AGREEMENT

Uranium Resources, Inc. and Corpus Christi State University agree that the System Design of a Data Processing System for Uranium In-Situ Leaching Projects may be submitted by Susan Scott Bertram as a graduate project but remains the property of URI.

Copies of the project will be kept only in the offices of the Dean of the College of Science and Technology and the Computer Science Department. The project, in part or in whole, will not be sold and will be made available only for review by students and faculty.

Susan Scott Bertram  
Graduate Student Computer Science  
CCSU

Date

Dr. Roy Ellsley  
Department Chairperson  
Computer Science

Date

Uranium Resources, Inc.

Date

R.M. Bakke  
Interim Dean  
College of Science & Technology

Date

College of Science and Technology  
Corpus Christi State University  
6200 Ocean Drive, Corpus Christi, Texas 78412  
(361) 991-6910  
A campus of the University System of South Texas  
Equal Opportunity Employer
DESIGN OF A DATA PROCESSING SYSTEM
FOR URANIUM IN SITU MINING PLANTS

Submitted in partial fulfillment
of the requirements for CS 595

November 26, 1980

SUSAN SCOTT BERTRAM
URANIUM RESOURCES, INC.
DATA PROCESSING SYSTEM

Table of Contents

1.0 INTRODUCTION .......................................................... 1
  1.1 PROBLEM DEFINITION .................................................. 1
  1.2 A DESCRIPTION OF URANIUM IN SITU MINING .................. 1
  1.3 GENERAL APPROACH .................................................. 2

2.0 SYSTEM SURVEY .......................................................... 3
  2.1 ORIGINAL SYSTEM .................................................... 3
  2.2 REDESIGNED SYSTEM .................................................. 6
    2.2.1 DATA PROCESSING FUNCTIONS ................................. 6
    2.2.2 FILE STRUCTURES .............................................. 8
    2.2.3 DATE ROUTINE .................................................. 9

3.0 FILE LAYOUTS .......................................................... 10
  3.1 THE SYSTEM FILE .................................................... 10
  3.2 THE WELL MASTER FILE .............................................. 12
  3.3 THE DAILY DATA FILES ............................................. 15
  3.4 THE FIELD AVERAGE FILE ......................................... 17

4.0 AN EXPLANATION OF ALPHABASIC .................................... 19
  4.1 VARIABLES ............................................................ 19
  4.2 MEMORY MAPPING ..................................................... 21
  4.3 ALPHABASIC FUNCTIONS AND STATEMENTS ......................... 23
  4.4 FILE SIZES, NAMES AND ADDRESSES ............................... 24

5.0 IMPLEMENTATION AND EVALUATION .................................. 25
  5.1 IMPLEMENTATION ...................................................... 25
  5.2 EVALUATION ........................................................... 26

6.0 APPENDIX ............................................................... 28
1.0 INTRODUCTION

1.1 PROBLEM DEFINITION

The purpose of this project is to design and implement a data processing system for uranium in situ mines for continuous use with the capability of producing progress reports on each project.

Uranium Resources, Inc. operates a number of uranium solution mines as part of joint venture projects. The responsibility of maintaining accurate records and reporting each project's progress has fallen to URI and demands a reliable and predictable system to do so. The programs and files initially set up to perform these record-keeping functions were not designed for long-term use. The re-design of the original system was necessary to allow for continuous use by many projects and to overcome other major limitations, as noted in the System Survey.

1.2 A DESCRIPTION OF URANIUM IN SITU MINING

This very general and very brief description of uranium in situ operations is included for those unfamiliar with the operations of URI. More technical explanations of in situ mining are available but are not necessary in explaining the data processing steps.

Uranium occurring in low-grade ores can often be recovered economically and with little surface damage through solution mining. This "in situ" mining process involves penetration of the ore body, permeation by a leaching solution, and the recovery of a mineralized solution.

Injection and extraction wells are drilled throughout an ore field. Through the injection wells certain chemicals are introduced into the formation which release the uranium into a solution. Extraction wells pump this enriched solution to a plant on the surface for eventual recovery of an oxide of uranium called yellowcake.
The measurements of the injected and extracted flows as well as their chemical composition are necessary for the efficient and economic operation of the plant because they are used in determining uranium recovery and techniques of operation. Data regarding a certain well, or a field in general, should be readily available for interpretation.

This data processing system for uranium in situ mining projects offers some consistency in data recovery and manipulation. Rather than having a separate set of programs for each project, this system takes a general look at all projects. It is, in effect, a package that can be applied to any project that Uranium Resources, Inc., chooses to undertake.

1.3 GENERAL APPROACH

The system design resulting from this project is based on the original data processing system of Uranium Resources, Inc. Basic drawbacks of the initial design necessitated changes in the data processing functions and file structures, as documented in the System Survey. The final file structures are explained in the File Layouts. Various aspects of AlphaBasic used to create the files and source documents are examined in the Explanation of AlphaBasic. Implementation and Evaluation indicate some of the problems encountered during development as well as some of the advantages and disadvantages of the newly designed system. The Appendix includes the program listings and any output generated by those programs.