

COUNCIL DECISION REQUEST

SUBJECT: Water Resources Update

MEETING DATE: Sept. 21, 2006

ITEM NO.:

SUBMITTED BY: Buzz Walker 

SUBMITTAL TO AGENDA
APPROVED BY TOWN MANAGER



CSP ITEM: Yes No X KRA#

TENTATIVE SCHEDULE: 4 mo

AMOUNT BUDGETED: \$200,000.00

EXPENDITURE REQUIRED: \$43,300.00

CONT. FUNDING REQUIRED: -0-

EXHIBITS (If Applicable, To Be Attached): SWCA Proposal

RECOMMENDED MOTION: I MOVE TO ENTER INTO AN AGREEMENT WITH SWCA ENVIRONMENTAL CONSULTANTS FOR A REDESIGN OF THE WATER DEPARTMENT WATER INFORMATION MANAGEMENT SYSTEM IN THE AMOUNT OF \$43,300.00 AND TO ALLOCATE THE COST TO THE WATER ENTERPRISE FUND.

SUMMARY OF THE BASIS FOR RECOMMENDED MOTION: Pursuant to Council direction to update the safe yield estimate for the Town's potable water resources it is necessary to access much water resources data developed by the Water Department. The data is in several locations and is not in a format that allows for easy access and interpretation. This Phase 1 and Phase 2 redesign of the several water resource information databases will make pertinent information readily available for Phase 3 tasks (at a later date) that will encompass the actual interpretation of this data to achieve the Council's desire for an updated water resources safe yield determination. SWCA will submit a proposal for Phase 3 at a later date. The Mayor's Water Task Force agrees that this effort is necessary and desirable.

PROS: Reorganizes water resource databases into easily accessible condition.

CONS: N/A

PUBLIC INPUT (if any): Town Council direction. Water Task Force Review.

BOARD/COMMITTEE/COMMISSION ACTIONS/RECOMMENDATIONS (if any) (give dates and attach minutes): Town Council direction.

SEP 21 2006 I.S.

OCT 05 2006 I.1



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August 24, 2006

Mike Ploughe
Town of Payson
303A N. Beeline Highway
Payson, AZ 85541

Re: Scope of Work and Cost Estimate for Redesign of Water Information Management System

Dear Mike:

Since 2000, the Town of Payson has been using the Water Information Management System (WIMS) database package to store and report data associated with the Town's public supply wells. This database package was originally designed and envisioned as a customizable, non-proprietary solution to help small to mid-size water companies (10 to 100 wells) manage their water system data.

Background

The initial focus of this project was to migrate all of the Town's hydrologic data into a single, digital database from its various historic locations as hardcopy or in Microsoft® Excel spreadsheets. This has been relatively successful for water level and well construction data, but less so for water quality and well production data. Water quality data was partially migrated up through 2001, with the remainder currently underway. While historic production data was migrated successfully into the database, recent and future well production data is currently collected and maintained automatically in the Town's SCADA system, and a link between WIMS and the SCADA system was constructed but never worked quite right.

A second focus of the original project was to customize WIMS to fit the Town's particular needs. This was accomplished by creating several customized graphs, reports, and data tables, most notably tracking of precipitation data, which had been absent from the original WIMS design.

Looking into the future and considering the Town's mandate to properly track and disseminate hydrologic data to the public, there are several shortcomings of the WIMS system that have become apparent.

- **Time Trend Graphing Features.** The current WIMS system uses a built-in Microsoft® Access graphing package to display time trends. While functional, the graphs are not readily customizable by the user, have formatting limitations, and cannot be saved as separate files for later manipulation or archiving.
- **Spatial Graphing Features.** WIMS currently exports contour creation and mapping to the Surfer software package. Like time trend graphing, this method is perfectly functional, but has some drawbacks. Over the last 5 years, this technique has largely been surpassed by the ubiquity and flexibility of Geographic Information Systems (GIS). In particular, the current Surfer method does not utilize true geographic coordinates, does not allow for the overlay of other data layers (such as geology, water infrastructure, or demographics), and does not allow for any three-dimensional graphing of surfaces (such as water levels or water production).
- **Interface with SCADA system.** As noted, this interface was attempted and promptly stopped working. The current SCADA system has graphing features, but lacks the ability to create output suitable for public display and more importantly, lacks the logic capabilities needed to error-proof the production data. WIMS is the better tool to manage production data, but to date has not successfully integrated with the SCADA system.
- **Overall speed and efficiency.** Access was originally chosen as the database platform because it was widely available, customizable, and non-proprietary. Due to the amount of relatively sophisticated code and queries used in WIMS, it also is rather slow and computing-intensive. While increasing computer speeds have helped alleviate the problem, there are still some functions that are disappointingly slow and likely could be improved.

Objectives for System and Proposed Approach

It is our understanding that the Town has the following objectives for a system to store and manage their water supply data:

- The system must be robust and reliable.
- The system should store all pertinent information, including production data.
- The system must allow continuing manual input of historic and future hydrologic data by Town personnel.
- The system must interface seamlessly with the SCADA system.
- The system should make periodic reporting (i.e., data releases to the public to the Town council) fast and easy.
- The system should allow data to be easily graphed as time trends, as well as spatially, to allow for rapid public dissemination of data and rapid analysis by Town personnel in order to properly manage the system.
- The system should have safeguards to allow for data quality control.

It is our belief that the WIMS database is still part of the long-term solution for the Town. The underlying database structure is well designed, and the query logic available in Access is incredibly powerful and flexible. In addition, Access allows use of Visual Basic code, which makes its functionality nearly limitless. The “Report” feature of Access is also quite powerful, and while the underlying queries could possibly be streamlined for efficiency, overall the reporting feature is functional, useful, and provides the output needed.

The graphing features of WIMS, however, are unacceptable in the long term. Instead of using the existing procedures, we envision “out-sourcing” these features from Access to other software packages best able to do the job. For time-trend graphing, Excel is probably the most appropriate package, as it allows for highly customizable design of graphs and can be saved for later use. For spatial graphing of data, the ESRI® ArcGIS software package is the industry standard and is probably the best long-term solution.

Proposed Tasks

SWCA envisions this remodeling of the WIMS system to consist of three different phases. Phase 1 would involve assessing the existing database structure and working

with the Town to discuss the future uses of the system and what their end-user needs will be. Phase 2 would involve redesigning the database system and adding the first suite of features--those that SWCA is nearly certain the Town will want to have and use. Cost proposals for these two Phases are included in this proposal.

Costs have not yet been developed for Phase 3. Phase 3 would involve creation of additional features, reports, and output, as well as possible solutions for disseminating information to the public. We feel that the specific tasks in Phase 3 will largely depend on the Town seeing and using WIMS after the completion of Phase 2, at which time a new wish list can be developed. For discussion, however, we have included below some items we suspect will be included in Phase 3.

Phase 1 – Assess User Needs and Existing System

- Task 1. SWCA will assess the underlying database structure and the current database queries to determine if there are fundamentally simpler, faster, or more direct methods that could be used. This will focus largely on the “Reports” feature, as this is the most time-consuming feature in WIMS.
- Task 2. SWCA will also assess the functionality of and “user-friendliness” of the existing data management and data entry tools. This will be done in conjunction with the Town’s staff who currently have been assigned to enter data. This will identify opportunities to make the database population more efficient. This will happen simultaneously with Task 3.
- Task 3. SWCA will attend an in-depth kickoff meeting in Payson with Town personnel. The purpose of the meeting will be to familiarize the project team with the existing database setup, observe how the system functions in the actual working environment, and brainstorm with Town personnel what they hope to get out of the redesigned system, including any reporting parameters or other mandates they have to meet.
- Task 4. SWCA will assess the existing GIS data available for the Town. This will include creation of metadata and documentation for the data, if not already available, and cleaning up those layers that most likely will be used in conjunction with the system.

Phase 2 – New Features

- Task 1. SWCA will redesign the existing graphing features of Access in order to automatically create graphs in Excel instead of the built-in graphing feature in Access. For this task, four graphs will be created in Excel : well production, water levels, precipitation, and water quality. Many of the other graphs currently available in WIMS are largely unused and export of those graphs into Excel can be included in Phase 3, if still desired.
- Task 2. SWCA will design an export feature to automatically display data in ArcGIS. This will initially include exporting point data for posting, and generation and display of two-dimensional contours. This task will include the export of three types of maps: water levels, water quality, and well production data. Standard map templates will be developed with the Town's input for each of these parameters.
- Task 3. SWCA will design an interface with the SCADA system to automatically obtain well production data and incorporate it into the database. This task will also include the design of logic queries to help flag production data with potential problems that may need revision. Based on the Town's needs, this feature may work automatically, or may require periodic attention from Town personnel to verify data before it is imported. SWCA will work with the SCADA design contractor during this task to ensure that the connection will be robust and will work indefinitely.
- Task 4. SWCA will also redesign specific queries within the underlying Access database that could be made more efficient and reduce overall report generation time.
- Task 5. SWCA would install the new database on the Town's computers, train personnel in operating them, and return when needed to deal with unforeseen bugs or problems.

Phase 3. Advanced Features

As noted before, Phase 3 includes those features that will be further designed after Phase 2 has been completed and the Town has had a chance to assess the results. Phase 3 tasks have not been costed out at this time. Likely items to be included in Phase 3 could be:

- Production of three-dimensional surfaces in ArcGIS to better display water levels and water production.
- Animation of three-dimensional or two-dimensional time series.
- Creation of a website for public consumption of water system data. This could include simple solutions such as automatic generation of PDF files, or more sophisticated solutions like an ArcIMS server that allow interactive display of GIS data over the web.
- Geologic modeling to compare production data or water levels with fractured zones, well construction, or other geologic data.
- Creation of custom ArcGIS interfaces for Town personnel to allow flexible formatting and analysis of data without being particularly skilled at ArcGIS.

Costs and Schedule

SWCA proposed to conduct this work on a time-and-materials basis. The following are estimates of the time and associated costs required.

Phase/Task	Man-hours Estimated	Approximate Cost
Phase 1. Task 1 – Assess Database Structure	48	\$3,400
Phase 1. Task 2 – Assess Data Entry Tools	24	\$1,800
Phase 1. Task 3 – Attend Kickoff Meeting	24	\$2,100
Phase 1. Task 4 – Assess GIS Data	48	\$3,800
Phase 2. Task 1 – Excel Graphing	96	\$6,800
Phase 2. Task 2 – ArcGIS Graphing	132	\$10,200
Phase 2. Task 3 – SCADA Interface	76	\$6,500
Phase 2. Task 4 – Query Redesign	66	\$4,700
Phase 2. Task 5 – Install and Support	40	\$4,000
TOTAL	554	\$43,300



2/36

The following is an approximate timeframe for this work. Phases 1 and 2 are estimated to take 20 weeks to complete:

Phase/Task	Week																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Phase 1. Task 1	█	█	█	█	█	█																			
Phase 1. Task 2	█																								
Phase 1. Task 3	█																								
Phase 1. Task 4	█	█	█	█																					
Phase 2. Task 1																									
Phase 2. Task 2																									
Phase 2. Task 3																									
Phase 2. Task 4																									
Phase 2. Task 5																									

We appreciate this opportunity to continue working with the Town on its water information system and believe that this proposal will result in a system that will be functional and flexible indefinitely into the future. Please don't hesitate to call if you have any questions regarding the proposed redesign.

Sincerely,

Christopher J. Garrett
Professional Hydrologist – Ground Water (P.HGW.)

Enc:

**PROPOSED PRIMARY PERSONNEL
AND BILLING RATES**

Personnel	Primary Responsibilities	Bill Rate
Chris Garrett	<ul style="list-style-type: none">• Project management and coordination of programming tasks• SCADA interface	\$85/hr
Lisa Dickerson	<ul style="list-style-type: none">• Primary access programmer• Excel redesign• Assessment of database structure• Query, report, and form redesign	\$65/hr
Glenn Dunno	<ul style="list-style-type: none">• GIS interface• Assessment and formatting of Town GIS data	\$75/hr