the endangered salamander is minimized.

I support a plan that will be compatible both for the salamander while allowing this treasure of a spring to be enjoyed by humans. I believe cleaning should be done as needed, with care toward salamanders and to preserve water quality for swimmers.

The Service agrees with this comment and the Service believes that the implementation of the HCP will provide this standard of care for all users.

13. POOL LOWERING – PARTIAL DRAWDOWNS

❖ **The plan does not explain why partial drawdowns of the pool level were not considered based upon the redesigned gate system.**

❖ **The plan does not explain why the gate system will be redesigned if partial drawdowns are not permitted.**

The HCP permits partial drawdowns with Service concurrence. The modified gate system will allow pool staff to partially lower the pool if deemed necessary for cleaning activities. In addition, this gate system would also allow pool staff to lower the pool when flooding occurs without endangering their personal safety.

There is no scientific evidence that partial drawdowns of the pool will take salamanders.

Experimental pool cleaning data indicate that take of salamanders can occur in the fissures area during partial pool drawdown.

Appropriate cleaning should be permitted and required at Barton Springs Pool. There is no evidence that drawdowns of the pool after floods or to facilitate cleaning appreciably reduce the likelihood of the survival and recovery of the species in the wild.

The data collected by the City and the Service during the past two years indicate that pool drawdown is one of the major causes of take at Barton and adjacent springs. The HCP is designed to minimize take associated with drawdown and other pool maintenance and operational activities. The HCP also allows for the routine maintenance of the springs and additional cleaning activities to mitigate for the impacts of flooding when necessary.

The City could use partial drawdowns with new floodgates during high or normal flows (during which a berm would be sufficient and swimmers could swim over). During low flows, no drawdowns could be mandated. The shallow end could be cleaned with panels placed in the berm to create a temporary dam. Thus, PARD would only have to deal with a dam during low flow conditions. With the pump system at Eliza Springs and Sunken Garden, and the beach removed, the only remaining impact to salamander habitat would be to the fissure area during high and normal flows because even partial drawdowns would expose this area.

A temporary dam is one of the water control structures currently under evaluation by the City. The HCP provides the City of Austin with the flexibility to implement the water control structure configuration that the City feels will best address cleaning and staffing requirements for the continued maintenance of Barton Springs. The Service believes that limiting drawdown protects salamanders in all areas of the pool and adjacent spring sites.

With redesigned gates, the take associated with drawdown would be minimized; there would be no need to limit partial drawdowns, as determined by spring flow rates and interaction of the new gate system and the pump systems for the adjacent springs. The plan should therefore allow enhanced cleaning of the deep end, including stairs, rocks around the diving board and non-habitat bottom areas using appropriate equipment to hose or vacuum the silt and remove debris.

The HCP permits routine cleaning of all areas of the pool. The areas considered non-habitat for the salamander include the shallow end of the pool, the proposed sidewalk along the beach, stairs, and areas of the deep end comprised of solid limestone substrate.

What rate of water fall can the salamanders tolerate? Does it make sense to start lowering the pool on Monday night to have it ready for work on Tuesday morning?

Data collected during the experimental pool cleanings indicate that drawdown rate is not a major factor in determining the level of salamander take related to lowering the level of the pool.

Biologists say that the dam is needed to minimize drawdowns that strand salamanders in Eliza and Sunken Garden. Swimmers have recommended new gates allowing partial drawdowns. Biologists reject this as being just as harmful to the species without having ever experimented with the idea.

Based on the data collected during experimental pool cleaning, a water control structure (temporary or permanent dam) would minimize take due to drawdown in the fissure area of Barton Springs, Eliza Springs, and Sunken Garden. A water control structure would enable City staff to clean the shallow end of the pool as often as needed without impacting the salamander or swimmers. A partial drawdown would not accomplish this level of protection. Salamanders are found stranded within one foot of the water surface (pool full) when the pool is lowered.

We recommend that the permit not specify exactly how the City must take action to minimize or eliminate pool drawdowns. Interested citizens should be allowed to participate. Adequate time for public process should be allowed.

The Service agrees that the responsibility for design and implementation of measures to minimize or eliminate pool drawdowns lies with the City of Austin. During the two public comment periods for the proposed HCP, City and Service staff have met with interested or concerned citizens to discuss the HCP and the implementation of the proposed measures. The Service believes that the 30-day public comment periods, the public meetings, and the public hearings, in addition to numerous meetings with concerned groups and individuals have provided adequate time for public input and comments. The Service has left the final decisions for how the drawdowns are minimized or eliminated to the City of Austin. Citizen participation in this process has also been left to the City of Austin. The Service will participate in the process.

14. SEDIMENT MANAGEMENT/AQUATIC VEGETATION

The HCP attributes the loss of aquatic macrophytes to the presence of sediment when the City of Austin has been dredging the pool to remove the vegetation for 5 years.

The proposed HCP includes plans for revegetation of the deep end of the pool and portions of the beach area. Plants are an important component of the ecosystem and this section has been expanded in the proposed HCP. The beach area has been addressed specifically in the proposed HCP. The beach will be lowered to 2 meters (6.5 feet) or greater and vegetated to minimize the need for cleaning.

- **I'm concerned about degradation (siltation) of the pool with the man-made modifications. The plan has no plan for removal of silt and algae, and is therefore in violation of the basic legal purpose of the section 10 permit regulations - to describe all activities to be undertaken.**

- **"Sediment and debris that is collected during routine cleaning...will be removed." This measure needs some clarification. Do you mean debris that is collected during the 40 shallow end cleanings or during the 4 deep cleans or both? Debris and sediment need to be collected more than 4 times a year from the deep end.**

  The plan has been amended to clarify the cleaning requirements. The discussion in the HCP has been expanded to include a minimum of quarterly cleaning of the deep end for silt removal. This would be accomplished using a combination of fire hoses and underwater vacuums. The removal of the cleaning debris refers to the shallow and deep end debris. Discharge of sediment accumulated during cleaning will not be allowed into lower Barton Creek.

There is no scientific basis to determine that there will be a "net benefit" to the species until a plan to reduce silt loading is included in this plan.

The plan has been changed to include measures to reduce sediment buildup in the pool. The Service does not make the argument that pool cleaning is necessarily a benefit to the salamander population. However, the dam, which creates the pool, also creates a place for sediment deposition. Location and rate of sediment deposition is dependent upon aquifer conditions and the frequency and severity of floods. When the sediment is allowed to build up, the gravel and rocks underneath quickly become unusable from the perspective of the salamander. Anoxic conditions underneath the sediment make the gravel unusable. Periodic cleaning does improve conditions for salamanders in some areas of the pool.

Failure to test the toxicity of Barton springs silt is a major biological error, and no reasonable plan can be developed without strict, historic and future monitoring of the silt's composition.

The City of Austin has been monitoring the toxicity of sediments in Barton Springs and Barton Creek for several years. Routine toxicity testing of sediment is a vital component of the City's Watershed Protection Department monitoring protocol. The City has also collaborated with the US Fish and Wildlife Service in the deployment of sensitive semi-permeable membrane devices (SPMDs) to monitor the levels of potential pollutants in the aquifer. The extensive database of surface water, ground water, stormwater, and sediment pollutant levels is a crucial component in the development of the Recovery Plan for the salamander.

The plan does not specifically state those adaptive management approaches required to mitigate take associated with toxic substances found in the silt at the pool's bottom.

The plan has been amended to include the periodic removal of sediment from all areas of the pool.

- **Threshold levels of silt and toxic materials should be developed, with specific monitoring and removal plans in place.**

- **No one has suggested how the vacuuming will take place. I am in favor of some sort of vacuuming method but the practicality and expense may be more than the City can bear. To remove silt through vacuuming, the spoil will need to be dewatered and then removed, or the water and silt must be placed in trucks for off-site disposal. Either way is very expensive and difficult to achieve. Allow budget and staff time to research silt removal techniques within this coming year. In the interim, use full drawdowns when needed to protect swimmers and salamanders from silt and algae loadings. Test the bottom material for toxic substances before disturbing.**

As stated above, the City has an on-going monitoring program for the levels of pollutants in Barton Springs and Barton Creek sediment. Previous routine methods of sediment removal (e.g., dragging the beach area, fire hosing the beach area, and fire hosing the deep end of the pool) moved the sediment from one area of the pool to another but were very limited with respect to sediment removal. These methods temporarily suspended the sediment in the water column but did little to remove the sediment from the pool. The City is currently evaluating various sediment removal techniques, which are more effective than previous routine methods. The flexibility to refine these methods has been built into the HCP.

Cleaning the springs and beach makes better salamander habitat. It may kill individual salamanders, but it helps the species as a whole.

The clean areas near the spring are excellent habitat for the salamander. Food sources in these areas are very rich and include aquatic insects and amphipods. The main spring outlets continue to be the best salamander habitat and the area where the most salamanders are found. As noted in the San Marcos plan, Eurycea salamanders appear to prefer habitat that is not covered with silt. The HCP includes provisions for cleaning both salamander habitats and those areas that are not salamander habitat.

The deep end can be cleaned by scuba divers with vacuum hoses. The water could be used to irrigate the south hill or be placed in settling tanks.

The Service agrees and the City is currently evaluating this technique.

Another flood control structure can be added upstream of the pool to filter out large debris.

The Service believes that this is a viable option that should be evaluated by the City.

We support minimizing the number of times the deep end of the pool is drawn down. However, there needs to be some flexibility due to the unpredictability of flooding and emergency situations. Drawdowns may not be necessary however, if silt management can be undertaken without pool drawdown.

The Service recognizes that Barton Springs and Barton Creek are dynamic aquatic systems. The HCP allows for flexibility when cleaning and maintenance after flooding is necessary.

Skimming the pool of debris that floats up from the bottom could help decrease sedimentation.

The Service agrees with this comment. Periodic skimming of the pool surface with nets or seines could be an effective method for removal of algae that floats to the surface. During the experimental pool cleanings, City staff effectively used nets to remove floating algae after the pool was refilled.

15. SUNKEN GARDEN, ELIZA, AND UPPER SPRINGS

Sunken Garden and the fissures should not be fenced off. Responsible human interaction with the natural world must be encouraged if endangered species are to be protected. A public park like Zilker is exactly the place to rely on policing by concerned and knowledgeable citizens as the best protection for the salamander.

During the past two years, City staff with the Parks and Recreation Department and Watershed Protection Department have observed numerous irresponsible acts at Sunken Garden that degrade the springs and could result in the take of salamanders. Sunken Garden is a unique natural resource that needs to be protected. These springs provide a unique opportunity for outdoor education and public awareness. Under the HCP, Sunken Garden and Eliza Springs will be used as outdoor ecological classrooms for all of the citizens of Austin.

More data are needed for Upper Springs to understand its dynamics. People have been allowed to use alcohol and to bring dogs to this section of Barton Creek, the potential for abuse to the salamander is much more severe than the regulated swimming in Barton Springs which bans both alcohol and dogs.

The Service agrees that continued monitoring of Upper Barton Springs is needed to better understand the dynamics of this site. The City has an on-going groundwater monitoring program

which includes all of the spring sites in Zilker Park that provide surface habitat for the salamander. The City would survey all of these sites on a daily basis under the HCP.

A stone bench should be placed at the Sunken Garden.

The Service supports the efforts of the City and its citizens to restore Sunken Garden and improve the aesthetics of the facility but will not require these measures as part of the HCP

I oppose the closing of Sunken Garden to recreational use. It should be a free swimming and educational area. Eliza and Upper Spring could be educational areas only.

Recreational use of Sunken Garden, as practiced in the past, has the potential to result in the take of salamanders. Based on the activities that City staffs have documented during the past year, restrictions need to be placed on the use of Sunken Garden to protect the springs, the habitat, and the salamander.

I support the installation of an iron grate near the bottom of Sunken Garden. That way, human users will not pose a danger to salamanders. An educational display should be installed to inform the public of the sensitive nature of the site, and PARD police and workers need to monitor human activity. I favor an upgrade or redesign of the Sunken Garden (and Eliza Spring) and the Barton Hills Neighborhood Association would be very pleased to play an active role in this process.

The Service supports the efforts of the City and its citizens to upgrade and restore the historical structures at Sunken Garden and Eliza Spring. The Service believes that both of these sites provide excellent opportunities for educational programs and public awareness efforts. Even though the installation of an iron grid system in the bottom of Sunken Garden is feasible, this proposal does not address all take of salamanders at these sites.

The fence at Sunken Garden should be taken down. Sunken Garden is not permanent salamander habitat. Flow is irregular from the spring and sometimes stops flowing.

Under the HCP, capping the underground outfall pipe that diverts springwater into Barton Creek will enhance surface spring flow at Sunken Garden. The Service believes that Sunken Garden provides excellent habitat for the salamander. Data indicate that the largest number of salamanders found at any of the four spring sites often occurs at Sunken Garden.

The total take of 400 salamanders is split evenly between Barton Springs and Sunken Garden. I can not believe that half of this would be from Sunken Garden given that it is a smaller area and that the number of swimmers in the beach and fissure areas vastly exceeds that of Sunken Garden. I see no support whatsoever for the claim that swimmers in Sunken Garden will cause more than insignificant fractions of the total recreational take.

During the past summer, City biologists have observed as many as 16 swimmers and four dogs in Sunken Garden at one time. This level of activity is comparable to or exceeds that of swimmers/surface area in Barton Springs. For this reason, the take numbers were divided evenly between the two sites.

I feel that Sunken Garden was closed due to discomfort on the part of the City that its lack of full -time supervision over the site could be construed in a court of law to constitute negligence under the ESA. The City's discomfort with it has to do also with its perception that it is dealing with the behavior unruly vagrants.

City biologists requested the installation of a temporary fence at Sunken Garden after a thorough assessment of the potential for take of salamanders at this spring site. City biologists

identified numerous threats such as the introduction of soaps and shampoo at the springs, trash and debris, unsupervised swimming and wading, dogs, and the release of exotic aquarium fish. The decision was based on assessment of the potential for take of salamanders, not an assessment of the socio-economic background of users.

Offer free showers for the homeless at a designated part of Zilker Park since they will not have Sunken Garden.

Free showers are currently available at the bathhouse at Barton Springs, as well as numerous locations on the hike and bike trail around Town Lake. The Service is not opposed to free showers being offered near Sunken Garden.

There have never been educational signs at Sunken Garden.

Educational signs and public awareness campaigns are important components of the HCP including signs at Sunken Garden.

Employ Eastside youth to repair Sunken Garden (this was done in 1937-38).

During the past two decades, several City departments and various civic and neighborhood organizations have researched the repair and restoration of Sunken Garden. Repair of the existing structure will require an extensive engineering study and design in order to provide stable footings for the concentric masonry walls. Any successful restoration effort will require the joint cooperation of government agencies and private enterprises (including the recruitment of youth organizations) in order to provide adequate resources for design and restoration at both Sunken Garden and Eliza Spring.

The interdependence of humans and nature needs to be compassionate and educational. The City has neglected both Eliza Spring and Sunken Garden. Wise use of natural resources should be encouraged. The proposed plan will place a barrier between the citizens and their environment.

The Service believes that implementation of the proposed HCP will enhance educational opportunities and public awareness at both Eliza Springs and Sunken Garden. The City would have the opportunity to clean these sites under the proposed HCP.

The City has erected an eyesore of a chain link fence around Sunken Garden without a public hearing. There is no evidence that human contact harms salamanders. Recent counts by the WPD have shown increasing numbers over the past year. Alternative measures such as educational signs, grate, etc. should be considered.

The chain link fence erected by the City is a temporary measure to minimize take of the salamander at Sunken Garden. Sufficient scientific evidence exists in support of the conclusion that human contact may cause harm or even mortality to the species. As stated above, the Service supports the development of public awareness campaigns and educational signs that will provide accurate information concerning the springs and the aquatic biota found at Sunken Garden. The HCP would include a wrought iron fence around the spring site. The City has made the decision that the impact of recreational use is too great at Sunken Garden. This is one of four sites in the world that support the Barton Springs salamander and, as such, deserves protection.

The HCP should address the restoration and enhancement projects at Eliza Springs so the public can determine the cumulative impacts.

During the past three years, the City has been collaborating with other agencies and concerned citizens in the development of restoration and habitat enhancement projects at both Sunken Garden and

Eliza Springs. The Service anticipates that the City will continue to rely on citizen involvement and review during all phases of the design and implementation process.

The ornamental iron fence may compliment the existing stone work around the pools.

The Service agrees. The City has stated that any modifications at Eliza Springs and Sunken Garden will comply with existing design guidelines for Zilker Park and would be accomplished with public input.

Remove the concrete floor of Eliza. Using a rock saw and a strong vacuum, the floor could be cut out and all the concrete dust could be simultaneously vacuumed out. This would allow for the ability to create much better natural habitat (including aquatic plants). This would also help in reducing the number of stranded salamanders that are being trapped during pool lowering.

The City has proposed partial removal of the concrete floor of Eliza Springs in order to evaluate the habitat conditions under the concrete. Based on this evaluation, the City, in concurrence with the Service, will decide if complete removal of the concrete floor is warranted for the net benefit of the species.

16. ECONOMIC CONCERNS

Any plan to pave the beach as described by City officials is not contained in the fiscal cost estimate, and will exceed the cost of the proposed dam, based upon City official's statements.

The fiscal cost estimate for the implementation of the HCP has been updated to include the installation of the sidewalk and wading area along the beach.

The plan does not describe the costs to the City associated with obtaining any needed waivers, approvals or other modifications to ordinances prior to construction projects in the pool.

City staff will address any waivers, approvals, or ordinance amendments that may be required for the implementation of the HCP. As such, the City will not incur additional expenditures.

The cost estimate does not describe the costs associated with future plans to remove silt and algae from the pool.

The cost estimates included in the HCP are specific to measures included in Section 6 of the document. The cost estimate does include money spent for the removal of silt and algae from the pool.

The plan will cost far in excess of the sums estimated in the plan. This money is misspent since it is aimed at reducing not enhancing the removal of dangerous and toxic silt and algae.

In this cost estimate, $607,000 is allocated for specific improvements or modifications that will mitigate the impacts of stormwater and flooding, effectively minimizing the quantity of silt and sediment that enters the pool. In addition, these measures will facilitate the removal of silt and algae from all areas of the pool.

You have collected 4 years of data, and now you want to waste our money by spending $45,000/year to study the salamander more.

Over the past five years, the City has shown a strong commitment to protect the salamander and the springs. The data collected by the City and the Service during these years were vital to the development of the HCP and the Recovery Plan for the species. However, significant questions remain unanswered concerning the reproductive biology of the species, population dynamics, and tolerance of the species to chronic and acute pollutant levels. A better understanding of the biology

and behavior of the species will provide crucial information for the future protection of the springs and its aquatic biota.

The issue that needs to be addressed by not only the City council, but also the people that will be making the decisions on this permit is the accountability of the money. Two million dollars is a lot of money to spend on a plan that is based on data that is not totally accurate. This should be a fair and public process.

The Service believes that the supporting data for the HCP is sufficient and accurate. Also, the Service and the City have welcomed public input and review during all phases of the design and implementation process for the HCP. The public process has been open and fair.

Consider giving Barton Springs revenue back to Barton Springs for the next five years. Estimated proceeds are $450,000 per year. Aquatics and WPD could share the rest to supplement research, construct more natural and aesthetic berms, dams, sidewalks, etc. Fund a dam installation/removal team with this source.

The Service believes that the funding proposed in the HCP is adequate for the implementation of the HCP. The Service would support additional funding that would facilitate the implementation process.

The HCP should clarify how and who will manage the "conservation fund" to ensure direct benefits to the salamander. There is question as to whether the City will appropriate sufficient funds to mitigate the take of the salamander.

Allocation and appropriation of conservation fund resources will be managed jointly by the City and the Service. Local and regional experts, in addition to interested citizens, will also participate in this process. The Service believes that the proposed funding level is adequate to mitigate for the incidental take of the salamander.

- **Why is there a one-year delay to allocate the funds to support implementation of the HCP? The HCP says that the City will set up a fund**

- **The HCP fails to adequately explain the year delay to allocate funds to support the implementation of the HCP.**

The HCP states that the funding will be in place within six months of permit issuance. The Service is allowing the City six months so that the cost could be accounted for in the City budget planning process. The Service believes that this timeframe is reasonable and prudent.

How much will implementation of the new pool cleaning methods cost the City of Austin?

A cost analysis is included in the EA/HCP on Appendix E.

- **Austin will lose the tourist attraction that brings income.**

- **Closing the pool serves only to deprive the City of Austin of a sizable chunk of income from the crowds who would normally begin a season of swimming there.**

The purpose of this HCP is to provide the City of Austin with a permit, which would allow for the operation and maintenance of the pool, while minimizing and mitigating effects on the salamander. The income from pool operations would be available to the City under the preferred alternative.

There should be some designation made for future financial responsibility for future adaptive management changes necessary to improve protection for the salamander.

Future financial responsibility for changes resulting from adaptive management would rest with the permit holder (City of Austin) as outlined in the HCP.

As a public entity, any commitments of the City to spend money in furtherance of the HCP will be subject to the political appropriations process. Yet, the HCP provides no funding plan or assurances relative to funding at all. Nor does it indicate the cost of the items proposed.

The estimated costs for implementation of the HCP are outlined in the EA/HCP, Appendix E. Acceptance of the 10(a) permit includes the responsibility for the funding of the plan.

17. GENERAL

What is good for the salamander is good for the swimmers and vice versa.

The Service agrees with this comment. Implementation of the HCP will minimize the incidental take of salamanders while providing a safe, recreational facility for swimmers and waders.

Salamanders and people have been co-existing for many years and I believe we can continue to co-exist. The pool should be cleaned and maintained for our children and grandchildren. If cleaning destroys the salamander, I'm sorry. I can't have a lot of sympathy for the little critter if the pool can't be cleaned.

The Service believes the proposed permit would not alter this relationship.

The building of a dam and the modifications to the beach will be a blow to the historic use and character of Barton Springs Pool. Silt and algae removal will be all but eliminated and conditions in the pool will only worsen. Every reasonable alternative proposed by the public has been informally vetoed by government biologists. The public is powerless to alter the outcome.

Numerous changes have been made to the HCP based on the comments received from the many diverse users of the springs. Implementation of the HCP will provide for the continued removal of silt and algae from all areas of the pool while preserving the historic use and character of the springs.

This plan makes any benefit from the $65 million bond package to buy sensitive land on the aquifer illusory.

The HCP would compliment the land bought on the aquifer by providing a clean safe spring for both people and salamanders.

The evidence is that silt and algae are the only real threats to the survival of the species. Swimmers and salamanders need the same water quality. Only the plan has given the appearance of pitting one against the other by alleging that wading and cleaning are the problems.

Threats to the species from maintenance and operational activities are well documented. Minimization of these threats is addressed under the preferred alternative. However, the Service agrees that protection of water quality at the springs is necessary for the continued survival and future recovery of the species.

Could the shallow end be painted with blue paint that prevents algae from growing?

The City would pursue this proposal and evaluate the effectiveness in the shallow end of the pool under the HCP. A paint product that inhibits the growth of algae could be a useful tool for pool maintenance. Clear paint may be a better choice to keep with the character of the springs.

Moving traffic violators should be given a minimum commitment of 16 hours of community service keeping the park clean.

This comment is beyond the scope of this document. A mandatory community service ordinance would have to be proposed and approved by the Austin City Council.

Alternative 4 is a potentially more reasonable alternative. The FWS and City should consider adapting this alternative such that there is reduced cleaning with attention to innovative technologies and conservation measures.

This alternative may not attain the level of care needed to ensure the safe use of the springs and could require periodic closure of some areas due to unsafe conditions. The HCP includes provisions for innovative technologies and other conservation measures that may be developed in the future.

If the permit for incidental take is not approved, that is what I would like to see done: Build the dam proposed in the plan; lay slabs over fissures; use Eliza as an instructional area; maintain Sunken Garden as a family swimming area: cap off the drain and raise the water level, thus preventing people from stepping on the bottom. If necessary, install a metal grate on the bottom. Repair the walls and have police or volunteers check the area. I have only seen the homeless people encourage others not to litter; I have never seen a garbage can in the spring, nor have I ever seen people bathing or washing their clothes. Even if the latter were occurring, the high water turnover rate would probably mean these activities would not affect the salamander. I feel we need to maintain some place in the springs where people and their dogs can swim and not have to pay a fee.

Many of these proposals are contained in the HCP. Under the HCP, Sunken Garden would be available to all people as an outdoor ecological classroom. Lower Barton Creek, downstream of the pool, provides an alternative free swimming area for people and their dogs.

I don't care about the salamander but I do care about children. My 8-year old grandson slipped and fell in the shallow end; the protection of children is much more important than any critter. One lifeguard talked about pulling people out of the shallow end with broken limbs and said that they can't clean the pool because of this little critter. The pool needs to be cleaned for the children.

The preferred alternative will ensure that the shallow end can be cleaned to provide a safe recreational area for swimmers and waders, including children.

The balance is between salamanders and swimmers on one hand, and urban activities that degrade water quality, not between salamanders and swimmers.

The Service believes that the provisions contained in the HCP will benefit all of the users of the springs, including swimmers and salamanders. The Service also agrees that protection of water quality is critical for all users.

I support all measures to protect the salamander but also support access for swimmers and waders. Review all proposals in the plan to determine if restrictive measures such as roping off areas or lowering the beach will actually benefit the salamander.

The Service believes that implementation of the HCP will result in a net benefit to the species with minor restrictions on recreational activities in the springs.

There is a lack of understanding of the process and what the ESA process is all about. Humans tend to trash those things that they love the most. Everyone has to be open to change; e.g.,

people with masks and snorkels have to be more responsible in policing the activities of other snorkelers.

The Service agrees that education and public awareness are vital components to any effort to protect the springs.

I'm opposed to unnecessary intervention to change the pool procedures unless mandated by law. I believe the proposed changes are not essential, and, until they are, money should be used to preserve the aquifer and swimming at Barton Springs Pool.

Sufficient data exist to document the impact of pool maintenance and operation on the species. Federal law requires the City to obtain an incidental take permit if the City continues to operate Barton Springs as an aquatic recreational facility.

The City has insisted on strong, industrial methods to clean the pool that are unnecessary; we can come up with better cleaning methods. I withdraw my support of USFWS because of this document that overreaches and is punitive to the users of Barton Springs. The fencing off Sunken Garden is repression. How long will it be until USFWS closes down Barton Springs?

The City believes that the pool cleaning methods represent a necessary and cost effective means of ensuring a clean safe recreational environment. New techniques would be developed to ensure the same or better standard of care under the HCP. The Service believes that the HCP, as proposed by the City, would be beneficial to spring users. The continued use and protection of the springs is the primary goal of this document.

I support the efforts to protect the Barton Springs salamander.

Thank you for your comment.

Barton Springs is a key element in Austin's wonderful quality of life, and therefore business and developers need to preserve it for their own self-interest. Cooperative solutions need to be found to protect the watershed for Barton Springs Pool, even if it costs more or is more trouble.

The Service agrees that long-term protection of the aquifer will require a regional approach supported by public and private agencies and enterprises.

The document is an attempt to draw attention away from the true endangered species at Barton Springs - the swimmers.

The HCP is designed to minimize the incidental take of salamanders while providing for the needs of all users, including swimmers and waders.

The City's plan seems hasty and drastic. A competition using students and teachers should be used to come up with real solutions.

Development of the HCP has been neither hasty nor drastic. City and Service staff began development of the document in the spring of 1997. The draft HCP was submitted to the Service in January 1998. During the past eight months, the plan has been open to a 45-day public comment period, a 30-day public comment period, two public meetings and two public hearings. The Service and the City have met with numerous interested citizen groups and concerned citizens. Numerous changes have been made to the document based on the comments received from the public.

The pool should be called Barton Springs, not Barton Springs Pool.

The Service is not opposed to a name change to better reflect the ecological character of the springs.

Cleaning the springs is not the major threat to the salamander and the document needs to be changed to include the recommendations of the Salamander Recovery Team.

To date, the only documented take of salamanders has resulted from pool operation and maintenance, or federally permitted scientific activities. Under the adaptive management clause of the HCP, recommendations from the Salamander Recovery Team can be incorporated into the HCP.

This issue clearly ethically challenges the environmental community.
If the springs ran distilled water, the greatest documented take is still pool-related activities. All pool activities, with the exception of swimming, affect the salamander. All areas that affect the salamander need to be addressed. Ignoring the issues of the pool is simply hypocrisy.
Landowners have paid dearly to protect the warbler and what is being asked of the swimmers is minuscule in comparison. This issue underscores the inadequacies and deficiencies of the ESA.
Landowners and environmentalists have to come to an accord with respect to enforcement of the ESA.

Congress amended the ESA to include provisions for incidental take of listed species. One of the requirements of an incidental take permit is that it cannot operate to the disadvantage of the species. The HCP results in a net benefit to the species while keeping the pool open. This flexibility in the ESA was the intent of Congress when the amendments were enacted.

I have always supported the salamanders and the need to protect them. In fact, I quite enjoy sharing the pool with them.

The Service agrees that salamanders and swimmers can peacefully co-exist to the benefit of both species.

Barton Springs has a spiritual component that heightens the experience of being in the pool.

The Service recognizes that physical, spiritual, and psychological benefits are available to the many users of the springs.

Why is the City bending over backwards to answer the demands of the people who brought on the lawsuit? The hidden agenda isn't about the Pool at all; it's to cause public rejection of the Endangered Species Act.

The City and the Service began the EA/HCP process in the spring of 1997, realizing that federal law required a permit for the continued operation and maintenance of Barton and adjacent springs. The City and the Service have not changed the HCP as a result of the lawsuit. The judge's ruling on the preliminary injunction supported the process used to collect information for the permit.

I like the proposal to clean the shallow end with spring water rather than City water.

The Service agrees.

I support the re-introduction of plant life in the pool.

The Service and City support an aggressive revegetation project for the deep end of the pool for sediment stabilization and nutrient uptake.

I support the plan that allows the separate cleaning of the shallow end and closes off the fissures. I believe that both mankind and amphibian-kind deserve their fair share of this resource.

The Service believes that a water control structure for the shallow end of the pool would provide an efficient and safe means for cleaning the shallow end. The Service also believes that

limestone slabs could be installed in the fissure area to minimize the incidental take of salamanders. Under the HCP, access to the fissure area would not be restricted.

This is a vengeance strategy to try to shut down the pool. We can work out a solution that protects the salamanders and allows swimming.

The Service believes that this plan will ensure the continued use of the springs for all users. Implementation of the HCP will maintain the recreational use of the pool while minimizing the impact on the salamander.

I think that you should do whatever you need to do to protect the salamanders. Curtailing human activity is entirely acceptable.

The Service believes that swimmers and salamanders can peacefully co-exist and continue to enjoy the springs for many future generations.

Appendix E

Cost Analysis for Implementation of the HCP (Section 6.0)

1) **Cost of Individual Measures to Minimize or Mitigate Incidental Take of Salamanders**

Pump system for the fissure area	3,000
Cap underground outflow drain at Old Mill Spring (Sunken Garden)	500
Mitigation for take (May 30, 1997 - permit issuance date)	10,000
Subtotal	**13,500**

2) **Cost of Individual Measures to Improve Pool Operation and Maintenance Procedures and Minimize Incidental Take of Salamanders**

Modification of the existing gate system	30,000
Design and installation of pump system	70,000
Design and installation of water control structure	300,000
Design & install underwater sidewalk (including habitat restoration)	146,000
Temporary silt fencing for stormwater runoff at all spring sites	1,000
Design and install permanent stormwater runoff mitigation	60,000
Design and install new bypass grate	30,000
Public awareness program	30,000
Fencing at Eliza Spring and Old Mill Spring (Sunken Garden)	8,000
Educational kiosks	2,000
Subtotal	**677,000**

3) **Cost of Individual Measures that will extend over the 15 year permit period**

Conservation Fund for research	(45,000/year)	675,000
Daily inspection of all spring sites	(3,650/year)	54,750
Visual inspection of beach and fissures area	(1,600/year)	24,000
Monthly salamander surveys	(1,920/year)	28,800
Captive Breeding Program	(20,000/year)	300,000
*Average Annual Pool Maintenance Costs	(40,430/year)	606,450
Subtotal		**1,689,000**

TOTAL (13,500 + 677,000 + 1,689,000) **2,379,500**

TOTAL Estimated HCP Implementation Costs **2,379,500**

* The Average Annual Pool Maintenance Costs Estimate does not include the additional $3,143,550 the City will spend for the general operation of Barton Springs over the 15 year permit period.