Western Kentucky University
Technical Assistance Center for Water Quality
Center for Water Resource Studies

"Supporting Small Water Systems in Meeting the Goal of Public Health Protection"

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Grant Number X83123601-0

First Year, Second Quarter Report
January – March, 2004

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Submitted to:
U.S. Environmental Protection Agency
Office of Water
30 March 2004

Executive Summary

Introduction

Western Kentucky University has established a Technical Assistance Center for Water Quality for small water systems. The underlying goal of the Center is to assist small water systems in the protection of public health and the provision of safe drinking water. Assistance is provided to small water systems through the Utility Management Institute, a small systems circuit rider, a source water protection program, and information technology. All aspects of the Center are focused on capacity development of small water systems through the enhancement of managerial, technical and financial capabilities. Information presented in this report represents efforts during the second quarter of year **one** (04) of this grant.

Synopsis

This second quarter, first contract year report depicts progress in each of the aforementioned tasks, with task activities that are focusing on the ultimate goal of improved public health through the provision of safe drinking water. The Technical Assistance Center for Water Quality's efforts continue in developing and delivering management training courses for small systems; in working with Western Kentucky University to provide technical oversight for online course development and delivery in water utility management; conducting on-site technical assistance for small system compliance; providing technical assistance to develop and promote source water protection, through source water assessments, field investigations, on-site source water assistance and community relations; and developing and distributing information and information tools.

Summary of Expenditures

Expenditures for this task from January 1 through March 31, 2004 are summarized in Table 1. Greater detail can be found in Appendix A.

Table 1. Summary of Expenditures

Task	Expenditure
Administration	$8,120.69
Task 1 – Utility Management Institute	$21,907.67
Task 2 – Small Systems Circuit Rider	$24,307.68
Task 3 – Source Water Protection	$7,371.04
Task 4 – Data Management	$10,178.07
Total	$71,885.15

Summary of Activities

Task 1: Utility Management Institute (UMI) The goal of the UMI is to develop and deliver a series of courses to be included in a "Utility Management Professional" certification program. This program is available to system managers, operators, and office managers of water systems serving rural areas and small municipalities with populations under 10,000.

Task 2: Small Systems Circuit Rider The "Circuit Rider" approach to providing a combination of on-site technical assistance and training is nationally recognized as the most effective method of assisting small public water systems to comply with state and federal environmental regulations. The Circuit Rider program works in partnership with Kentucky Division of Water (DOW) to target the public water systems serving populations below 3300, with particular emphasis on systems serving less than 500 people. Our "Circuit Rider" approach works to target those small systems experiencing profound difficulties in complying with SDWA provisions in order to enhance protection of public health.

Task 3: Source Water Protection Work on the Source Water Protection Initiative's four major existing projects: Task 3A, the Source Water Protection Education Project, Task 3B, the Disinfection Byproducts and Haloacetic Acids (HAA's) Project, Task 3C: the Impaired Watershed Program, and Task 3D: Landuse and Source Water in Karst Regions each achieved scheduled progress during the quarter. We continued to work closely with the Kentucky Department of Agriculture, Division of Pesticides regarding this work, and have completed fieldwork in the agricultural Upper Iowa River watershed, Iowa, in collaboration with the Upper Iowa River Watershed Alliance. We uploaded draft versions of three educational modules to the internet, including *Introduction to Source Water Protection*, *Impacts of Karst on Source Water Protection*, and *Developing Stakeholder Networks. Pat Kambesis* gave three workshops in Iowa to audiences including state and federal environmental officials, local businesses, landowners, and the general public on agricultural land use and karst groundwater quality, gave two workshops in Kentucky on pesticide and nutrient Best Management Practices and made plans to offer four workshops in the next quarter in collaboration with the (Kentucky) Barren River Area Development District. We worked with several water systems on the Rough River on atrazine contamination, and continued sampling at the Marion supply for isoxaflutole and its metabolites. Within the Disinfection Byproducts and Haloacetic Acids (HAA's) Program we have completed the preliminary analysis of the data we collected last October as part of the pilot study for HAA production in the Ohio River basin. If this work is successful than our THM model (currently under review at *Water Research*) will have much broader applicability.

Task 4: Database Management and Information Tools The Database Management component of this Task provides appropriate methods for reporting and retrieving data and metadata. The Information Tools function of our Task works to put technology, information, and the tools to create "information capacity" and capability directly into the hands of water providers, and to make that information technology as accessible as possible in order to promote the protection of public health. This quarter we publicized the work and findings of the TACWQ and the CWRS at a number of venues. We have completed the first version of a piece of interactive software for water systems to use in completing their Emergency Response Plans. In the coming quarter we will test and refine this software, and then distribute it. We have also structured a nationally-appropriate Tools CD that can include this piece. We have developed maps illustrating comparisons of water rate structures for drinking water systems in the state of Kentucky. We have also completed a number of website updates that have significantly improved navigation, visual appeal, and the ability to search for information within the site.

Task Reports

Task 1: Utility Management Institute (UMI)

I. Work Status

The goal of the UMI is to develop and deliver a series of courses to be included in a "Utility Management Professional" certification program. This program is available to system managers, operators, and office managers of water systems serving rural areas and small municipalities with populations under 10,000.

A. Work Progress. During the quarter, the course entitled "Utility Finance and Administration" was presented in Gilbertsville, Kentucky on March 17-18, 2004 at the Kentucky Dam Village State Resort Park. There were twenty-seven (27) students participating in this course. Course assessments for the March 17-18 course are included as an appendix to this report

The Utility Management Institute was highlighted in an article included in the publication *E-Train*, produced by the National Environmental Training Center at West Virginia University in Morgantown, WV.

An updated informational brochure, specifically developed to promote the Utility Management Institute's course of study and upcoming schedule of UMI classes, was mailed to all water and wastewater utilities during the Quarter. The brochure lists the dates and locations for each of the six course presentations scheduled in 2004.

B. Difficulties Encountered. No unanticipated difficulties were encountered.

C. Preliminary Data Results. The Utility Management Institute now claims a total of one hundred fifty-five (155) students. Thirty-seven (37) of our students have now completed all six of the courses in the UMI Series and have been awarded the Utility Management Professional designation. Course assessments continue to show a high level of satisfaction with the training. Seventeen (17) of the eighteen (18) assessors rated the session at the highest levels (very beneficial or beneficial). One assessment was marked at the next level (slightly beneficial).

D. Anticipated Activities. During the third quarter of 2003-2004, the UMI course entitled "Utility Organization, Regulation and Law" will be presented in Burksville, Kentucky on April 28-29, 2004 at the Dale Hollow Lake State Resort Park.

II. Key Personnel Changes
There were no personnel changes during this quarter.

Task 2: Circuit Rider Program (Second Quarter 03/04)

I. Work Status
The "Circuit Rider" approach to providing a combination of on-site technical assistance and training is nationally recognized as the most effective method of assisting small public water systems to comply with state and federal environmental regulations. The Circuit Rider program works in partnership with Kentucky Division of Water (DOW) to target the public water systems serving populations below 3300, with particular emphasis on systems serving less than 500 people. Our "Circuit Rider" approach works to target those small systems experiencing profound difficulties in complying with SDWA provisions in order to enhance protection of public health.

A. Work Progress. During the 2nd Quarter of 2003-2004, the Circuit Rider position logged 610.75 hours. Of that time 41% of the total time was spent directly assisting systems or their personnel including 138.5 hours on-site working with systems, 77.75 hours developing plans and reports for systems, and 35.5 hours providing formal training.

Much of this quarter was spent developing consumer confidence reports and vulnerability assessments. Compliance assistance included monitoring and reporting, Groundwater Protection Plans, TTHM monitoring plans, water withdrawal permits and revising wellhead protection plans. Technical assistance included GPS mapping, leak detection and aquifer testing.

Significant Contacts: Although many other systems were assisted this quarter this one provided the greatest challenge.

Sandy Hook Water District – Located in Sandy Hook, Elliott County, Kentucky serving 1,100 water connections. The system treats groundwater with pressure filtration, approximately 150,000 GPD, from four wells drilled in to the Lee Sandstone.

Brief History: Groundwater has been their sole source of water until a recent extension project has connected district with a neighboring system. The system began experiencing water supply shortage problems as a result of a 42-mile waterline extension project. This has increased the operation time of the plant and caused the district to purchase water to supplement their production. A new well was drilled, but before it could go online an aquifer pumping test and water quality analysis was required by the state primacy agency. The circuit rider became involved at the request of the water district.

From the water district's wellhead protection plan, developed by Kentucky Rural Water Association several years ago, much of the baseline hydrogeologic information was available. Thanks to the interconnection, the wellfield was allowed over 24 hours to equilibrate. Water level monitors were placed in four of the five wells the week prior to the aquifer test to collect background data and to determine when static conditions were achieved. The test began with a step rate increase test to determine the optimal pumping rate then continued at a constant rate for the remainder of the test. Water quality (pH, dissolved oxygen, conductivity and temperature) was monitored throughout the test. Total coliform and fecal samples were collected to determine whether the well was influenced by surface water from a nearby creek.

Early indications form the test show that well #5 will provide 80-90 gpm with minimal effect on the other wells. There is no indication that the well is under the direct influence of surface water.

B. Difficulties Encountered. No unanticipated difficulties were encountered.

C. Preliminary Data Results. See Work Progress above.

D. Anticipated Activities. During the next quarter, the WKU Small System Circuit Rider will continue to assist systems with operational and management problems. An increasing amount of the Circuit Rider's time is expected to be spent on-site demonstrating and training system personnel to use GPS technology to map and manage their utility. Also, time will be spent in developing a monitoring and reporting database. The database will be designed to provide water systems better control and analysis of their monitoring results. The Circuit Rider will continue to create educational opportunities for the communities we serve. Educational activities will focus on elementary, middle, and high school children and will emphasize the role small utilities play and the importance of good source water quality. This work will be coordinated with efforts within the WKU Center for Water Resource Studies.

Task 3: Source Water Protection Initiative

I. Work Status

A. Work Progress

Work on the Source Water Protection Initiative's four primary initiatives, a) the Source Water Protection Education Project, b) the Disinfection Byproducts and Haloacetic Acids (HAA's) Project, c) the Impaired Watershed Program, and d) the Landuse and Source Water in Karst Regions, each achieved progress as described in the report below.

Task 3A: Source Water Protection Education Project:

In our Source Water Education Program, we uploaded draft versions of three educational modules, including *Introduction to Source Water Protection*, *Impacts of Karst on Source Water Protection*, and *Developing Stakeholder Networks* at the website. We also met with several groups of officers from several local organizations and the Barren River Area Development District to plan a series of four workshops that will be held at the District office about various source water protection issues over the next two quarters.

Pat Kambesis gave three workshops in Iowa to audiences including state and federal environmental officials, local businesses, landowners, and the general public on agricultural land use and karst groundwater quality, and the details are described in Task 3D, below. She also met with officials of the Upper Iowa River Alliance to discuss their sponsorship of an educational workshop on karst and discussed ideas for content and format for an educational brochure on karst.

Dr. Ritchie Taylor worked with the KY Department of Agriculture and others to present Best Management Practices (BMPs) workshops in Dixon and White Mills, KY. The workshops were conducted March 23 and April 2, 2004. The workshop series is titled, "Pesticide and Nutrient BMPs: From the Classroom to the Field", and is focused on presenting farmers with BMPs that can be used to reduce pesticide and nutrient loadings into source water supplies. As part of the series, a CD and workbook has been produced and presented to each workshop participant.

Organizers of this fall's National Conference of the Geological Society of America meeting in Denver Colorado have accepted our proposal for a topical session entitled *Source Water Protection for Small Systems: Stakeholder Needs, Public Policy, and Geologic Realities*, and the Society's Hydrogeology Section has requested to be a cosponsor of this session.

Task 3B: Disinfection Byproducts and Haloacetic Acids (HAA's) Program

We have completed the preliminary analysis of the data we collected last October as part of the pilot study for HAA production in the Ohio River basin. Trihalomethane formation potential (THMFP) was highest in the low light/no light tanks, which is consistent with our earlier work on the role of algal senescence on THMFP (Figure One).

In our experiments this spring and summer, we will be performing a series of full-scale assessments of HAA production and comparing our results to the predictive model we developed for THMFP. Our hypothesis is that the precursors for the HAA group of disinfection by products is similar to those of THM so water companies will be able to use the same surrogates to predict THM and HAA levels in their finished water.

Implications for HAA Research and Model Development and Water Management: If this work is successful than our THM model (currently under review at *Water Research* will have much broader applicability. Water companies will be able to use the model to predict the levels of two major disinfection by products in their finished water by measuring the concentrations of the appropriate surrogates in their raw water.

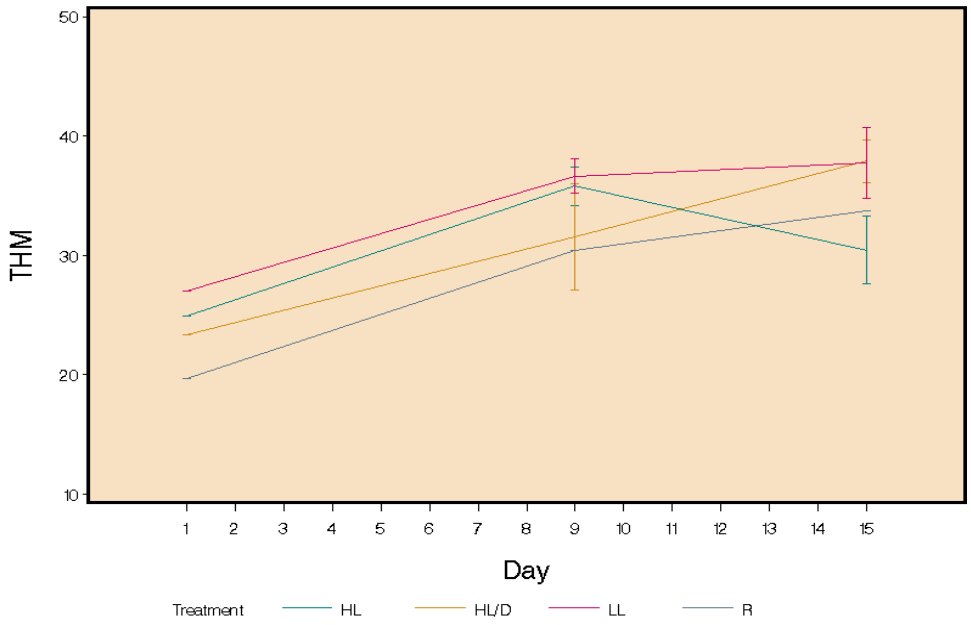


Figure 3-1. THMFP as a function of incubation time and treatment (HL=high light, HL/D= high light then darkness, LL=low light, R=river.

Task 3C: Impaired Watershed Program

This section of the report summarizes work completed under the Source Water Protection Program, Impaired Watersheds task, and in support of capacity development of small water systems. This task, within the Source Water Protection Program, is designed to

work with small water systems to increase capacity development through the application of source water protection methods, technology, partnership initiatives, best management practices and outreach. The intent is to develop frameworks to address restoration of impaired watersheds and improve source water quality.

This second quarter sixth contract year report depicts progress in the aforementioned task with activities that were focused on the ultimate goal of improved public health. The efforts in this quarter continued in providing technical assistance to develop and promote source water protection, through source water assessments, field investigations, on-site source water technical assistance, presentation of results, and creating frameworks that develop partnerships to assist small water systems. We continue to conduct assistance related to atrazine contamination of drinking water supplies in order to reduce the public health risk of this herbicide and others. A goal in this arena is to work with farmers, agricultural assistance providers, regulators and other stakeholders to determine best management practices that reduce levels of herbicides in drinking water supplies and to create partnership frameworks that help water small water systems go from the assessment to the implementation phase. Additionally, we continue to strive to publish and present results of the task in publications and at conferences of regional and national significance. A focus is to get information to the small systems and their communities.

During this quarter we have focused on providing technical assistance to small water systems in the Rough River Watershed of Kentucky.

We have continued to sample and evaluate various pesticides/herbicides that are used in Kentucky and that may pose a health risk to communities that are served by small water systems. As a component of our source water program, we participated in the Bayer CropScience Isoxaflutole State Water Monitoring Program. Previously, we have worked with the City of Marion to monitor atrazine concentrations in source waters and finished drinking water. On going work includes the evaluation of alternative herbicides, such as isoxaflutole, that have been used as a replacement for atrazine.

During the quarter we presented as part of the AWWA's 2004 Water Sources Conference and Exposition in Austin, Texas, January 11, 2004, an international meeting. We were invited by and worked with the AWWA source water protection committee to present in the Sunday Workshop, Best Management Practices for Source Water Protection. Our presentation highlighted effective methods for creating stakeholder partnerships and implementing programs for assessing results. We also provided a generic presentation that could be used by participants to assist them in developing partnerships for source water protection. Presentation materials were provided by AWWA to workshop participants and included copies of items that were produced by a TACWQ member.

We continue to work with small water systems to increase the use of technology and methods for mapping infrastructure and resources. Although this specific work is more of a community technical service area, providing students the opportunity to work with communities and directly assist small water systems, we are hoping to advance the use GPS and GIS in source water protection. However, small water systems must first learn

the benefits of this technology and how it can assist them in the management of their systems. Currently, we have a technical assistance project with Webster County Water District to map their infrastructure and assist in development of a GIS for their system. We are working in Kentucky to increase the use of GPS and GIS in small water system management. A concern of many small systems is that the location of infrastructure is difficult at best to determine with as built system maps, operator knowledge, and changing system conditions. Therefore, we are assisting small systems in using advanced technology to manage their systems.

This Quarter we have produced several presentations and one publication to advance capacity development of small systems. One article was published in the spring issue of *Waterproof*. This publication went out to small rural water systems across Kentucky. Our article, "Utilization of GIS Technology: Part II", highlighted the resources, time, and steps necessary to develop a GIS for a small water system. Additionally, the article provides specific information regarding man-hours, pitfalls to avoid, and financial requirements of creating a small system specific GIS.

Through a program initiated by the Kentucky Pesticide Workgroup, of which Western Kentucky University and the TACWQ are a major participant, atrazine use was curtailed in the City of Marion source and finished waters by use of an alternative herbicide use program. This program has resulted in reduced levels of atrazine below the Maximum Contaminant Level (MCL), as shown in Figure 3-2. Results for isoxaflutole monitoring, as analyzed and reported by Bayer CropScience are presented in Tables 3-1, 3-2, 3-3, and 3-4. Results indicated that isoxaflutole was not detected in the source or finished waters. However, the metabolites RPA 202248 and RPA 203328 were detected in the source waters of Old City Lake from June through October of 2003. Also, the metabolite RPA 203328 was detected in the finished water from June through October of 2003. These results indicate that isoxaflutole and its metabolites do have the potential to be persistent and accumulate in surface waters and may contaminate finished water supplied by small water systems. The continued purpose of this monitoring in 2004 will be to further assess the potential of isoxaflutole and its metabolites to contaminate source and finished waters, as it is used as a replacement for atrazine. Although the practice of herbicide replacement may be effective in reducing levels of a target herbicide, such as atrazine, the potential does exist for the alternative, isoxaflutole, to persist and accumulate in source water. Based on these initial results, isoxaflutole was not detected at levels that pose a significant health risk as defined by EPA (EPA, 1998). However, an MCL has not been established for this herbicide. According to the EPA's 1998 Pesticide Fact sheet for isoxaflutole:

> "Isoxaflutole is mobile and is expected to persist and accumulate in surface water and groundwater. Modeling data show that parent isoxaflutole and its primary metabolite RPA 202248 may accumulate to concentrations that would result in harm to non-target plants. Isoxaflutole's terminal metabolite RPA 203328 is expected to persist and accumulate, but does not demonstrate phytotoxicity. Additional studies, including prospective groundwater studies and surface water monitoring, will be conducted to determine whether isoxaflutole and its primary

metabolite RPA202248 do or do not exceed concentrations deemed potentially harmful to the environment."

As such, we have continued in 2004 to participate in the Bayer CropScience State Monitoring program. The use of isoxaflutole as a replacement for atrazine has been described as a BMP to reduce atrazine levels below the MCL. Sufficient data has not yet been collected to make this judgment in Kentucky. Also, we do not want this practice to be advocated until the science is such that we know that there is minimal risk to public health. We will continue to support small water systems in providing training to farmers that demonstrates the use of physical BMPs that are designed to reduce the runoff of pesticides and nutrients. Physical BMPs include the use of buffer strips, set backs, and the elimination of direct tile drainages to streams and water conveyances that discharge to source waters. With continued efforts and partnership programs, we anticipate that pesticide contamination of source waters of small water systems can be reduced and/or eliminated in most cases. This continued work will serve as a model for reducing source water contamination risks to small water systems.

EPA. 1998. *Pesticide Fact Sheet: Isoxaflutole*. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C. 7501C.
EPA. 1998. *Pesticide Fact Sheet: Isoxaflutole*. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C. 7501C.

Figure 3-2.

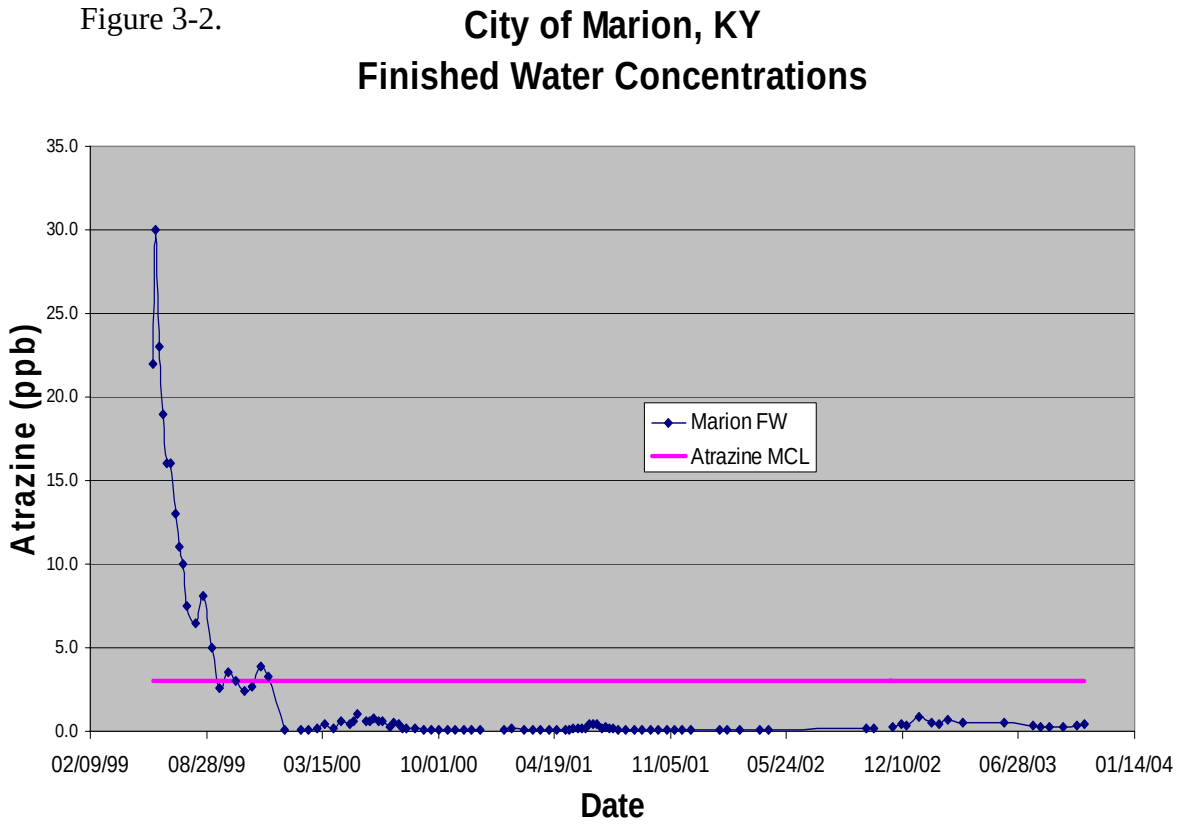


Table 3-1. City of Marion, Old City Lake Isoxaflutole Monitoring*

Date Collected	Isoxaflutole (ppt)	RPA 202248 (ppt)	RPA 203328 (ppt)
6/24/2003	ND	26	17
7/9/2003	ND	17	13
7/22/2003	ND	16	12
8/5/2003	ND	<LOQ (5)	<LOQ (5)
8/20/2003	ND	<LOQ (4)	ND
9/12/2003	ND	10	<LOQ (7)
10/6/2003	ND	<LOQ (7)	<LOQ (6)
10/20/2003	ND	<LOQ (7)	<LOQ (6)

* Samples analyzed through the Bayer CropScience Isoxaflutole State Water Monitoring Program

LOQ = Limit of Quantification (10 ppt).
ND = Not Detected, <3 ppt Limit of Detection (LOD).

Table 3-2. City of Marion, Lake George Isoxaflutole Monitoring*

Date Collected	Isoxaflutole (ppt)	RPA 202248 (ppt)	RPA 203328 (ppt)
6/24/2003	ND	ND	ND
7/9/2003	ND	ND	ND
7/22/2003	ND	ND	ND
8/5/2003	ND	ND	ND
8/20/2003	ND	ND	ND
9/12/2003	ND	ND	ND
10/6/2003	ND	ND	ND
10/20/2003	ND	ND	ND

* Samples analyzed through the Bayer CropScience Isoxaflutole State Water Monitoring Program

LOQ = Limit of Quantification (10 ppt).
ND = Not Detected, <3 ppt Limit of Detection (LOD).

Table 3-3. City of Marion, CLW Isoxaflutole Monitoring*

Date Collected	Isoxaflutole (ppt)	RPA 202248 (ppt)	RPA 203328 (ppt)
6/24/2003	ND	ND	ND
7/9/2003	ND	ND	ND
7/22/2003	ND	ND	ND
8/5/2003	ND	ND	ND
8/20/2003	ND	ND	ND
9/12/2003	ND	ND	ND
10/6/2003	ND	ND	ND
10/20/2003	ND	ND	ND

* Samples analyzed through the Bayer CropScience Isoxaflutole State Water Monitoring Program

LOQ = Limit of Quantification (10 ppt).
ND = Not Detected, <3 ppt Limit of Detection (LOD).

Table 3-4. City of Marion, Finished Water Isoxaflutole Monitoring*

Date Collected	Isoxaflutole (ppt)	RPA 202248 (ppt)	RPA 203328 (ppt)
6/24/2003	ND	ND	11
7/9/2003	ND	ND	<LOQ (7)
7/22/2003	ND	ND	<LOQ (7)
8/5/2003	ND	ND	<LOQ (4)
8/20/2003	ND	ND	<LOQ (3)
9/12/2003	ND	ND	<LOQ (5)
10/6/2003	ND	ND	<LOQ (5)
10/20/2003	ND	ND	<LOQ (4)

* Samples analyzed through the Bayer CropScience Isoxaflutole State Water Monitoring Program

LOQ = Limit of Quantification (10 ppt).
ND = Not Detected, <3 ppt Limit of Detection (LOD).

Task 3D: Landuse and Source Water in Karst Regions

Pat Kambesis has finished project fieldwork in Iowa, and is currently writing up the results for a refereed publication. She gave three workshops in Iowa to audiences including state and federal environmental officials, local businesses, landowners, and the general public on agricultural land use and karst groundwater quality. The first was held on February 7 at the Decorah State Farm Bureau Office for staff of the Iowa Department of Natural Resources, U.S. Fish & Wildlife Service, U.S. EPA, and local businesses, and was entitled *A Systematic Approach to Understanding Agricultural Contaminant Sources and Transport in a Karst Groundwater Basin*.

Also on February 7, Ms. Kambesis presented *A Study of the Hydrogeology of the Coldwater Cave Karst Groundwater Basin* at Luther College, sponsored by the Northeast Iowa Resource Conservation and Development office, for landowners and general public. Title: *A study of the Hydrogeology of the Coldwater Cave Karst Groundwater Basin*. On February 8, in Coralville, Ms. Kambesis presented *Water Quality in a Shallow Karst Groundwater Basin* at the Spring Meeting of the Iowa Groundwater Association, attended by professionals in source water, wastewater, water quality, academics and agency personnel (including those from the Iowa Department of Natural Resources, U.S.EPA, and Iowa Geological Survey).

Ms. Kambesis met with Dr. David Faldet, a professor at Luther College who is writing a book about evolution of land use in Winneshiek County, Iowa, and they discussed how the land use in our Iowa study area has affected the groundwater quality both locally and "downstream". She gave him a tour of the study area, sampling sites, springs and a representative tour of the different land use ongoing in the area.

She also met with Ron Fairchild, Environmental Specialist, Iowa Division of Soil Conservation. He is writing a grant which would provide funds to institute BMP's in the Coldwater Cave Groundwater basin, to reduce bacteria levels in the shallow groundwater aquifer. The grant would also provide funding for water quality monitoring to determine if the BMP's are actually making a difference. We agreed to provide him the data from our karst feature inventory and recommended sampling locations. We also discussed more dye tracing in the area. He is very interested in this (as is Iowa DNR). They are requesting our assistance in conducting more traces and if the grant is approved, participation in the study.

She met with Adam Kiel of Upper Iowa River Alliance to discuss their sponsorship of an educational workshop on karst and have asked for our assistance in putting together a program and in actually being part of the workshop, which is tentatively scheduled for early fall of this year. They also discussed ideas for content and format for an educational brochure on karst.

Other Progress

Dissemination of Results

Presentation at Scientific Conference

Kambesis, P.K. and C. Groves, 2004, *Contaminant Source and Transport in a Karst Groundwater Basin*, Southeast/Northeast Regional meeting of the Geological Society of America, Washington, DC.

Kambesis, P.K., 2004, *Water Quality in a Shallow Karst Groundwater Basin*, Spring Meeting of the Iowa Groundwater Association, Decorah, Iowa.

Publication

Taylor, R., 2004, Utilization of GIS Technology: Part II, *Waterproof*, Spring 2004 issue (attachment 3-1).

B. Difficulties Encountered. During the quarter there were no difficulties in performing the tasks of the project.

C. Anticipated Activities. Work will continue on all aforementioned initiatives

II. Changes in Key Personnel
During the quarter there have been no changes in key personnel.

APPENDIX 3-1

"Utilization of GIS Technology: Part II"
Spring 2004
Waterproof

Task 4: Database Management and Information Tools (Second Quarter 04)

I. Work Status

The Database Management component of this Task provides appropriate methods for reporting and retrieving data and metadata. The Information Tools function of our Task works to put technology, information, and the tools to create "information capacity" and capability directly into the hands of water providers, and to make that information technology as accessible as possible in order to promote the protection of public health.

A. Work progress.

This quarter we publicized the work and findings of the TACWQ and the CWRS at a number of venues. We have completed the first version of a piece of interactive software for water systems to use in completing their Emergency Response Plans. In the coming quarter we will test and refine this software, and then distribute it. We have also structured a nationally-appropriate Tools CD that can include this piece. We have developed maps illustrating comparisons of water rate structures for drinking water systems in the state of Kentucky. We have also completed a number of website updates that have significantly improved navigation, visual appeal, and the ability to search for information within the site.

We have also been engaged in a number of activities that are concerned with source water protection. Dr. Meier has participated in planning meetings with the Division of Water – sponsored Green River Basin Management Team, and cooperated with several other agencies and groups to try to obtain funding for work in source water protection within the upper Green River basin. She has also served on committees of the Kentucky Waterways Alliance and the Upper Green River Watershed Watch group. Dr. Meier served as a reviewer of the Kentucky Landscape Snapshot GIS project; data corrections suggested will improve the accuracy of the national landuse coverage now being built as well. A set of large maps with handwritten notations by personnel from The Nature Conservancy of serious streambank erosion problems was photocopied and converted to digital format; this information will be incorporated into baseline information for pre-

implementation of the Green River Conservation Reserve Enhancement Program as a source water protection project. Water quality maps developed by Dr. Meier and her lab were shared at a Rotary Club meeting in Columbia, Kentucky. Dr. Meier attended the Kentucky Rural Water Association conference on 10-11 February. In addition to weekly meetings of Dr. Meier's lab and of the Center for Water Resource Studies, our Task also prepared information for the EPA Washington meeting of TAC's, met with classes of undergraduate and graduate students about opportunities in the Center for Water Resource Studies, and as a matter of public outreach contributed to community planning efforts for Earth Day (April 22) and for a regional Green River Festival (July). Dr. Meier also met with faculty members in Computer Science who have been invited by the director to take over and further develop the Database Management section of this Task for the CWRS.

We are on schedule with our workplan goals:
1. Information Management and Integrity
2. Internet Communication of Information, Services, and Products
3. Information Tools and Services for Small Water Systems
    National tools CD
    Emergency Response Planning Tool
4. Research on Source Water Quality Issues and Challenges
5. Analyze National Patterns of Drinking Water Problems
6. Explore Potential for Producing Watershed Mapping Utilities by State
7. Professional Cooperation with Agencies, Groups and Institutions

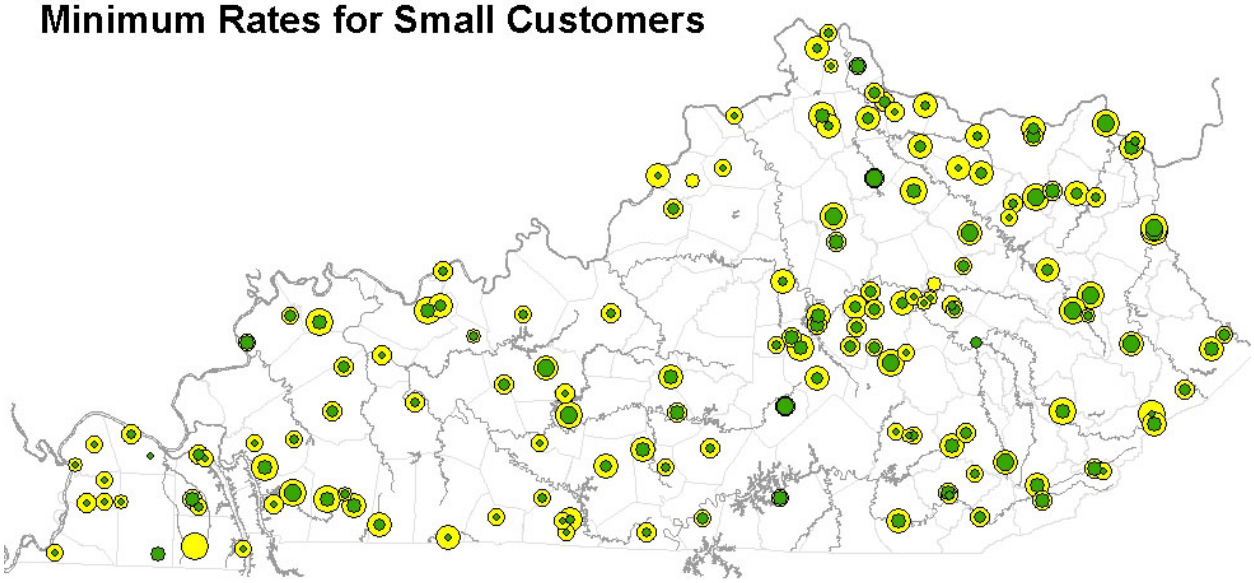
For goal #6, security concerns have prevented us from distributing mappable information layers by CD. Dr. Ernest is exploring the possibility of offering this information on a secure server instead.

B. Difficulties encountered. No insurmountable difficulties have been encountered.

C. Preliminary data results. Data results and findings that have been presented in previous quarters are currently being incorporated into publications.

We have developed maps of rates being charged by drinking water systems, using data gathered from published records of the Public Service Commission of Kentucky. The need for these maps for understanding water system price structures was suggested by the Kentucky Rural Water Association and the Bluegrass Institute for Public Policy Studies. These maps are presented in the figures below, and will be published on our website as well as shared with the KRWA and the Bluegrass Institute for their further distribution.

Drinking Water Rates in Kentucky: Minimum Rates for Small Customers

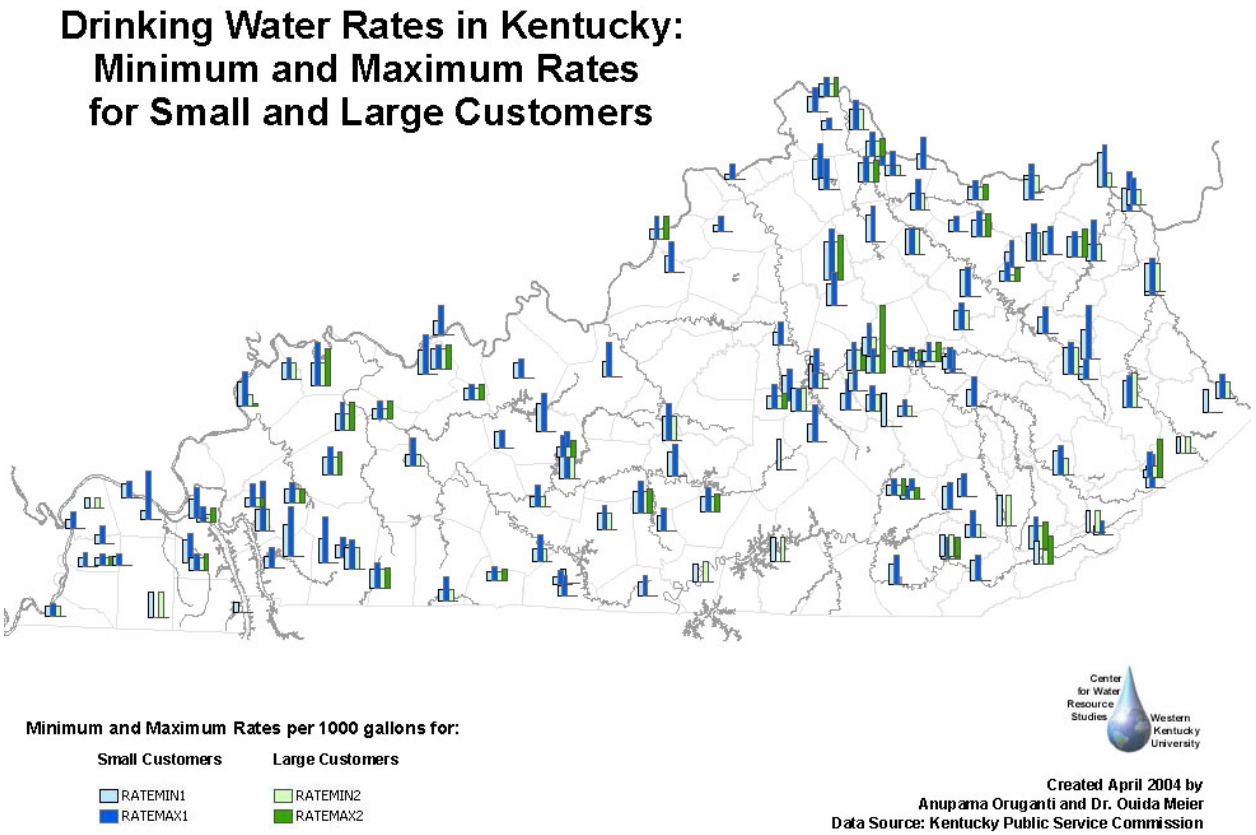


Residential and Small Customers:

Minimum Bill	Minimum Rate
1.38 - 7.45	0.90 - 2.11
7.46 - 11.16	2.12 - 2.90
11.17 - 13.80	2.91 - 3.75
13.81 - 16.80	3.76 - 4.85
16.81 - 23.62	4.86 - 7.12
	per 1000 gallons

Center for Water Resource Studies
Western Kentucky University

Created April 2004 by
Anuparna Oruganti and Dr. Ouida Meier
Data Source: Kentucky Public Service Commission



D. Anticipated activities. In the coming quarter, we anticipate making additional revisions to the Emergency Response Assistant software. We will also continue to make scheduled progress on the other goals of our workplan.

II. Key Personnel Changes

There have been no changes in key personnel within Task 4 during this quarter. Dr. Ouida Meier continues to direct the efforts of Task 4. Her salary and efforts for this quarter have in part shifted to wastewater and environmental work.

We are grateful to our team of bright and talented graduate and undergraduate students who assist with the work in Task 4. Ms. Anupama Oruganti and Mr. Naveen Midde have contributed significantly to this project this quarter through mapping and software programming, respectively. Assistance with the website work for the Center this past quarter was contributed first by Ms. Madhavi Mamidipalli, and subsequently by Mr. Gopi Kallepalli. The Center is very grateful for the dedicated and skillful efforts of each of these individuals. It is a goal of the Center to help educate students through applied research and to increase the pool of technically talented people that are aware of the issues facing drinking water systems and public health protection.

Appendix A

Grant X83123601-0
FY 04, 2nd Quarter
January 1, 2003 through March 31, 2004