

City Council Introduction: **Monday**, June 25, 2012  
Public Hearing: **Monday**, July 9, 2012, at **3:00** p.m.

Bill No. 12R-137

## **FACTSHEET**

**TITLE: COMPREHENSIVE PLAN AMENDMENT NO. 12002**, requested by the Director of the Public Works & Utilities Department, Division of Watershed Management, to amend the 2040 Lincoln-Lancaster County Comprehensive Plan to add the Antelope Creek Watershed Basin Management Plan to the list of subarea plans and to add language to better describe the variety of watershed planning activities being conducted in Lincoln and Lancaster County.

**SPONSOR:** Planning Department

**BOARD/COMMITTEE:** Planning Commission  
Public Hearing: 06/13/12  
Administrative Action: 06/13/12

**RECOMMENDATION:** Approval (7-0: Gaylor Baird, Sunderman, Hove, Francis, Butcher, Weber and Cornelius voting 'yes'; Lust and Esseks absent).

**STAFF RECOMMENDATION:** Approval

### **FINDINGS OF FACT:**

1. This is a request to amend the Comprehensive Plan to amend language on page 11.13 in the Energy and Utilities chapter, and page 12.16 in the Plan Realization chapter, to include the Antelope Creek Watershed Basin Management Plan as a subarea plan. The full report of this Management Plan can be found at [www.lincoln.ne.gov](http://www.lincoln.ne.gov) (Keyword = watershed) or <http://lincoln.ne.gov/city/pworks/watrshed/mplan/antcreek>.
2. The staff recommendation of approval is based upon the "Analysis" as set forth on p.4-5, concluding that the proposed amendment is in conformance with the goals of the 2040 Lincoln-Lancaster County Comprehensive Plan. The specific amendments proposed to the Comprehensive Plan are found on p.5-7. The staff presentation is found on p.8-9.
3. There was no testimony in opposition.
4. On June 13, 2012, the Planning Commission agreed with the staff recommendation and voted 7-0 to recommend approval (Esseks and Lust absent).

**FACTSHEET PREPARED BY:** Jean L. Preister

**DATE:** June 19, 2012

**REVIEWED BY:** Marvin Krout, Director of Planning

**DATE:** June 19, 2012

**REFERENCE NUMBER:** FS\CC\2011\CPA12002

**LINCOLN /LANCASTER COUNTY PLANNING STAFF REPORT**  
**for June 13, 2012, Planning Commission Meeting**

- PROJECT #:** Comprehensive Plan Amendment #12002
- PROPOSAL:** Amend the 2040 Lincoln/Lancaster County Comprehensive Plan to amend language on Page 11.13 in the Energy and Utilities chapter, and Page 12.16 in the Plan Realization chapter to include the Antelope Creek Watershed Basin Management Plan as a subarea plan.
- CONCLUSION:** The amendment to the Energy and Utilities chapter and Plan Realization chapter is in conformance with the goals of the 2040 Lincoln-Lancaster County Comprehensive Plan.

<b><u>RECOMMENDATION:</u></b>	Approval of the proposed amendment
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**GENERAL INFORMATION:**

**COMPREHENSIVE PLAN SPECIFICATIONS:** The 2040 Comprehensive Plan states the following (in part) about floodplains and watershed plans:

*Vision and Plan: Vision for Environmental Stewardship and Sustainability*

*The following goals are based on this Environmental Stewardship and Sustainability statement:*

- Natural and environmentally sensitive areas are preserved and thrive. Wetlands, native prairies, endangered species, and stream (riparian) corridors are preserved to ensure the ecological health of the community. (p. 1.4)

*Environmental Resources; Guiding Principles*

Obtain reasonably Constrained Regulations

- Maintaining a balance between the natural and human built environment is always a delicate one. Planning policy and regulatory approaches employed in achieving the Plan's Vision and Greenprint Challenge should strive to be effective, tempered, pragmatic, circumscribed, and respectful of private property rights. (p. 3.3)

*Implementation Strategies for the Greenprint Challenge*

- Integrate the natural resource feature concepts into future planning activities such as zoning and subdivision review, watershed master planning, subarea planning, transportation and utility planning, and floodplain management studies.
- Conduct outreach efforts bringing together private land owners, environmental interests, and the development community to seek a common understanding and approach regarding natural resource features and the vision described in this Plan. (p. 3.5)

### *Energy and Utilities; Watershed Management Guiding Principles*

- Watershed planning will continue in order to be proactive and integrate stewardship principles for land conservation, stream and wetland buffers, better site design, Best Management Practices (BMP), and erosion and sediment control. The natural drainage system can serve multiple benefits, including wildlife habitat and recreation.
- The community encourages site designs that are compatible with the natural characteristics of the site, clustering development, minimizing grading and impervious surfaces, and preserving site hydrology to the maximum extent possible. Naturalized or bioengineered solutions to drainage issues should be used wherever possible. (p. 11.2)

### *Utilities: Watershed Management*

When it rains in Lincoln, stormwater flows into drainage inlets, gutters and underground pipes before reaching Salt Creek, which drains into the Platte River. Rain that falls on hard surfaces like rooftops, parking lots and other surfaces can carry pollutants into our streams and lakes.

Local floodplain and stormwater management responsibility is shared by the City of Lincoln, which assumes care of the tributaries and storm drain system, and the Lower Platte South Natural Resources District (LPSNRD), which maintains the main stream channels. Both the City of Lincoln and Lancaster County participate in the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA).

Water quality from stormwater is managed under the Federal Clean Water Act. The National Pollutant Discharge Elimination System (NPDES) program addresses non-agricultural sources of stormwater discharge. This program is administered in the State by the Nebraska Department of Environmental Quality (NDEQ).

A comprehensive approach to watershed planning is crucial as development expands into new basins around the Lincoln city limits and as redevelopment occurs within the existing urban area. A comprehensive watershed management program needs to incorporate a range of strategies including land use planning, conservation efforts, appropriate standards for floodplains and stormwater, flood warning system development/expansion, stream stabilization, stormwater storage basins, and other structural flood control efforts.

Detention facilities should be identified and developed in a manner that incorporates water quality best management practices and causes minimal adverse impact to existing residential, agricultural and other land uses. (p. 11.12 & 11.13)

### *Strategies for Watershed Management*

- Develop and utilize watershed plans during the review and evaluation of proposed developments and as a guide in the preparation of future capital improvement projects; unify individual plans into a Watershed Management Master Plan for Lincoln and future growth areas.
- Utilize naturalized approaches or bioengineered solutions to drainage issues wherever possible, and use public projects as an opportunity to set positive examples. Seek opportunities for “Best Management Practices” (e.g. Rain to Recreation, Rain Gardens, etc) that reduce flood damages, protect water quality and natural areas, while providing for recreational and educational opportunities so as to realize multiple benefits.
- Preserve and enhance vegetative buffers along stream corridors to slow the flow of stormwater, filter pollutants, protect the biological health of the stream, and conserve other natural functions of the floodplain.

- Seek broad public participation in the location and design of specific watershed management projects, and evaluate the relative benefits as they relate to flood hazard reduction, water quality, channel integrity, natural character, bridges, culverts, and existing public and private structures. (p. 11.14)

## **ANALYSIS:**

This proposal to amend the Comprehensive Plan is to reflect the Antelope Creek Watershed Basin Management Plan in the text of the 2040 Comprehensive Plan. The full report of the Antelope Creek Watershed Basin Management Plan can be found at [www.lincoln.ne.gov](http://www.lincoln.ne.gov) (Keyword “watershed”) under “Master Plans” or “Featured Sites”. The Executive Summary chapter is attached to this report.

1. The Federal Clean Water Act (CWA) requires certain communities with municipal separate storm sewers systems (MS4s) to have a permit under the National Pollutant Discharge Elimination System (NPDES) for all discharges from a municipal separate storm sewer. The City of Lincoln per state and federal regulations is required to have a NPDES permit. The City's permit is issued in compliance with the provisions of the Federal Water Pollution Control Act, the Nebraska Environmental Protection Act and the rules and regulations promulgated pursuant to these Acts. The municipal separate storm sewer system identified in the City's permit is authorized to discharge stormwater and other authorized flows.

In part the permit requires controls to reduce the discharge of pollutants to *the maximum extent practicable*, including management practices, control techniques, and system design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants. The recommendations of the Antelope Creek Watershed Basin Management Plan are in line with the requirements of the City's MS4-NPDES permit.

2. The Basin Management Plan is an extension of the Comprehensive Watershed Management Plan as described in the Energy and Utilities chapter of the Comprehensive Plan.
3. Basin management plans focus on water quality improvements, while other Watershed Master Plans primarily focus on stream stability and on stormwater volume management primarily for the prevention of flooding.
4. The Antelope Creek watershed has had extensive improvement over the past decade with the Antelope Valley Project addressing flooding issues in the lower reaches and the renovation of Holmes Lake and the accompanying water quality improvement projects in the upper reaches.
5. The Antelope Creek Watershed Basin Management Plan focuses on water quality in the lower reaches of Antelope Creek, the area between Holmes Lake and Salt Creek. This area has been identified as impaired by the Nebraska Department of Environmental Quality (NDEQ) for Escherichia coli (E. Coli) bacteria and ammonia. Ammonia levels have since been shown to have been reduced below the level that would indicate impairment.

6. The basin management plan identifies likely sources of contamination and appropriate best management practices (BMPs) for reducing those contaminants. BMPs identified are structural and non-structural.
7. Public participation efforts included a 12-member Advisory Council; an 8-member core work group including representatives from Parks and Recreation, Planning, Public Works and Utilities, the Lower Platte South NRD, and NDEQ; two open houses; Stakeholder Meetings, four newsletters, and information placed on the City website.
8. Best management practices selected for the recommended list of projects and programs were evaluated according to ownership and location, public education opportunities, spatial constraints, pollutant loading, and the amount of area treated. Final recommendations took into account the cost of projects and total pollutant load reductions anticipated.
9. It is anticipated that many of the lessons learned during the Antelope Creek Watershed project will be applicable to other urbanized watersheds in the City.

The proposed amendments meet the 2040 Comprehensive Plan Vision and Goals for Environmental Stewardship and the guiding principles and strategies for Environmental Resources and Energy and Utilities.

#### **PROPOSED AMENDMENTS:**

Amend the 2040 Lincoln-Lancaster County Comprehensive Plan as follows:

1. Energy and Utilities, page 11.13

As part of the overall watershed management program, the City, in cooperation with the LPSNRD, is developing a unified master watershed management plan. This plan will provide information and computer models to aid in analyzing stormwater management alternatives. Individual ~~W~~Watershed Master Plans for ~~seven~~ six watersheds in Lincoln and the surrounding area have already been completed and are adopted as subarea plans in this document (see "*Plan Realization*" chapter). These plans evaluate and propose projects to address a wide range of water resources, and they are formulated in cooperation with other local, state and federal agencies. Ideally, additional watershed ~~master~~ plans are completed and adopted prior to urban development occurring within a new basin. This allows projects and recommendations in the ~~master~~ plan to be considered during the review of specific development proposals.

Watershed Master planning and the performance and adequacy of stormwater storage basins and other measures to prevent increases in peak flows will require continued assessment with the growth of the City. Upstream detention facilities are critical to preventing further increases to the floodplain, and if properly designed also help to reduce pollutant loads to downstream water bodies. Detention facilities should be identified and developed in a manner that incorporates water quality best management practices and causes minimal adverse impact to existing residential, agricultural and other land uses.

Basin management plans are a more recent watershed planning initiative that is part of the ongoing effort to proactively forecast, evaluate, and manage stormwater quality impacts associated with existing and future development and redevelopment of the City. These plans provide available information on the source of contaminants and how such contaminants can be reduced through projects and programs. They also include information for the education of the public on water quality and include projects to protect and restore stream channels. The first of these basin management plans (Antelope Creek from Holmes Lake to Salt Creek) provides a framework upon which future plans can be built.

## 2. Plan Realization, page 12.16

### On-Going Comprehensive Plan Activities; Subarea Planning

- Wilderness Park Subarea Plan; February, 2000
- NRGIS Greenprint Challenge, August, 2001
- City of Lincoln Strategic Plan for HUD Entitlement Programs; FY 2010-2012, Urban Development;
- Lincoln Water System Facilities Master Plan Update, Public Works and Utilities Department; April, 2007.
- Lincoln Wastewater Facilities Master Plan, Public Works and Utilities Department; November, 2007.
- Watershed Master Plans:
  - o Beal Slough Stormwater Master Plan, May, 2000.
  - o Southeast Upper Salt Creek Watershed Stormwater Master Plan, 2003.
  - o Stevens Creek Watershed Master Plan, 2005
  - o Cardwell Branch Watershed Master Plan, 2007
  - o Deadmans Run Watershed Master Plan, 2007
  - o Little Salt Creek Watershed Master Plan, 2009
  - o Antelope Creek Watershed Basin Management Plan, 2012
- Lincoln Public Schools 10 year Plan, April, 2010
- North 48th Street/University Place Plan: Neighborhood Revitalization & Transportation Analysis, 2004
- Lincoln Airport F.A.R. Part 150 Noise Compatibility Study, 2003
- Airport West Subarea Plan, 2005
- Downtown Master Plan, 2005
- Transit Development Plan, September, 2007

- Antelope Valley Project, 1999
- West Haymarket Integrated Development Plan, July, 2009
- The Implementation Plan for the Conservation of Nebraska's Eastern Saline Wetlands, 2003

Prepared by:

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Planner

May 29, 2012

**APPLICANT:** Miki Esposito, Director  
Public Works and Utilities Dept, and  
Glenn Johnson, General Manager  
Lower Platte South NRD

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# COMPREHENSIVE PLAN AMENDMENT NO. 12002

## PUBLIC HEARING BEFORE PLANNING COMMISSION:

June 13, 2012

Members present: Gaylor Baird, Sunderman, Hove, Francis, Butcher, Weber and Cornelius; Lust and Esseks absent.

Staff recommendation: Approval.

There were no ex parte communications disclosed.

Staff presentation: **Ben Higgins of Public Works & Utilities, Division of Watershed Management**, stated that this is a request to add the Antelope Creek Watershed Basin Management Plan as an approved subarea plan in the 2040 Comprehensive Plan. It is a joint project between the City and the Lower Platte South NRD. Other approved master plans include Stevens Creek, Deadman's Run, Little Salt Creek, Beal Slough, Southwest Upper Salt Creek and Cardwell Branch. The area of this basin is below Holmes Lake. All previous plans have been about floodplain and fold control. This is mostly about water quality.

Higgins advised that there has been a large public process with open houses, a citizen advisory committee, postings on the Web site, newsletters, and stakeholder meetings. The reason for this plan is that Antelope Creek has been designated as impaired by the state for E. Coli bacteria and ammonia. Because this is a stream which has the chance of full body contact, it requires consideration of the pollutants in terms of the health standards. The goal is to come up with projects and programs to reduce pollutants in the stream, to increase awareness and to provide education to the public. Sampling of the watershed found that the average amount of E. Coli needs to be reduced by 90%. The E. Coli was sparse, and the likely sources are from urban wildlife and domestic pets, and other sources naturally occurring from groundwater influence. The level of pollutants is similar to other streams throughout the nation.

In addition, Higgins advised that the flow coming out of Holmes Lake was found to be relatively clean with not a lot of pollutants, but as you get further downstream there is more and more drainage area, but they do not see any spikes. There is really no easy way to do one thing to clean it up. The total estimated cost to reduce the pollutants to the preferred health levels is \$57 million for the whole creek. Part of the reason the study was done and the report formatted in a certain way was to get grant funding to assist with the cost. The \$57 million estimate is over a 40-year period. We need to break that down into manageable chunks so it is split into eight phases, as set forth in the study. Phase I includes \$1.7 million. Some of the programs would be bridge retrofits to discourage bird roosting; continued monitoring; rain garden and rain barrel programs, etc. The initial five-year period would be Phase I. This will be re-evaluated after 5 years to determine the effectiveness.

In summary, the study was done to come up with projects and programs to reduce pollutants in Antelope Creek.

Gaylor Baird asked whether Public Works has had discussions about potential public notification in areas where there might be greater numbers of public, specifically in Union Plaza where there are steps leading down to the water. Higgins stated that the potential for body contact is pretty common in all urban streams. He stated that he has not had any real serious discussions such as posting of signs, etc. He suggested that everyone needs to take a common sense approach. Gaylor Baird thinks it is important for Union Plaza because the design actually has stairs leading to the water, almost encouraging people or children to get in the water. Higgins agreed to bring this up with Parks and the NRD.

Since these are fairly common numbers in pollutant levels, Weber wondered whether it is worth spending the money to try to alleviate a little bit of that, or are we just not going to accomplish a whole lot? Higgins' response was that our storm drainage system is a passive system – we do not treat any of the stormwater, but we actually have a permit from the federal and state that says we have to reduce pollutants. If you can make a green area more inviting, you are able to better serve the public in the long term. It is well worth the money. We need to at least start the process and look at the steps we can do to help reduce pollutants in the city. It is the responsible thing to do.

There was no testimony in opposition.

**ACTION BY PLANNING COMMISSION:**

June 13, 2012

Francis moved approval, seconded by Sunderman.

Francis agrees that it is the right thing to do to try to get some of the pollutants out of the water, especially in an area where so much public activity is occurring.

Cornelius noted that the Planning Commission received a detailed briefing on this two weeks ago, which also informs the decision they are making today.

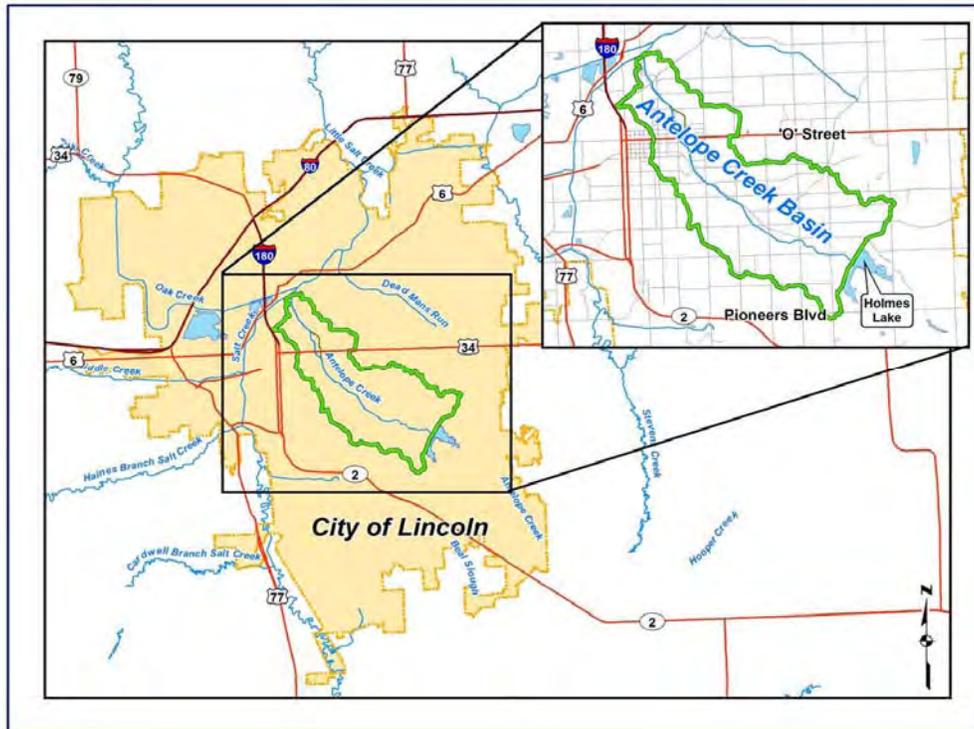
Motion for approval carried 7-0: Gaylor Baird, Sunderman, Hove, Francis, Butcher, Weber and Cornelius voting 'yes'; Lust and Esseks absent. This is a recommendation to the City Council.

## EXECUTIVE SUMMARY

### Introduction

The City of Lincoln (City) and Lower Platte South Natural Resources District (LPSNRD) have continued efforts towards developing Comprehensive Watershed Management Plans for the City of Lincoln and future growth areas with the establishment of the Antelope Creek Watershed Basin Management Plan (Basin Plan). The focus of the Basin Plan is improving water quality as compared to past Basin Plans that provided information primarily for flood control and stream degradation projects. The Basin Plan addresses improvement of water quality in a stretch of Antelope Creek that is highly urbanized in the center of Lincoln, Nebraska. The Basin Plan only includes the portion of the Antelope Creek watershed downstream of Holmes Lake (see Figure ES-1).

**Figure ES-1: Antelope Creek Location Map**



Previously adopted Watershed Master Plans include:

- Beal Slough (2000)
- Southeast Upper Salt Creek (2003)
- Stevens Creek (2005)
- Cardwell Branch (2007)
- Deadmans Run (2007)
- Little Salt Creek (2009)

The Basin Plan boundary totals 4,932 acres, from Antelope Creek's confluence with Salt Creek near the Devaney Sports Center, southeast to Holmes Lake. The watershed includes approximately 7.7 square miles— 5.7 miles of stream with a maximum width of 2 miles, and maximum length of 5 miles.

The City and LPSNRD worked with a team of scientists and engineers during plan development from May 2010 through March 2012. The team was led by EA Engineering, Science, and Technology, Inc. (EA) located in Lincoln, NE. EA worked in cooperation with JEO Consulting Group (JEO) of Lincoln, NE, Wright Water Engineers (WWE) of Denver, CO, and a nationally recognized water quality expert, Dr. Robert Pitt, from the University of Alabama.

In 2007, the Nebraska Department of Environmental Quality (NDEQ) and the United States Environmental Protection Agency (EPA) listed this stretch of Antelope Creek as being impaired due to elevated levels of ammonia and the bacterium *Escherichia coli* (*E. coli*). *E. coli* bacteria are commonly found in the intestines of animals and

humans and serve as an indicator of fecal contamination. Antelope Creek was determined to be a Category 5 water body and was listed on EPA's Clean Water Act Section 303(d) list of impaired waters. In response, NDEQ developed a Total Maximum Daily Load (TMDL) in 2007 for Antelope Creek, in order to set goals for pollution reduction levels necessary to remove Antelope Creek from the 303(d) list.

The primary goal of this Basin Plan is to identify sources of pollution, provide alternatives to reduce pollutant loads below EPA criteria, and to provide information to aid in removing this segment from the 303(d) list. Secondary goals include educating the public about water quality, and applying lessons learned from the Basin Plan to other basins within Lincoln, NE and future growth areas.

Although reducing concentrations of *E. coli* in Antelope Creek is a primary focus, the Basin Plan was written comprehensively to address both non-point and point sources and other contaminants found in the Creek. A community-based planning process was used which emphasized public involvement. In addition, the Basin Plan was written with a focus on EPA's Nine Elements of watershed planning.

## Public Involvement

The City and LPSNRD emphasized public participation and education as key aspects of the Basin Plan. A public involvement strategy was established so that citizens could participate in public decisions that might affect them, their property, and their interests. Public involvement was also included due to the importance of educating the public on stormwater best management practices (BMPs) and their use by the City as well as by residential landowners. The public involvement process included the following:

- **Advisory Council** – A 12-member group was appointed by the Mayor and is displayed in Table ES-1. The group members' roles and responsibilities included reviewing elements of the Basin Plan, asking questions, raising issues, and sharing information with one another, the public, and the team. The team facilitated three Advisory Council meetings.
- **Core Work Group** – An eight member, technically-based group, including the City of Lincoln Parks and Recreation, Planning, and Public Works, the LPSNRD, and the NDEQ, was established at the beginning of the project to provide technical direction for Basin Plan development. The project team facilitated 11 core work group meetings.
- **Open Houses** – Two open houses were conducted, one in September 2010 and a second in December 2011. Post card invites were sent to 11,000 landowners in the Basin Plan area.
- **Stakeholder Meetings** – Presentations were conducted for multiple stakeholders, including the University of Nebraska–Lincoln (UNL), Witherbee Neighborhood Association (NA), Colonial Hills NA, Homebuilders Association of Lincoln, 40<sup>th</sup> and A Street NA, and the Lincoln Children's Zoo.
- **Watershed News** – Four newsletters providing information on the Basin Plan development and public education were distributed through mailing to 1,100 key stakeholders in Lincoln.
- **City Website** – The City's website provided plan information and announcements, and made materials such as the newsletter available to the public.



Picture 1: JB Dixon answers questions at Open House #1

Public involvement and input from the Advisory Council, open houses, Core Work Group, and stakeholder meetings were used by the project team during establishment of strategies in the Basin Plan.

**Table ES-1. Basin Plan Advisory Council**

Representing	Name
Non-profit	Mike Renken, NeighborWorks
Lincoln Public Schools	Scott Wieskamp, Facilities & Management
Business Group	Andrew Campbell, Campbell's Nursery
Business Group	Steve Hill, Assurity
University of Nebraska – Lincoln	Jennifer Dam, Campus Planning
Lincoln Golf Courses	Dale Hardy, Administrator
Lincoln Children’s Zoo	John Chapo, President
Neighborhood Group	Tracy Corr, 40th and A Street
Neighborhood Group	Bob Kuzelka, Near South
University of Nebraska – Lincoln	Rachel Herpel, Water Center
LPSNRD	Karen Amen, Board Director
City of Lincoln	Adam Hornung, City Council

**Basin Plan Elements**

The Basin Plan preparation included several key elements that enabled the project team to review existing information, collect field data, model the watershed, screen potential project locations, conceptualize and prioritize projects, and formulate an implementation strategy. Summaries of each significant Basin Plan element are provided below:

**Basin Inventory**

- Completed an inventory to identify critical areas within the watershed with potential to be pollutant sources.
- Completed a bridge inventory to identify locations where animals can directly contribute to pollutant loads within Antelope Creek.

**TMDL Assessment**

- Assessed the TMDL requirements for Antelope Creek and the data set used to develop the TMDL.

**Water Quality Monitoring**

- Conducted a visual inspection of dry weather flows contributing to Antelope Creek to identify potential point sources by walking the creek bed and observing more than 220 outfalls.
- Developed and implemented a water quality monitoring program to characterize pollutant distribution in the surface water and sediments.



**Picture 2: Antelope Creek Open House #1**

### Source Loading and Management Model for Windows (WinSLAMM)

- Utilized WinSLAMM to evaluate stormwater pollutant loadings specific to storm hydrology and land use conditions in the Basin Plan area.
- Completed a detailed land use inventory of specific locations in the watershed to calibrate WinSLAMM.
- Utilized WinSLAMM to evaluate alternative Best Management Plans (BMPs) throughout the watershed to analyze the effectiveness of different combinations of BMPs.

### Best Management Practices (BMPs)

- Conducted a field screening and desktop review of more than 50 sites throughout the watershed to identify potential sites for water quality BMPs.
- Ranked and selected sites in the watershed based upon watershed specific selection criteria to identify the most feasible project locations.
- Conceptualized 13 structural BMP projects, including description, cost, water quality benefits, and pollutant loading estimates.
- Established more than 20 non-structural recommendations including expansion of existing programs and consideration of new programs.

### Implementation Strategy

- Developed a long-term implementation strategy to improve water quality in Antelope Creek.

### Summary of Findings

The TMDL regulatory driver set by NDEQ, as mandated by the EPA, requires that Antelope Creek attain water quality standards of a full body contact recreational stream during the months of May through September. The two regulated pollutants listed in the 2007 TMDL are ammonia and *E. coli* bacteria. The TMDL also identifies other “pollutants of concern” for the stream, including conductivity, selenium, and chloride. Currently, no TMDL has been developed for these pollutants for Antelope Creek. The activities conducted in preparation of this Basin Plan allowed the Project Team to successfully identify sources of the pollutants, define the magnitude of the problem, and develop Basin Plan recommendations to address the problem. Below is a summary of the Basin Plan findings.

1. **Antelope Creek does not attain the TMDL standard for *E. coli* bacteria.** The *E. coli* standard for the stream established by the EPA is 126 colony-forming units per 100 milliliters (cfu/100 mL) during both dry and wet weather conditions. The recreation season geometric mean concentration of *E. coli* at the confluence with Salt Creek measured by NDEQ in 2004 used to develop the TMDL was 3,433 cfu/100 mL. The 2007 TMDL lists 113 cfu/100 mL as the reduction goal for Antelope Creek. The recreation season geometric mean concentration of *E. coli* at the confluence with Salt Creek measured during the 2010-2011 sampling activities as part of the Basin Plan was 1,511 cfu/100 mL. The project team used the 1,511 cfu/100 mL level in development of the Basin Plan recommendations. This means that a 93% reduction in the *E. coli* pollutant load to Antelope Creek will be necessary to meet the recreational stream standards and TMDL goal at the confluence with Salt Creek.
2. **Other pollutants found in Antelope Creek are not as great of a concern as *E. coli*.** With the exceptions of *E. coli*, conductivity, chloride and selenium, Antelope Creek currently attains all other stream standards assigned to the stream by NDEQ. Based on sampling activities conducted as part of this Plan, ammonia is no longer present in the stream at levels exceeding the current TMDL. Conductivity, selenium, and chloride are currently only listed as pollutants of concern and do not have TMDLs. Groundwater inflows to the stream are expected to be the source of chloride, conductivity, and selenium in the lower portion of Antelope Creek, and are most likely naturally occurring.
3. ***E. coli* bacteria are likely from a diffuse source such as urban wildlife and potentially also from domestic pets.** Pollution sources within a watershed



Picture 3: Antelope Creek near Jim Ager Golf Course

are generally divided into two categories; point sources and non-point sources. Point sources consist of a single site or location from which pollution occurs such as a sewer main break, or a facility discharging pollutants directly into the watershed. Non-point sources are background sources of pollutants that are spread throughout a watershed (*i.e.*, wildlife, domestic pets, fertilizers, and urban stormwater runoff that collects bacteria from rooftops or gutters). Sampling of stormwater outfalls to the stream indicated the *E. coli* bacteria source is a non-point source mainly from urban wildlife (*e.g.*, pigeons, raccoons), and potentially from domestic pets. The background level of bacteria naturally occurring in the watershed is unknown. It should be noted that other local urban and rural streams also exhibit high levels of *E. coli*.

4. **Achieving the TMDL standard for *E. coli* will be difficult, costly, and require a long term systematic approach.** Due to the relatively ubiquitous and diffuse nature of such background level pollutants, it is impractical to remove all sources (wildlife and pets), and it is also impractical to treat the entire watershed at the lower end in a similar manner to how wastewater is treated. The diffuse nature of the sources of *E. coli*, will make meeting the standard difficult and costly, and will require a long-term, systematic approach. The estimate of total cost to implement best management practices (BMPs) and projects in the watershed that will achieve the EPA standard for *E. coli* will be approximately \$57 million over the 40-year life of this plan. From a regulatory perspective, it is important for the City to proactively implement measures that may help to incrementally reduce *E. coli* loads to the stream.
5. **For the Antelope Creek Basin, the most effective pollution control strategies for diffuse sources of *E. coli* are source controls, stormwater surface runoff volume reduction, and infiltration BMPs.** Source controls, or non-structural BMPs, reduce the source of the pollutant rather than treating the pollutant through a structural BMP. Source controls are usually low-cost and are typically the responsibility of the resident or property owner to implement (*i.e.*, Low/No-phosphorus fertilizers and picking up pet waste). BMPs that achieve stormwater runoff volume reduction ultimately reduce the volume of surface water reaching Antelope Creek, thus reducing the pollutant load. Infiltration BMPs treat stormwater runoff and capture pollutants prior to reaching Antelope Creek.
6. **The levels of pollutants found in Antelope Creek are typical of other urban streams found throughout the United States.** In-stream monitoring of Antelope Creek in 2010 and 2011, and a review of existing water quality data have shown that the problems of Antelope Creek are not unique as compared to other urban streams.

## Summary of Recommendations

The ultimate goal of this Basin Plan is to remove Antelope Creek from the Clean Water Act Section 303(d) impaired waters list. Based on the most recent in-stream sampling, this equates to reducing the levels of *E. coli* bacteria in the stream by 93%. Due to the diffuse nature of the pollutant sources within the Antelope Creek watershed and the magnitude of the problem, the process used to achieve this goal could be challenging, costly, and long-term.

### Pollution Control Strategies

Two main types of pollution control strategies are recommended; source controls (non-structural programs) and pollutant treatment practices (structural BMPs).

- 1) Non-structural source control strategies involve controlling the pollutant source in the watershed as much as possible before it has the chance to be mixed with stormwater and enter Antelope Creek. These strategies might include pet waste removal, wildlife management strategies, and Low/No-phosphorus fertilizer programs.
- 2) Structural BMPs involve constructing projects throughout the watershed to treat the pollutants within the stormwater before reaching Antelope Creek, or within the creek. These include installation of grass swales using native vegetation, rain gardens, enhancing existing wetlands and small tributaries to increase ponding of stormwater (filtration, infiltration, and water retention), use of hydrodynamic separators, and others.

On a watershed basis non-structural source control strategies are generally more cost-effective than structural controls for treating non-point sources of *E. coli* bacteria. However, non-structural source controls alone may not adequately reduce the *E. coli* levels in Antelope Creek by 93%. Structural BMPs may need to be constructed throughout the watershed to provide the additional pollutant removal capacity needed to meet the water quality goal.

### General Water Quality Recommendations

To improve water quality in the Antelope Creek Watershed the following actions are recommended:

1. Continue enforcing existing City ordinances to control pollutant sources within the Antelope Creek watershed, such as pet waste ordinances and sediment control.
2. Review existing ordinances and target the development of new ordinances based on the pollutants of concern.
3. Develop and implement wildlife control practices in the Antelope Creek watershed, such as retrofits to bridges to limit roosting/nesting, detour geese away from waterways using landscaping techniques (tall grass/shrubs), etc.
4. Continue and expand preventative maintenance and cleaning activities to minimize future pollutant sources, such as sanitary sewer inspections, street sweeping, and in-stream sediment removal.
5. Continue and expand pollution source control and runoff quantity reduction programs, such as public education programs, Low/No-phosphorus fertilizer program, and the rain garden/rain barrel programs.
6. Develop and implement additional pollution source and runoff volume control programs such as a downspout disconnection program and continue yard waste pickup programs.
7. Implement structural stormwater BMP ordinances for BMPs that would treat frequently occurring rainfall events and reduce surface runoff volumes. The BMPs should be designed to target 90% of all rainfall events (1.25 inches and under) if possible. Such stormwater BMPs could be implemented on new development projects and retrofit projects. There also could be opportunities for demonstration projects with the City and/or LPSNRD as funding is available.
8. Evaluate the feasibility of altering release patterns from Holmes Lake to determine whether more frequent “flushing flows” would benefit water quality in Antelope Creek.
9. Evaluate channel modifications throughout Antelope Creek to minimize sedimentation areas and reduce nuisance algae blooms.
10. Evaluate Lincoln’s Storm Drainage Criteria Manual to ensure it is up to date. The evaluation can be compared to the 2010 version of the Urban Drainage and Flood Control District (UDFCD) manual, or another comparable national manual.
11. Consider concentration of resources into a priority sub-basin. A concentration of resources, such as developing several projects in a smaller sub-basin, would allow the City to more closely evaluate BMP performance. Focusing on a sub-basin is a more practical approach for a diffuse pollution source and is typical of EPA approved water quality plans.

## Summary of Implementation Plan and Projected Costs

Reducing the pollutant load into Antelope Creek is a complex and challenging effort that will require the City and LPSNRD to acquire outside financial and technical resources. A cost estimate was established in order to quantify potential financial resources necessary to remove Antelope Creek from the impaired waters list and does not reflect any type of commitment of resources by Basin Plan stakeholders.

### Implementation Strategy

The Basin Plan includes a strategy which describes practices to be implemented over the entire watershed for a 40-year period. A total of 8 sub-basins have been identified as a guide for step-by-step implementation to improve water quality overtime. This strategy assumes that projects will be implemented over a 5 year period for each sub-basin. During each phase projects should be evaluated further in regard to water quality, property owner interest, and cost. The implementation strategy includes a process for the City and NRD to follow in order to review progress towards improving water quality using evaluative criteria and monitoring.

### Phase One – Antelope Park Sub-Basin

Phase One of the Basin Plan includes implementation of several non-structural control strategies across the entire Antelope Creek watershed and several structural BMPs within a 630 acre sub-basin. The Phase One sub-basin includes Antelope Park from A Street south to Sheridan Boulevard and the Lincoln Children’s Zoo as seen in Figure ES-2.

Although all non-structural BMPs listed in the Basin Plan may be considered, the nine listed below were given higher priority during the planning process and were viewed as being more effective in limiting *E. coli*, sediments, and

nutrient loadings from entering Antelope Creek. The following five non-structural BMP recommendations would be implemented by the City and/or LPSNRD:

- 1) Retrofitting older bridges and overpasses crossing Antelope Creek to limit bird activity
- 2) Sanitary Sewer Line Inspection Program Expansion
- 3) Dry Weather Storm Drainage Screening
- 4) Enforcement of existing pet waste ordinances
- 5) Supplying and maintaining additional pet waste containers

The following four non-structural BMPs listed below would be implemented by residents and property owners through programs offered by the City and/or LPSNRD.

- 1) Low/No-phosphorus fertilizer program
- 2) Rooftop disconnection incentive program
- 3) Rain garden program
- 4) Rain barrel program

In total, 14 demonstrative structural BMPs have been identified to treat stormwater and remove pollutants from Antelope Creek. Five of these 14 structural water quality BMPs have been recommended as part of the Phase One implementation. The location of these proposed projects can be found in Figure ES-3.

To ensure success of both non-structural and structural BMPs, the City and LPSNRD could work together to provide educational opportunities and community outreach to residents and property owners throughout the Basin Plan area. Phase One would conclude with monitoring of water quality at the confluence with Salt Creek to assess the effectiveness of implemented strategies.

The total estimated cost of Phase One is \$1.7 million over a 5-year period. Cost estimates are based upon preliminary engineering estimates, a review of City program cost, and several cost assumptions listed in the Basin Plan. Implementations of Phase One actions are dependent upon availability of funding resources and cost share from State/Federal resources and willingness of residents and property owners to participate in non-structural programs. Table ES-2 below displays cost estimates for the structural BMP projects as well as the estimated cost for implementation of non-structural programs as part of Phase One.

**Table ES-2. Phase One Antelope Creek Basin Implementation Plan**

Basin Plan Watershed	Project Cost
<b>Phase One: Structural BMPs</b>	
P01: Antelope Park: Van Dorn St to Sheridan Blvd	\$125,000
P02: Antelope Park: South St to Van Dorn St	\$125,000
P03: Antelope Park: SW of 33rd and South St	\$125,000
P04: Antelope Park: A Street to South Street	\$250,000
P06: Lincoln Children’s Zoo	\$425,000
<b>Sub-total</b>	<b>\$1.1 million</b>
<b>Phase One: Non-Structural BMPs</b>	
Basin-wide Non-structural Programs	\$550,000
<b>Phase One: Review, Monitoring, plan revision</b>	\$50,000
<b>Grand Total</b>	<b>\$1.7 million</b>

**Additional Implementation Phases**

It is estimated that all phases would cost approximately \$57 million which may be necessary to eventually meet existing regulatory criteria for *E. coli* in Antelope Creek. This cost estimate was established using information in the Source Loading and Management Model for Windows (WinSLAMM), Phase One cost estimates, and historical and current non-structural programs cost. This estimate far exceeds available funding, therefore it is recommended that the City and LPSNRD continue a phased approach, implementing the most cost effective practices in the early years and continuing to evaluate and implement additional practices over a 40-year period. In Phases 2-8 additional

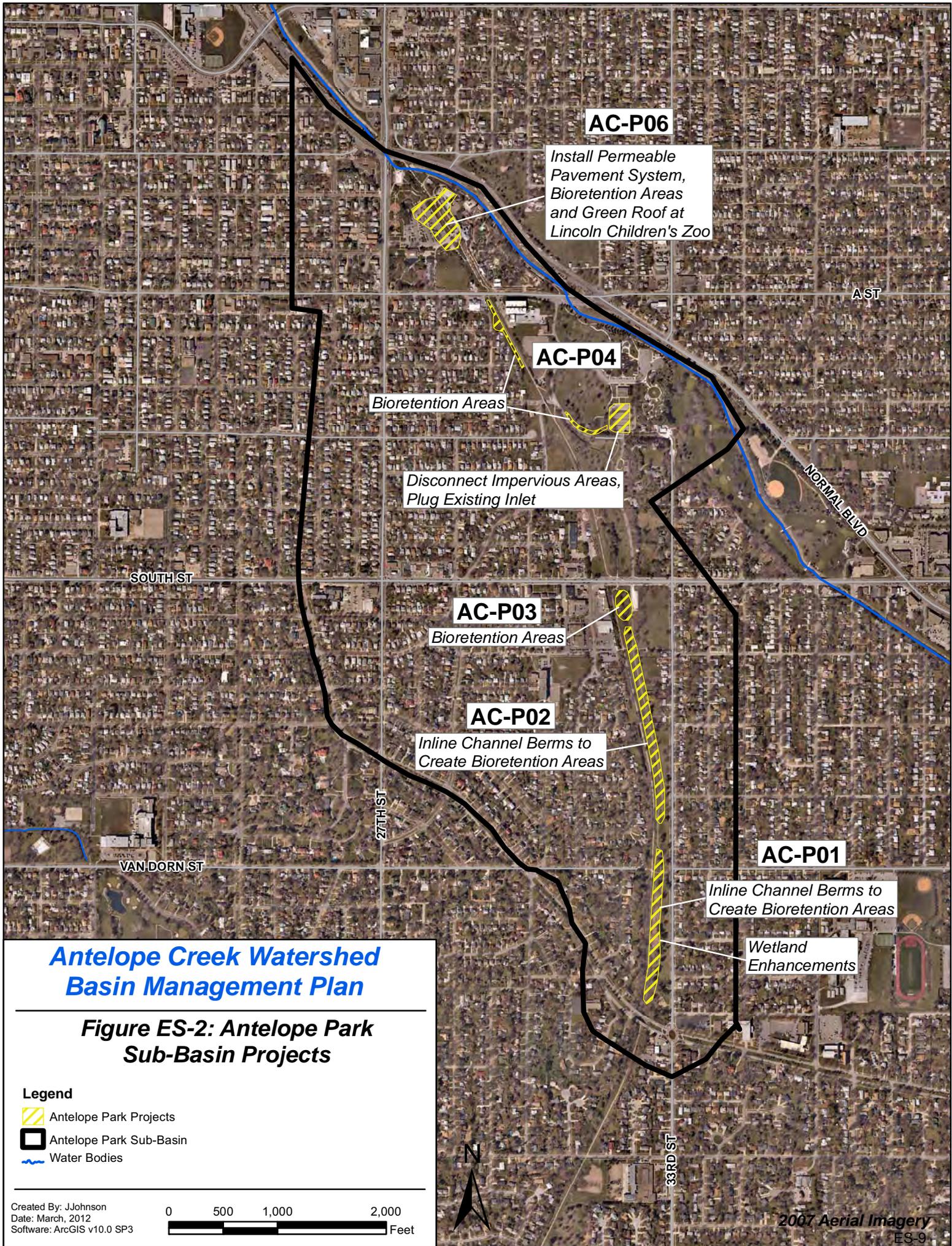
structural water quality improvement projects will be considered for construction within the Antelope Creek watershed.

### **Conclusion**

The project team understands that financial expenditures of this magnitude, to consistently meet the EPA criteria in a recreational stream segment within an urbanized watershed, are somewhat impractical as compared to existing financial resources available. Plan reviews could potentially have large effects on the overall cost estimate based upon the effectiveness of the Phase One project and program implementation. Funding assistance from Federal, state, and local sources are anticipated to be available to provide assistance with funding during implementation of the Basin Plan.

Although the goal of this Basin Plan is to remove Antelope Creek from the impaired waters list, the structural and non-structural BMPs recommended have multiple benefits. These include, but are not limited to: reduction of a wide range of other pollutants, reduced stormwater runoff volume, reduced landscape maintenance, increased stream stability, reduced infrastructure cost downstream, recharging groundwater levels, aesthetics, educational opportunities, increasing the overall health of Antelope Creek, and improving public safety, health, and welfare for Lincoln citizens and visitors.

Together, the City, LPSNRD and Lincoln citizens can work proactively to reduce *E. coli* loads to the stream and implement strategies outlined in the Basin Plan. Successful implementation of strategies outlined in the Basin Plan will allow the City to begin working towards water quality improvements in Antelope Creek as well as other basins in the City.



April 16, 2012

Marvin Krout, Planning Director  
Lincoln-Lancaster County Planning Department  
555 South 10<sup>th</sup> Street, Suite 213  
Lincoln, NE 68508

RE: Antelope Creek Watershed Basin Management Plan

Dear Marvin:

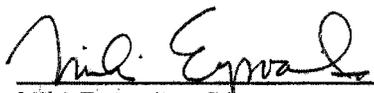
This is a request by the Public Works and Utilities Department and the Lower Platte South Natural Resources District (NRD) to schedule a Comprehensive Plan Amendment for the Antelope Creek Watershed Basin Management Plan on the June 13, 2012 Planning Commission agenda.

The Antelope Creek Watershed Basin Management Plan is a joint project between the City of Lincoln and the Lower Platte South NRD and it represents the seventh master planning effort to date. Master Plans for Beal Slough, Southeast Upper Salt Creek, Stevens Creek, Cardwell Branch, Deadmans Run and Little Salt Creek have previously been adopted as sub area plans. The major emphasis in the previous master plans was flooding and stream stability with lesser emphasis on storm water quality. However in the Antelope Creek Watershed extensive work had been done to address flooding and much of the stream channel had been hardened under previous projects, therefore, water quality was the emphasis for this study. Antelope Creek is designated as an impaired water body by the Nebraska Department of Environmental Quality because the amount of e-coli bacteria exceeds the limit set by the Environmental Protection Agency. The projects identified in this Basin Plan will provide significant benefit to the City of Lincoln in addressing how to improve the quality of water in Antelope Creek as well as other drainages in the City.

Throughout the Basin Plan study, information was made available to the public and meetings were held to give the public opportunities to provide input. An advisory committee of 12 people representative of stakeholder throughout the basin met 3 times to provide input and guidance. A website is maintained to share information from the study which can be found under Featured Sites at [lincoln.ne.gov](http://lincoln.ne.gov), keyword: "watershed". Also, attached is the executive summary from the Basin Plan Study.

Should you have any questions or need further information, please contact Ed Kouma in the Public Works and Utilities Department [ekouma@lincoln.ne.gov](mailto:ekouma@lincoln.ne.gov) or at 402-441-7018.

Sincerely,

  
\_\_\_\_\_  
Miki Esposito, Director  
Public Works & Utilities Department

  
\_\_\_\_\_  
Glenn Johnson, General Manager  
Lower Platte South NRD

cc: Terry Genrich - Parks Department  
Ben Higgins, Ed Kouma - PW/U Department  
Sara Hartzell - Planning Department  
Jon Trombino - EA Engineering, Science & Technology  
Paul Zillig, JB Dixon - Lower Platte South NRD  
Mary Schroer - Nebraska Department of Environmental Quality

  
**CITY OF LINCOLN**  
**NEBRASKA**

**MAYOR CHRIS BEUTLER**

[lincoln.ne.gov](http://lincoln.ne.gov)

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*The Community of Opportunity*