# Subcontract Number 9-XQE-5035K-1

## Waste Management and Technologies Analytical
## Database Project
## for
## Los Alamos National Laboratory/Department of Energy

# Final Report

### Period of Performance: June 7, 1993 - June 15, 1994

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By
Summitec Corporation
665 Emory Valley Road, Oak Ridge, Tennessee 37830
Tel.: (615) 482-6460   •   FAX: (615) 482-1884

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1.0    Period of performance: June 7, 1993 through June 15, 1994

2.0    Introduction and Summary:

The Waste Management and Technologies Analytical Database System (WMTADS) supported by the Department of Energy's (DOE) Office of Environmental Management (EM), Office of Technology Development (EM-50), was developed and based at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico, to collect, identify, organize, track, update, and maintain information related to existing/available/developing and planned technologies to characterize, treat, and handle mixed, hazardous and radioactive waste for storage and disposal in support of EM strategies and goals and to focus area projects.

WMTADS was developed as a centralized source of on-line information regarding technologies for environmental management processes that can be accessed by a computer, modem, phone line, and communications software through a Local Area Network (LAN), and server connectivity on the Internet, the world's largest computer network, and with file transfer protocol (FTP) can also be used to globally transfer files from the server to the user's computer through Internet and World Wide Web (WWW) using Mosaic.

Under this subcontract, Summitec provided support services to LANL in developing and maintaining the WMTADS, specifically in the following areas:

**Survey Federal and State Agencies and Plan Interconnection**
After reviewing all relevant and necessary documents, Summitec staff members visited several laboratories and other DOE sites to participate in the Congressional enactment of the Federal Facility Compliance Act of 1992 mandated Mixed Waste Inventory Report (MWIR) data collection and reports. Interviews were conducted with on-site engineering personnel to develop Waste Stream Treatment Facilities and Technology Development questionnaires. Once questionnaires were completed through on-site interviews for data collection, data was entered into the computer database system. All questionnaires were organized and a list with related personnel maintained. Summitec created a log book to demonstrate exactly how information was collected, recorded, and evaluated from the previous data collection. Summitec also developed the final version of *The 1994 Technology Development Data Collection Scheduling/Labor/Cost Recommendations*.

In regards to future data collection, Summitec composed several documents concentrating on lessons learned and the status of future data collection and the problems/obstacles involved with initiating the next step in the data collection process. Summitec also contacted nine Federal Agencies to obtain a Source Point of Contact to use in acquiring Memorandums of Understanding and Interagency Agreements with the goal of assembling a database and archive for information reference and tracking purposes.

## Internetworking

The proposed wide area network (WAN) includes local area networks (LANs) in DOE Germantown, Maryland, the Los Alamos National Laboratory (LANL), and Summitec's office in Oak Ridge, Tennessee. The LAN in Summitec's Oak Ridge office has been installed, tested, and operated since January 1994. The Internet connection has been established. The file transfer protocol (FTP) has also been successfully tested and operational between the LANL and Summitec Oak Ridge offices.

For Germantown's LAN, all needed LAN and Internet components and the respective implementation procedures have been identified. The 10BaseT wiring has been installed and tested in Bellemead Building II. However, the implementation of the LAN and establishing an Internet connection in Germantown have remained on hold due to equipment and software shipment delays, and the impact assessment of moving out of the Bellemead Building II facility on May 15, 1994. A recommendation of riding the existing Bellemead T1 circuit and remote bridge into the DOE LAN was made in December 1993 as an alternate to an Internet connection, but has yet to receive approval from DOE Headquarters EM-14 staff.

## Network Management and Administration

Summitec developed several sources to promote awareness of the WMTADS. Summitec designed and published WMTADS brochures, established a 1-800 number, and established data access via computer. WMTADS can now be accessed by a computer, modem, phone line, and communications software through a local area network (LAN), and server connectivity on the Internet, with transfer files from the server to the user's computer via World Wide Web (WWW) using Mosaic.

## Application Software

In regards to Application Software, an IBM version template has been created for Waste Stream, Technology, and Treatment files. A dBASE file structure has been established for the draft Data Dictionary. In addition, Summitec has conducted research for using Artificial Intelligence and Expert System for data analysis.

An IBM compatible disk was created entitled "U.S. Department of Energy Interim Mixed Waste Inventory Report Database." This disk contains data for DOE Waste Stream, Technology and Treatment Facilities, with software tools to search, display, and print data.

## 2.1 Accomplishments:

### 2.1.1 Survey Federal and State Agencies and Plan Interconnection Strategy:

Summitec tracked down, from DOE, and reviewed the three documents on information and network systems - GAO Report (Better IS Resources Needed to Accomplish Mission) by DOE, Coleman Research (The Environmental Technologies Information Systems Report), and The Information Systems Catalog by SAIC. Summitec also traveled to DOE's Savannah River Site in Augusta, GA, the Hanford, WA site, Argonne National Laboratory, Ames National Laboratory, Brookhaven National Laboratory, Fernald Environmental Management Project, Idaho National Engineering Laboratory, LANL, Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, Oak Ridge Y-12, Oak Ridge K-25, Pantex, Paducah, Portsmouth Gaseous Diffusion Plant, Rocky Flat Plant, Sandia National Laboratory, and other DOE sites to participate in MWIR data collection by:

- Conducting interviews with on-site engineering personnel for the purpose of completing Waste Stream Treatment Facilities and Technology Development questionnaires;
- Entering Savannah River Site MWIR (Mixed Waste Inventory Report) data from hardcopy questionnaires onto the computer database system, and updating previously collected data from other team members of the earlier MWIR; and
- Reorganizing and maintaining a list of completed questionnaires with related personnel.

Summitec assumed and wrapped up data entry responsibilities and shipped finished data input forms and disk copies to LANL. Summitec participated in updating Technical Task Plan (TTP) to evaluate the progress and determine the current status of each individual task. A log book was created to demonstrate exactly how information was collected, recorded, and evaluated from the previous data collection. Summitec developed the final version of the "1994 Technology Development Data Collection Scheduling/Labor/Cost Recommendations" document which consists of the following:

- Adjustment of labor and cost projections so that a comparison can be made between the data entry personnel traveling to the sites and those stationed at one centralized location to perform the tasks
- Addition of one "Administrating Support Specialist" who will have the responsibility of overseeing the entire data collection from start to finish
- LANL providing a supplemental cover page identifying data gaps in each individual site-specific questionnaire
- DOE Program Manager providing an instructional cover letter to accompany each site's related TD questionnaires for transmittal to DOE Field Office EM-TPO with copies sent to all TPM's
- Identification of team members and organization of scheduling of participants by teams visiting each of the sixteen major DOE sites.

Summitec revised and wrote several documents concentrating on the status of the future data collection and the problems/obstacles involved with initiating the next step in the data collection process, and has coordinated with related personnel with regards to the future data collection efforts. Summitec has contacted nine Federal Agencies (USDA, DOE, DOD, DOI, DOT, DOC, EPA, NASA, and NRC) to acquire a Source Point of Contact (POC) in obtaining Memoranda of Understanding (MOU's) and Interagency Agreements (IAG's). The intent was to identify and obtain copies of MOU's and IAG's from various federal agencies to organize and assemble them into a departmental database, establishing an MOU and IAG archive for information reference and tracking purposes. The main objective was to avoid the creation of redundancies with existing documents which are all in support of DOE's interagency activities. A finalized list of names and telephone numbers for each agency was produced, and is now in use.

### 2.1.2 Internetworking:

The Network with Commercial Connection Plan and the Network with DOE Connection Plan were drafted for Bellemead Building II. The corresponding implementation plans and an overall network management plan were also established. All required elements for IBM PC and Macintosh integration under a Novell NetWare LAN and Internet environment were researched, identified, and submitted to DOE for review. A list of necessary components of the LAN implementation and Internet connection with the respective procurement information was submitted to DOE as requested in the task. The cabling scheme for 10BaseT and FDDI using unshielded twisted pair were researched, and subsequently, the 10BaseT cable system was installed and tested in the Bellemead Building. The other software, computers, and network support for DOE Government and contractor personnel included:

- Setting up a DOE NetWare 3.11 LAN connection using an Xircom External Ethernet Adapter which was coordinated through Ms. Mary Ann Breland, Mr. Bill Schutte, Mr. Paul Lurk, Mr. Jim Fannon, and Coleman Research.
- Pushing through paperwork for DOE NetWare LAN accounts for EM-30, EM-40, and EM-50 contractors in Trevion Building I.
- Developing a purchase plan and document for network items needed to provide connectivity for Summitec personnel and other contractors in Trevion I.
- Setting up a Windows PC on AppleTalk network for printing;
- Moving and setting up printers for PCs;
- Setting up a sub-notebook PC with DOS 6.0, new BIOS, Windows, Windows applications, modem communications, and a printer;
- Purchasing, setting up, and troubleshooting the Mac PowerBook functions of direct printing, modem to digital PBX communication, and SCSI disk drive sharing.

The configuration of hardware, software, and wiring for the local area network at Summitec's Oak Ridge office was engineered, installed, tested, and operated. The following tasks have been accomplished:

- Searched for and downloaded html editor and generator for Unix, PCs, and Macintosh through Internet for use to convert and create .html files for World Wide Web data distribution.
- Installed, tested, and studied the html editor and generator in a PC and the Sun SPARCStation.
- Reconfigured Summitec's Communication Server and enabled five ports for PPP (Point to Point Protocol) connection.
- Reconfigured Chameleon and MacPPP to make a PPP connection from the PCs and Macintosh computers.
- Began writing users' manuals for installing and using InterSlip and Mosaic in a Macintosh computer and installing and using Chameleon and Mosaic in PCs.
- WMTADS and User's Manual:
  - Reviewed, read, or scanned all books and articles on technologies, products, and access providers for remote access to the WMTADS Web Server via the Internet.
  - Petitioned and signed up for beta testing of Internet-in-a-Box by Spry and SuperHighway Access by Frontier Technologies.
  - Wrote a brief document on accessing EM's & LANL's Technology Selection Catalog and WMTADS information via WWW.
  - Downloaded, formatted, and printed various Request for Comments (RFCs) and For Your Informations (FYIs) off of the Internet for inclusion into the WMTADS Access and User's Manual.
  - Connected a SLIP server from Germantown, MD to Summitec in Oak Ridge, TN for access to Internet using a Chameleon Sampler package from one of the books on Internet access.
  - Set up a stand-alone Windows workstation with Mosaic and a number of WMTADS HTML documents for demonstration purposes.
  - Researched Ethernet PCMCIA cards and Macintosh SCSI-to-Ethernet interfaces.
- Set up Sun Station; installed operation system, Solaris 2.2; and subsequently configured and connected to the LAN;
- Installed TCP/IP software to Network server;
- Set up "NIS+" system at Sun Workstation;
- Configured Sun Station as a mail server of the Summitec network domain, and enabled E-mail;
- Configured and created necessary directory in Sun Station so the nfs can function properly on importing and exporting files;
- Configured and enabled MacTCP application in the Macintosh Quadra 900 to allow Internet related applications, such as NCSA Telnet, Mosaic, Fetch, and etc. to work;
- Installed FaxModem for users to dial into Summitec's computer system for file browsing in the future;
- Prepared Quadra 900 Macintosh computer to be an effective network server by:
  - Upgrading Telnet utility to version 2.6;
  - Installing Mosaic and testing it by logging into LANL's WWW server;
  - Installing uncompressed utility of "Stuffit Expander" file; and
  - Installing PageMaker 5.0 to convert files of emhpmail.em.doe.gov into .gif graphic files and MS Word files.
- Configured new Cisco Communication Server which will provide users with the ability to dial in through modems and then connect to Internet;
- Connected Quadra 900 to Internet to access NCSA Telnet;
- Configured sendmail and Domain Name Server (DNS) files;

- Installed MacSLIP for TCP/IP on the Macintosh computers in order to run Mosaic on remote Macs via a telephone line through the Cisco Communication server;
- Configured Chameleon for Windows to enable the PPP and/or SLIP connection to communication server through the modem for users to run Internet software such as ftp, telnet, Mosaic, etc.; and
- Configured InterSLIP which is now able to provide the connection to communication server for Mac users to run Internet software.

In addition, Summitec has supported database information and data call procedure which included reviewing data call questionnaires, attending data call review meetings, and conducting training sessions.

### 2.1.3    Network Management and Administration:

Routine tasks involved in this area of work included weekly and monthly periodical surveys; background research on network management; daily backups from the NetWare server; and identifying action items in each contract task and matching them with the established milestone activities of WMTADS. Specific activities include:

- Designing and publishing WMTADS brochures;
- Establishing a 1-800 number (MCI) for WMTADS in Germantown, MD;
- Preparing the EM mid year review on WMTADS;
- Summarizing evidence of DOE technology which supports environmental problems involving in DOD base closures in a memorandum for the Deputy Assistant Secretary Office of Technology Development;
- Reviewing and presenting an outline of conclusions regarding Cost Effective Analysis of ISRIP created by the Energy and Environmental Analysis Group of LANL which has concerns of Definition of Technologies, Definition of System, Performance Characterization, Development Life-Cycle Cost of Alternatives, Uncertainty, Environmental Risk, Conduct Cost-Effectiveness Analysis and Total Cost Saving.

### 2.1.4    Application Software:

Summitec assisted LANL in finalizing questionnaires for waste streams, technologies and treatments, and in preparing final survey forms in Mac version for all sites. An IBM version template for "Waste Stream", "Technology", and "Treatment" files was created by adjusting and rearranging the layout to avoid display overlapping according to the display of an IBM computer. The database, managed under this task, has the capability to accommodate imported existing datafiles and to create new data files. Summitec has created a dBASE file structure; prepared draft Data Dictionary for IBM PCs; developed FileMaker Script for transferring FileMaker's Database to plain text files; established Clipper programs to import data from text file to dBASE format database; and used "ftp" function to reach the server at LANL for transferring data and testing the conversion programs with Waste Management and Technology Analytical Data System (WMTADS).

Summitec staff created a program written in Clipper for searching, displaying and printing data in DOE Interim Mixed Waste Inventory Report database. This program was later loaded with data into an IBM compatible diskette for distribution to other Government Agencies who were interested in the DOE Report in electronic format. The database was in dBASE format so that it can be easily maintained and used by a wider range of users.

Summitec's staff has traveled to LANL to reinstall the Solaris 2.2 operating system for the Sun Station, and to configure the Sun Station for ftp and telnet functions. As a test, Summitec personnel downloaded an IBM version FileMakerPro file from Mac system into the Sun Station in Los Alamos using ftp, and then uploaded this file into the Sun Station in Summitec's Oak Ridge office. The resulting file was successfully read by FileMakerPro in a Mac machine at Summitec's office.

Summitec received a Macintosh Quadra 900 system on loan from LANL to assess its network functions and role in application software. Summitec was able to transfer FileMaker Pro files of MWIR from LANL directly using NCSA Telnet and through the Sun Server. Summitec has found that unnecessary "bin hexed" FileMaker Pro files would increase file size by 50% and prolong the transfer period, and reported the finding to the LANL's project manager.

A considerable amount of effort has been devoted to exploring World Wide Web (WWW) as a vehicle for application software. Summitec has established WWW servers using a Quadra 900 computer and the Sun Workstation, and studied html markup languages in providing service with WWW servers.

Summitec assisted in the development of 4D database application to MWIR and investigated the mechanism by which the raw data is processed through FileMakerPro and 4D, and eventually presented in WWW.

Summitec participated in the research using artificial Intelligent/Expert Systems, such as Exsys, for application development. In addition, a subcontract was issued to Consultec Scientific Inc. for the development of Simple Waste Amelioration Process (SWAP). This part of the work was directed by LANL Program Manager, Dr. William McCulla.

Other accomplishments include:

- Assisting LANL in upgrading and adding to the database system;
- Establishing "help" software to sort, compare, and search with FileMakerPro;
- Participating in the development and evaluation of high-level application programs to match technology to waste streams;
- Upgrading and improving the network and developing high-level applications and decision support application, as determined by DOE-HQ and users of the database;
- Investigating the capacity of Mosaic with both PC and Macintosh and the scope of WMTADS through Mosaic; and
- Searching for PPP or SLIP software for Macintosh.

## 3.0    Recommendation for Continuing Work:

### Survey Federal and State Agencies and Plan Interconnection Strategy:

- Research POCs, phone numbers, e-mail addresses, and mail addresses for states other than WGA and other interested state agencies.

### Internetworking:

- Track the development of the cell- and frame-based switching products.
- Continue study of the "FORM" creation for information search.
- Investigate Broadband Networks:  Frame Relay, ATM, SMDS.

### Network Management and Administration:

- Prepare a User Manual to access information server at LANL.
- Track the development and integration of network management products and technologies, especially those involving SunNet Manager, Novell NetWare, and Synoptic Optivity.

### Application Software:

- Collect information for preparing User's Manual on using Mosaic to browse waste management information in LANL.
- Develop a switch method to redirect WWW users to a second server whenever the first one is overloaded with high traffic.
- Establish a bulletin board to update and circulate new information on the WMTADS server.
- Explore availability of Landsat or other surface data from NASA for integration into WMTADS.