

The following proposal was submitted to the Pennsylvania Department of Environmental Protection Growing Greener Program in February, 2002. As part of the application process for finalizing the scope of work, the original proposal may be revised to meet PaDEP requirements. Those changes may be reflected in this document.

Water Budget Analysis/Resource Protection Plan for Manheim, Lititz, and Ephrata, Pa., Area Ground Water Basin

Project Location Map

Relationship to Watershed Plans

A major cornerstone to comprehensive water resources planning is an analysis of resource availability at the local watershed and ground water basin hydrologic scale, including surface and ground waters. This project acknowledges that the nonpoint source problem has both a solute and solvent, and that nonpoint source problems can be reduced by both a reduction in the solute (contaminant) and by an increase in the solvent (water). The proposed project will allow quantitative evaluation of changes to water use and resource availability for various locations in the study area. At a local watershed scale, managers and planners will be able to evaluate the impact of agriculture and development on resource availability.

The use of a hybrid ground water basin/watershed approach in resource availability analysis and the resulting water budget, lends itself to planning that is truly comprehensive. This allows for determinations concerning instream flow needs, aquatic and natural resource impacts, public water supply demand, total maximum daily loads (TMDLs), antidegradation, consumptive use, low flow management, and recreational, agricultural, commercial, and industrial needs. The municipalities within the watershed can incorporate the water budget analysis and resource management plan as a resource and guide to land planning in their communities, based on resource supply and protection of water quantity.

There are five watershed groups in the proposed project area that were contacted for information on watershed plans. Only one watershed plan, Lititz Run Watershed "A Community Improving Its Water Quality," was available. The Lititz Run Watershed Alliance through its rivers conservation plan has stated, "A more comprehensive scale of analysis and management is required to reduce nonpoint source pollution." The proposed project addresses this objective. The plan also recognizes that water availability both in quantity and quality is necessary to ensure future economic potential of the area. Other watershed stressors identified in the watershed plan are the loss of aquifers through increased impervious surfaces associated with urban development.

While only one watershed plan is available, there are several other plans recommending "comprehensive water resource analysis and planning." The water budget

analysis and resource management plan is consistent with the State Water Plan and pending Pennsylvania Water Resources Management Legislation. The Lititz Borough/Warwick Township Joint Strategic Comprehensive Plan recognizes the loss of ground-water recharge and increased nonpoint pollution and is addressing urban growth through its Physical Development Initiative-Urban Growth Boundary Reduction.

The proposed project also supports the Environmental Futures Planning Process (EFP2) objectives listed under Indicator 3, number of water resources used beyond the sustainable yield. Development of a water budget analysis and resource management plan works toward the objectives identified by the Pennsylvania Department of Environmental Protection's Bureau of Watershed Management (BWM) and Bureau of Pollution Prevention and Compliance Assistance (BPPCA). These objectives include:

1. Support and build the capacity of Conservation Districts to deliver conservation and environmental programs at the local level. (BWM)
2. Investigate the causes, effects, and issues of indicator 3. (BWM)
3. Develop and encourage use of ground-water recharge technologies. (BPPCA)
4. Develop and encourage use of water conservation technologies. (BPPCA)
5. Provide education and outreach to 6,700 developers, property owners, and homeowners by 12/03 regarding water conservation and proper development. (BPPCA)
6. Reduce consumption from poorly planned industrial development by promoting eco-industrial parks. (BPPCA)

Detailed Project Description

Executive Summary

Excess nutrients, sediment, residual pesticides, and bacteria from agriculture and urban/ stormwater runoff impair surface and ground water in most of the limestone-based portion of subbasins 07G and 07J in Lancaster County, Pa. High demand for water in a 32,000-acre (~ 50-square mile) carbonate area underlying Chiques Creek, Cocalico Creek, and Hammer Creek Watersheds contributes to nonpoint source pollution. The Susquehanna River Basin Commission (SRBC) in partnership with the Lancaster County Conservation District and five watershed groups is proposing to address this problem. The proposed tasks are to engage local stakeholders to participate in an advisory group during development of a water budget analysis and resource management plan and present results at an educational and implementation strategies workshop. This approach will improve both ground water and surface water quality through conservation and protection of water quantity.

Statement of Need & Justification of Funding

The high demand for and overuse of water can contribute to nonpoint source pollution in several ways, including altered instream flows, failure of on-site disposal systems, reduction and loss of wetlands and riparian habitats, and increased nitrate and

soluble contaminants leached to ground water due to irrigation. The recognition of nonpoint source pollution as a major contributor to declining water quality has created another approach to improving our water resources (better water quality through greater water quantity). A water-use efficiency program is a pollution prevention practice, which can help local communities achieve cleaner water through conservation.

How can water use reduce nonpoint source pollution? A real world example showed that a water conservation program to reduce a community's use of drinking water resulted in a reduction in the amount of water loaded into a septic tank drainfield system and reduced nonpoint source contamination. The water conservation program resulted in a reduction from 250,000 gallons per month to 200,000 gallons per month within the first nine months, following the adoption of the conservation program. Operation and maintenance costs for water supply wells decreased due to reduced water demand, and surfacing septic overflow from the community's drainfields has not been a problem since adoption of the conservation program (after Eddy, N. 1993. *Small Flows* 7(2):15). This example not only demonstrates the potential for reducing nonpoint source contamination, but also shows cost reductions.

The SRBC is proposing a water budget analysis and resource management plan for portions of State Water Plan Subbasins 07G and 07J. This analysis will allow for evaluation of stressed or potentially stressed resource areas.

As part of the water budget development, SRBC will interface with local and regional water resource agencies and the Pa. DEP. A public outreach effort will be conducted to educate communities and residents of the watershed. Through a workshop and resource management strategy, final results of the analysis will be presented to local and regional officials for inclusion in their respective planning activities.

The proposed project meets the intent of Pennsylvania's Nonpoint Source (NPS) Strategy (NPS). The objective of Pennsylvania's NPS Strategy is to work *through partnerships with the citizens, agencies, and industries of the Commonwealth to achieve appropriate water quality standards and protect beneficial uses of all surface and ground water*. Pennsylvania's NPS Management Program 1999 Update recognizes that indirect changes in hydrology (e.g., changing land uses, increasing impervious surface areas, lack of stormwater management) can result in nonpoint sources of pollution. The action plan calls for implementation of activities to address hydrologic/habitat modification and water quality. The approach to watershed restoration needs to be flexible enough to consider the whole watershed or ground-water basin.

Ground water is important to the protection of Pa.'s surface waters, since it provides a significant percentage of the sustaining baseflow to streams and maintains the integrity of wetlands. Pennsylvania's NPS Strategy states that wetlands provide an important role in filtering out NPS pollutants before they reach streams. Adverse hydrologic changes, such as excessive withdrawals, can destroy wetlands. Hydromodification from over use can lead to changes in physical characteristics of

surface water bodies and limit their assimilative capacity and ability to protect water quality.

The approximately 50-square-mile project area contains portions of the upper Chiques Creek, Hammer Creek, and Cocalico Creek Watersheds in State Water Plan Subbasins 07G and 07J. The geologic structure of the study area has been described as “bathtub shaped” with the interior consisting of a carbonate aquifer bounded by low, permeable confining units restricting ground-water flow into and out of the area. These confining units of Ordovician Triassic sedimentary rock serve as the boundary of the study area. Manheim, Lititz, and Ephrata Boroughs overlie this water supply limited aquifer. Development in this tri-borough area and need for increasing water use has resulted in reported lowering of ground water levels and drying stream reaches. Excessive ground-water withdrawals increase the infiltration of nonpoint source pollutants to the underlying aquifer.

Pennsylvania’s Watershed Restoration Action Strategies (WRAS) indicate that the entire limestone section of subbasin 07G is impaired due to excess nutrients and sediment from agriculture, with municipal point source, habitat modification, and urban/stormwater runoff as secondary sources. A total maximum daily load (TMDL) was approved for Chiques Creek in 2001. Excess nitrates, residual pesticides, and bacteria impair surface and ground water in most of the limestone-based portion of subbasin 07J. Upper portions of the Conestoga River, Little Conestoga, Mill, and Cocalico Creeks are impaired by nutrients and sediment from agriculture. A TMDL for the Conestoga River will be prepared. However, increasing demands on water supply and lowering base flows will hamper the objectives of the TMDL.

WRAS also identified future threats to surface and ground water quality in subbasins 07G and 07J. Nonresidential development, which includes office, industrial, and commercial development, is booming in the subbasin. As development expands out from the suburbs around the boroughs and villages of the subbasin, agriculture may contribute less impairment and the stormwater runoff impairment potential will increase. This type of development has a high potential for impact on surface- and ground-water resources due to massive site grading, removal of vegetation, and large areas of paving for parking lots. Increased development and paving may further impede water infiltration and ground-water recharge and increase the need for public water supply wells. This could decrease ground-water quantity and reduce stream base flow, affecting nonpoint source impacts on water quality. Water removed from ground-water wells for use as drinking water and by industry is returned to the river or smaller streams. Therefore, the opportunity for ground-water recharge is reduced and the water table is lowered, which also contributes to the formation of more sinkholes.

Several initiatives are being implemented in the watershed. The Lancaster County Conservation District is continuing its efforts to install agricultural Best Management Practices (BMPs) and to provide public education and awareness through programs funded through the Environmental Quality Incentives Program, Nutrient Management Act 6, and the Chesapeake Bay Program.

The U.S. Fish and Wildlife Service, Ducks Unlimited, Trout Unlimited, Chesapeake Bay Foundation, and Alliance for the Chesapeake Bay are continuing their public awareness, streambank reforestation and fencing, and habitat improvement efforts in Chiques Creek Basin. Implementation of BMPs for agricultural sources in impaired areas should reduce nutrient and sediment loading. Few restoration activities have been implemented in the Conewago Creek Watershed.

Goals & Objectives

The goal of a water budget analysis is to identify where the demand for water exceeds, or is projected to exceed, available supplies. These areas would be designated as stressed or potentially stressed resource areas in the resource management plan. Local governments can then focus attention on planning activities, i.e., ordinances and zoning, to protect and restore those areas.

The project is organized in five phases with different partners assisting with each phase. An advisory committee with citizen and watershed group involvement is present throughout all phases. The phases include: holding an initial public meeting to establish an advisory committee; gathering water-use and GIS database information; completing a water budget analysis and report; developing a Water Resource Management Plan; and conducting a workshop. These phases are needed to accomplish the goal.

Partnerships

Partnerships in any program are key to the success of that effort. To best achieve the goals and objectives of this project, many partnerships have been formed to ensure the success of both the project, and the watershed community's involvement.

SRBC is proposing to partner with the Lancaster County Conservation District and several local watershed groups (Lititz Run Watershed Alliance, Chiques Creek Watershed Alliance, Hammer Creek Watershed Association, Furnace Run/Segloch Run Watershed Alliance, Save our Creek—local reach on Cocalico Creek in Ephrata) and the Delaware River Basin Commission to complete the project. Other partners include municipalities, water authorities, industry and agricultural interests.

The SRBC will be responsible for overall project management. This includes conducting the public forum and workshop, collecting water-use data and GIS files, running the water budget analysis, and developing the resource management plan. Lancaster County Conservation District will assist SRBC in monitoring water levels, gathering supplemental water-use data, and cosponsoring the workshop. The Lancaster County Conservation District, members of the respective watershed groups, and other interests will serve on an advisory committee to the SRBC throughout the project period and provide input on the resource management plan in year 2 of the project. The Delaware River Basin Commission will serve as the technical advisor on the water-use analysis program software.

Work Plan & Timeline

The project schedule, tasks descriptions for each phase of the project are presented below. The project schedule is based upon a 10-1-2002 start date and will be revised depending on the grant award date. Project duration is 33 months.

Project Schedule (revised to reflect SOW changes)

<u>Task</u>	<u>Start Date</u>	<u>Complete Date</u>
Phase 1. Initial Public Form	01-01-03	03-31-03
Phase IIa. Data Inventory and Identify Gaps	02-01-03	04-30-03
Phase IIb. Existing Data Collection	03-01-03	03-31-04
Phase IIc. Spatial/GIS Database	03-01-03	03-31-04
Phase IId. Field Data Assessment	09-01-03	11-30-03
	*possible Spring 2004	
Phase III. Water-Budget Analysis & Report	04-01-04	08-31-04
Phase IV. Resource Management Plan	03-01-03	02-28-05
Phase V. Workshop	02-01-05	04-30-05
Final Report	04-30-05	06-30-05

Task Descriptions

TASK: Phase 1. Initial Public Form
COMPLETION DATE: 03-31-03
RESPONSIBILITY: SRBC and Lancaster County Conservation District

A public meeting will be held in the Manheim, Lititz, Ephrata project area to announce and describe the project. The intent is to inform local stakeholders why the project is being undertaken and to solicit participation on an advisory committee to SRBC.

The advisory committee would recommend contacts for sources of water use information, provide input on issues and promote dialogue between municipal government, industry, and community groups. Partnerships with watershed groups would already be in place prior to this meeting. The advisory committee would meet quarterly with the first meeting to review the detailed scope of work for Phase II.

TASK: Phase IIa. Data Inventory and Identify Gaps
COMPLETION DATE: 04-30-03
RESPONSIBILITY: SRBC and Advisory Committee.

Currently, existing data are collected and stored in many places, in various formats, and by different agencies. An inventory of existing environmental data and GIS databases will include the data source, formats, producer, and usefulness to the project. This inventory will be reviewed in cooperation with the advisory committee and data gaps will be identified. The data gaps will be filled through a field measurement effort (see Phase IIc) and by contacting local water users (e.g., industry, purveyors, etc.) for current water use information.

TASK: Phase IIb. Existing Data Collection
COMPLETION DATE: 03-31-04
RESPONSIBILITY: SRBC and Advisory Committee.

The appropriate existing environmental resource information will be collected and reviewed. Data will include current quantities and locations of withdrawals, discharges, imports and exports. Other data will include water quality of the surface- and ground-water resources within the study area and sources in and out of the area. Data sources include Pa. DEP's State Water-Use Data System (SWUDS), Pa. DEP's Unassessed Waters Program and data identified by members of the advisory committee. Other data sources include SRBC's project review database on surface and ground-water use, and information SRBC is currently collecting for Pa. DEP's Source Water Assessment and Protection Program. An inventory will include the data source, formats, producer, and usefulness to the project.

TASK: Phase IIc. Spatial/GIS Database
COMPLETION DATE: 03-31-04
RESPONSIBILITY: SRBC

Spatial data required for the analysis will be collected from existing GIS data available from Pennsylvania Spatial Data Access (PASDA) and SRBC. Lancaster County and local municipalities will be contacted for available GIS data. SRBC will convert required spatial data sets into the GIS files needed for the analysis.

TASK: Phase IIc. Field Data Assessment
COMPLETION DATE: 11-30-03 & tentative Spring 2004
RESPONSIBILITY: SRBC, Lancaster County CD and cooperating partners.

While every effort will be made to utilize the available information, data gaps will need to be filled or data will need to be updated. Some information will need to be acquired from field measurements and sampling. Examples include an effort to measure

water levels from existing water supply wells, sample ground water for nonpoint source pollutants, measure base flow at critical points along the streams crossing the basin, and map observable ground-water discharge points (springs). Field work will be performed by a team of two to three individuals. The team will include a person from the SRBC to provide technical expertise and leadership, while other individuals will be from cooperating groups. SRBC will supply the necessary field equipment to complete the field measurements.

TASK: Phase III. Water-Budget Analysis and Report
COMPLETION DATE: 08-31-04
RESPONSIBILITY: SRBC with technical review by DRBC

A water-use analysis computer program was developed by the Delaware River Basin Commission (DRBC) to assist in the management and allocation of water resources in the Neshaminy Creek Basin. As presented by DRBC, the methodologies are transferable to other watersheds. SRBC proposes to update and adapt this method for use in the project area. The program uses relational database management software that allows for water-use data input, editing, updating, and output for use in a watershed water-use report. Information collected in Phase II will provide the data for this program.

From the water-use analysis program, a watershed analysis report will list the summations of public-supply, industrial, commercial, institutional, and agricultural well withdrawals; public, industrial, and private surface withdrawals; wastewater treatment facility discharges; estimates of aggregate domestic groundwater withdrawals; imports and export of water across the basin; estimates of evaporative loss and consumptive use; and an estimate of septic system discharge to ground water.

These results will help define the stressed or potentially stressed resource areas and provide input to the development of a Water Resource Management Plan (see Phase IV).

TASK: Phase IV. Water Resource Management Plan
COMPLETION DATE: 02-28-05
RESPONSIBILITY: SRBC and Advisory Committee.

A Water Resource Management Plan will be prepared by SRBC in cooperation with the Advisory Committee. This plan will pertain to issues and concerns identified in Phase I and new information resulting from the water budget analysis.

Information will be collected on local zoning ordinances, comprehensive plans, and stormwater management ordinances and compare their relationships to water quantity/supply issues. A summary of quality and quantity threats and problems will be prepared through a review of local efforts to protect water resources such as source water assessment plans, wellhead protection plans, watershed plans, etc. All this information

will be incorporated in a report, which details a comprehensive approach to water resource management based on the protection of important resource areas and strategies that counter the impact of stressed or potentially stressed areas.

SRBC will identify these stressed or potentially stressed areas through the water budget analysis and meetings with the Advisory Committee. Illustrated examples will be included demonstrating effective engineered and behavioral practices that improve, protect, or conserve water resources with estimated costs and recommended locations. The quantification analysis will include a water savings estimate or volume of increased recharge for each management practice identified so planners can assess the benefit of each practice. Recommendations will be included explaining how this information can be applied on a local planning level.

Through the advisory committee, representatives from system users (residential, industries, farmers) and system operators (municipalities, private suppliers), will be asked to review and provide input as the plan is developed.

TASK: Phase V. Workshop
COMPLETION DATE: 04-30-05
RESPONSIBILITY: SRBC and Lancaster County Conservation District.

A public meeting/workshop will be held to present the report and plan. The purpose of this meeting is to educate the local watershed community regarding excessive demands on water supply, the adverse impacts to natural resources, management recommendations to protect the resource, and ways to implement recommendations. The workshop participants will discuss the use of ordinances and other landuse planning techniques to ensure restoration and long-term protection goals.

Measurable Environmental Results/Benefits

The proposed project provides an assessment of water use and resource availability within the study area, identifies stressed or potentially stressed resource areas, and provides a plan that presents several options to protect the water resources of the area.

The study supplies a detailed water budget of the inputs, outputs, and the location of stressed or potentially stressed areas. Working with the local communities, the water budget and resource management plan will increase public awareness of the need for water conservation and its benefit in protecting water supply.

The workshop will present the results to the public and provide information on protection and options and how to implement these strategies through the use of municipal comprehensive plans and ordinances. The workshop and plan also will present

recommended monitoring activities that local watershed groups and municipal officials can put into practice to measure benefits.