

Town Lake Update Executive Summary

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ABSTRACT

Town Lake water quality conditions were last fully evaluated in a 1992 Clean Lakes study which indicated that a variety of non-point source pollution impacts were observed and considered to be worsening. With an additional period of data, conditions have been improving in many respects; however, caution and continued vigilance in City programs, regulation, and capital expenditures will be necessary to maintain this resource as the contributing watersheds are developed and upstream impacts dominate conditions. Degradation is still observable in many water quality parameters under specific storm and release conditions and of concern in comparison to statewide screening criteria. Sediment quality is of concern for many parameters and increasing awareness of Polycyclic Aromatic Hydrocarbon levels from a variety of urban sources was noted. The fish consumption advisory for chlordane has been removed; however mercury levels in tissue are a new concern. Trash and debris tracking has improved as well as responses through voluntary and City cleanups. Masterplanning responses have contributed to water quality controls in Town Lake creeks and the beneficial impact of this program is looked for in future monitoring results.

INTRODUCTION

Town Lake's importance as a natural resource is growing in tandem with Austin's rapid population growth. The lake is not only a source of drinking water for the City, but its greenbelt and open waters are widely used for recreation and as an open space for public events. In 1992, under the Clean Lakes program, a comprehensive report the "Town Lake Study" (COA 1992) was prepared on the condition of the lake (Volume I), water quality control alternatives (Volume II), and a feasibility study (Volume III). This report updates the diagnostic study, Volume I (COA 1992) including the current status of water quality with data analyzed through the year 2000 and includes a summary of measures taken to reduce pollution from urban runoff since 1990.

CHANGES SINCE THE 1992 TOWN LAKE STUDY

In the ten years from 1990 to 2000, the population in Austin and surrounding areas increased more than 20 percent putting more pressure on our natural resources. Recognizing signs of increasing detrimental impacts to water quality and the environment, the City of Austin put in place enhanced measures to protect Austin's creeks and receiving water bodies. With continual increases in impervious cover, traffic, and associated non-point source pollution, it is difficult to identify improvements from individual efforts, but protection measures continue to offset the impacts of development in our watersheds. The most far-reaching regulatory measure now protecting Town Lake is the Urban Watersheds Ordinance. This ordinance amended the Austin City Code in 1991 to provide water quality protection through requirements for buffers, structural water quality controls, and protection of critical environmental features. Other policy changes recommended in the Town Lake Report were also implemented in the early 1990's including a minimum flow (MDF) policy put in place by the Lower Colorado River Authority (LCRA) and a City ban on phosphorus in detergents. Multiple programmatic measures such as education efforts as well as construction of water quality control structures are also being implemented as described in Section 2.2. Current efforts and new proposal for all these aspects of water quality protection are being directed by and are described in detail in the Watershed Protection Masterplan, Phase I (COA_WPD June 2001).

TOWN LAKE WATER QUALITY

Analyses of water quality data demonstrate the impacts of our urbanized watersheds on the Colorado River as it courses through central Austin; concentrations of turbidity, chlorophyll-a, and some nutrients increase in the downstream direction. During storms, the levels of many constituents and bacteria are elevated downstream of the most urbanized watersheds, exhibiting temporal effects of urban inputs. This degradation of water quality as it moves through Town Lake may eventually impact the Colorado River downstream of Austin, although the flow type and inputs of treated wastewater effluent below the dam may be of greater import.

The water quality impacts from Austin's urbanized landscape were observed ten years ago, and now some evidence of degradation over time is seen when examining the extended period of monitoring data. Slight, but significant, increasing trends are observed during some of the specific storm and flow conditions for Total Kjeldahl Nitrogen (TKN), temperature, chlorophyll a, and dissolved copper. A few parameters including ammonia and dissolved lead, however, appear to be improving during the recent period. Levels of nitrate+nitrite as well as fecal coliform counts have a percentage of exceedances that may soon indicate a concern using TNRCC criteria although overall trends are not significant.

Conditions contributing to the trophic status of Town Lake have remained similar to those throughout the past; with new analyses showing Town Lake's trophic status as wavering between oligotrophic and mesotrophic most of the year. Eutrophic levels, however, are observed during most years at some time. Some of the water quality parameters measured seem to indicate the potential for worsening algae conditions, but not consistently for similar parameters. During the fall of 2000, the algal counts remained high for twice as long as the previous longest period, though overall the counts do not show a significant trend, however, the maximum chlorophyll *a* concentrations have been increasing over time. Using TNRCC screening levels (TNRCC 2002), Town Lake has exceeded criteria for chlorophyll-a in 6 of the last 7 years in at least 5% of samples; however, a higher percentage of exceedances is required for an assessment by the state that this is a concern. The location of the highest algal levels unfortunately coincides with the location of the drinking water intake.

Both pollutant levels, particularly nutrients, and algal growth affect the biological life in the lake. Decreases in dissolved oxygen (DO) may indicate a potential concern, in particular, the frequency and duration of near-anoxic conditions at the deepest downstream area of the lake are increasing over time. One clam kill was observed in September of 1996 and, following the kill, bottom DO was 0.25 mg/L at the Lamar Street bridge, where the majority of the clams were dead. Potential causes of the abnormally low DO include an influx of organic debris and nutrients in stormwater, subsequent algal growth, and atypically low releases from Tom Miller Dam (235 cfs on August 31). Although LCRA did put into affect their latest Minimum Daily Flow (MDF) policy in 1992, even the 100 cfs flow required under non-drought conditions may be insufficient to maintain the DO under post-storm, non-release conditions.

The significance of non-urban inflows also remains critical to the condition in Town Lake, particularly during non-storm conditions. Barton Creek and Barton Springs influences, particularly from the elevated groundwater nitrates, are demonstrated spatially with increases in the lake below the influxes. In addition, when the annual average discharge of Barton Springs drops below 30 cfs, Town Lake annual percentages of nitrate values exceeding TNRCC screening levels are lowest. Therefore, maintaining the quality of Town Lake continues to depend upon maintaining the quality of water from this source as well as Lake Austin. Tracing in the Barton Springs segment of the Edwards Aquifer (BSEA) has found surprising results including rapid travel times, which emphasize that impacts on the nonurban watersheds may be transmitted to Town Lake with little opportunity for attenuation. During release conditions, flows are dominated by Lake Austin water. The water quality in Lake Austin exhibits higher mean values of TKN, solids, and plankton than in Town Lake, but most concentrations are inversely related discharge to

Town Lake, thus providing cleaner water during release conditions. Lake Austin may also be changing its patterns of algal levels, and any changes may have an effect on Town Lake as well. Overall, the forecast for water quality in Town Lake is unclear. Evaluations of future conditions are discussed in Volume II where modeling examines further conditions and limiting nutrients.

TOWN LAKE SEDIMENT

Sediment deposition and its effects in terms of clarity and siltation have been of historical concern in Town Lake as indicated by the original Town Lake goal to decrease sediment loads to the lake by 50%. The impacts of sediment within the lake are seen as clarity decreases and turbidity increases in the downstream direction. In addition, over time a slight decreasing trend in clarity is observed. Sediment deposition could reduce the volume in the lake, and the USGS did identify a backwater area in the downstream basin of the lake where they obtained a core to characterize the sediments and deposition. The core results indicate an accumulation rate in that localized area of 0.98 inches/year. However, over the majority of the lake area, sedimentation appears to be offset by scouring events that transport the sediment downstream. A volumetric survey in 1999 indicates no net sedimentation in the lake system since 1992. Aerial photography also indicated similar temporary deltaic formations at creek mouths since 1951.

Sediment quality is important because sediments can reflect water quality constituents that are hydrophobic, as are many of the more toxic pollutants such as pesticides and PCBs that resulted in the 1990 fish consumption advisory. Sediment samples from Town Lake record the long-term effects of anthropogenic emissions and the recovery of a system from persistent pollutants. New analyses of Town Lake sediment toxin concentrations confirm some of the analyses conducted in the original 1992 Town Lake Report. Many toxic constituents in the sediment remain at levels of concern and, in addition, continue to move from upland sources to the receiving water body. Some decreases in restricted chemicals are seen, however, the levels of these constituents are still higher relative to sediment quality guidelines (SQGs) than metals that are continuing inputs.

Many lake samples had concentrations for some metals, particularly for cadmium and lead that exceeded at least one screening level. Zinc and other metals showed a fairly strong spatial pattern through the lake, increasing downstream with highest levels below the most urban watersheds at First, Congress, or I-35. These urban watersheds are the source of these pollutants as demonstrated by the high levels detected in sediment collected from water quality control structures capturing runoff from urbanized areas. Most metal concentrations are decreasing slightly over the period of record. While control measures put in place may be promoting this improvement, sediments are also impacted by severe flood events that may resuspend and flush older deposited sediments downstream.

The organochlorine pesticides still show concentrations over SQGs, with chlordane and DDE (the breakdown product of DDT which persists the longest) most prevalent in recent years. The presence of these banned pesticides in water quality control structures, moreover, indicates their continued transport from older upland soils to Town Lake. Decreasing trends for the DDTs and chlordane were significant as is expected with their discontinued use.

Besides pesticides, many synthetic organic materials are being produced for various purposes and as the by-products of other processes (such as the refining of gasoline and oils). PCBs and PAHs are found in sediments in the Austin area. PCB medians above detection limits have only been seen in water quality control structures, where they are the highest, and in Town Lake sediments. Similar to pesticides, PCBs are apparently still at levels of concern and still being input into the receiving water system. PAHs have not only been identified as a problem in deposited sediments, but have been identified associated with suspended particulates. Many PAHs are found in creek sediments, exceeding SQGs in some creeks; however concentrations in lake sediments are below detection limits. The highest concentrations have

been documented in dry tributaries and control structures, but some structures in high traffic areas had low levels. Increasing concern about PAHs is rising as they are detected in more areas and may be showing a dramatic increase over time, as indicated in a USGS core sample from the Town Lake basin. As the City plans new policies and methods to address nonpoint source pollution problems, the polycyclic aromatic hydrocarbons may arise as a new focus. Although levels of concern are not yet reflected in Town Lake sediments they are of concern in the creeks.

TOWN LAKE FISH TISSUE STUDIES

Since the 1992 Town Lake Report, fish tissue analyses has been conducted in three years, 1994, 1995, and 1998 resulting in the removal of the fish consumption advisory in October of 1999. The removal of this advisory accomplished a primary goal for Town Lake. Parallel to results seen for sediment toxins, the maximum detected organochlorine pesticide concentrations in fish tissue have been decreasing over time although some still have concentrations above the FDA action levels. Recent metal concentrations in fish tissue have not shown continued decreases after 1985, contrary to sediment results. Maximum mercury concentrations, in fact, have been steadily increasing rather than decreasing; although when normalized by fish weight they peak in the middle of the time period and none of the fish tissue metal levels in 1998 were above USEPA Fish Tissue Residue Criteria.

If using a new reference dose for mercury for fish consumption, announced by USEPA in January of 2001, a monthly consumption limit for Town Lake fish would be required. State criteria, however, have not yet been revised.

TRASH AND DEBRIS

The impact of trash and floatable debris as a form of visible pollution has been recognized since the 1992 Town Lake Report, which identified a reduction goal. The Visual Index of Pollution (VIP) was implemented in April 1994 to provide a periodic measure of the City of Austin's litter control performance by documenting visible trash on the shores of Town Lake. An increase or decrease in the amount of trash along these waterways can indicate the usefulness of several methods of trash abatement currently used by the City. The scores have consistently decreased from the original baseline in 1994 (a decrease indicating a reduction in visual trash and debris). Continued improvements in the method and coordination with staff responsible for cleanup efforts should continue to increased effectiveness, as the consistent increase in the amount of trash removed from the lake over four of the last five fiscal years has shown.

MASTERPLANNING AND LAKE PROTECTION

The multiple impacts of both continuing development and protection efforts are demonstrated by the changes in the lake now being observed. Some improvements such as decreases in pesticides in sediment and fish are the result of national efforts, as this report concludes near the 30th anniversary of the Clean Water Act. Some signs of continuing degradation emphasize the difficulty in treating runoff from new development and increased traffic. The City has undertaken the task of applying the most efficient management practices for water quality control, while also addressing the contributing problems of increased flood flows and eroding creek banks by developing Phase I of a Watershed Protection Master Plan (COA_WPD 2001). This plan revisited the goals for Town Lake using the model described in Volume II of this report and projections of future development with current regulations. The overall goals related to water quality and individual objectives for specific waterbodies are summarized in Section 2 and are described in detail in the Master Plan Report. The overall goals for Town Lake are synthesized in the state's and Clean Water Act goals of meeting its Designated Use Support status. Environmental Resources Management staff examined the potential problem areas that may impact its uses aquatic Life Use, Noncontact Recreation and Public Water Supply and derived strategies and watershed specific goals to address algae blooms by controlling nutrient loads, sediment toxin loads,

sedimentation and trash debris. The masterplan then recommends solutions to address these problems, prioritized citywide and in conjunction with flood and erosion solutions. As these solutions are implemented, new Town Lake target goals will be to maintain existing loads to the lake and similar algae bloom conditions and maintain or achieve excellent aesthetic conditions. Continuing lake monitoring as recommended in this report will determine if Austin is able to achieve its goals and preserve Town Lake as a beneficial natural resource.