Advisory Group for the Heidelberg Tributary Loading Program

Final Report

Lake Erie Protection Fund Project SG 401-11

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Advisory Group for the Heidelberg Tributary Loading Program

Abstract

The Heidelberg Tributary Loading Program (HTLP) of the National Center for Water Quality Research (NCWQR) is the longest-term (44 years) and most detailed program of its kind in the United States. This specialized water quality monitoring program accurately measures the quantities (loads) of nutrients, sediment, and pesticides exported from watersheds by rivers and creeks in Ohio and Michigan. Data from the HTLP are widely used by federal and state agencies, university researchers, industries, engineering firms, environmental organizations and educators in studies and training regarding the impacts on water quality of nonpoint-source pollution, especially that resulting from food production. Yet, the continuation of the HTLP is constantly jeopardized by uncertain funding. This grant provided support to plan, organize and convene an advisory group that would focus on strategies to achieve stable, long-term support for the HTLP, prioritize and evaluate the program components and costs, and identify funding opportunities. As of the end of December 2012, an Advisory Council consisting of seventeen individuals from a broad array of data users and funding partners met in May and December 2012. We are currently developing a formal Funding Coalition that should significantly increase funding stability and the administrative efficiency of the HTLP.

Contents

Introduction

Background

The National Center for Water Quality Research (NCWQR) is a research arm of the science departments of Heidelberg University. Its staff of eleven scientists and technicians assisted by student trainees encompasses expertise in fields ranging from water chemistry to biomonitoring and watershed modeling. The stated mission of the NCWQR is "to promote the sustainable use of water and soil resources while striving to protect ecosystem integrity." The Heidelberg Tributary Loading Program (HTLP) is the flagship research and monitoring program of the NCWQR. It began in 1974 and continues today as a specialized water quality monitoring program designed to accurately measure the total amounts (loads) of pollutants exported from watersheds by rivers and creeks. Such studies require both stream flow and pollutant concentration data during storm runoff events. The sampling program utilizes automatic sampling equipment located at selected U.S. Geological Survey stream gaging stations across Ohio and into Michigan. More than 50% of Ohio's land area is upstream from HTLP stations in both the Lake Erie and Ohio River basins. The current network of 15 stations (**Figure 1**) is unique within the United States in terms of its detail and duration.

The HTLP provides information to support the development of effective and efficient nonpoint source management programs. **Appendix A** presents a summary of some of the kinds of information and data available for the 14 tributary loading stations operated in the 2012 water year, including the locations, years of study, drainage areas upstream of the monitoring stations, land uses, and unit area loads and mean concentrations of nutrients and sediments. Data are also available as far back as 1980 for agricultural herbicides and insecticides in several tributaries. The HTLP also supports the application of adaptive management to water resource protection programs by assessing program effectiveness and identifying emerging problems. Long-term data sets from most of our loading stations are accessible on our web site at http://www.heidelberg.edu/academiclife/distinctive/ncwqr/data. A special set of reports and interpretive summaries on the concentrations, loads and impacts of dissolved phosphorus in Ohio's rivers is available on our home page under "Focus on Dissolved Phosphorus" (http://www.heidelberg.edu/academiclife/distinctive/ncwqr).

Funding History of the Heidelberg Tributary Loading Program

Over the years, funding has come from a combination of federal and state agencies, industries and foundations. Much of that funding history is documented in the annual reports produced the NCWQR (accessible through links on our home page). Most State of Ohio support has been passed to the HTLP through ODNR's Division of Soil and Water Resources. State funding currently supports approximately one-third of the costs of the HTLP. That funding has been provided in every biennium budget since around 1991 with the exception of the 2010-2011 biennium (1 July 2009 through 30 June 2011). During that time we maintained the HTLP with grants and cooperative agreements from USDA's Natural Resources Conservation Service (NRCS), the Ohio Lake Erie Protection Fund (LEPF), the Ohio Water Development Authority (OWDA), the Great Lakes Protection Fund, the Environmental Defense Fund, and the Michigan Department of Natural Resources. Several of these funding sources (e.g., NRCS, LEPF, OWDA) provided a single year of funding as a "stop-gap" measure while we searched for other funding sources.

Funding through the state's biennium budget was restored in July 2011 (for the period 1 July 2011 through 30 June 2013), and other support in Fiscal Year 2012 was provided by Environmental Defense Fund, Great Lakes Protection Fund, IPM Institute, Miami Conservancy District, Michigan Department of Environmental Quality, National Science Foundation, Ohio Lake Erie Protection Fund, Ohio Water Development Authority, The Andersons Inc., The Fertilizer Institute, and USDA NRCS. Funding for individual tributary stations has often been used over the years as matching support for agricultural implementation grants, such as our present Honey Creek Targeted Watershed grant funded by the U.S. EPA.

The Heidelberg Tributary Loading Program (HTLP) is the longest-term and most detailed of its type not only in the Great Lakes Basin but within the entire United States. Its value to studies of nonpoint-source pollution resulting from food production activities grows with each succeeding year. Data from the HTLP are used by federal and state agencies, university researchers, industries, environmental engineering firms, environmental organizations, and educational institutions.

Yet, despite the acknowledged value of the HTLP, the continuation of the program is constantly jeopardized by uncertain funding. **Table 1** demonstrates the frequent changes and wide range in the sources of funding that have been necessary to keep each of the current fifteen monitoring stations in operation.

Station Name
Blanchard River near Findlay OH
Chickasaw Creek at St. Marys, OH
Coldwater Creek near Coldwater, OH
Cuyahoga River at Independence, OH
Great Miami River at Miamisburg, OH
Honey Creek at Melmore, OH
Maumee River at Waterville, OH
Muskingum River at McConnelsville, OH
Portage River at Woodville, OH
River Raisin near Monroe, MI
Rock Creek at Tiffin, OH
Sandusky River near Fremont, OH
Scioto River at Chillicothe, OH
Tiffin River at Stryker, OH
Unnamed Tributary to Lost Creek near Farmer, OH (ne of Hicksville)

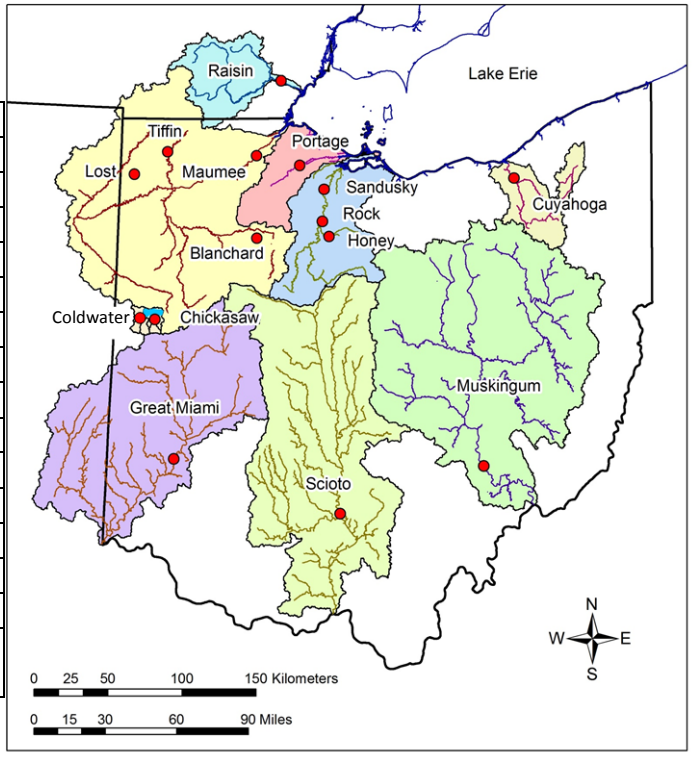

Figure 1. The fifteen stations in the Heidelberg Tributary Loading Program (shown by red dots) that were in operation during the 2012 water year (ending 30 September 2012). The Coldwater Creek station in the Grand Lake Saint Marys watershed came on-line officially in October 2012.

Project Objective and Expected Products

The objective of this project, as stated in our proposal to the Lake Erie Protection Fund, was "to organize an Advisory Group for the Heidelberg Tributary Loading Program (HTLP) that will provide guidance to Heidelberg University's National Center for Water Quality Research (NCWQR) in developing a strategy for achieving stable, long-term funding of this program." We proposed that the advisory group would work with the NCWQR staff to accomplish the following objectives:

1. Focus on a strategy to achieve long-term support for the HTLP.
2. Develop a plan to scale the level of monitoring effort to available resources.
3. Identify and prioritize the essential components of the monitoring program and develop a plan to adjust the program annually as needed.
4. Evaluate costs for each component to determine how to achieve cost savings.
5. Determine funding needs based on objectives (1) through (4) above.

Heidelberg Tributary Loading Program: Funding Status and Needs (as of 12 December 2012)

Calendar Year		2010		2011				2012				2013			
Water Year		2010 WY		2011 WY				2012 WY				2013 WY			2014 WY
State Fiscal Year		2011 Ohio FY				2012 Ohio FY				2013 Ohio FY				2014 Ohio FY	
Tributary Station	Start date	Jul – Sep	Oct - Dec	Jan - Mar	Apr – Jun	Jul – Sep	Oct - Dec	Jan - Mar	Apr – Jun	Jul – Sep	Oct - Dec	Jan - Mar	Apr – Jun	Jul – Sep	Oct - Dec
Lake Erie Drainage															
Maumee	1976	NRCS	NSF NCWQR	NSF LEPF	NSF LEPF	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF Andersons - TFI	NSF → Andersons – TFI →
Sandusky	1975	NRCS	NCWQR- IPM	LEPF	LEPF	LEPF	LEPF	IPM (GLPF)	IPM (GLPF)	IPM (GLPF)	IPM (GLPF)	IPM (GLPF)	IPM (GLPF)	IPM (GLPF)	IPM – Oct only St. Ohio
Cuyahoga	1983	NRCS	NCWQR	LEPF	LEPF	LEPF	LEPF	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio
Portage	2011*	No station	NRCS	NRCS	NRCS	NRCS	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio		
Honey Cr.	1976	GLPF	GLPF	GLPF	GLPF	GLPF	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio
Rock Creek	1983	GLPF	GLPF	GLPF	GLPF	GLPF	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio
Blanchard	2008	Env. Def.	Env. Def.	Env. Def.	Env. Def.	Env. Def.	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio
Lost Cr. Trib.	2008*	Env. Def.	Env. Def.	Env. Def.	Env. Def.	Env. Def.	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio	State of Ohio		
Tiffin River	2008	Env. Def.	NCWQR	OWDA LEPF	LEPF	LEPF St. Ohio	State of Ohio	State of Ohio	State of Ohio	NCWQR	NCWQR				
Raisin	1982	MDNR	MDNR	MDNR	MDNR	MDNR	No coop-	erator							
Ohio River Drainage															
Great Miami	1996	MCD	MCD	OWDA	OWDA	OWDA	OWDA	MCD	MCD	MCD	MCD	MCD	MCD	MCD	MCD
Scioto	1996	inactive			OWDA	OWDA	OWDA	OWDA	OWDA	OWDA	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio
Muskingum	1996	NCWQR	NCWQR	OWDA	OWDA	OWDA	OWDA	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio	St. Ohio
Chickasaw	2008	NRCS	NRCS	NRCS	NRCS	NRCS	State of Ohio	State of Ohio	OWDA	OWDA	OWDA	OWDA	OWDA	OWDA	OWDA
Coldwater	2012	No station				No Funds					ODNR	ODNR	ODNR		

★ Heidelberg operated the Portage River station from 1974-1978 and the Lost Creek Tributary station from 1982-1991.

Current Funding Sources: **Env. Def.** – Environmental Defense Fund/Joyce Foundation; **GLPF** – Great Lakes Protection Fund; **IPM**- IPM Institute of North America, Inc.; **MCD** – Miami Conservancy District; **MDNR** – Michigan Department of Natural Resources; **NCWQR** – Heidelberg National Center for Water Quality Research; **NRCS** – Natural Resources Conservation Service, USDA; **NSF** – National Science Foundation (University of Michigan Grant: Water Sustainability and Climate), 50% funding; **OWDA** – Ohio Water Development Authority; **TFI** – The Fertilizer Institute

Funding status	NCWQR = Operated w/o funds	= Funds Pending	= No Funds Pending
			→ = Funding into CY 2014

6. Identify funding opportunities to meet the funding needs.

The project proposal called for the following products:

1. By-laws or similar organizational document that describes the purpose, goals, purview and structure of the Advisory Group and the roles of its individual members.
2. List of Advisory Group members, their affiliations, and areas of expertise.
3. A case statement describing the Heidelberg Tributary Loading Program (HTLP) and its accomplishments and justifying investments in the long-term operation of the network.
4. A written funding plan that is adaptable to changing funding needs and funding opportunities and that presents an analysis of alternative funding strategies.
5. A draft agreement that explicitly delineates the role of funding entities, the uses of their monetary contributions and resulting data, and expected products to be produced by the NCWQR HTLP.
6. Minutes of the meetings of the Advisory Group and follow-up actions taken or to be taken by the NCWQR with target dates.
7. Detailed final report that will include the first six Deliverables.

Activities and Accomplishments

The NCWQR Advisory Council

A necessary early step in this project was the formation of the advisory group, which is now formally called the NCWQR Advisory Council. This involved (1) selecting a membership representative of the broad range of organizations who have expressed interest in our data, have collaborated with us on tributary loading projects, and/or who have funded the HTLP in the past. Numerous discussions among the NCWQR staff resulted in an initial invitation list of 18 individuals external to the staff of Heidelberg University. Of those, only one individual declined, resulting in 17 external charter members on the Advisory Council. *Ex officio* members consist of the NCWQR director and director emeritus, the NCWQR business manager, and the Heidelberg director of development. The members along with their titles, affiliations and membership categories are listed in **Appendix B**. **Appendix C** presents the Advisory Council by-laws, which describe the purpose, goals, purview and structure of the Council, the roles of individual members, and operational details. It is important to note that the Advisory Council was formed to provide advice on all programmatic areas of the NCWQR, of which the Heidelberg Tributary Loading Program is the overarching program. The by-laws produced by this project had the unexpected benefit of serving as the starting point of discussions about long-term funding options between the NCWQR and the Heidelberg Enterprise Initiative (HEI) committee of the Heidelberg board of trustees. NCWQR staff members conducted a PowerPoint-mediated discussion with that committee in February 2011to provide them a better understanding of NCWQR staffing, operations, and funding needs. That meeting was followed in June 2011 with a HEI committee discussion of the proposed Advisory Council and the draft by-laws.

The first meeting of the Advisory Council was held on 1May 2012 on the Heidelberg campus and was attended by 14 (82%) of the 17 off-campus members. When given the choice of meeting either annually or semi-annually, the Council chose by consensus to meet approximately every six months. Therefore, the second meeting of the Advisory Council was conducted, again on the Heidelberg campus, on 7 December 2012, with 13 (76%) of 17 off-campus members represented (two sent substitutes). The agendas of the first two meetings appear in **Appendix D**. Summaries of the meetings are available on request.

The first session of each meeting of the Advisory Council was devoted to introducing the members to, or updating them on, the major research and monitoring projects being conducted by the NCWQR

staff. This took the form of PowerPoint presentations with discussion taking placing during and following each presentation. This will continue to be a necessary part of future meetings; however, we found that the project discussions left insufficient time to discuss overarching issues related to the funding and trajectory of the NCWQR. Therefore, future Advisory Council meetings will begin with those topics (see the agendas of the May and December meetings) and will be followed by the project presentations. Advisory Council members made numerous helpful suggestions during the meetings. A short list of suggestions related to program funding includes:

- Regarding the Private Well Testing Program, increase participation by sending email inquiries to individuals and organizations who have had their wells tested in the past.
- Although federal agencies probably will not contribute to a funding coalition because of several issues, consider industry-university collaborative efforts through the National Science Foundation.
- Consider requesting funding from entities concerned with Gulf of Mexico hypoxia and harmful algal blooms (HABs).
- Foundations might be a better way to pool resources. We must present them with concrete deliverables at the end of the project period.
- Grant writing is inefficient. Have one prospectus that gets presented to each funding source that we might be interested in working with instead of writing grant proposals repeatedly.
- Several names were suggested as contacts to help locate a local cooperator and funding to continue the River Raisin monitoring station in Michigan.
- Consider making connections with USDA's Long-Term Agro-ecosystem Research network.
- A fee, such as one on fertilizer sales, might be a means of funding the HTLP.

This project also called for us to identify and prioritize essential components of the HTLP and evaluate costs for each program component. In addition, we wanted to evaluate the operating costs for each of our tributary loading stations so that we could quote more-documentable annual costs to our funders. Therefore, we developed a process to estimate operational costs at individual tributary stations more precisely than in the past. Costs include, to varying degrees, travel for sample collections and station maintenance, payment to a local cooperator who ships samples from certain stations, shipping costs for some stations, electricity, sample analyses, equipment maintenance and repair, program administration, and eligible indirect costs, among other costs. An example of the template we are using to itemize estimated operating costs at each station is shown in **Appendix E**.

Funding Coalition

As part of this grant from the Lake Erie Protection Fund, we proposed to establish a "funding coalition" for the Heidelberg Tributary Loading Program. The need for sustainable and dependable funding for the HTLP is clear. As we state in our two-page case statement for an HTLP Funding Coalition, attached as **Appendix F**:

> Our current means of funding, which primarily consists of a combination of short-term funding commitments from diverse groups, is undercutting our operational efficiency, as well as our planning for major equipment replacements and upgrades. More importantly, the uncertainty of our funding base makes it difficult to attract new staff to whom we can pass our unique "institutional memory" from our soon-to-be fully retiring senior staff. Given the widespread use of HTLP datasets by governmental agencies, industrial groups, university researchers and environmental organizations, we believe that this unique program warrants establishment of what may also be a unique funding base. That funding base is an HTLP Funding Coalition.

The success of the HTLP Funding Coalition will be dependent on commitments of relatively modest but long-term support from Coalition partners. As explained in Appendix F:

> We will seek to broaden the base of support within each sector of the Funding Coalition partners. We believe that for many potential funding partners, participation in such a program would fall either within their funding program elements or within discretionary portions of their budgets. Fund Coalition partners will have an annual opportunity to review program progress, as well as examine expenditures of program funds. Budgetary details for managing funds will be developed in consultation with Funding Coalition partners. Our goal is to arrange funding support of about $700,000 per year."

Among the proposed products resulting from this LEPF grant, we stated that we would develop a case statement describing the Heidelberg Tributary Loading Program (HTLP) and its accomplishments and justifying investments in the long-term operation of the network. We have developed and distributed two versions of such a case statement since 2010. The most recent version of that document is presented as **Appendix G**. We also stated that we would develop a draft agreement that explicitly delineates the role of funding entities, the uses of their monetary contributions and resulting data, and expected products to be produced by the HTLP. We have not yet reached an appropriate point to develop that document.

Our formation of an NCWQR Advisory Council represents a major milestone that has already led to several new initiatives by our staff. A side benefit has been that several of the Advisory Council members have requested to meet with us either before or after the Council meetings in order to discuss current and potential research collaborations. For example, following our 7 December 2012 meeting, we conferred with both Carrie Vollmer-Sanders of The Nature Conservancy and Dr. Mark Thomas of Monsanto regarding some new initiatives.

Although we have progressed more slowly than we had hoped in forming the Funding Coalition, most of that delay has simply been the result of the increasing demands of administering multiple funding sources, as was described above, as well as pursuing new leads for funding. In the 2012 fiscal year we administered 28 separate accounts. One of our Advisory Council members observed at the May 2012 meeting that it was not clear how a funding coalition would be different from the arrangement we have now. The comment was in reference to the fact that for a number of years we have received monetary support from several corporations that provide for general program support; that is, their funds permit us to channel the funds to areas of need within the HTLP each year without the constraint of being tied to specific budget line items. That has provided much-needed flexibility in addressing fluctuating program needs, such as equipment repair and replacement, travel for presentations of HTLP results, support of staff time and travel in attending off-campus meetings with state and federal agencies and at conferences, and various other needs. Those same funders also do not require individual, formal reports regarding their funds but instead accept our various data sets, presentations and written reports as sufficient for their reporting purposes. This approach eliminates the need to track even more budgets and write even more reports. A formal Funding Coalition consisting of more contributors representing a greater diversity of interests will, we hope, confer greater stability and permit more-certain planning for the future of the Heidelberg Tributary Loading Program.

To bring the Funding Coalition to fruition, we will pursue several steps in the next few months. They will include:

1. Continue the development of a Funding Coalition prospectus.
2. Prepare a PowerPoint presentation to use in conjunction with the prospectus when visiting potential funding partners.
3. Make in-person presentations to several potential funding partners between January and March 2013.
4. Develop a formal agreement of understanding between the funding partners and the NCWQR.
5. Involve the Advisory Council actively in the process of forming the Funding Coalition.

Appendices

A. NCWQR Advisory Council Members

B. Station, Watershed, and Water Chemistry Characteristics of the 14 Tributary Loading Stations Operated in the 2012 Water Year

C. Advisory Council By-Laws

D. Agendas of First Two Advisory Council Meetings

E. Example of Cost Estimate for Individual Tributary Loading Stations

F. Case Statement – HTLP Funding Coalition

G. Case Statement – The Heidelberg Tributary Loading Program

Appendix A

NCWQR Advisory Council Members

Person	Position Title	Representing	Membership Category
External Organizations (Voting Members)			
Dr. Larry M. Antosch	Senior Director, Program Innovation and Environmental Policy	Ohio Farm Bureau	Other Nonprofits & Coalitions
Cynthia Brookes	Watershed Specialist	Sandusky River Watershed Coalition	Watershed Groups
Dr. Thomas W. Bruulsema	Director, North America - Northeastern	International Plant Nutrition Institute	Other Nonprofits & Coalitions
Douglas R. Busdeker	Area General Manager, Farm Centers; Plant Nutrition Group	The Andersons, Inc.	Agricultural Corporations & Commodity Groups
Karen Chapman	Great Lakes Regional Director	Environmental Defense Fund	Other Nonprofits & Coalitions
Thomas R. Crane	Deputy Director	Great Lakes Commission	Other Nonprofits & Coalitions
Dr. Joe DePinto	Senior Scientist	LimnoTech	Modeling & Engineering Firms
Jeff DeShon	Ecological Assessment Manager	Ohio EPA, Surface Water, Columbus	State of Ohio
Mike Ekberg	Manager, Water Monitoring	Miami Conservancy District	Watershed Conservancy Districts
Kevin Elder	Chief, Division of Livestock Environmental Permitting	Ohio Department of Agriculture	State of Ohio
Dr. Norman R. Fausey	Research Leader and Supervisory Research Soil Scientist	USDA Agricultural Research Service, OSU Columbus	Federal Agencies
Richard Focht	President	Seneca Industrial & Economic Develop-ment Corporation	Local Economic Interests
James R. Morris	Director	U.S. Geological Survey, Ohio-Michigan	Federal Agencies
Dr. Carol A. Stepien	Director	University of Toledo Lake Erie Center	Universities
Dr. Mark A. Thomas		Monsanto, Environmental Sciences Technology Center	Pesticide & Lawn Chemical Manufacturers

Carrie Vollmer-Sanders	Western Lake Erie Basin Project Director	The Nature Conservancy	Other Nonprofits & Coalitions

Heidelberg University (*ex officio*)

Dr. David Baker	Director Emeritus	NCWQR	Director Emeritus, NCWQR
Charlie Cole	Member	Heidelberg Univ. Board of Trustees	Board of Trustees
Dr. Ken Krieger	Director	NCWQR	Director, NCWQR
Lee Martin	Executive Director of Development	Heidelberg University Development Office	Director of Development
Nancy Miller	Business Manager	NCWQR	Staff member, NCWQR

Appendix B

Station, Watershed and Water Chemistry Characteristics of the 14 Tributary Loading Stations Operated in the 2012 Water Year

Table B.1. Station Identifiers, Years of Study, and Coordinates.

Station name	USGS No.	Upstream Area, km^2	HUC_8	Years of study*/ Period of Record	LAT_DMS	LON_DMS
Blanchard River near Findlay OH	4189000	895.8	4100008	5 years, 2008-	41°03'21"	83°41'17"
Chickasaw Creek at St. Marys, OH	40291308-4285400	42.5	5120101	4 years, 2009-	40°29'12.8"	84°28'54.2"
Cuyahoga River at Indepen- dence, OH	4208000	1,830.3	4110002	31 years 1982-	41°23'43"	81°37'48
Great Miami River at Miamisburg, OH	3271500	7,018.5	5080002	17 years, 1996-	39°38'40"	84°17'23"
Honey Creek at Melmore, Ohio	4197100	385.7	4100011	37 years 1976-	41°01'20"	83°06'35"
Maumee River at Waterville, OH	4193500	16,387.6	4100006	35 years, 1975-1978, 1982-	41°30'00"	83°42'46"
Muskingum River at McConnelsville, OH	3150000	19,214.7	5040004	19 years, 1994-	39°38'42"	81°51'00"
Portage River at Woodville, OH	4195500	1,108.0	4100010	2 years, 2011-	41°26'58"	83°21'41"
River Raisin near Monroe, MI	4176500	2,697.6	4100002	35 years, 1982-	41°57'38"	83°31'52"
Rock Creek at Tiffin, OH	4197170	89.6	4100011	30 years, 1983-	41°06'49"	83°10'06"
Sandusky River near Fremont, OH	4198000	3,238.7	4100011	38 years, 1975-	41°18'28"	83°09'32"
Scioto River at Chillicothe, OH	3231500	9,964.6	5060002	13 years[2], 1996	39°20'29"	82°58'16"
Tiffin River at Stryker	4185000	1,061.4	4100006	5 years, 2008-	41°30'16"	84°25'47"
Unnamed Tribu- tary to Lost Creek near Farmer, OH (ne of Hicksville)	4185440	11.0	4100009	5 years, 2008	41°21'42"	84°41'28"

[2] Scioto records incomplete 2009-2011

Table B.2. Land use characteristics of tributary watersheds.

Monitoring station	Land use as percent of total watershed area upstream from stream gage.							
	Agriculture	Forest	Grass_Hay_ Pasture	Open_ Water	Other	Urban	Wetland	Total
Blanchard	78.8	6.3	3.5	0.6	0.1	10.5	0.3	100
Chickasaw	79.0	2.8	8.9	0.0	0.1	9.1	0.0	100
Cuhayoga	9.0	33.6	11.8	2.6	0.4	39.5	3.1	100
Great Miami	64.5	8.6	8.5	1.0	0.1	17.0	0.3	100
Honey Creek	81.1	9.5	2.0	0.3	0.2	6.7	0.2	100
Lost Creek	77.5	7.9	8.6	0.3	0.0	4.3	1.5	100
Maumee	73.3	6.5	6.3	0.7	0.2	10.6	2.3	100
Muskingum	23.6	43.0	18.8	1.2	0.4	12.4	0.5	100
Portage	84.4	4.5	1.3	0.4	0.2	9.0	0.2	100
River Raisin	49.6	11.0	18.7	1.4	0.4	10.8	8.2	100
Rock Creek	71.9	11.4	7.8	0.0	0.0	8.8	0.2	100
Sandusky	77.6	8.8	4.3	0.5	0.3	8.1	0.3	100
Scioto	61.7	10.9	8.6	1.0	0.2	17.3	0.3	100
Tiffin	60.5	8.9	14.8	1.0	0.2	7.5	7.0	100

Table B.3. Unit area yields (kg/ha) of nutrients and sediments exported from tributary loading stations. For long-term stations values represent the average of annual flow weighted means for the 16 year period including the 1996-2011 water years. For the Blanchard, Tiffin, Lost Creek tributary the averages are for the four year period including the 2008-2011 water years. For Chickasaw Creek, the averages are for three years, 2009-2011. The Portage values represent the 2011 water year only.

Station name	Discharge	SS,	TP,	DRP,	Nitrate-N	TKN,	Chloride
	cm	unit area yield, kg/ha	unit area yield, kg/ha	unit area yield, kg/ha	unit area yield, kg/ha	unit area yield, kg/ha	unit area yield, kg/ha
Blanchard River near Findlay OH	37	568	1.76	0.43	16.2	6.4	117
Chickasaw Creek at St. Marys, OH	34	448	2.11	0.936	49.6	8.2	155
Cuyahoga River at Independance, OH	52	1316	1.41	0.2	8.5	5.44	785
Great Miami River at Miamisburg, OH	43	633	1.71	0.61	17.02	5.39	180
Honey Creek at Melmore, Ohio	36	491	1.5	0.37	18.46	5.83	76
Maumee River at Waterville, OH	34	565	1.35	0.28	19.13	5.86	93
Muskingum River at McConnelsville	40	323	0.72	0.15	6.49	2.92	140
Portage River at Woodville, OH	50.6	650	2.07	0.453	26.8	8.31	140
River Raisin near Monroe, MI	29	256	0.57	0.12	13.34	3.28	112
Rock Creek at Tiffin, OH	33	868	1.59	0.23	12.01	6.01	74
Sandusky River near Fremont, OH	39	719	1.63	0.32	20.97	6.45	100
Scioto River at Chillicothe, OH	39	462	1.33	0.48	14.14	4.57	163
Tiffin River at Stryker	38	264	0.86	0.24	13.23	4.57	86
Unnamed Tributary to Lost Creek	45	628	1.77	0.49	11.53	7.46	49

Table B.4. Unit area yields (lbs/acre) of nutrients and sediments exported from tributary loading stations. For long-term stations values represent the average of annual flow weighted means for the 16 year period including the 1996-2011 water years. For the Blanchard, Tiffin, Lost Creek tributary the averages are for the four year period including the 2008-2011 water years. For Chickasaw Creek, the averages are for three years, 2009-2011. The Portage values represent the 2011 water year only.

Station name	Discharge	SS,	TP,	DRP,	Nitrate-N	TKN,	Chloride
	inches	unit area yield, lb/acre	unit area yield, lb/acre	unit area yield, lb/acre	unit area yield, lb/acre	unit area yield, lb/acre	unit area yield, lb/acre
Blanchard River near Findlay OH	14.6	507	1.57	0.38	14.47	5.72	104
Chickasaw Creek at St. Marys, OH	13.4	400	1.88	0.84	44.29	7.32	138
Cuyahoga River at Independance, OH	20.5	1175	1.26	0.18	7.59	4.86	701
Great Miami River at Miamisburg, OH	16.9	565	1.53	0.54	15.20	4.81	161
Honey Creek at Melmore, Ohio	14.2	438	1.34	0.33	16.48	5.21	68
Maumee River at Waterville, OH	13.4	505	1.21	0.25	17.08	5.23	83
Muskingum River at McConnelsville	15.7	288	0.64	0.13	5.80	2.61	125
Portage River at Woodville, OH	19.9	580	1.85	0.40	23.93	7.42	125
River Raisin near Monroe, MI	11.4	229	0.51	0.11	11.91	2.93	100
Rock Creek at Tiffin, OH	13.0	775	1.42	0.21	10.72	5.37	66
Sandusky River near Fremont, OH	15.4	642	1.46	0.29	18.73	5.76	89
Scioto River at Chillicothe, OH	15.4	413	1.19	0.43	12.63	4.08	146
Tiffin River at Stryker	15.0	236	0.77	0.21	11.81	4.08	77
Unnamed Tribu- tary to Lost Creek	17.7	561	1.58	0.44	10.30	6.66	44

Table B.5. Flow-weighted and time-weighted mean concentrations of nutrients and sediments exported from tributary loading stations. For long-term stations values represent the average of annual flow weighted means for the 16 year period including the 1996-2011 water years. For the Blanchard, Tiffin, Lost Creek tributary the averages are for the four year period including the 2008-2011 water years. The Portage values represent the 2011 water year only.

Station name	Parameter	SS, mg/L	TP, mg/L	DRP mg/L	Nitrate-N, mg/L	TKN, mg/L	Chloride, mg/L
Blanchard River near Findlay OH	FWMC	148	0.456	0.111	4.76	1.76	33.6
	TWMC	40	0.243	0.113	6.36	1.05	67.5
Chickasaw Creek	FWMC	136	0.624	0.270	15.45	2.53	48
	TWMC	25	0.332	0.216	8.49	1.47	134
Cuyahoga River at Independence	FWMC	239	0.266	0.041	1.70	1.04	152.9
	TWMC	118	0.210	0.063	2.45	0.89	165.3
Great Miami River at Miamisburg	FWMC	139	0.395	0.147	4.16	1.26	44.5
	TWMC	65	0.354	0.194	3.67	1.00	65.0
Honey Creek at Melmore, Ohio	FWMC	127	0.389	0.097	5.48	1.60	22.6
	TWMC	44	0.176	0.061	4.44	0.98	31.5
Maumee River at Waterville,	FWMC	162	0.384	0.079	5.803	1.711	28.2
	TWMC	*68*	*0.222*	*0.056*	*4.086*	*1.346*	*42.3*
Muskingum River at McConnelsville,	FWMC	79	0.179	0.038	1.62	0.73	35.9
	TWMC	44	0.144	0.045	1.41	0.67	46.6
Portage River at Woodville, OH	FWMC	128	0.408	0.090	5.30	1.64	27.6
	TWMC	38	0.159	0.055	4.40	0.95	64.5
River Raisin near Monroe, MI	FWMC	93.1	0.196	0.040	4.779	1.154	39.9
	TWMC	*53.2*	*0.119*	*0.025*	*2.793*	*0.876*	*49.0*
Rock Creek at Tiffin, OH	FWMC	240	0.449	0.070	3.87	1.77	24.0
	TWMC	43	0.132	0.033	2.28	0.69	36.2
Sandusky River near Fremont	FWMC	177	0.400	0.076	5.727	1.650	26.8
	TWMC	72	0.188	0.043	4.138	1.061	41.1
Scioto River at Chillicothe, OH	FWMC	115	0.345	0.128	3.86	1.21	45.6
	TWMC	60	0.304	0.161	3.47	0.94	53.7
Tiffin River at Stryker	FWMC	71	0.231	0.064	3.57	1.22	22.6
	TWMC	52	0.165	0.050	2.30	0.97	29.9
Unnamed Tributary to Lost Creek	FWMC	139	0.389	0.107	2.60	1.67	10.8
	TWMC	24	0.125	0.045	2.35	0.87	16.9

Appendix C

NATIONAL CENTER FOR WATER QUALITY RESEARCH OF HEIDELBERG UNIVERSITY
TIFFIN, OHIO

ADVISORY COUNCIL BY-LAWS

ARTICLE I – NAME

The name of the advisory group will be the "National Center for Water Quality Research Advisory Council", also known as the "NCWQR Advisory Council" or herein as the "Advisory Council".

ARTICLE II – GOAL

The goal of the Advisory Council will be to provide guidance to the National Center for Water Quality Research (NCWQR) that will help to

A. Maintain and enhance its relevance to environmental concerns of researchers, managers, policy-makers and the community at large in both the public and private sectors at the local, state, regional, national, and international levels;
B. Develop a sustainable economic platform for the NCWQR; and
C. Identify emerging and expanding water quality issues at local through international scales that might provide new research opportunities for the NCWQR.

ARTICLE III – PURPOSE

The Advisory Council will advise the NCWQR staff with regard to three primary goals:

A. Increase the scientific and societal relevance of the NCWQR. Areas of advisement could include:
    1. Approaches to expand the geographic, societal and scientific impact of NCWQR programs,
    2. Maintenance and potential expansion of the Heidelberg Tributary Loading Program,
    3. Further development of NCWQR's Cooperative Private Well Testing Program,
B. Stabilize NCWQR's funding stream and locate new funding sources. Suggestions might include:
    1. Ways to improve the operational and fiscal efficiency of the NCWQR,
    2. Marketing tools and strategies to enhance and stabilize the funding stream for the NCWQR,
    3. Sources and methods of funding to sustain and develop the research and monitoring programs of the NCWQR.
C. Identify newly developing or expanding water quality issues at the local, state, regional, national and international levels that might provide new opportunities to the NCWQR for water quality research. Possible recommendations include specific suggestions regarding:
    1. Adjustment or expansion of NCWQR's existing suite of water chemistry analyses to include compounds of emerging or increasing interest to society,
    2. Expansion of NCWQR's biological research and monitoring programs.

ARTICLE IV – ROLE OF INDIVIDUAL MEMBERS

Individual Members will:

A. Prepare for Advisory Council meetings by reviewing advance documents received from the NCWQR staff or other members of the Advisory Council for discussion at the meeting;

B. Remain alert to program and funding opportunities that may benefit the NCWQR, and bring such opportunities to the attention of the NCWQR Director in a timely way;
C. To the extent practical, physically attend each meeting of the Advisory Council, and when travel to the meeting is not practical, attend the meeting by video-conference or conference call;
D. Become familiar with the mission statements and histories of both Heidelberg University and the NCWQR;
E. Maintain an up-to-date awareness of information on the NCWQR web site.

ARTICLE V – LIMITATIONS, LEGAL AUTHORITY AND LIABILITY

All recommendations offered by the Advisory Council will be strictly advisory in nature and will not be binding on the NCWQR. The Advisory Council will have no legal authority to put its recommendations into action nor will it have any liability that may result from consequences of actions taken by Heidelberg University or the National Center for Water Quality Research.

ARTICLE VI – MEMBERSHIP

A. Voting members will initially be appointed by the *ex officio* members of the Advisory Council. Changes and new appointments to the voting membership will be made by the Advisory Council during and after its first meeting. Voting members of the Advisory Council will consist of at least one representative of each of the following interests:
    1. Federal environmental agencies, such as the USEPA, NOAA, USGS, USDA and others
    2. State of Ohio agencies; for example ODNR, Ohio EPA, and Ohio Department of Agriculture
    3. Ohio and Michigan watershed conservancy districts
    4. Agriculture-related corporations
    5. Pesticide and lawn chemical manufacturers
    6. Foundations that focus on environmental issues
    7. Non-profit environmental and agricultural organizations and coalitions with a regional or national scope
    8. Watershed groups within the watersheds encompassed by NCWQR studies
    9. Universities engaged in current or recent collaboration with the NCWQR
    10. Either the Seneca Industrial and Economic Development Corporation (SIEDC) or the Tiffin Area Chamber of Commerce.

B. *Ex officio* members of the Advisory Council will include each of the following individuals or a designated representative:
    1. Heidelberg University Director of Development
    2. One member of the Heidelberg University Board of Trustees
    3. Director of the National Center for Water Quality Research
    4. Director emeritus of the National Center for Water Quality Research
    5. One additional staff member of the National Center for Water Quality Research who will also serve as Secretary
    6. Heidelberg University School of Business professor of marketing

Ex officio members will have a voice in the deliberations of the Advisory Council but will not have the power to vote. The Advisory Council may designate additional *ex officio* members as deemed appropriate.

C. Terms of appointment. Voting members will be appointed to staggered two-year terms and may be reappointed to consecutive terms. Approximately one-half of charter voting members will be appointed to three-year terms. *Ex officio* members will have permanent appointments; an *ex officio* member or his/her immediate superior, as appropriate, may appoint a permanent replacement from that operational subdivision of the University or an *ad hoc* (non-voting) member for the purpose of attending and reporting on a specific Advisory Council meeting.

ARTICLE VII – OFFICERS

A. The Advisory Council will elect a Convener and a Co-Convener from its members. These officers will serve a one-year term and may be re-elected to consecutive terms. The Convener, or in his/her absence the Co-Convener, will preside at all meetings of the Advisory Council.
B. A Secretary will be appointed from the NCWQR staff by the NCWQR Director and will serve as an *ex officio* member. The secretary will prepare advance materials as requested by the NCWQR Director and will mail or email them to all Advisory Council members at least one week prior to each meeting. The secretary will also record the minutes of each meeting and will send a copy of the draft minutes, which will clearly indicate all items requiring action, to all Advisory Council members within two weeks following the meeting.

ARITCLE VIII – MEETINGS AND AGENDAS

Meetings will be conducted at least annually. The Advisory Council may call for more frequent meetings by a majority vote. The NCWQR Director will give notice of all meetings at least three months prior to each meeting. Notice of any special meetings will be accompanied by a statement of the purpose of the meeting. The Convener will coordinate with the NCWQR Director to develop an agenda for each meeting. Any member of the Advisory Council may submit agenda items up to two weeks prior to any meeting, at which time the NCWQR will distribute the agenda to all members.

ARTICLE IX – DECISION-MAKING

Unless elsewhere directed in these By-Laws, any issue requiring a decision on the part of the Advisory Council will be made by consensus unless at least one member (voting or *ex officio*) requests a vote. Following such request, a simple majority vote by those members holding voting privileges and attending the meeting in person or by video-conference when the motion is discussed will decide the issue. Proxy votes in writing or by email will not be accepted. To be considered valid, all decisions, whether by consensus or vote, will require a quorum; a quorum will consist of more than one-half (1/2) of the current Advisory Council members who are eligible to vote. Therefore, more than half of the current voting members must be in attendance at an Advisory Council meeting if formal decisions and recommendations are to be made.

ARTICLE X – COMPENSATION

No member of the Advisory Council will be provided with monetary compensation for their time or travel costs associated with their activities related to the Advisory Council, including attendance at its meetings. If, on occasion, funds are available for compensation of travel expenses, the availability of such funds will be announced to all members at least one month in advance of the next meeting to which the funds could be applied.

ARTICLE XI – AMENDMENT OF BY-LAWS

These By-Laws may be amended at the discretion of the Advisory Council. Any member, either voting or ex officio, may propose an amendment to the By-Laws. The proposed amendment must be presented in writing by e-mail or mail at least three months prior to the next scheduled meeting of the

Advisory Council to provide sufficient time for consideration and on-line or telephone debate. The proposed amendment will be considered tentatively adopted upon receiving the affirmative vote of two-thirds (2/3) of all voting members. The proposed amendment will then be forwarded to the Provost and legal counsel of Heidelberg University, who will determine whether or not the amendment conflicts with Heidelberg by-laws and policies. Upon determination that no conflict exists, the proposed amendment will be adopted as part of the By-Laws.

ARTICLE XII – DISSOLUTION OF THE ADVISORY COUNCIL

The Advisory Council will be dissolved and will cease to exist as the result any one of the following actions:

A. A vote by two-thirds (2/3) of the current voting members of the Advisory Council;
B. A directive from the President or Provost of Heidelberg University;
C. Failure of the Advisory Council to conduct a regular meeting for twenty-four (24) consecutive months.

ARTICLE XIII – ACKNOWLEDGEMENT

These By-Laws were modeled in part and some language (e.g., part of Article VI) was used verbatim from the "Old Woman Creek National Estuarine Research Reserve Advisory Council By-Laws" (revised May 2005).

Appendix D

Agendas of First Two
Advisory Council Meetings

NCWQR ADVISORY COUNCIL AGENDA

First Meeting – Tuesday, 1 May 2012
Aramark Room, Hoernemann Refectory, Heidelberg University

9:00 A.M. Refreshments

9:30 Welcome – President Huntington and Provost Weininger (5 minutes)

9:35 Introductions (15 min.)

9:50 Overview & Discussion of NCWQR Research and Monitoring Programs (5 to 10 min. each)

- General Overview of NCWQR Structure, Staffing and Funding - Ken
- Heidelberg Tributary Loading Program – Ken, Pete
- Pesticide Program – Aaron
- Private Well Testing Program – Nancy
- Analytical Services – Ellen, Barb, Jack

11:00 BREAK (10 min.)

- GLNPO Grant, GLPF Grant, Targeted Watershed Grant – Dave
- NSF-WSC Grant, EcoFore Grant – Pete
- Watershed Modeling – Rem
- Biological Studies – Jake, Ken

11:40 Overview of NCWQR Education and Outreach Activities (5 min. each)

- Heidelberg Environmental Science Curriculum – Ken
- Informal On-Campus Education and Extension Activities – Ellen, Jake, Aaron
- Off-Campus Outreach & Impacts of NCWQR Programs – Dave, Pete

12:15 P.M. LUNCH – Hoernemann Refectory (covered by NCWQR)

1:00 Discussion and Recommendations

- HTLP Funding Coalition (30 minutes) – Dave
- NCWQR Endowments (5) – Dave
- Other Funding Options (10) – Ken
- NCWQR Data Sharing Policies (10) – Ken
- New Horizons for NCWQR Research and Education (15) – council members
- Summary of Day's Discussions and Recommendations (5) – Ken

2:15 Advisory Council Organizational Matters

- Review, modify and adopt bylaws; elect convener and co-convener (15 minutes)
- Discuss membership rotations (1, 2 and 3-year appointments) (10)
- Recommend additional representation on council (5)

2:45 Adjourn

2:50 Tour of NCWQR Facilities – 3rd floor of Gillmor Hall (about ½ hour)

NCWQR ADVISORY COUNCIL AGENDA

Second Meeting – Friday, 7 December 2012
Aramark Room, Hoernemann Refectory, Heidelberg University

9:00 A.M. Optional Tour of NCWQR Facilities – 3rd floor of Gillmor Hall

9:30 Coffee, tea, water available in Aramark Room of Hoernemann Refectory

10:00 Introductions

10:10 Program and Project Updates and Discussion

- The Heidelberg Tributary Loading Program (HTLP)
  - Overview of HTLP, and HTLP network characteristics
  - The SPARROW model and NCWQR's critique
- Honey Creek Targeted Watershed Project – USEPA
- P Soil Test Metric – GLPF project
- Bioavailable Phosphorus Transport to Lake Erie – USEPA GLNPO project
- EcoFore project
- Climate change and the Great Lakes – NSF project
- Harmful Algal Bloom (HAB) forecasting – NOAA project
- IPM and other watershed modeling projects
- Ohio EPA nearshore biomonitoring project

12:00 P.M. LUNCH (covered by NCWQR) – Go through cafeteria in Hoernemann Refectory; bring lunch back to the Aramark Room

12:45 NCWQR - Present status and plans for the future

- Budget status
- Funding coalition
- Partnership with Dinsmore PSA
- NCWQR's goals for FY 2013 and beyond
- Revised mission and vision statements; results of strategic planning sessions
- NCWQR name
- Concerns of Advisory Council members
- Summary of the day's discussions and recommendations
- Month of next meeting

2:30 Adjournment

2:45 Optional Tour of NCWQR Facilities – 3rd floor of Gillmor Hall

"Homework"

- A.C. member paragraphs on how NCWQR projects/data intersect member interests and affect policy decisions (for use in funding requests & prospectus)

Appendix E

Example of Cost Estimate for Individual Tributary Loading Stations

MONITORING STATION COST ESTIMATE FOR NUTRIENTS & SEDIMENTS - DOES NOT INCLUDE METALS OR PESTICIDES

STATION: **CUYAHOGA** Samples will be shipped? **YES** Weekly travel to station? **NO**

A. PERSONNEL SALARIES, WAGES & BENEFITS							**BASED ON 10 STATIONS IN TRIB LOADING PRGM**
1. Salaries - Senior & Support Staff (Baker, Krieger, Richards, Confesor, Miller)							
5 people X 25% of their time X individual salaries, divided by 10 stations					$ 6,147		This cost applies to the overall program assuming 10 monitoring stations.
2. Salaries & Wages - Chem lab Staff (Kramer, Roerdink, Ewing, Merryfield, Boehler, student							This cost is based on an average of 550 samples/yr & 10 monitoring stations
2.a. Lab Time	This assumes that 10 stations equally share 80% of $195,648, which is total salaries of Jack (at 1/2 full-time for CY12), Ellen, Barb, Aaron's NCWQR time, and half of Jake's time + $2000/yr students				$ 14,417		
2.b. Travel to station		**0**	days/wk	2 persons	$ -	* See footnote.	This is a **variable** cost dependent on distance. Rationale: No weekly sample collections by NCWQR staff.
				Total Salaries & Wages	$ 20,564		
3. Benefits, estimated at 28% of S&W					$ 5,758		
					TOTAL PERSONNEL	$ 26,322	
$26,322	**65.8%** = percent of $40K contributed by SW&B excluding travel						
B. NON-PERSONNEL STATION OPERATING COSTS (travel, shipping, electricity, pump repairs, etc.)							
1. Travel	1. Weekly collections	@ $0.51 per mile 2011 federal rate	round-trip miles =	**0**	$ -		This is a **variable** cost dependent on distance. Rationale: No weekly sample collections by NCWQR staff.
	2. Station maintenance, pump repair, etc.		rd-trp mi =	**190**	$ 291		3 times per year
2. Electricity	Paid by who? NCWQR						
If NCWQR pays, historic ave. monthly rate# =				**$ 85**	$ 1,020	# See footnote.	This is a **variable** cost dependent on station
3. Shipping			weekly both ways	**$ 56.25**	$ 2,925		This is a **variable** cost dependent on distance
4. Pumping system repairs & maintenance (annual average)					$ 800		This is a **fixed cost except** grab stations
5. Labware, lab instrument repair, reagents, paper, etc.					$ 2,000		This is a **fixed** cost for all stations with ave. 550 samples/yr
6. Maintenance agreements					$ 443		Proportional charge here is only for Dionex ($4,427 in FY2011)
7. Observer (cooperator)	52 weeks/year				$ 780		Observers are paid $15 per week.
					TOTAL NON-PERSONNEL	$ 8,258	
C. TOTAL DIRECT COSTS						$ 34,580	
D. INDIRECT COSTS	0.15	% of SW&B				$ 3,948	$ 11,582 Heidelberg I.C. Cost Match at 59% of SW&B
TOTAL COSTS						$ 38,528	

* cost = days/week X number of travelers X ave. daily salary of $205 ($45,000/yr, 220 days) X 52 weeks/year

Electricity rate is based on average of 12 months provided by Nancy on 20 May 2011.

Appendix F

Case Statement – HTLP Funding Coalition

NATIONAL CENTER FOR WATER QUALITY RESEARCH

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310 East Market Street
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A Funding Coalition to Support the Heidelberg Tributary Loading Program

This document summarizes the case for establishing a Funding Coalition to support the ongoing operation of the Heidelberg Tributary Loading Program (HTLP). The HTLP *uniquely supports* efforts to reduce the adverse impacts of agriculture on water resources. The goal of reducing agricultural pollution while increasing food production is shared by many governmental agencies, agricultural industries, farming groups, environmental organizations and foundations. Achievement of that goal represents a major challenge to our society. The HTLP's historical datasets and ongoing monitoring programs provide freely available, critically important "information infrastructure" for working toward that goal, not just in the Lake Erie Basin and Ohio, but also regionally, nationally and internationally. As such, the HTLP warrants broad funding support.

To address water pollution problems, it is essential to know the relative importance of point sources and nonpoint sources of the pollutants that are causing those problems. *Point sources* are associated with domestic and industrial water use. In developed countries, waste treatment processes have greatly reduced the amounts of point source pollutants. However, point sources still contribute to water pollution problems. The amounts of pollutants from point sources *are directly measured* where they enter surface waters through identifiable pipes. *Nonpoint sources* are associated with the interaction of land use and rainfall/snowmelt events. As water from rain and snow-melt flows into streams, that water carries pollutants derived from land uses, such as agriculture, forestry, transportation and urban/suburban uses. Because it is impossible to measure nonpoint pollutants directly everywhere they enter streams, nonpoint pollutants *are measured indirectly*. The total pollutant export (load) from both point and nonpoint sources is measured at tributary loading stations. Nonpoint source contributions are calculated by subtracting upstream point source inputs from the total pollutant export. While this concept of indirectly measuring nonpoint pollutants is straightforward, its implementation is uncommon because accurately measuring pollutant transport in streams and rivers requires intensive, long-term sampling programs. The HTLP is recognized as *the most detailed and long-term program of this type in the U.S*.

Heidelberg researchers began studies of storm event transport of nutrients and suspended sediments into Lake Erie in 1969, and, since 1975, have operated a network of tributary loading stations throughout Ohio and extending into Michigan. In 1980, pesticide monitoring was added to the program. The major objectives of this program are --

1. To accurately quantify the magnitude and nature of agricultural non-point pollution;
2. To support the development of appropriate agricultural pollution abatement programs;
3. To assess the effectiveness, at the watershed scale, of abatement program implementation;
4. To identify emerging problems associated with changing agricultural production practices.

We are often asked how we have been able to maintain the HTLP in the face of ever declining support for water monitoring programs. Our answer is five-fold. (1) Our location -- we are in a highly productive agricultural region whose soils are particularly prone to runoff and whose drainage enters

the western basin of Lake Erie, the most nutrient-vulnerable area of the Great Lakes. (2) We have a highly automated analytical laboratory that keeps our costs low, even while meeting stringent quality control measures. (3) We capitalize on economies of scale. (4) We have developed a diversified funding base that includes governmental agencies, industries and foundations. (5) Where funding shortfalls for long-term stations develop, we continue station operation with limited laboratory reserves until we are able to secure external support.

The HTLP has come to a critical point in its history. Our current means of funding, which primarily consists of a patchwork of short-term funding commitments from diverse groups, is undercutting our operational efficiency, as well as our planning for major equipment replacements and upgrades. More importantly, the uncertainty of our funding base makes it difficult to attract new staff to whom we can pass our unique "institutional memory" from our soon-to-be fully retiring senior staff. Given the widespread use of HTLP datasets by governmental agencies, industrial groups, university researchers and environmental organizations, we believe that this unique program warrants establishment of what may also be a unique funding base. That funding base is an HTLP Funding Coalition (See Figure 1).

An essential feature of the Funding Coalition will be commitments of relatively modest but long-term support among the partners. We will seek to broaden the base of support within each sector of the Funding Coalition partners. We believe that for many potential funding partners, participation in such a program would fall either within their funding program elements or within discretionary portions of their budgets. Funding Coalition partners will have an annual opportunity to review program progress, as well as examine expenditures of program funds. Budgetary details for managing funds will be developed in consultation with Funding Coalition partners. Our goal is to arrange funding support of about $700,000 per year. We have received a small grant from the Ohio Lake Erie Protection Fund to support staff travel to meet with potential funding partners. In addition to this summary, more detailed descriptions of each component shown in Figure 1 are available.

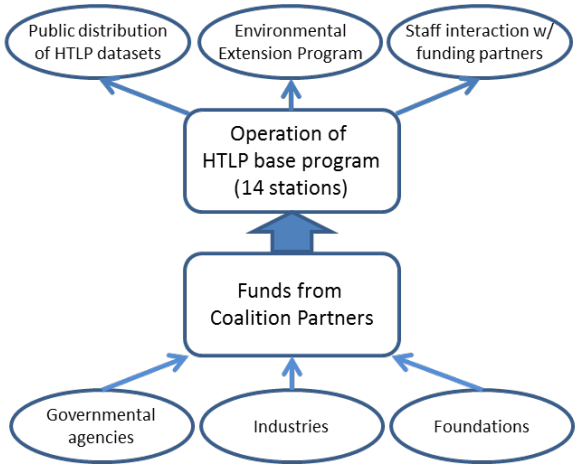

Figure 1. Conceptual diagram of the Funding Coalition and HTLP program operation.

The HTLP is the "signature program" of what is now known as the National Center for Water Quality Research (NCWQR) of Heidelberg University. In addition to the HTLP, the NCWQR conducts biological studies of rivers and lakes, a large private well testing program, and contract chemical and biological analyses for other organizations. NCWQR programs are totally supported by grants and contracts from diverse groups. The diversity of our funding base lends additional credibility to our reputation for objectivity in data interpretation. Heidelberg University supports NCWQR programs by providing facilities and foregoing collection of most indirect costs associated with NCWQR grants. While most NCWQR staff members are full-time researchers, some also teach in Heidelberg's Environmental Science program.

We ask that you consider becoming a Funding Coalition partner so that the NCWQR's signature program, the HTLP, can continue to uniquely serve it multiple and diverse constituents.

Appendix G

Case Statement – The Heidelberg Tributary Loading Program

The Heidelberg Tributary Loading Program

Information for Managing Agricultural Nonpoint Pollution

What is the Heidelberg Tributary Loading Program (HTLP)?

The HTLP is a specialized water quality monitoring program designed to accurately measure the total amounts (loads) of pollutants exported from watersheds. Such studies require both stream flow and pollutant concentration data during storm runoff events. The sampling program utilizes automatic sampling equipment located at selected U.S. Geological Survey stream gaging stations across Ohio and into Michigan. More than 50% of Ohio's land area is upstream from HTLP stations (see map).

How and when did the HTLP get started?

In 1969, Heidelberg researchers recognized that accurate measurements of nutrient transport by rivers required detailed studies during storm runoff events. In 1974, as part of the U.S. Army Corps of Engineers' Lake Erie Wastewater Management Study (LEWMS), we received contracts to expand our studies from the Sandusky Watershed to Ohio's major tributaries to Lake Erie. At the urging of the Ohio Farm Bureau Federation, the HTLP was extended to include the Ohio River Basin in 1996. The current network of 14 stations is unique within the United States in terms of its detail and duration.

Who funds the HTLP?

Over the years, funding has come from a combination of federal and state agencies, industries and foundations. Most State of Ohio support has been passed to the HTLP through ODNR's Division of Soil and Water Resources.

How are data from the HTLP used? (Some examples)

- Provide a basis for calculations of annual phosphorus loading to Lake Erie since 1975.
- Help develop management plans for the restoration of Lake Erie.
- Quantify the magnitude of agricultural nonpoint pollution (more reliably than models).
- Help develop TMDL (Total Maximum Daily Load) plans.
- Develop agricultural pollution abatement plans for nutrient and sediment load reduction.
- Assess the effectiveness of agricultural pollution abatement programs.
- Identify trade-offs associated with nonpoint control measures. (Example: initiation of the Ohio Lake Erie Phosphorus Task Force to address the problem of increasing dissolved phosphorus loads.)
- Aid research through design of sampling programs, pesticide exposure assessment, water quality model calibration, climate change impact prediction, scale-effect studies, and nutrient trading.
- Assist education in uses ranging from classroom illustrations to master's and Ph.D. research throughout the U.S.

What are the economic benefits of the HTLP?

The information provided by the HTLP gives agencies and institutions a competitive edge in gaining federal and foundation support for both Best Management Practice (BMP) implementation projects and related environmental research programs. Federal and state investments in this information have helped leverage millions of additional dollars that support farmers, soil and water districts, agribusinesses and university researchers. Both agriculture and water resources are extremely important to our nation's economic vitality, both now and into the future. The HTLP serves both sectors.

What are the environmental benefits of the HTLP?

The HTLP provides information to support the development of effective and efficient nonpoint source management programs. It also supports the application of adaptive management to water resource protection programs by assessing program effectiveness and identifying emerging problems.

The Heidelberg Tributary Loading Progam

Heidelberg University, Tiffin, Ohio

Active Stations as of December 2011