NATIONAL CENTER FOR WATER QUALITY RESEARCH

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Proposal for Funding Continued Operation of the Tributary Loading Station on the Scioto River in Calendar Year 2014 and Computation of Point-Source and Nonpoint-Source Loads

Submitted to
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Department of Public Utilities
Division of Sewerage and Drainage
The City of Columbus, Ohio

by
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Introduction and Rationale

The National Center for Water Quality Research (NCWQR) requests funding in the amount of $38,000 to continue operation of the water quality and pollutant loading station on the Scioto River at Chillicothe during calendar year 2014 ($34,000) and to calculate the separate contributions of point-source and nonpoint-source loads of phosphorus in the Scioto watershed upstream of Chillicothe ($4,000). The water quality station operated by the NCWQR at Chillicothe is housed in the hydrology building maintained at the edge of the Scioto River by the U.S. Geological Survey (Figure 1).

The NCWQR, founded in 1969 by Dr. David B. Baker, is a research organization within the science division of Heidelberg University in Tiffin, Ohio. The Heidelberg Tributary Loading Program (HTLP) began in 1975, and the Scioto River at Chillicothe has been included in the HTLP since 1996. Presently there are 16 stations in the HTLP in Ohio and Michigan and in both the Ohio River and Lake Erie basins. The NCWQR staff is comprised of 11 scientists and technicians, and all individuals are involved to some extent in station maintenance, sample collection, sample analysis, data storage, data analysis, and data interpretation and presentation in reports and public presentations. The HTLP is funded by a combination of state and federal agencies, foundations and industries, and all of the resulting data, including those for the Scioto, are publicly available at our tributary data download website (www.heidelberg.edu/academiclife/distinctive/ncwqr/data).

Measurements of pollutant export from watersheds are used to compare the amounts of pollutants derived from diffuse *nonpoint* sources, such as agricultural and urban storm runoff, with contributions from *point* sources, such as sewage treatment plants. Detailed knowledge of concentrations and loads of nutrients and sediments exported through these river systems has added greatly to our understanding of the impacts of rural, largely agricultural land management practices on stream water quality and ultimately the quality of both the Ohio River and Lake Erie. This information has also permitted detection of trends in water quality, especially changes in phosphorus loads, which greatly influence the development of harmful algal blooms in Lake Erie and inland lakes and reservoirs, and forms of nitrogen, which along with phosphorus has a particularly large impact on the growth of algae and the development of an oxygen-devoid "dead zone" in the Gulf of Mexico. HTLP data enable direct assessment and evaluation of the watershed-scale

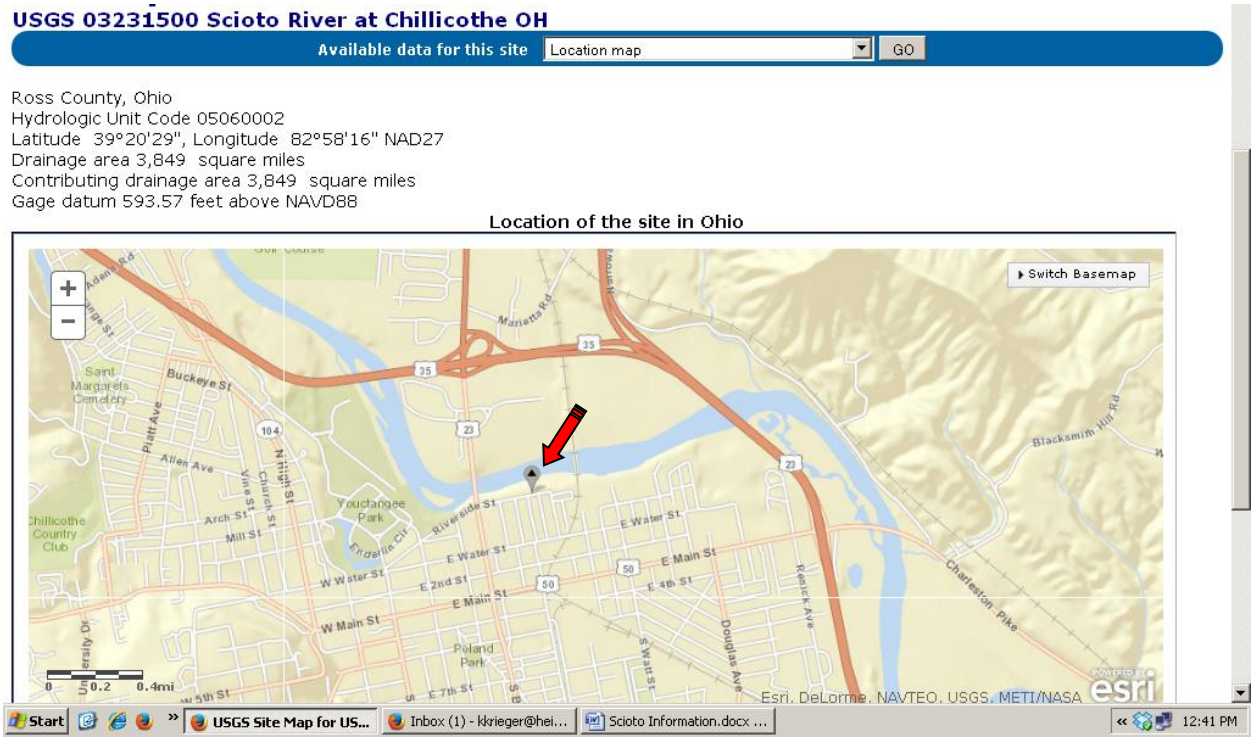


Figure 1. Location of the USGS hydrology station on the Scioto River at Chillicothe (arrow), which also houses the water sampling equipment operated by the Heidelberg NCWQR (downloaded from USGS website).

effectiveness of BMP implementation programs aimed at nutrient load reductions from Ohio watersheds to Lake Erie, Grand Lake St. Marys, and the Ohio River. Scientists at numerous universities who are developing land use-water quality models for Lake Erie rely on HTLP data to calibrate and validate their models. More information about findings of the HTLP and the use of HTLP data by others can be read in our most recent annual reports at www.heidelberg.edu/ncwqr and in a series of documents in the "Focus on Phosphorus" menu at www.heidelberg.edu/.

Project Period

The proposed work covers one year, beginning 1 January 2014 and ending 31 December 2014.

Work Plan

1. We will maintain one refrigerated automated Isco sampler inside the monitoring building. The sampler will collect one discrete sample every eight hours year-round. Samples will be shipped to us by our cooperator at the Ross County Soil and Water Conservation District weekly (except the last week in December). Heidelberg technicians will visit the site as needed, usually one to two times a year, to perform required maintenance and repairs. We have an excellent rapport with the Ross SWCD, and they occasionally have volunteered their assistance in ensuring that the station is operational and has minimal "down time".

2. As we have done since 1996, we will analyze 500 (± about 50) samples in calendar year 2014, the exact number dependent on the number and duration of storm runoff events during the year. We will analyze daily samples and additional samples as needed to accurately characterize storm runoff loads of the analyzed compounds. All analyses conform to methods specified in our U.S. EPA-approved QAPP. Several of our laboratory technicians (J. Kramer, E. Ewing, B. Merryfield) and research scientists (A. Roerdink, D. Baker, P. Richards) are certified by Ohio

EPA as Level 3 qualified data collectors for chemical water quality assessment. We will analyze all water samples for specific conductance and the concentrations of total phosphorus, dissolved (soluble) reactive phosphorus, nitrate nitrogen, nitrite nitrogen, total kjeldahl nitrogen, ammonia, chloride, sulfate, dissolved silica, and total suspended solids.

3. We will continue to upload our concentration data and the corresponding flow data (provided by USGS) for each analyzed sample on our tributary data download website on a quarterly basis following QA/QC analysis, and we will make the data available sooner upon special request. After the end of the water year (30 September 2014), we will calculate the annual loads, unit area loads, flow-weighted mean concentrations and time-weighted mean concentrations for each parameter. We will provide an interpretive summary of those results, with comparison to other stations in the HTLP, early in calendar year 2015.

4. As requested by the Division of Sewerage and Drainage (DSD), we will, in addition to our usual data analysis, obtain the best available data on point source loads to the Scioto River upstream of the monitoring station at Chillicothe and will compute the proportional contributions of point-source and non-point source loads of total phosphorus and other nutrients of interest to DSD. The point versus nonpoint load comparison will be included in the interpretive summary. We have added a small additional amount to the budget to cover part of our time to collect, organize, analyze and interpret the data. Because the process, once developed for the Scioto, may also prove useful for application to our other monitored tributaries, we will match most of the costs that will be incurred. We expect that the costs for such computations in future years will be minimal.

5. In addition to the above tasks, the NCWQR will analyze a subset of samples collected at the Chillicothe station during the 2014 calendar year for total dissolved solids, alkalinity and hardness. The number of samples, the timing of sample collections, and the specific analytical methods will be mutually agreed upon by NCWQR and DSD.

Budget

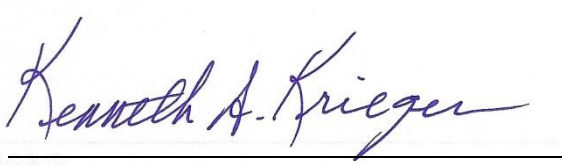
The operational costs to monitor water quality at the station in calendar year 2014 plus the estimated costs for the special load calculations and costs specifically for analysis of total dissolved solids, alkalinity and hardness are shown in the table below. Please also see the budget explanation that follows.

1. Annual Operating Cost for the Scioto River at Chillicothe	**Calendar Year 2014**
Station operation, sample collections, analyses, & data reporting (direct costs)	28,000
Total Indirect Costs charged to City of Columbus	6,000
Total City of Columbus Operational Costs	**$34,000**
Heidelberg match (approximate amount of indirect costs waived)	$5,450
2. Costs for Point/Nonpoint Source Load Calculations	
Total City of Columbus Costs (direct costs only)	**$4,000**
Heidelberg match (direct costs and waived indirect costs)	$6,000

3. Special TDS, Alkalinity and Hardness Analyses – As many as 20 samples @ $80/sample	
City of Columbus – direct costs, not to exceed	$1,600
– Indirect Costs (~28% of SW&B), not to exceed	400
City of Columbus Costs (direct and indirect), not to exceed	**$2,000**
Heidelberg match (amount of indirect costs waived), not to exceed	450
Total Request to City of Columbus, not to exceed	**$40,000**

Budget Explanation

1. The costs quoted in budget task 1 do not include any part of USGS program costs. The USGS operates and maintains the hydrological instrumentation that measures creek stage and discharge. NCWQR does pay all electrical bills for the station, currently approximately $75 per month.
2. Of the operational costs (budget task 1), the NCWQR will waive approximately $5,450 of the total calculated annual indirect costs of $11,450, which are based on a rate approved by the U.S. Department of Health and Human Services equal to 59.0% of salaries, wages and fringe benefits (SW&B). Indirect costs charged to the City of Columbus will be $6,000 (28%) of SW&B, or only 52.4% of our approved indirect costs. The NCWQR will waive all indirect costs related to the effort involved in calculating proportional loads from point and nonpoint sources.
3. The above quote (budget task 1) is based on an economy of scale that our present monitoring network of 16 stations provides. Were the number of stations to be reduced, per-station costs would increase because of various fixed operational costs. However, we expect that the annual cost ($34,000) for operation of the Cillicothe station will remain the same for calendar years 2015 and 2016.
4. In budget task 3, the quoted cost per sample is based on a Web survey of representative commercial laboratory charges for TDS, alkalinity and hardness, and we have quoted the lower end of the range. After analyzing a number of samples, we may find that we can reduce the cost per sample. Note that we also have quoted a "not to exceed" total dollar amount for task 3, as the number of samples to be analyzed is not exactly known at this time.



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