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DEVELOP DATA MANAGEMENT SYSTEM FOR ASSISTANCE IN
CONDUCTING AREAS OF REVIEW IN KANSAS

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Develop Data Management System for Assistance in Conducting Areas of Review in Kansas

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ABSTRACT

This technical report will serve as the Final Report. This report was prepared as an account of the progress made on the Area of Review Analysis sponsored by the Department of Energy (DOE). It updates the Agency concerning the Third Quarter 1998 accomplishments achieved by the Information Services section of the Conservation Division of the Kansas Corporation Commission, located in Wichita, Kansas as well as summarizing the entire project.

EXECUTIVE SUMMARY

During the third Quarter 1998, continued debugging and program enhancements were made to the project under DoE Award Number **DE-FG22-95MT95002**. The finished product is a functional, 32-bit version of RBDMS, accessed via a Microsoft Access 97 user interface, with ODBC connectivity to a Microsoft SQL Server 6.5 database engine. The system utilizes the client/server model which is implemented on a Microsoft Windows NT Server 4.0 network operating system, with clients utilizing Windows 95 desktops. Connection of the remote sites (the KCC District Offices) to the RBDMS data set in Wichita via the Wide Area Network (WAN) was realized during the First Quarter of 1998.

INTRODUCTION

The Kansas Corporation Commission (KCC) was awarded a grant by the DoE to create an automated system to perform Area of Review Variance Analysis in the state of Kansas. The project is a national effort to assist state oil and gas regulatory agencies. The KCC project began in 1995 with the installation of a Wide Area Network and the purchase of Pentium-class personal computer systems, peripherals, operating systems and application software. The KCC chose to address the AOR Variance question through the use of an electronic data management system called RBDMS (Risk-Based Data Management System), developed by the Tulsa, Oklahoma office of CH2M Hill, an engineering consulting design group. RBDMS requires a relational/normalized data system containing all well types. This is the Final Technical Progress Report which provides a synopsis of the entire project, as well as a summary of the activities and advances made during the Third Quarter of 1998, the final quarter of the project.

PROJECT OVERVIEW

The RBDMS project proceeded in the following general sequence of events:

- The Underground Injection Control (UIC) and Area of Review (AOR) functional requirements were established.
- The various legacy data sets had to be converted and merged into RBDMS to satisfy the requirements and scope of the DoE-funded project.
- RBDMS had to be modified to facilitate the data migration due to the fact that the legacy systems that were combined for integration into RBDMS included data fields not in RBDMS. Further, the KCC had unique functional requirements that were not previously addressed in the RBDMS program.
- Functional requirements necessitated the upsizing of RBDMS to a 32-bit platform. This effort included upsizing those objects required by the KCC from Microsoft Access 2.0 to Access 8.0. This did not include the upsizing of those RBDMS components not required by the KCC.
- The AOR Variance Questionnaire (AorVarQ) and Zone of Endangering Influence (ZOEI) programs were developed and implemented into RBDMS. AorVarQ will be used to assist the KCC in evaluating areas that may meet variance guidelines. The ZOEI program will be used to assess proscribed AOR radius' and allows Division staff to evaluate pressure transient possibilities in determining the zone of endangering influence.
- A procedural analysis was performed, which resulted in the development of a user's manual for the KCC. This manual was also deployed in HTML format to the RBDMS web site.
- The user population was trained on the utilization of RBDMS. In addition to training related to the technical/operational aspects of the program, facilitated by CH2M Hill, the training seminars also included discussions of goals and objectives by KCC Division management, and deployment issues by KCC Division IS staff.

PROJECT SUMMARY

UIC/AOR Requirements

CH2M Hill built the AOR Variance Questionnaire (AorVarQ) and Zone of Endangering Influence (ZOEI) programs to be implemented into the KCC's version of RBDMS. A *Select* custom UIC user interface was developed for the

software. Other specific requirements included the facility to annually monitor UIC data; the facility to locate operator transfers by docket number; the facility to generate letters to operators; the facility to track dockets; and miscellaneous modifications to address the KCC's unique needs, e.g. river basins.

Data Conversion and Merging

To realize the goal of a single, centralized repository of data, numerous legacy data sets had to be converted and merged. These data sets included:

- The KCC District 3 UIC database and other existing UIC databases
- The KCC "Master Well" data set
- The Kansas Geological Society (KGS) data set
- The Dwight's/Morrison data set
- Various databases for plugged wells
- Docket and License databases
- Miscellaneous reference data

The result of this migration was a data set housing approximately 335,000 well records. In terms of number-of-records, this represents the largest implementation of RBDMS nation-wide.

RBDMS Upsizing

In 1995, when the KCC project was first started, RBDMS was a 16-bit software program, running on Microsoft Access 2.0. However, functional requirements made the migration to a 32-bit platform a necessity. All of the KCC's Windows 3.1 PCs were upgraded to Windows 95, and the Microsoft Office Professional suite was upgraded to Office 97, providing a full 32-bit database product in Microsoft Access 97. These software improvements placed additional requirements upon the hardware. Therefore all of the PCs were upgraded from 16 to 32 MB RAM, and the Intel-based 75 MHz Pentium processors were upgraded to 100 MHz processors; the fastest processor upgrade possible utilizing the existing main boards. This facilitated the use of the faster, more powerful software interfaces.

At the outset of the project, the KCC servers were Novell 3.12 and 4.1 systems. When the other Divisions of the KCC chose Microsoft NT Server 4.0 as their network operating system, the Conservation Division migrated to this platform.

With this migration, Windows 95 clients, and the full 32-bit Access 8.0; the decision also was made to utilize Microsoft's SQL Server 6.5 database engine in lieu of the Oracle product originally specified. This was to facilitate the alleviation of some of the inherent problems associated with cross-platform database administration. SQL Server was implemented in the Third Quarter of 1997.

Procedural Manual

During the beta testing of RBDMS, it became apparent that a manual of procedures for using RBDMS would be very helpful to the KCC users. CH2M Hill performed a procedural analysis to determine what procedures were most needed. It was determined that the focus would be on the UIC Program. A draft copy was sent the KCC for additions and editing. After feedback from KCC staff, a final version of the procedural manual (copy included) was prepared in hard-copy. The RBDMS Procedural Manual also has been made available via the Internet at:

<http://www.ch2m.com/ch2mhill/projects/rbdms>

AOR Variance and ZOEI

The DoE Grant was geared primarily towards addressing AOR variances as part of the Class II UIC program. As such, two associated programs were developed: the RBDMS AOR Variance Questionnaire (AorVarQ) Program and the RBDMS Zone of Endangering Influence (ZOEI) Program.

With the RBDMS AorVarQ Program, UIC staff can investigate the possibility of giving an AOR variance to selected permit applications and producing fields where they see the utility of not having to do AORs. A great deal of time can then be saved in the permitting process while still protecting the environment. The AorVarQ program was modeled after the Ground Water Protection Council's Area of Review Variance Manual.

The ZOEI Program calculates and graphically plots the pressure and head differences between the USDW (Underground Sources of Drinking Water) and injection zone after a predicted period of injection so that the UIC Department can quantify the potential for the proposed UIC well to affect nearby open or plugged bore holes. Determining the zone of endangering influence is especially critical to operations in Southeast Kansas.

User Training

On February 3rd, 4th and 5th of 1998, Division-wide training on RBDMS was provided at the Wichita Central Office (see attached agenda). Dan Arthur, P.E., the RBDMS Project Manager and Mark Layne, Ph.D., the RBDMS project's principal programmer were present during this time. Mr. Arthur did the training and Dr. Layne provided technical support. The first day consisted of an all-user overview of the software. Fifty-four KCC staff members from all over the State were present for this session. The second and third days were small group training sessions for "lead" users. These users received more individualized, hands-on training, and will assist other users in their respective Department or District Office i.e. serve as peer trainers. All training participants received a hard-copy version of the RBDMS Procedural Manual at their training session.

RECOMMENDATIONS FOR FUTURE WORK

Future needs for RBDMS implementation in Kansas includes, but is not necessarily limited to, the following:

- The Conservation Division continues to require additional interfaces for the RBDMS program to meet its diverse and/or unique needs. These range from incorporation of components that have previously been developed for other states (e.g. the Montana UIC data entry form) to custom forms to meet KCC data entry requirements.
- The Division continues to need general technical support from CH2M Hill. As the largest installation of the RBDMS program, assistance from the program's developers is needed to support the KCC with continued implementation. For example, data from approximately 20 legacy databases were merged and imported into the RBDMS data model. Many of the records for plugged wells and from historic data sets did not include unique identifiers. As a result, the KCC has uncovered several data quality issues

that could not be addressed electronically and will require manual reconciliation. Assistance in this area from CH2M Hill is considered of critical importance by several of the primary users of RBDMS.

- A key aspect of the KCC's oil & gas program is its Abandoned Well Program. The addition of a component in RBDMS to track abandoned wells, their status, plugging costs, related contracts with KCC plugging contractors, etc., would be beneficial to the Division and should be investigated. Due to the current low price of crude oil more and more wells are being abandoned. The need to track abandoned wells has been a major issue to the KCC during the last few years. Due to the depressed market environment the issue will continue to grow in importance.
- The KCC must develop a comprehensive implementation strategy for the RBDMS program. There are several components that are not currently used, but that are desired. Further, the KCC has not yet fully developed a comprehensive workflow strategy pertaining to the data entry source for each and every data field collected by the Conservation Division. Some data will be entered by District Offices while entry of some data may be restricted to specific Central Office staff.
- Although the KCC has performed a number of RBDMS training events, detailed training has been geared towards those individuals dealing with Class II UIC issues. Further training should be conducted to train staff dealing with field issues, oil and gas production, assurance bonding, reclamation, etc.
- The KCC currently issues annual licenses to operators in the state. To date, the KCC has maintained a separate Licensing System and replicated data from that system to RBDMS. Although this accomplishes the end goal, it is cumbersome and time consuming. In order to streamline the process, it would be reasonable to integrate the Licensing System into RBDMS, and should be investigated.
- The existing procedural manual is generally limited to UIC and AOR issues due to the nature of the grant from the DoE. Expanded documentation for power users and database administrators should be investigated. The procedural manual, to some extent, has been supplemented by the documentation available on the RBDMS web site, but has not eliminated the need for an augmented user's manual.
- As technology has advanced, KCC staff have expressed interest in providing its data to industry and the public via the Internet. The development of an Internet Interface for the RBDMS program, provided it could be used directly by the KCC, should be investigated.

- Field staff, in several District Offices, have been collecting GPS data for wells in the state, primarily in Southeast Kansas. The close proximity of many of these older wells makes location tracking by latitude and longitude essential. Further, the addition of GIS functionality to the RBDMS program could provide significant benefit to the resolution of environmental problems caused by abandoned wells.

ENCLOSURES

Enclosure 1: Agenda, Kansas Corporation Commission RBDMS Training

Enclosure 2: RBMDS Procedural Manual