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Computer modeling to evaluate capital and operating costs associated with aggregate resource potential of subsurface northern Missouri limestone units. (Volumes I and II)

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COMPUTER MODELING TO EVALUATE CAPITAL AND OPERATING COSTS ASSOCIATED WITH AGGREGATE RESOURCE POTENTIAL OF SUBSURFACE NORTHERN MISSOURI LIMESTONE UNITS

VOLUME I

by

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ABSTRACT

Supplies of usable near-surface limestone aggregate resources in northern Missouri are severely limited because suitable rock units are covered by up to 1,200 feet of younger rock and Pleistocene age glacial debris. Valuable limestone, suitable for a wide range of products, exists at depth in the Pennsylvanian, Mississippian, and Devonian Systems. These units are up to 150 feet in thickness and may be economically producible. In this aggregate-short region of northern Missouri, crushed stone and other limestone-derived products are frequently imported from distant sources. Product cost may more than triple per unit volume for a transport distance of 100 miles. The research study presented here takes a twofold approach in addressing this problem. First, a series of maps that assist in the location of producible limestone materials in the subsurface, which have not been exploited to date, has been created. Second, two FORTRAN computer programs have been developed. These programs can be customized by the user to model specific sites and operations to aid in economic feasibility studies, specifically capital and operating costs for room-and-pillar limestone mining operations. Additional emphasis has been placed on after-market use of the underground space created by a room-and-pillar mining operation.

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I. INTRODUCTION

The six essential natural forms of matter considered to be the building blocks of industry and commerce are iron ore, salt, sulfur, petroleum, coal, and limestone. Of these natural materials, limestone produces the greatest tonnage, surpassing even that of coal since the year 1963. Next to sand and gravel, limestone, in all of its carbonate forms, constitutes the second largest tonnage of any material produced in the United States. More than one billion tons of crushed stone and limestone-derivative products are consumed annually by the American public (National Stone Association, 1989).

The uses of this natural resource are extremely diverse. Essentially every object that exists in our modern surroundings requires limestone, or lime derived from the stone resource, in some phase of its manufacture (Boynton, 1980). Quality limestone aggregate is a basic material used in the construction of highways, airport runways, erosion control structures, bridges, and dams. Construction of the average home requires about eight tons of limestone in its foundation, sidewalks, and driveway. Lime, a calcined or burned form of limestone, and other limestone by-products are used for producing a range of goods as diverse as carpeting, animal feed, paint, toothpaste, medicines, and soaps.

Fortunately, calcium, the basic element of limestone, is contained in 4.15 weight percent of the earth's crust and ranks fifth in overall abundance. Thus, limestone sedimentary rock is the most abundant of all nonclastic (chemical) sedimentary rock types on the planet (Foster, 1979). Unfortunately, this resource is deposited in limestone rock strata laminated between layers of sandstones, shales, conglomerates, and other rock types. Economical

access to this resource is therefore limited as a result of natural depositional placement. In other cases, man's environment is developed over and around once-accessible portions of the resource, rendering it economically unretrievable.

A. PURPOSE

With present and probable future increases in demand for limestone as an essential material in so diverse a product market and the depletion of easily accessible reserves of the resource, limestone producers will be investigating, developing, and managing reserves that, in the past, would have been considered uneconomical for production. This research was designed to aid producers in all of these phases of future limestone-producing operations.

B. GEOLOGICAL MAPPING

There is a dearth of national, regional, and local maps that delimit limestone formations in this country (Boynton, 1980). Currently, no maps are available to the State of Missouri that specifically delineate the presence of this resource within an economically producible range of modern mining methods (Rueff, 1989, personal communication). To aid in alleviating this situation and to assist future producers in their investigations, an extensive well-log database and a series of maps defining geologic units that are known to contain high-quality limestone have been developed as part of this research. Structure contour and isopach maps, 12 in all, depict subsurface geologic configuration of the potentially producible quality limestones for the northern third of the State of Missouri.

Although limestone and lime (a product of the parent limestone rock) are used in a huge variety of products, this research is oriented toward the shortage of construction-quality aggregate available in northern Missouri. The exclusion of other uses for northern Missouri limestone in the following discussion is not intended to indicate that aggregate production is the only potential market for this material. Specifically, the potentially available quantity and quality of the limestone units discussed here are consistent with needs related to the Missouri construction industry. Quantity and quality guidelines other than the ones considered herein will have to be met when considering the limestone materials for other uses.

The commercial limestone industry, as with any industry, is driven by the profit potential of the product. Prior to investment of capital, producers must consider the costs associated with developing and operating a limestone-producing mine. Economically producible limestone is associated with a mining operation that can generate a profit greater than that which would be collected if the capital were invested in another way. Currently, there is a lack of tools in this mining industry to aid producers in evaluating capital and operating costs for a mining installation prior to capital investment (Petrick, 1987). Capital investment and operation cost analysis systems range from nonexistent in some smaller mining operations, which exhibit a wildcat funding approach, to simple in-house computer spreadsheet and hand-written calculations in some of the larger companies (Mayger, 1990, personal communication; Seamen, 1989, personal communication).

C. COMPUTER MODEL DEVELOPMENT

Two FORTRAN applications have been developed to address the cost-estimating tool deficiency. These applications, which can be run on personal computers capable of processing IBM Professional FORTRAN commands, allow the user to estimate capital and operational costs for underground limestone mining operations. These software applications can be customized by the user with a minimum knowledge of FORTRAN programming to duplicate costs associated with a specific operation. The programs are designed to be as flexible and explanatory as possible to avoid the "black-box" approach associated with many computer programs. While setting up and running these programs, the user easily familiarizes himself with all of the equations and variables associated with the cost-estimation and therefore understands the numbers that are produced by the computer. He also becomes aware of the unavoidable limitations of these and any cost-estimating systems. Note that there are many economic considerations that will have to be evaluated in the development of a limestone-producing operation that these models do not include. Considerations of factors such as local and regional product market, availability of work force, political and social climate associated with the proposed site, and alternatives for capital investment could influence project viability. Capital investment and operating costs, although substantial cost items, are only two discrete areas to be included in research on project feasibility.

D. UNDERGROUND SPACE UTILIZATION

The economic production of limestone must be considered beyond the basis of marketing the material. Postmining use of space created by limestone extraction should be given significant consideration in long-term investment structures of the operation. Surface-mining

operations may be limited in this scope. Underground operations, however, can offer many postmining development opportunities. This aspect of underground mining is also a vital part of resource management.

The Kansas City, Missouri, area exemplifies secondary usage of mined space in North America. Light and heavy industry, offices, storage and refrigeration facilities, and university facilities all present choice examples of how underground space created by room-and-pillar-type limestone-mining operations can be utilized. Underground mining in Kansas City is now carried out with secondary usage in mind (Stauffer, 1976). With proper resource management, specific mining techniques can be employed to successfully develop the underground space. Proper management can also prevent subsidence of overlying surface areas and facilitate their continued undisturbed state. This research emphasizes mine development techniques conducive to postmining space development.

E. PREVIOUS WORKS

Literary information pertaining to this study can be divided into five categories. These areas are:

- **Physical and Chemical Properties of Limestone** Generalized references defining the physical and chemical properties of limestone, its origin and modes of occurrence, and its commercial uses. These references also define the standards used to specify physical and chemical properties required of the material in various applications.
- **Mine Design** Manuals providing instruction and specifications for design and development of mining operations.

- **Limestone Resources in Northern Missouri** Information characterizing the subsurface geological makeup of northern Missouri.
- **Cost-Estimating Approaches to Mining** Documentation on cost-estimating approaches related to mining technology.
- **Utilization of Underground Space** Inventories, prospects, and legal considerations dealing with post-mining development and utilization of underground space.

1. Physical and Chemical Properties of Limestone Boynton (1980) provides comprehensive coverage of the occurrence of limestone, its extraction, and its uses for a wide variety of products. His explanation of the broad spectrum of products requiring limestone and lime in processing and in manufacturing substantiates the importance of this resource. He also gives listings and procedures for the standardized tests defined by the American Society for Testing and Materials (ASTM) related to limestone and lime materials used in various applications.

ASTM Special Technical Publication 774 (1980), a collection of papers from a symposium chaired by W. W. Hotaling, Jr., presents new technologies for extending aggregate resources. These papers present results from experiments that add or substitute stabilized waste products from industrial processes to limestone aggregate. Papers are also presented on the benefication of low-quality natural aggregate materials for enhancing their performance in engineering applications.

The Geological Society of London, England, in the report published by the Working Party of the Engineering Group (1985), provides similar coverage to the subject matter as

does Hotaling. The Working Party, however, limits the scope of the work to materials used as aggregate and includes rock types other than limestone in the discussion. The Working Party also defines the English system for classification and testing of aggregates. The system, which parallels the ASTM in many ways, is referenced as the International Society of Rock Mechanics (ISRM) approach.

2. Mine Design Limestone literature abounds in many design manuals and case histories related to all aspects of mine design, performance, and operation. One specialized reference consisting of a group of papers presented at the Tunnel and Shaft Conference, sponsored by the Civil Engineering Department at the University of Minnesota (1968), provides discussion of problems and progress in rapid excavation techniques related to shaft sinking and tunneling. Of special interest are presentations by W. I. Gardner on tunnel site investigations and by A. A. Mathews on support and lining systems.

The Society of Mining, Mineral and Exploration Engineers, a subdivision of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) (1982), has compiled a 1,754-page handbook dealing with underground mining methods. This "cookbook" for design and development of coal and noncoal mining systems describes most aspects of developing an underground mining facility and includes contributions by 165 professionals associated with underground mine development and operation.

Bossard (1983) separates mine ventilation from the all-encompassing AIME design coverage in his discussion of underground mine ventilation design systems and practices.

The 1984 paper presented by L. B. Page at the AIME Geomechanics Unit Committee conference on geomechanics applications in underground hard rock mining provides a discussion of mine development stages and rock monitoring in a large-opening high-tonnage oil shale mine. This same conference includes a paper by M. P. Board and M. J. Beus detailing deep-shaft and decline liner stress-monitoring techniques used in hard rock environments.

The 1984 collection of papers from the AIME symposium dealing with applied mining geology presents a 219-page collection of material that emphasizes the importance of understanding subsurface geological structure and conditions prior to mine design phases of a proposed project.

3. Limestone Resources in Northern Missouri McQueen and Greene (1938) provide the last complete characterization of the rock units that compose the bedrock subsurface of northern Missouri. The document details rock strata to depths of the Precambrian basement; little reclassification or redescription has taken place since the report was issued. This document also provides several generalized geologic cross sections, isopach, and structure contour maps for the northwestern portion of the state. Unfortunately, this document is not geared toward specifying quality data for limestone resources in the area. Neither Herndon Map Service nor Petroleum Information, two of the larger private mapping services, could provide additional geologic information relative to limestone resources in this area of the state.

Several states other than Missouri, including Tennessee and Indiana, recognize the importance of identifying locations of limestone resources and have published relevant documents. Hershey and Maher (1963) compiled such a work for the Tennessee Department of Conservation and Commerce, Geology Division. A similar work was introduced to the Indiana Department of Natural Resources by Rooney and Carr (1975).

In fulfilling one of the goals of this research, that is, mapping the location of unexplored resources of quality limestone in the subsurface of northern Missouri, much of the previous work is in the form of well logs and oil well records. This work is considered as raw data and is contained in the files of the Missouri Department of Natural Resources (DNR), Geological Survey Division, in Rolla, Missouri.

4. Cost-Estimating Approaches to Mining A wealth of information exists for the individual interested in economic considerations of developing and operating a mining operation. However, most of these resources are developed around the coal-mining industry and are not necessarily applicable to limestone mining and processing. As early as 1915, W. B. Franklin considered the economic geology of the Wapanucka Limestone and some surrounding formations in the subsurface of Oklahoma. Rex (1955) continued the Oklahoma study to include the Baum Limestone.

Sholes (1981) researched the economic value of the Freeport Coal in Pennsylvania. Although this research is not directly applicable, it does provide some insight into economic considerations that are relevant to any type of mineral production.

Cost-estimating handbooks abound in mining literature. Katell (1974) outlines the basic considerations for estimating capital and operation costs for strip mining of coal. Nilsson (1981) uses an example to evaluate mine plans and development schedules in optimizing underground mine development.

The coal industry appears to have far surpassed the limestone industry in application of computer technology for resource planning and development. Cline (1981) introduced a directory of computer models applicable to coal mining. This directory includes models used in predevelopment cost-estimations as well as development and production optimization.

The U.S. Department of the Interior, Bureau of Mines (1987), developed a capital estimation and operating cost-estimating handbook for open-pit and underground hard rock mining. The Bureau system divides each discrete function undertaken in a mining operation into costs for labor, supplies, and equipment. It then considers adjustment factors for each of these costs. Cost equations are based on statistics collected from producers of metal ore within the mining industry. Used in the published form, the handbook requires massive amounts of hand calculations. A Lotus 1-2-3 spreadsheet version of the Bureau of Mines publication is available, but it does not provide any flexibility to update or revise cost equations for user-specified mining situations.

Gibbs and Arcomone (1987) review some of the computer programs that are currently available to aid in both mine design and in cost-estimation. Petrick and Dewey (1987) document their version of a BASIC language computer program based on the Bureau of Mines system that estimates the capital costs incurred in surface mine development.

With the expanding capabilities of personal computers and an increase in computer literacy in the industry, software applications developed to aid investors and developers in cost-estimations, mine planning, and production optimization and management should become increasingly popular.

5. Utilization of Underground Space The majority of mine literature dealing with underground space presents inventories of existing space and its uses. Stauffer (1972) provides a guidebook that takes the reader on a field trip through some of the underground space developed in the greater Kansas City area. He also provides a technical paper describing the potential for future development of underground space in Kansas City and discusses problems, as well as benefits, to locating facilities underground. In his 1976 publication, Stauffer provides an update to his 1972 inventory and prospect.

Whitfield (1981) with the Missouri DNR, Division of Geology and Land Survey, produced a document similar to those of Stauffer's but expanded the scope to include inventory and prospects for underground development within the entire state of Missouri. Whitfield also presents information on the geological unit mined at each underground site and the problems associated with developing the space for postmining use.

The 1972 paper by the American Society of Civil Engineers author presents legal considerations of ownership and property rights associated with underground space. Because occupation of improved underground space is a relatively new concept, these types of laws, which are in developmental stages, are being based on laws used to define rights pertaining to air space related to aircraft travel routes. They also present plans for developing residential and commercial sites in underground locations, addressing specific underground designs as well as access plans. Also, this document gives zoning regulations that are in place to regulate underground development in several areas of the country.

II. EVALUATING THE POTENTIAL FOR PRODUCTION OF LIMESTONE FROM THE SUBSURFACE OF NORTHERN MISSOURI

A. INTRODUCTION

When developing or using any type of a model that attempts to simulate a real-world system, the results will be no better than the user or developer's understanding of the real-world system (Bureau of Mines, 1987). To estimate, with any accuracy, the capital and operating costs associated with any operation or, specifically, a limestone-mining operation in northern Missouri, the following knowledge must be obtained.

- What are the geological characteristics of the subsurface in the areas targeted for mining?
- Based on these geological characteristics, what type of mining method can be economically employed for material extraction?
- With a selected mining method, what are the design and operation details of the mining system?
- Using engineering judgment, what are the estimated costs using the parametric approach; that is, an estimate of the costs for developing and operating this mining system based on actual past experience?

B. SELECTION OF STUDY LOCATION

The northern third of the State of Missouri, an area considered aggregate deficient, is sparsely populated. Two of the larger cities in this region are Kirksville and St. Joseph (Figure 1). Considering the work force required to develop and operate a limestone mine, it would be advantageous to locate the mine within reach of the two cities to make accessible a work force. Therefore, the radius of this area can be defined in a model by drawing a square

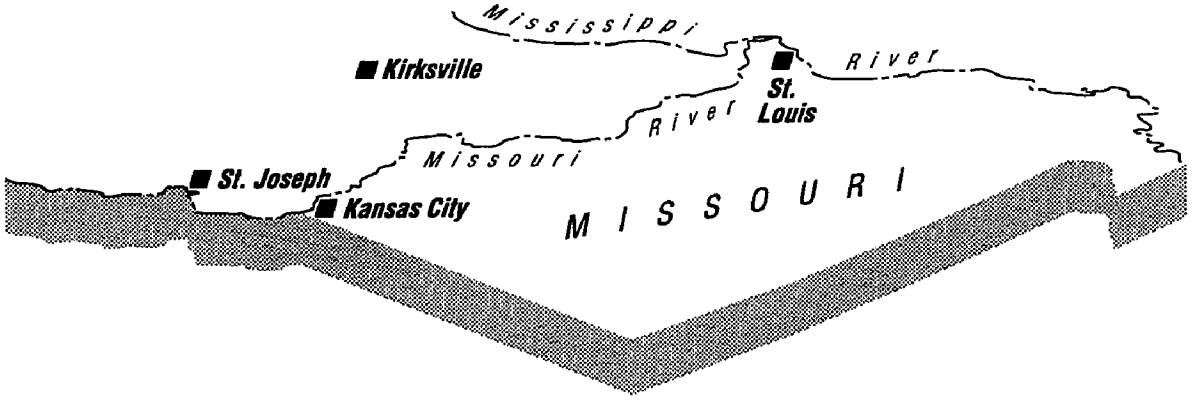


FIGURE 1
REGIONAL LOCATION MAP

encompassing each of these cities to establish the boundaries of a two-dimensional target area for mine development (Figure 2).

Three formations in the subsurface of northern Missouri are known to contain rock members that have the potential to produce high-quality limestone aggregate materials. In the St. Joseph area these target units include the following areas:

- Kansas City-Lansing
- Keokuk-Burlington
- Callaway-Cooper

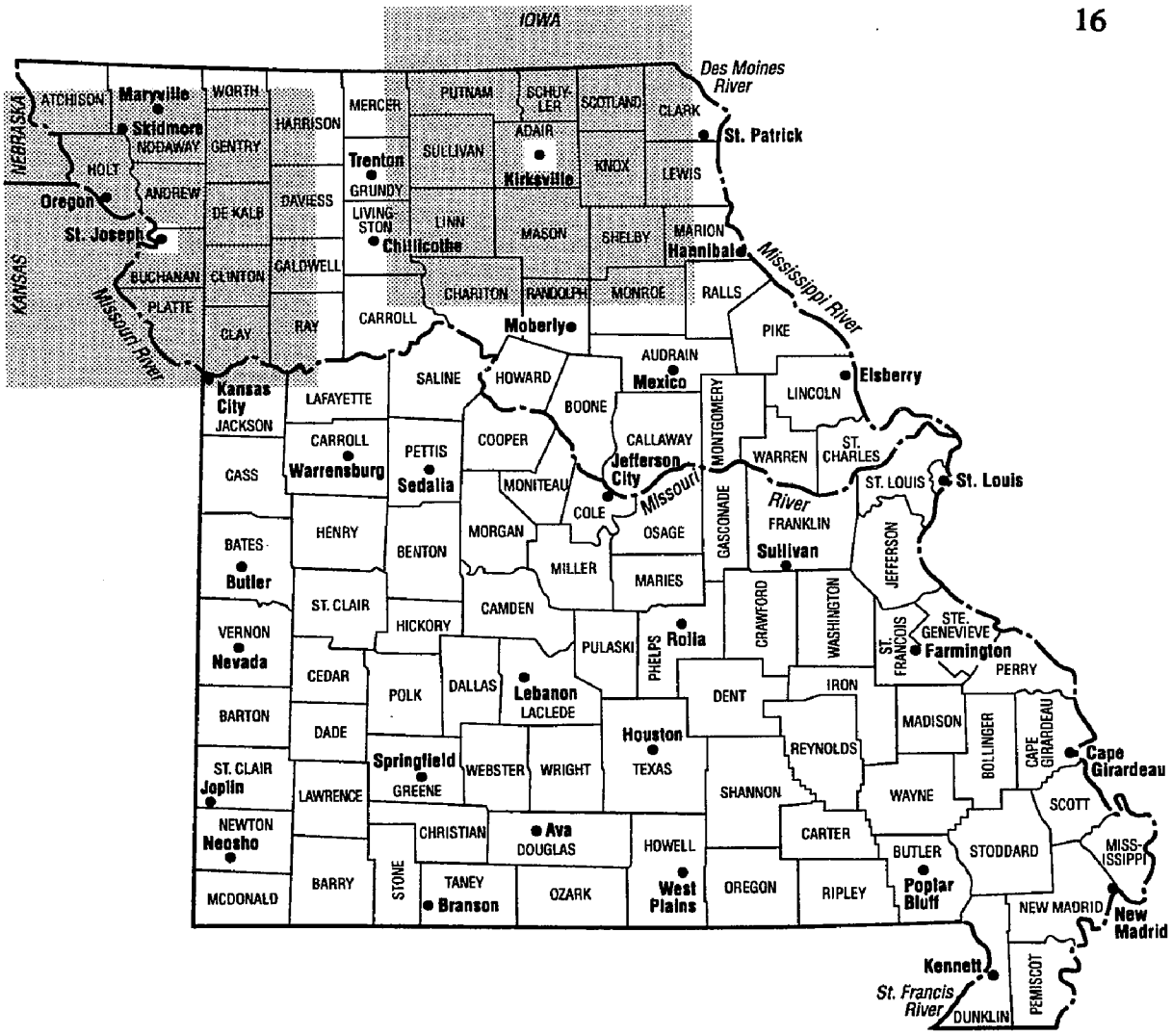
In the Kirksville area these target units are:

- Keokuk-Burlington
- Callaway-Cooper

Kansas City-Lansing is not present within the target area defined around Kirksville (Rueff, 1988, personal communication). Structure contour and isopach maps have been developed for the stratigraphies listed. These maps are the basis for defining the mining depth in the two regions and for giving the mine location a target depth or third dimension.

C. GEOLOGICAL CHARACTERIZATION

Regionally, the target areas under consideration are in the midcontinental structural geologic province known as the Forest City Basin. The basin, which has been both a structural and depositional basin during its history, is bounded on the west by the buried Nemaha Uplift, on the north by the Thurman-Wilson structural feature, on the east by the Lincoln Fold, and on the south by the Ozark Dome.



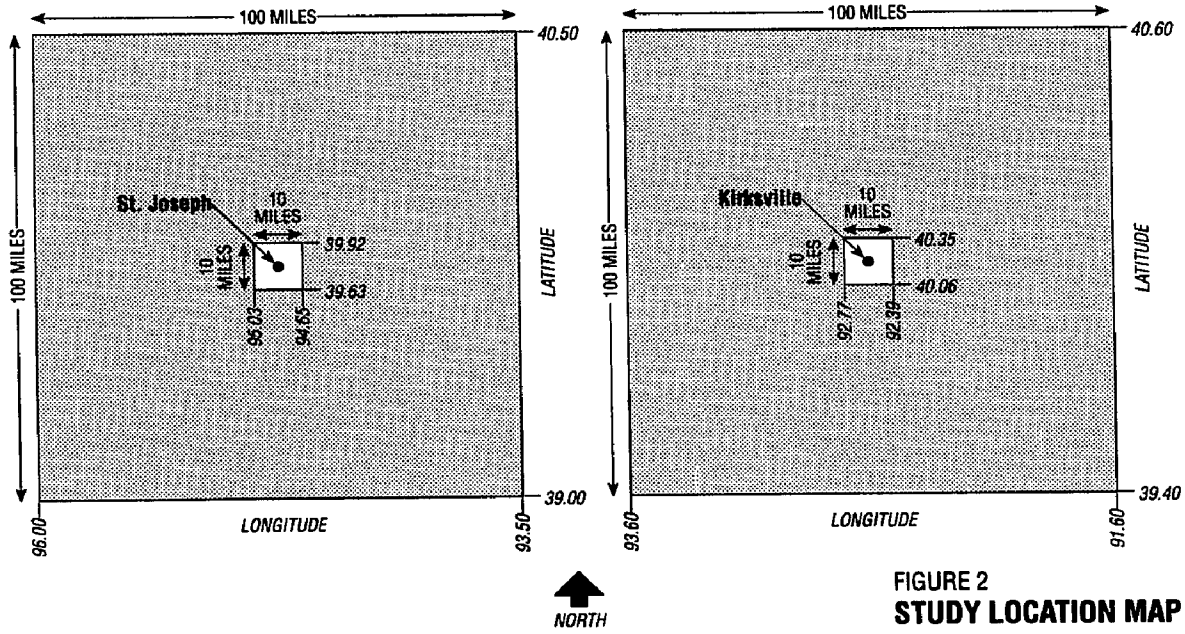


FIGURE 2
STUDY LOCATION MAP

The City of Kirksville is situated on the eastern edge of the basin. The rock units in this area have bedding that dips to the west toward St. Joseph at less than 10 degrees. Topography in both areas generally consists of undulating rolling hills. Local relief rarely exceeds a few hundred feet.

The upland surface of both areas is covered with a substantial thickness of glacial lodgment till. This is the remnant of the glacial debris spread over the erosional surface of Pennsylvanian-age bedrock in the St. Joseph area and Mississippian-age strata in the Kirksville area that was present at the time of glaciation. (There appears to be some debate on how much, if any, Pennsylvanian-age material was deposited or has survived glacial erosion in the Kirksville area.)

Postglacial erosion is responsible for a few outcrops of Pennsylvania rock that occur in valley sidewall exposures in the area defined around St. Joseph. Only small, isolated outliers of Pennsylvanian rock are present in the far western areas of the Kirksville target area. Bedrock surface exposures in the Kirksville area are due to post-glacial erosion and are Mississippian in age.

The result of glacial debris spreading over the ancient erosional landscape is a subsurface consisting of deep in-filled valleys. Debris is up to 300 feet thick in some of the preglacial valleys. Current drainage has not reestablished itself in preglacial patterns to exhume the paleolandscape that existed prior to ice sheet advance.

The buried depth of the Kansas City-Lansing, Keokuk-Burlington, and Callaway-Cooper formations precludes cost-effective open-pit mining techniques for production.

Although it is necessary to mine through geologic materials above these formations to reach the limestone to be extracted, the majority of mine development must be within the unit being produced. Therefore, detailed geologic characterizations are limited to the potential production units and the thick blanket of glacial debris covering the region.

1. Glacial Materials "Glacial debris" is a general term for all deposits having their origin in glacial activity, such as lodgment till, ablatian till, and loess. Lodgment till is a dense, hard, clay-rich unstratified material deposited directly below the passing ice mass. It has often been overridden by the ice sheet and is highly overconsolidated. Ablatian till is a cohesionless sand, gravel, cobble mass deposited by flowing water associated with melting ice. It is often deposited at the terminal end of the ice sheet or within channels of meltwaters flowing within the ice sheet. Loess is fine-grain post-glacial clay drift and silt transported and deposited by wind.

The glacial debris associated with the areas under study have their origins in the Nebraskan and Kansan time. The lodgment till in the area consists of clay to boulder-size material. Igneous, metamorphic, and sedimentary rock types are all suspended in the till, but Pennsylvanian limestone pebbles predominate. Ablation till is rare in the Northern Missouri target areas; however, individual beds of glacial-fluvial and outwash sand, gravel, and boulders do occur. The lodgment till generally appears as a bluish-gray "boulder clay" in the unweathered state and weathers to clay of yellow color. Thick loess, up to 100 feet thick in places, exists along the Missouri River near St. Joseph. These deposits thin rapidly to the east of the river.

2. Kansas City-Lansing The Kansas City-Lansing Formations consist of alternating beds (cyclothems) of limestone and shales. Individual limestone members range in thickness from 1 to 40 feet. Shale members are from 0.5 to 55.0 feet in thickness. Limestones are remarkably uniform in thickness and lithology in the St. Joseph area and then thin to the east. The shales are generally gray or drab and are of various types. A detailed chart describing the individual members of the Kansas City-Lansing formations is given in Appendix A, Volume II.

3. Keokuk-Burlington The Keokuk-Burlington formations are contained within the Osage Group of the Mississippian system. The formations consist of light tan to white to gray limestone and magnesian limestone. Textures vary from fine to medium into coarsely crystalline and crinoidal. Chert is present in relatively large volumes, 10 percent to 40 percent in some intervals. The chert is usually white, gray, blue, and dense. Sand is also present in small quantities in some intervals, and the materials are very dense to slightly porous.

4. Callaway-Cooper The Callaway-Cooper formations are contained within the Devonian system. The Callaway formation consists of fine to coarsely crystalline, many times highly fossiliferous, limestone. Colors range from white to gray to pink and brown. In some areas the formation is sandy, the grains having a brown color. Sphalerite and glauconite, white quartoze chert, and solidified fossil fragments are often present in percentages (by volume) of less than 10 percent, as insoluble residue.

The Cooper formation is light gray to light brown dense lithographic limestone. It is very uniform in character over large areas. Small crystals of disseminated calcite in the

lithographic matrix are an identifying characteristic. Insoluble residues of less than 10 percent are most often composed of dark shale, pyrite, and marcasite (Branson, 1923).

Stratigraphic columns based on oil well logs drilled in the areas of St. Joseph and Kirksville summarize the general subsurface stratigraphy in the target areas (Figures 3 and 4, respectively). These stratigraphic columns also depict the depth to and elevation of the limestone units defined as production targets.

D. STRUCTURE CONTOUR AND ISOPACH MAP GENERATION

1. Data Gathering and Manipulation Top-of-rock elevation fluctuations and thickness of the target units in the areas around St. Joseph and Kirksville are estimated by way of structure contour and isopach maps. For the overlying glacial material, only isopach maps have been generated. Structure contour maps for the top of the glacial materials would represent existing surface topography. Published maps are available for existing topography.

At the beginning of this study, the Missouri Department of Natural Resources, Division of Geology and Land Survey, had created a database that contained approximately 300 water well logs from driller's reports on wells drilled in the northern third of Missouri. These well logs included data on the depth to and thickness of the target units under consideration and the thickness of glacial debris in the target areas. Because of the varying depths of completion of the wells in the database, information on all of the units being considered was not contained in every well log. Some wells had been terminated before the target units had been penetrated. Plotting the location of the wells in this database on a 1:250,000-scale

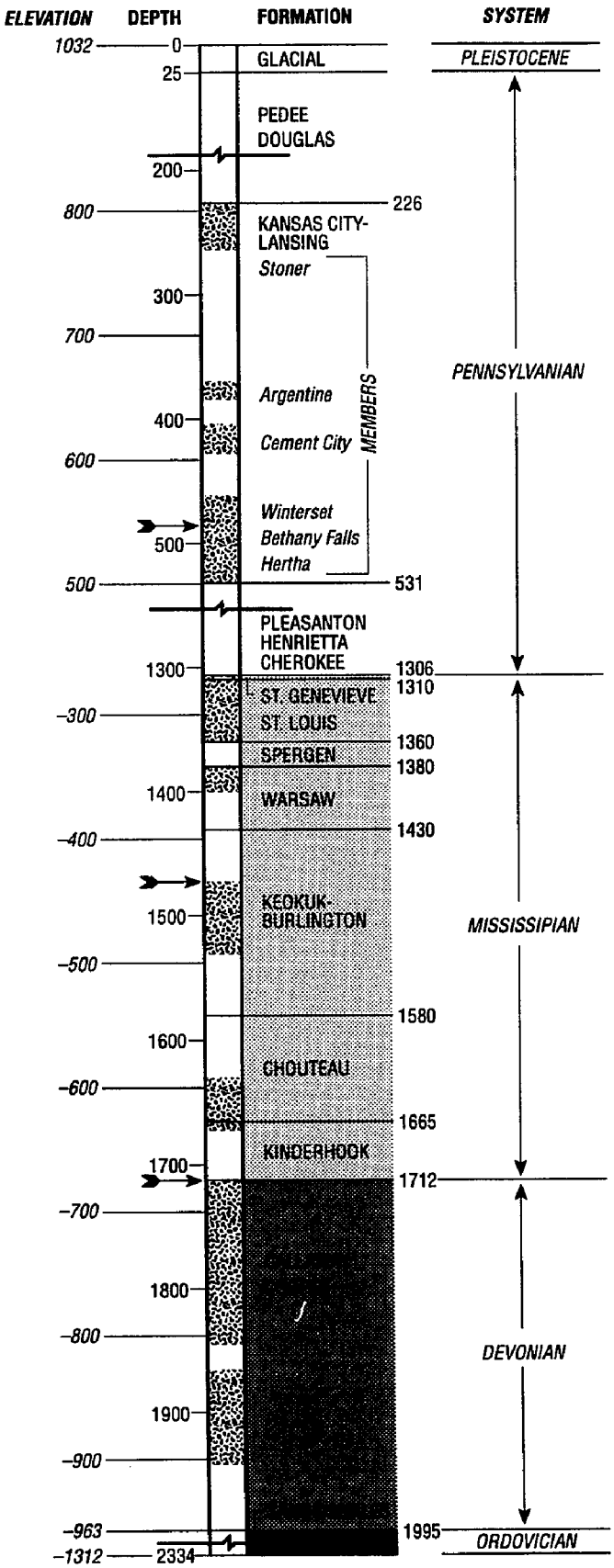


FIGURE 3

OHIO OIL COMPANY WELL 1: LOG 7308
BUCHANNAN COUNTY, MISSOURI
TYPE LOG: ST. JOSEPH AREA

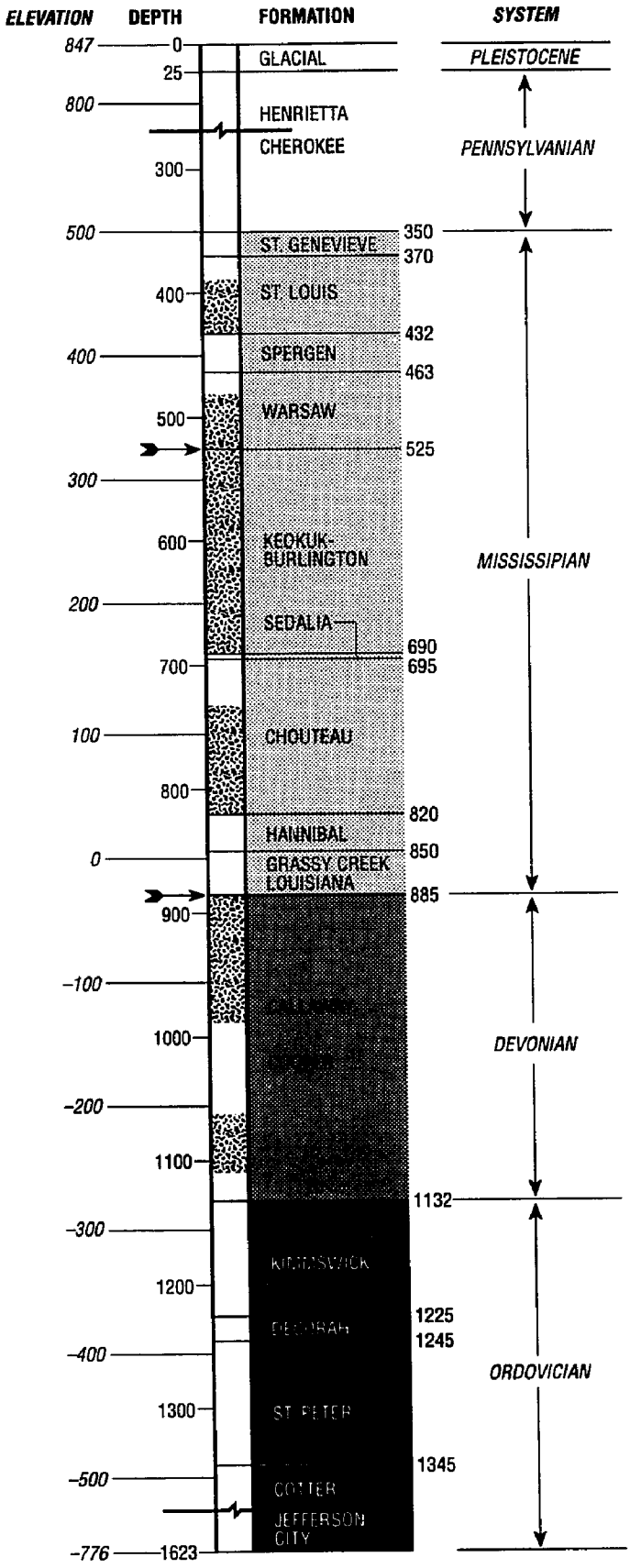


FIGURE 4
WARD-McGINNIS WELL 1: LOG 5762
ADAIR COUNTY, MISSOURI
TYPE LOG: KIRKSVILLE AREA

topographic map of the areas surrounding St. Joseph and Kirksville revealed that more data were needed before a valid attempt could be made at isopach or structure contour map generation.

Additional data were collected by reviewing hand-written strip logs filed in the well log catalogue at the Rolla, Missouri, office of the Missouri Division of Geology and Land Survey. Every filed log within the target areas around St. Joseph and Kirksville was examined to determine if it had penetrated one of the target units and recorded the depth of glacial debris. The locations of the additional well logs were digitized into the database, after hand plotting their locations on 1:250,000-scale maps, along with the corresponding depth and thickness records pertaining to the materials under consideration. The addition of these well logs resulted in a database containing 1,898 records. Visual inspection of the location of these well log records on 1:250,000-scale maps indicated a good scattering of data throughout the two areas around St. Joseph and Kirksville. Although not all well records contained information on every unit because of varying completion depths, the additional wells helped provide information in areas that had been blank on the 300-well log map. All of the maps presented herein were generated based on the 1,898-record database.

2. Map Creation Structure contour and isopach maps were created using a computer-driven contouring package in a program called "Surfer" (version 3.00, Golden Software, Inc., 1987). Surfer uses the X and Y coordinates of the well log records, which correspond to longitude and latitude locations, respectively. Each of these X and Y points also had an "elevation" or "thickness of unit" value assigned to it as a Z value. These data points are irregularly spaced on the map within the 100-mile square box centered around the two areas under investigation.

Surfer must create an evenly spaced grid over these data points in order to begin contouring. The program uses either inverse distance squared or kriging statistical estimation procedures to determine the Z value at each intersection of the evenly spaced grid system that is developed. The kriging technique was used to generate all of the maps in this study.

To determine Z values on the grid, the Surfer program divides the space around each grid intersection into 45-degree quadrants (octants). Then working with the grid intersection as the center point, it considers the Z values of the closest data points in each of these octants. This forces the program to consider data points located in all directions from the grid element being estimated. This procedure is sometimes referred to as the "Best Linear Unbiased Estimator" (Clark, 1984) and will produce the most accurate estimate of the Z value for the intersection of the regularly-spaced grid being defined. After each grid intersection is evaluated for a Z value, contour lines are drawn connecting equivalent values.

The kriging technique for estimation involves solving a set of numerically intensive calculations in simultaneous equations. These equations are developed based on a model that represents the variance of pairs of samples that are taken at some distance apart. This model is referred to as a "semivariogram." It is constructed by taking a large number of pairs of samples and evaluating the variation between them. The variation between the pairs is then plotted as a function of the distance between them. The expected variation between a pair of samples taken very close to each other would be very low. As the distance between the samples is increased, the variation would be expected to be larger and larger, and often some limiting value is reached.

The pattern created by semivariogram plots can often be defined as one or a combination of several simple mathematical models. These include linear, spherical, and exponential. The accuracy of the subsequent kriging estimations is directly related to the fit of the mathematical model to the shape of the plot of the semivariogram (Clark, 1984). Unfortunately, the Surfer software assumes a linear semivariogram model for all applications. This assumption results in errors in Z value estimations at grid intersects and subsequent contouring. Work by Leseman (1990), using some of the geological data gathered for this study, indicates that a spherical semivariogram model may provide more accurate Z-value estimates. A comparison of linear and spherical semivariogram models and the subsequent structure contour and isopach maps produced is an area of potential future study.

E. DISCUSSION OF MAPPING RESULTS

The 12 isopach and structure contour maps generated in this research are presented in this section. Isopach maps represent glacial material or target unit thickness. Structure control maps, created only for the target units, represent the elevation of the top of the target unit mapped. No structure contour maps are prepared for glacial materials since these materials are currently exposed at the surface and a structure contour map would duplicate a map of surface topography.

Each map represents spatial characteristics related to the glacial or target unit materials in an area centered around Kirksville or St. Joseph. Small- and large-scale maps have been prepared to show regional geologic trends across the state and local stratum details around the two cities of Kirksville and St. Joseph.

The small-scale maps are square, represent 100 miles on each side, and therefore portray a 10,000-square-mile area. These maps are hereafter referred to as "regional maps."

The larger scale maps are also square in configuration, represent 10 miles per map side, and portray a total area of 100 square miles. These maps are hereafter referenced as "local maps." The local maps portray the same information as the regional maps but with more detail. These maps are insets within the regional maps that have been pulled out and expanded to a larger scale that could be more useful when examining conditions in the immediate area of either Kirksville or St. Joseph.

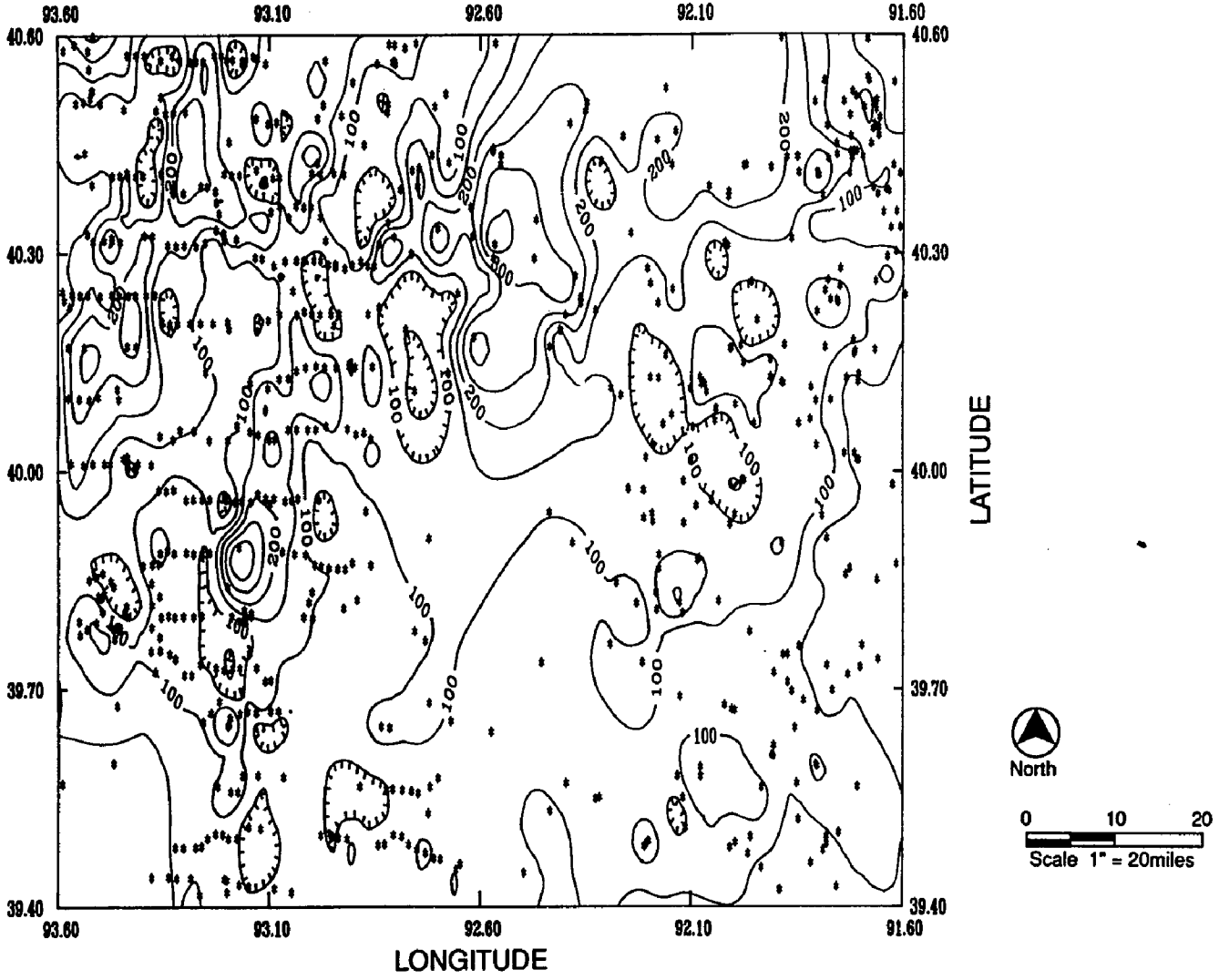
A summary of the maps prepared and the latitude and longitude that bound each is given in Table I.

Each of the maps is shown as a conventional plan view map and also as an orthographic projection. The plan view maps, hereafter referred to as "two-dimensional maps" (2-D maps), are most convenient for taking measurements and estimating distances or locations. The orthographic projection, a pseudo-3-D figure, hereafter referred to as "three-dimensional projection" (3-D projection), gives a representation of the glacial or target unit that is easier to visualize than the 2-D map. The data points used to create the maps are indicated on the 2-D maps by the "*" symbol and on the 3-D projections as the "1" symbol. Vertical exaggeration, indicated as a multiple of the horizontal scale, is given on each of the 3-D projections. The "direction of view" is also indicated on the projection. As indicated, all 3-D projections represent a view of the 2-D map from the southwest corner.

1. General Subsurface Trends The following discussion considers the regional and local maps generated around Kirksville and St. Joseph. The 2-D maps and related projections for glacial materials, Kansas City-Lansing, Keokuk-Burlington, and Callaway-Cooper target units are given in Figures 5 through 28, respectively. Note that the elevations and thickness indicated on the maps and projections and included in the discussion are statistically generated and should be considered as approximate.

Table I
Summary of Prepared Maps

	Latitude	Longitude	Glacial Unit or Target Unit	
			Isopach	Structure Contour
Kirksville Maps				
Regional Scale 1:1,267,200	39.40-40.60	91.60-93.60	Glacial Keokuk-Burlington Callaway-Cooper	Keokuk-Burlington Callaway-Cooper
Local Scale 1:126,720	40.06-40.35	92.39-92.77	Glacial Keokuk-Burlington Callaway-Cooper	Keokuk-Burlington Callaway-Cooper
St. Joseph Maps				
Regional Scale 1:1,267,200	39.00-40.50	93.50-96.00	Glacial Kansas City-Lansing Keokuk-Burlington Callaway-Cooper	Kansas City-Lansing Keokuk-Burlington Callaway-Cooper
Local Scale 1:126,720	39.62-39.93	94.65-95.03	Glacial Kansas City-Lansing Keokuk-Burlington Callaway-Cooper	Kansas City-Lansing Keokuk-Burlington Callaway-Cooper


93.60
93.10
92.60
92.10
91.60
40.60
40.30
40.00
39.70
39.40
LONGITUDE
LATITUDE
North
0
10
20
Scale 1" = 20miles

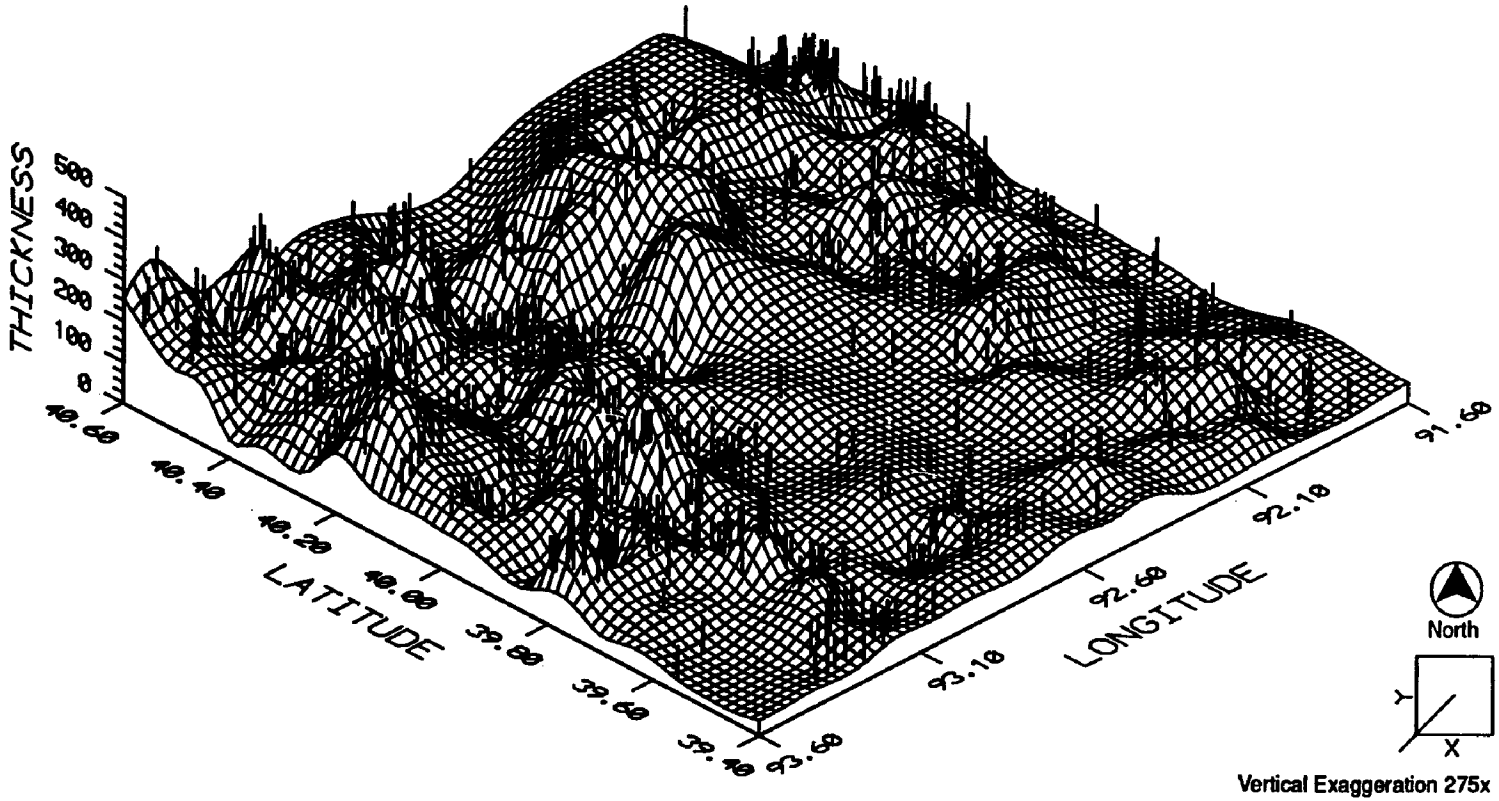
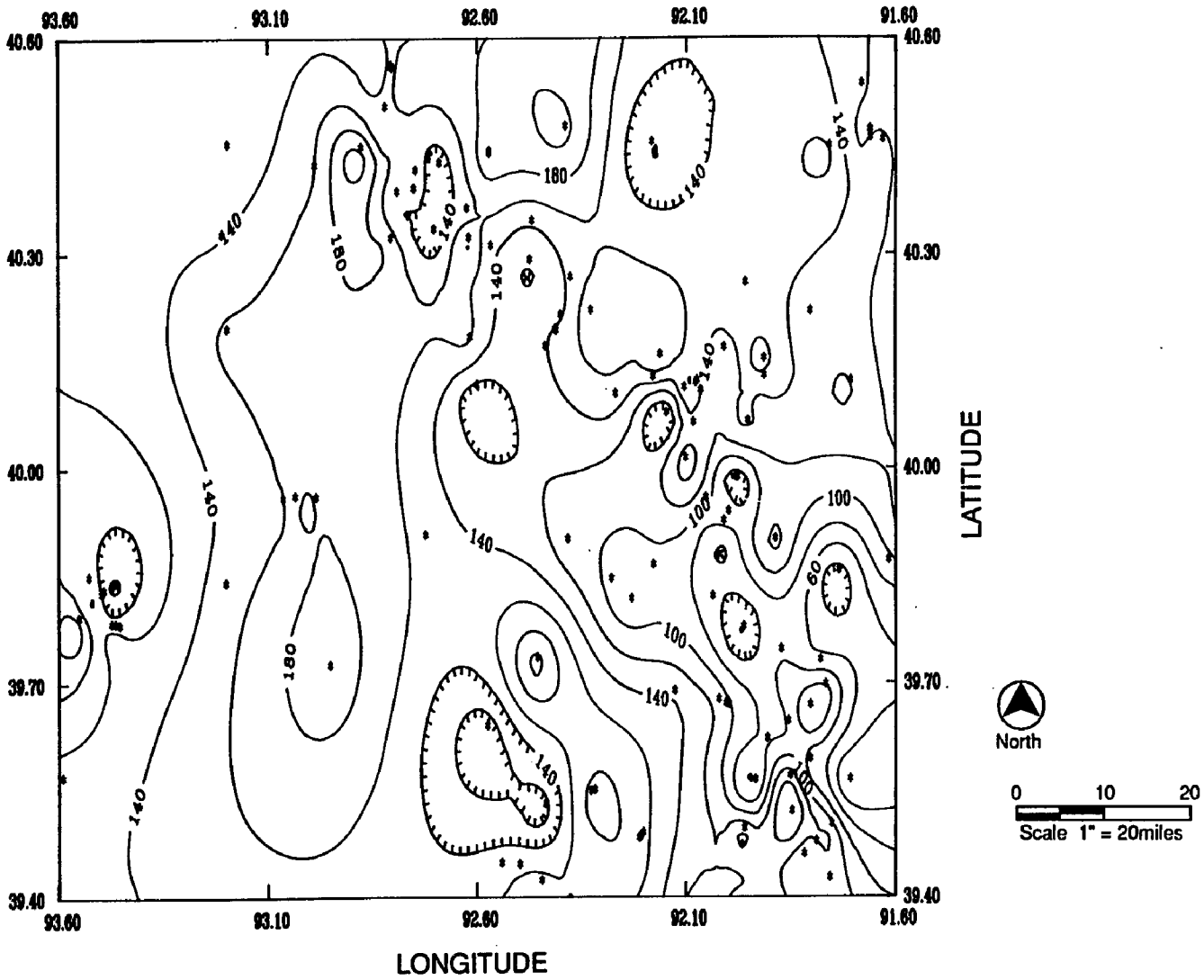


FIGURE 5
GLACIAL COVER, KIRKSVILLE. REGIONAL SCALE.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93.10
92.60
92.10
91.60
40.60
40.30
40.00
39.70
39.40
LATITUDE
LONGITUDE
North
0 10 20
Scale 1" = 20miles

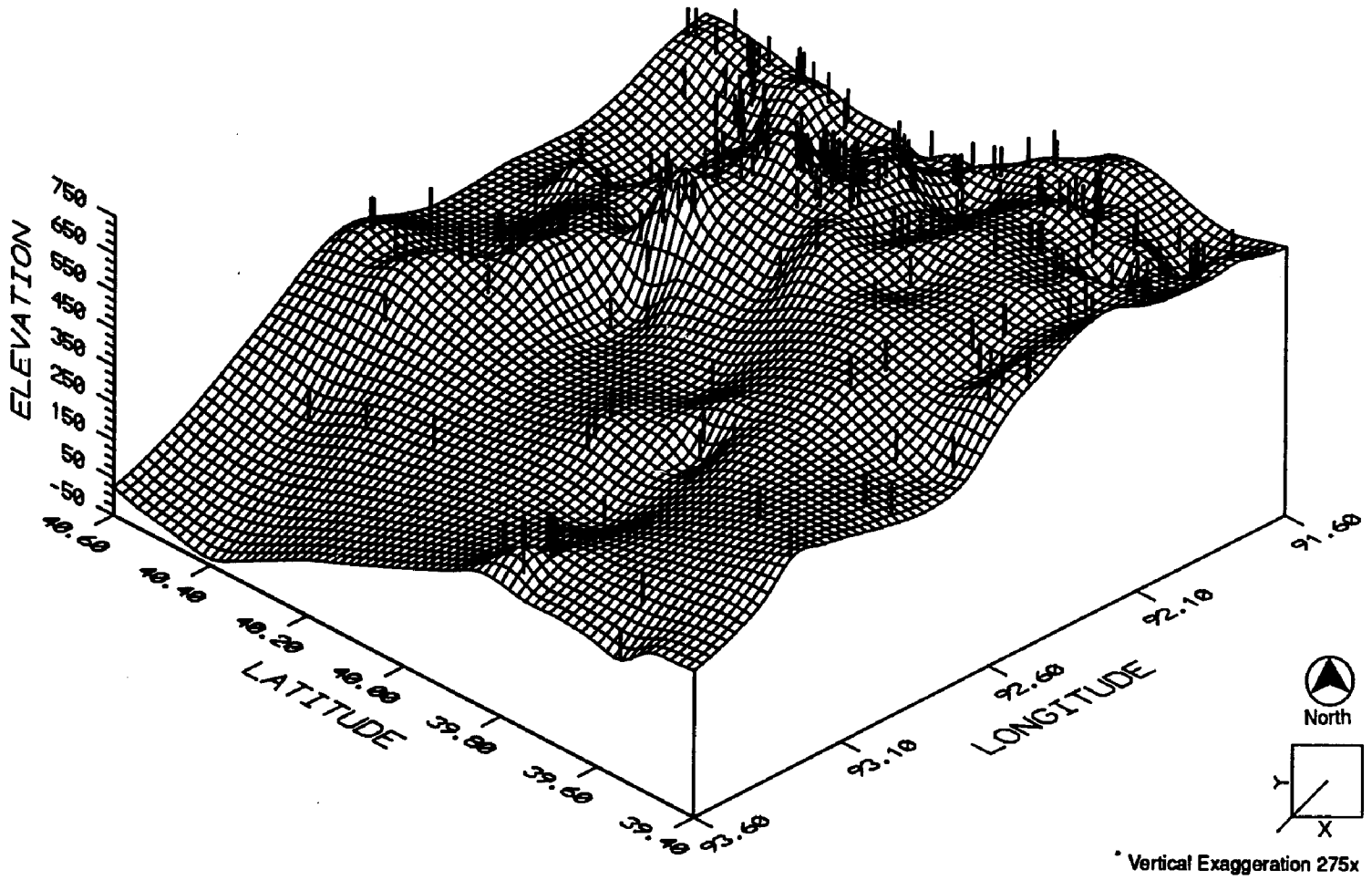
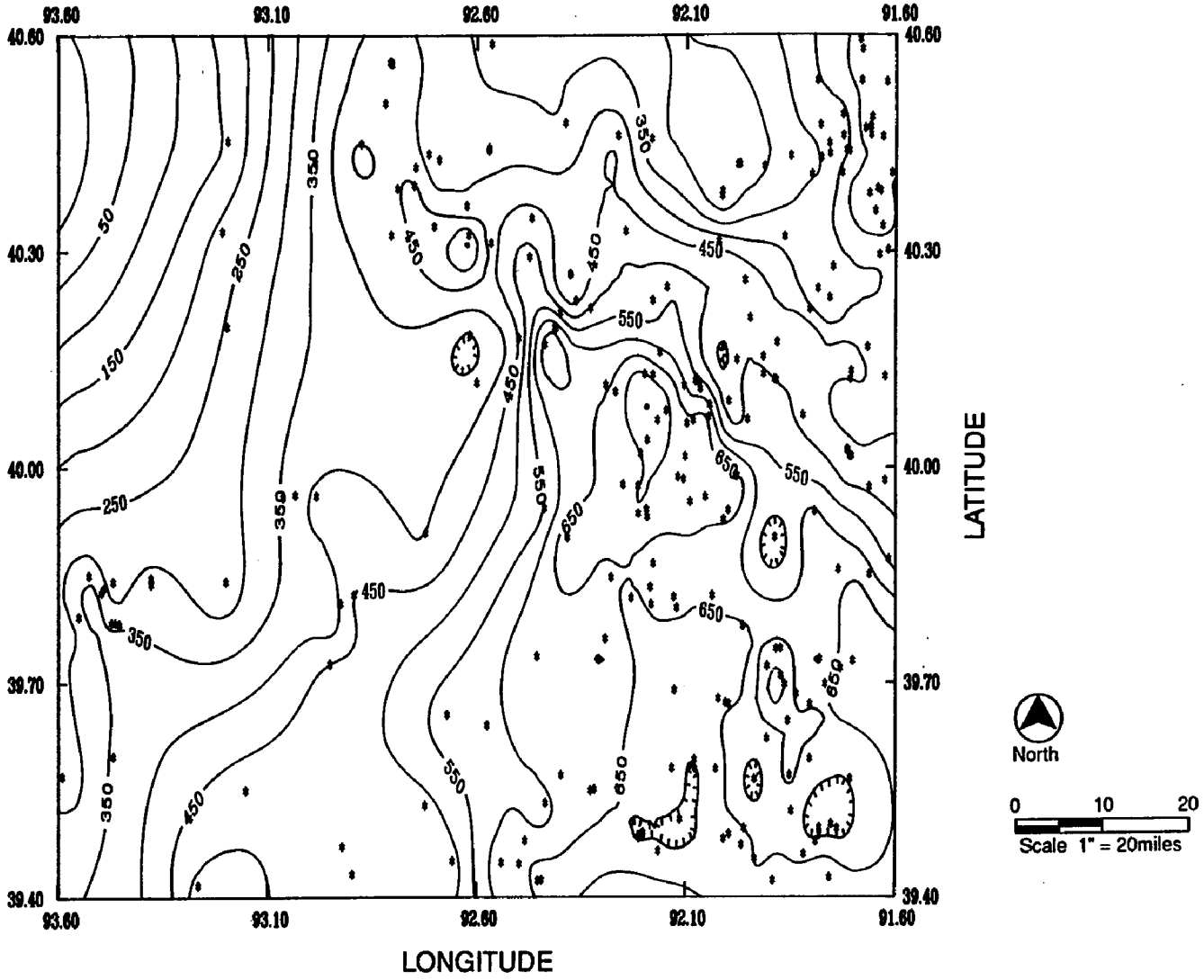


FIGURE 6
KEOKUK-BURLINGTON ELEVATION, KIRKSVILLE. REGIONAL SCALE.


93.60
93.10
92.60
92.10
91.60
40.60
40.30
40.00
39.70
39.40
LATITUDE
LONGITUDE
North
0 10 20
Scale 1" = 20miles

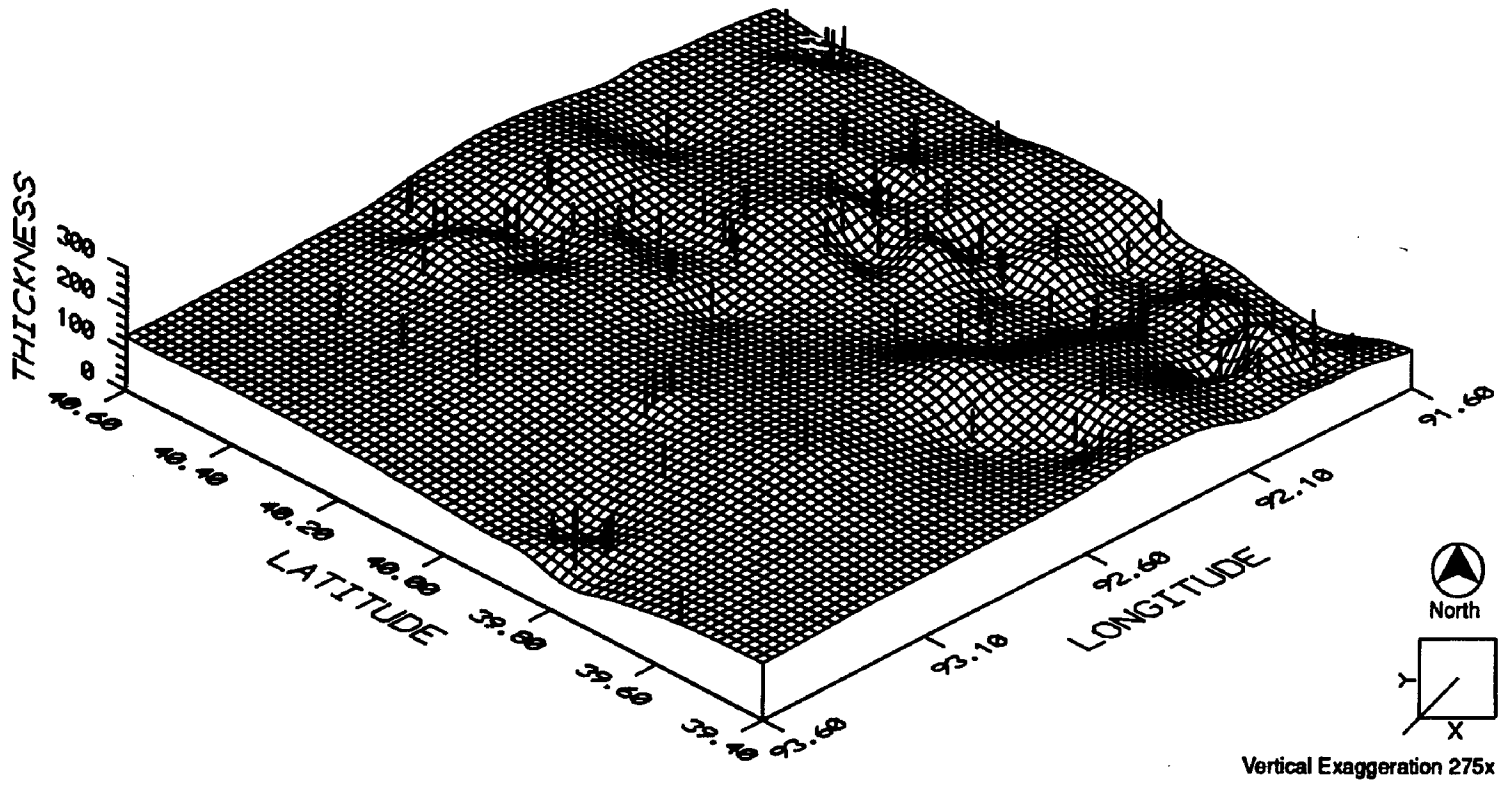
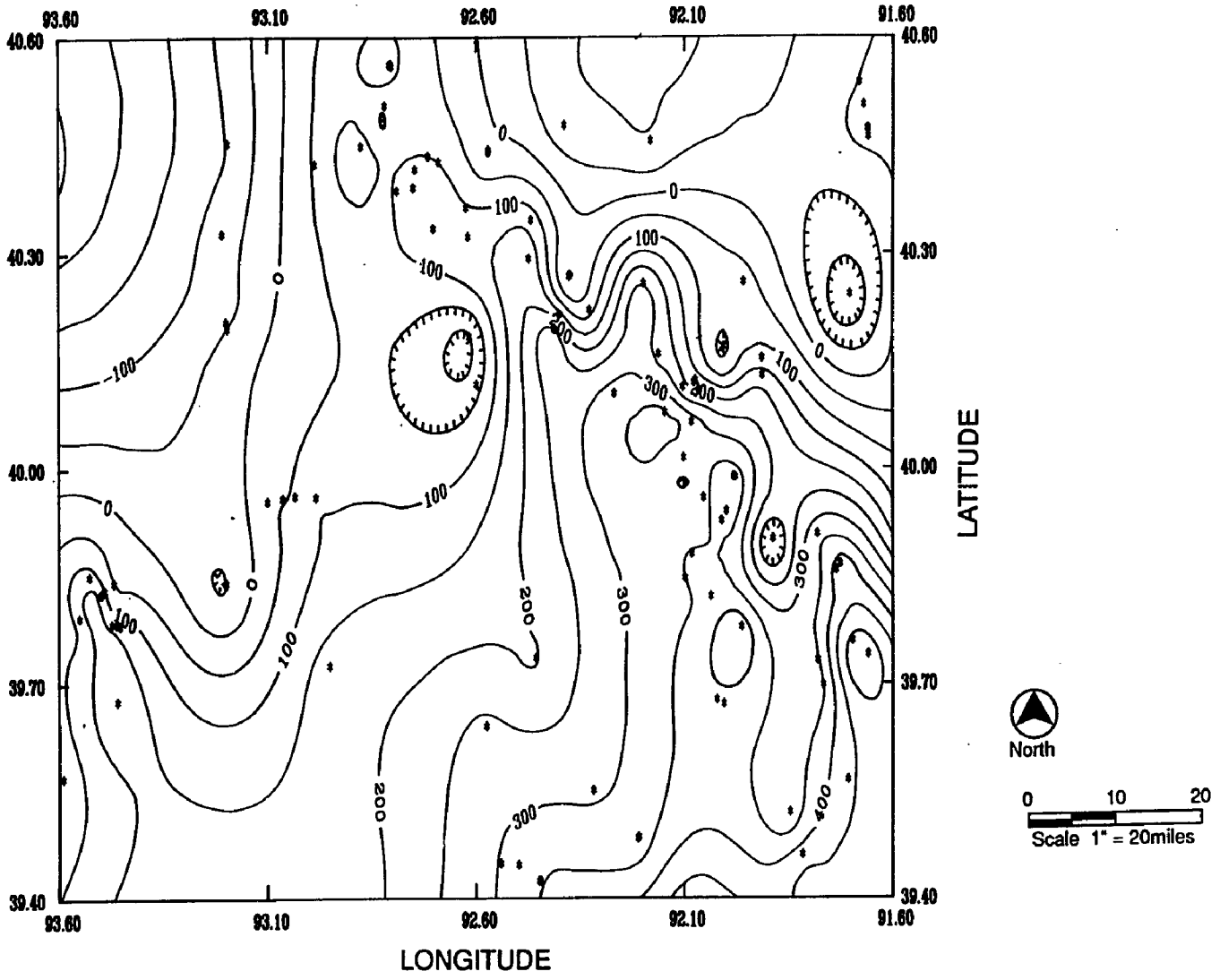


FIGURE 7
KEOKUK-BURLINGTON THICKNESS, KIRKSVILLE. REGIONAL SCALE.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93.10
92.60
92.10
91.60
40.60
40.30
40.00
39.70
39.40
LONGITUDE
LATITUDE
North
0
10
20
Scale 1" = 20miles

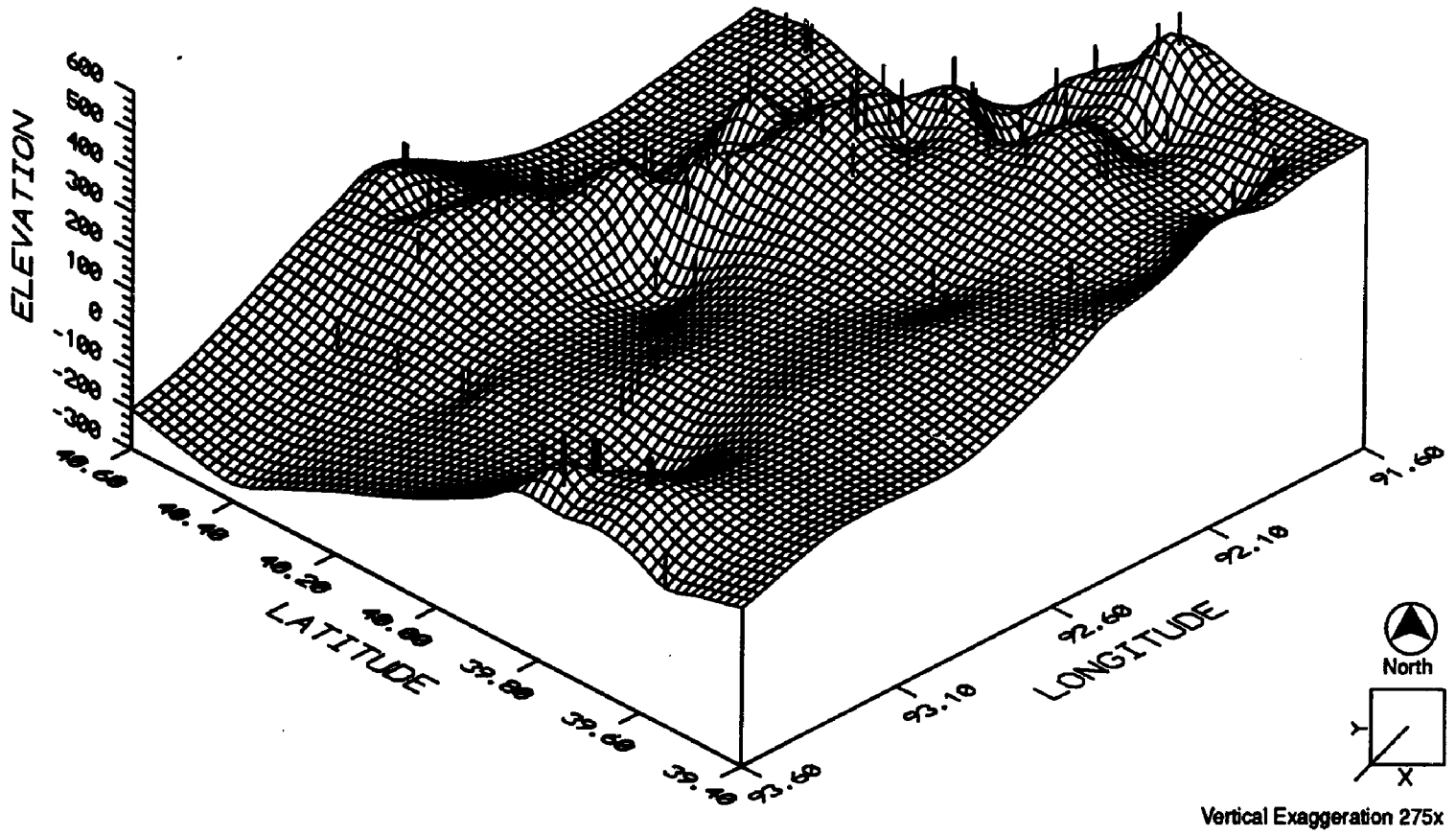
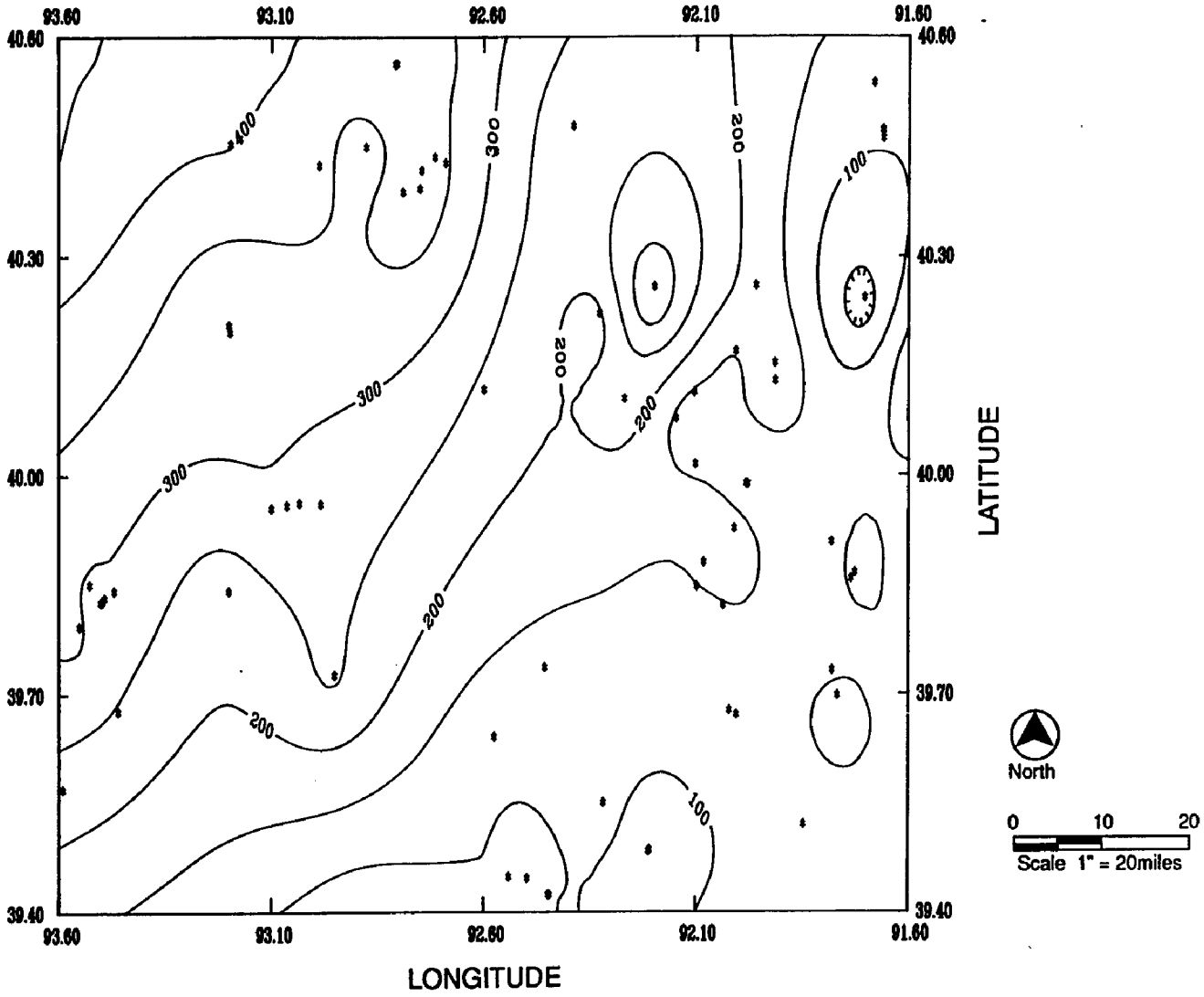


FIGURE 8
CALLAWAY-COOPER ELEVATION, KIRKSVILLE. REGIONAL SCALE.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93.10
92.60
92.10
91.60
40.60
40.30
40.00
39.70
39.40
400
300
300
200
200
200
200
100
100
LATITUDE
LONGITUDE
North
0
10
20
Scale 1" = 20miles

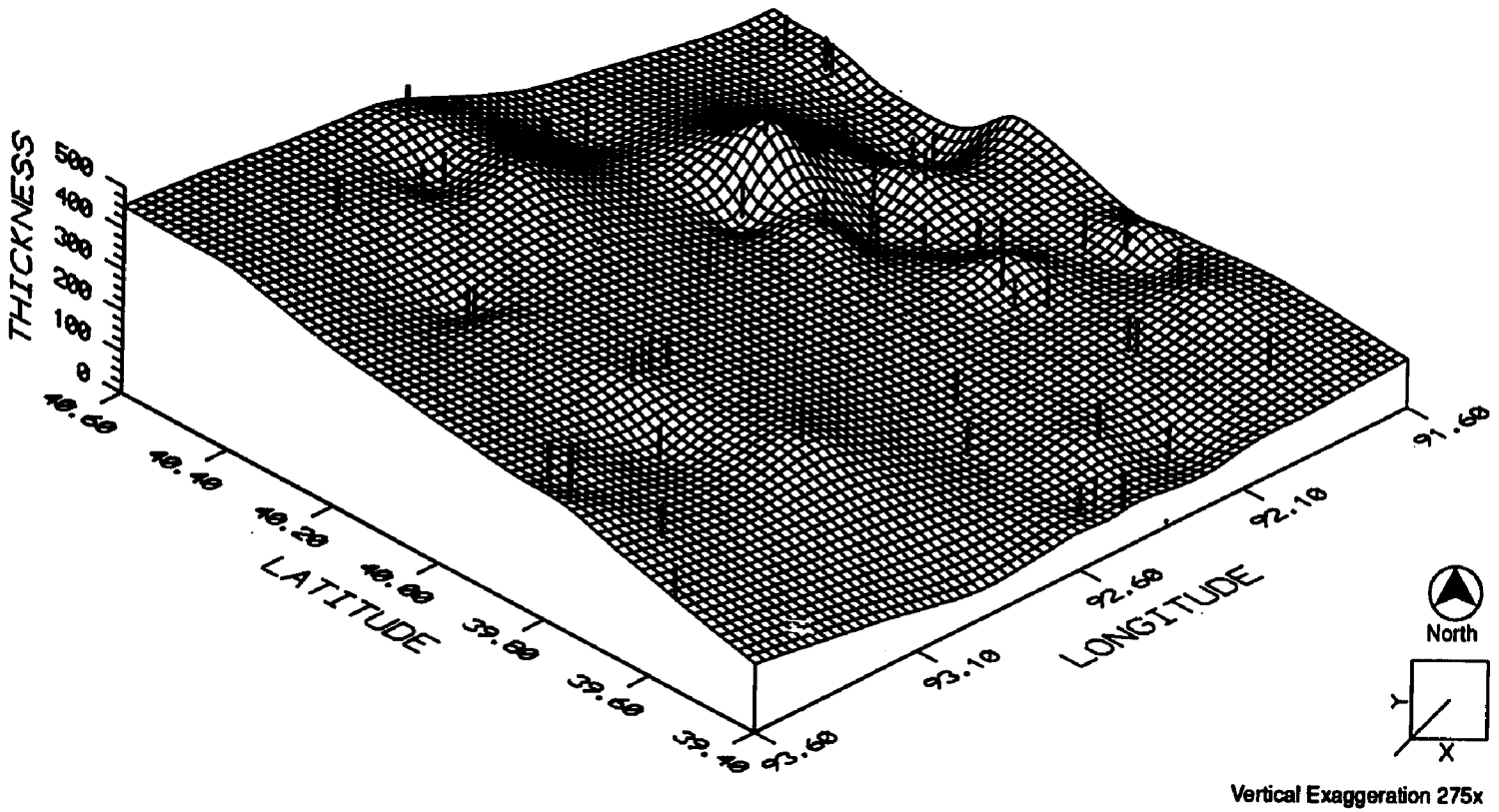
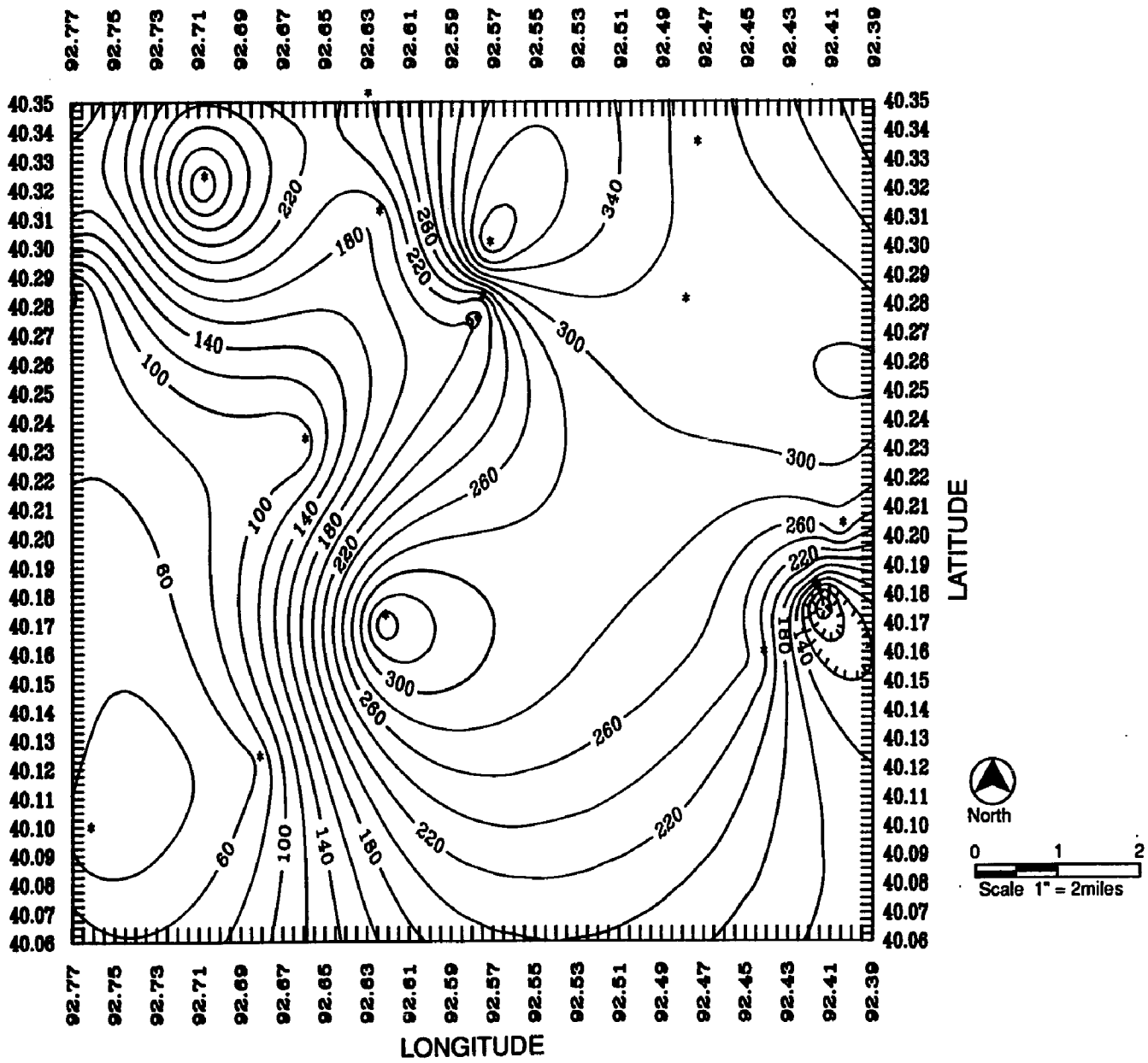


FIGURE 9
CALLAWAY-COOPER THICKNESS, KIRKSVILLE. REGIONAL SCALE.


92.77 92.75 92.73 92.71 92.69 92.67 92.65 92.63 92.61 92.59 92.57 92.55 92.53 92.51 92.49 92.47 92.45 92.43 92.41 92.39
40.35 40.34 40.33 40.32 40.31 40.30 40.29 40.28 40.27 40.26 40.25 40.24 40.23 40.22 40.21 40.20 40.19 40.18 40.17 40.16 40.15 40.14 40.13 40.12 40.11 40.10 40.09 40.08 40.07 40.06
60
100
140
180
220
260
300
340
LONGITUDE
LATITUDE
North
0 1 2
Scale 1" = 2miles

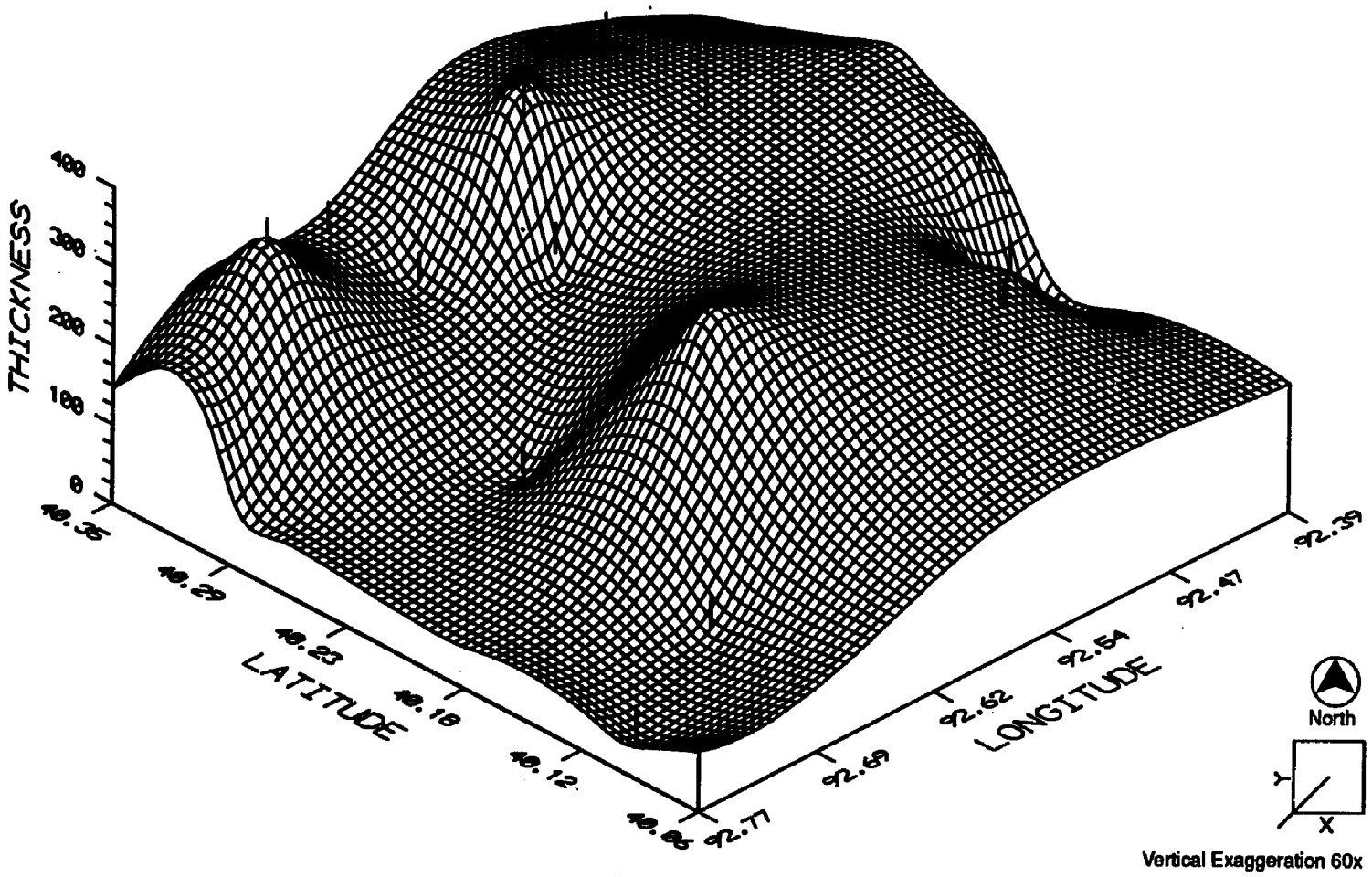
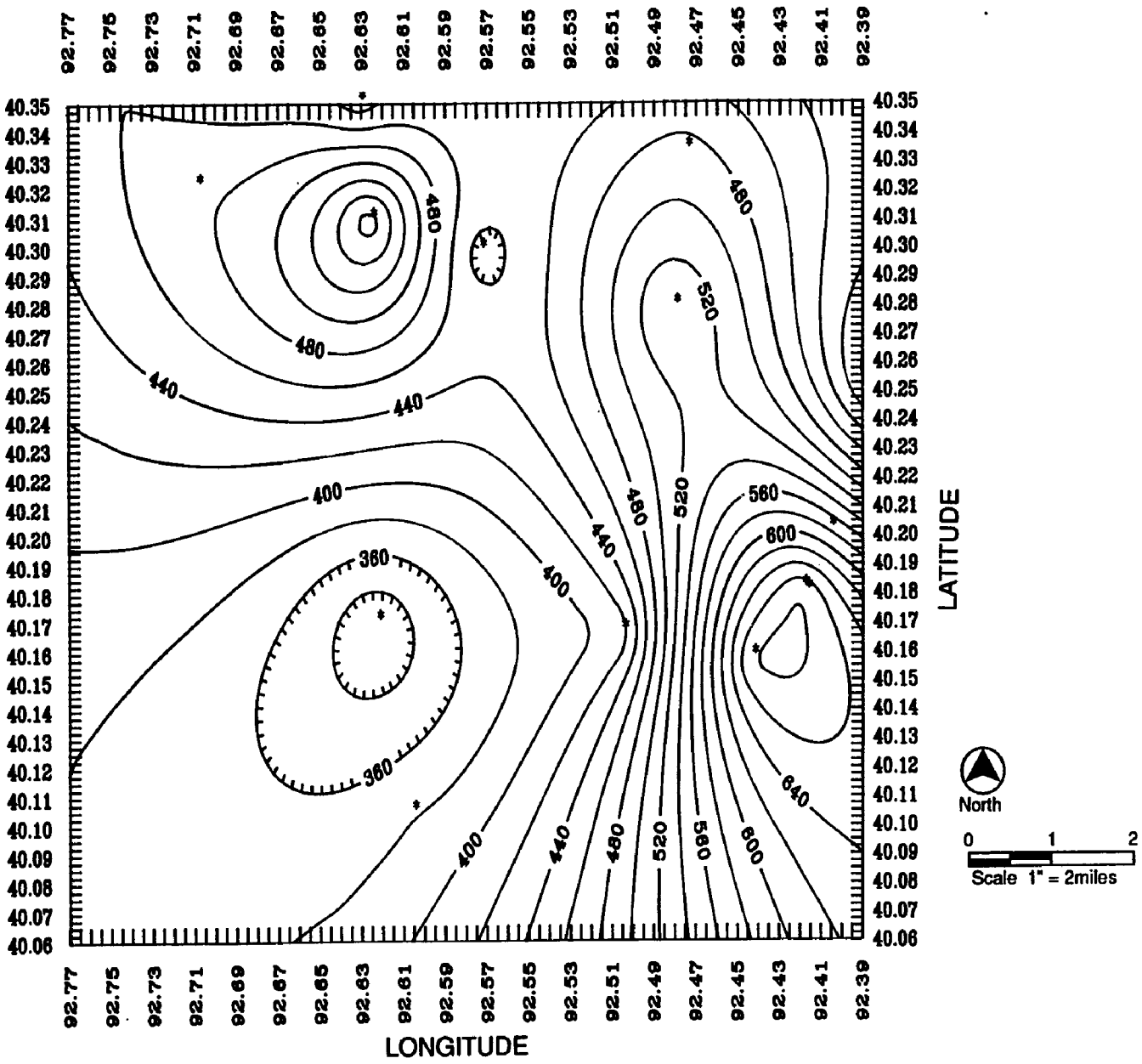


FIGURE 10
GLACIAL COVER, KIRKSVILLE. LOCAL SCALE.


92.77 92.75 92.73 92.71 92.69 92.67 92.65 92.63 92.61 92.59 92.57 92.55 92.53 92.51 92.49 92.47 92.45 92.43 92.41 92.39
40.35 40.34 40.33 40.32 40.31 40.30 40.29 40.28 40.27 40.26 40.25 40.24 40.23 40.22 40.21 40.20 40.19 40.18 40.17 40.16 40.15 40.14 40.13 40.12 40.11 40.10 40.09 40.08 40.07 40.06
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400
440
480
520
560
600
640
LONGITUDE
LATITUDE
North
0 1 2
Scale 1" = 2miles

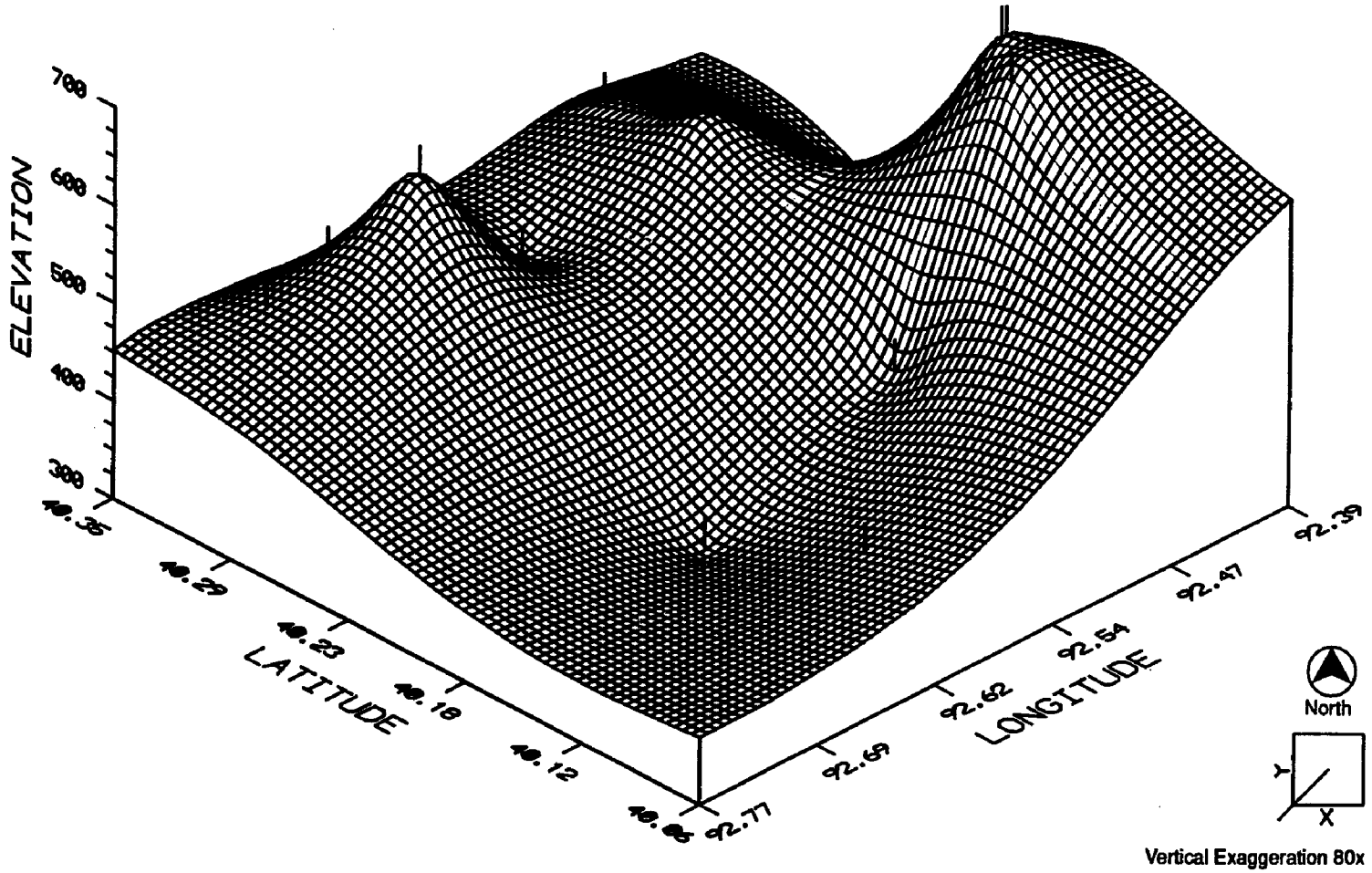
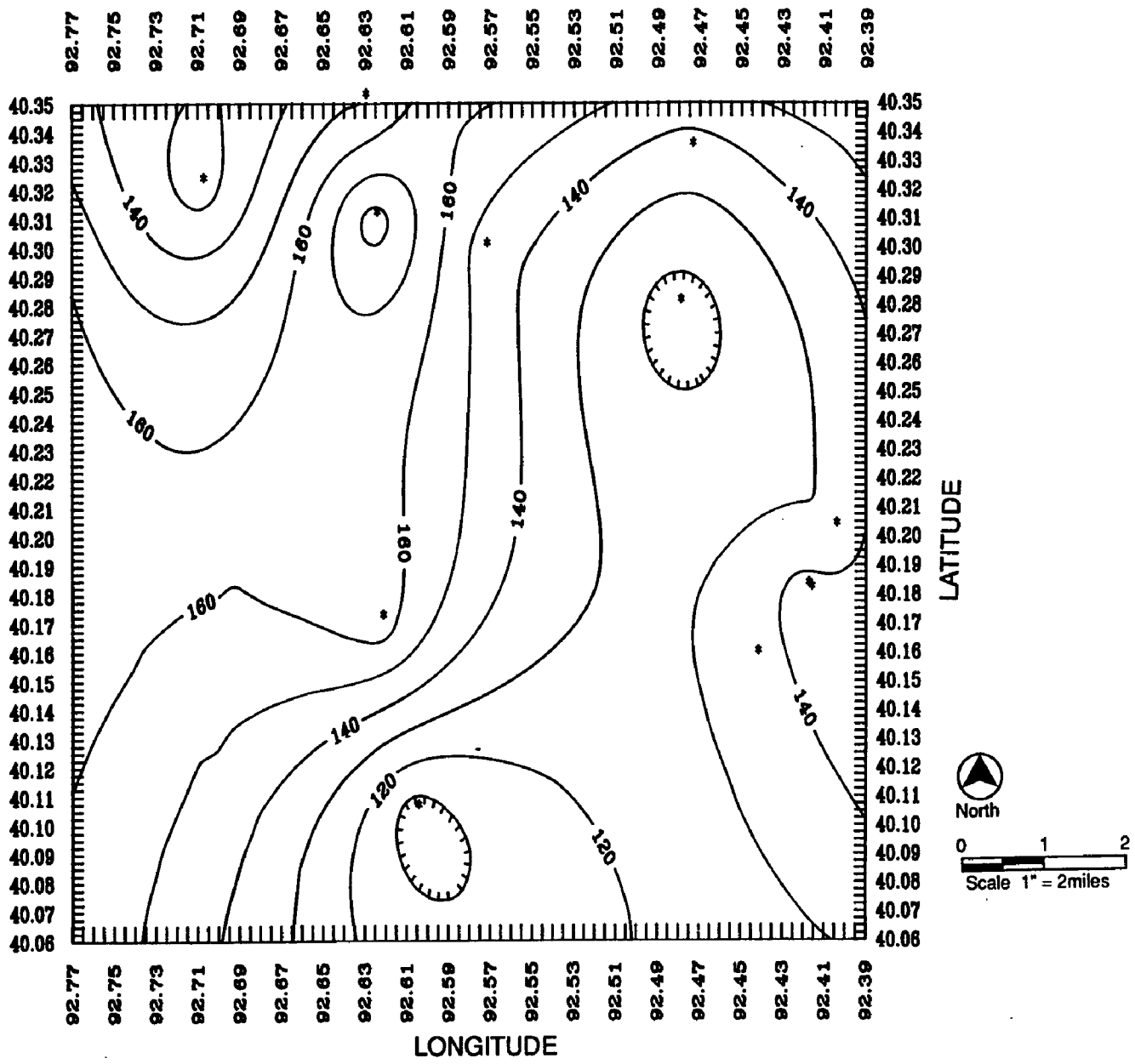


FIGURE 11
KEOKUK-BURLINGTON ELEVATION, KIRKSVILLE. LOCAL SCALE.


92.77 92.75 92.73 92.71 92.69 92.67 92.65 92.63 92.61 92.59 92.57 92.55 92.53 92.51 92.49 92.47 92.45 92.43 92.41 92.39
40.35 40.34 40.33 40.32 40.31 40.30 40.29 40.28 40.27 40.26 40.25 40.24 40.23 40.22 40.21 40.20 40.19 40.18 40.17 40.16 40.15 40.14 40.13 40.12 40.11 40.10 40.09 40.08 40.07 40.06
160
140
120
LONGITUDE
LATITUDE
North
0 1 2
Scale 1" = 2miles

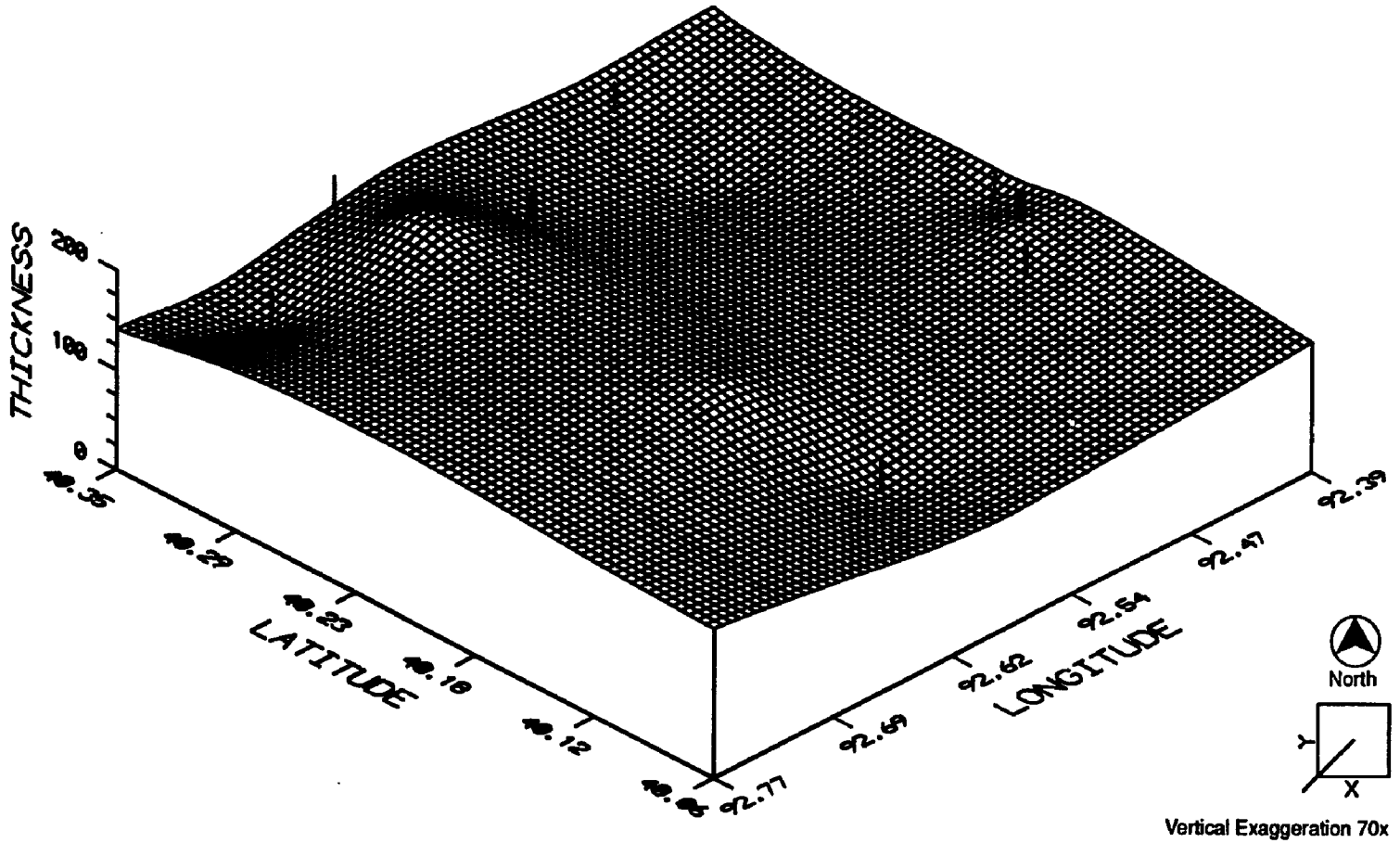
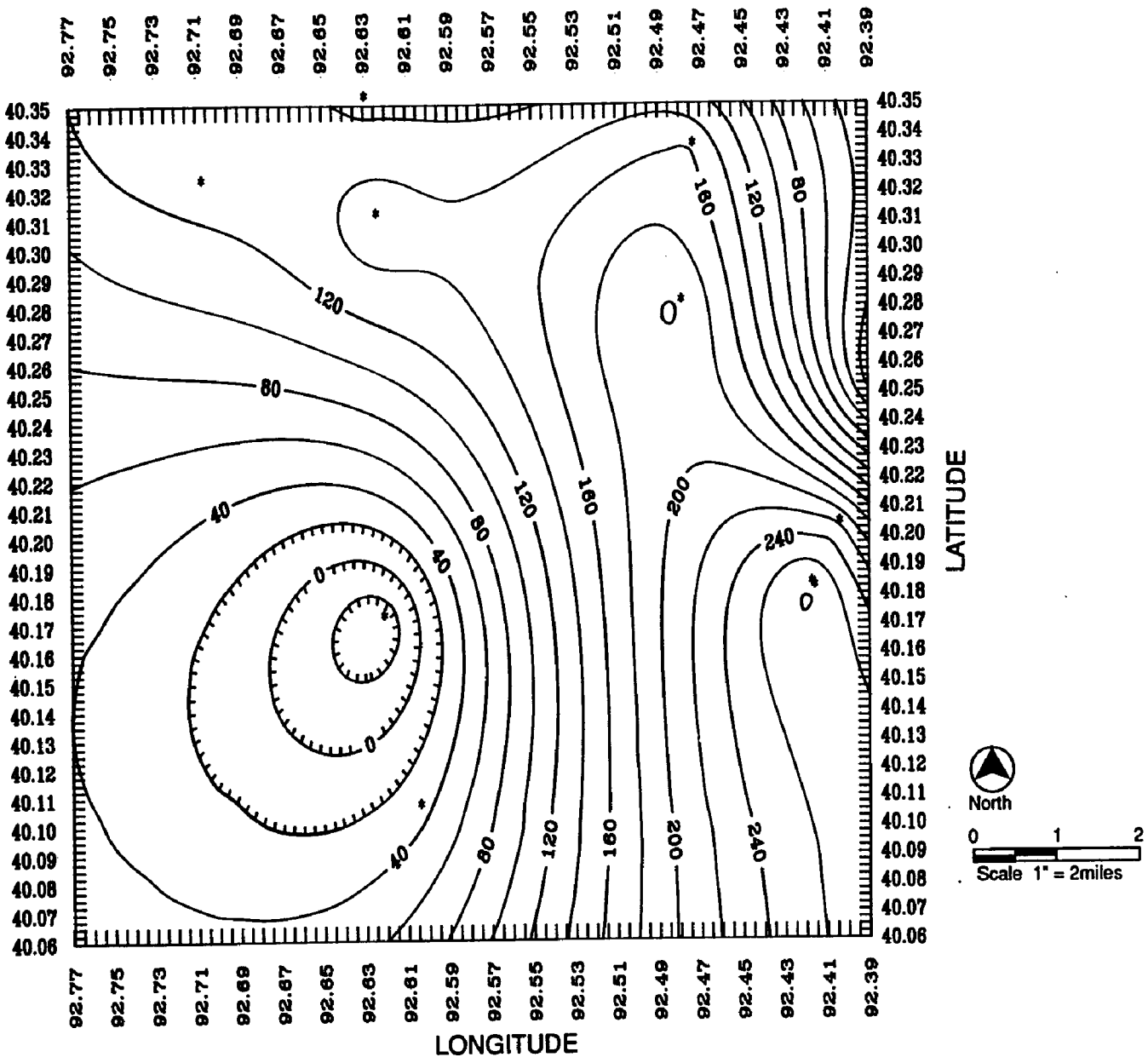


FIGURE 12
KEOKUK-BURLINGTON THICKNESS, KIRKSVILLE. LOCAL SCALE.


92.77 92.75 92.73 92.71 92.69 92.67 92.65 92.63 92.61 92.59 92.57 92.55 92.53 92.51 92.49 92.47 92.45 92.43 92.41 92.39
40.35 40.34 40.33 40.32 40.31 40.30 40.29 40.28 40.27 40.26 40.25 40.24 40.23 40.22 40.21 40.20 40.19 40.18 40.17 40.16 40.15 40.14 40.13 40.12 40.11 40.10 40.09 40.08 40.07 40.06
0
40
80
120
160
200
240
LONGITUDE
LATITUDE
North
0 1 2
Scale 1" = 2miles

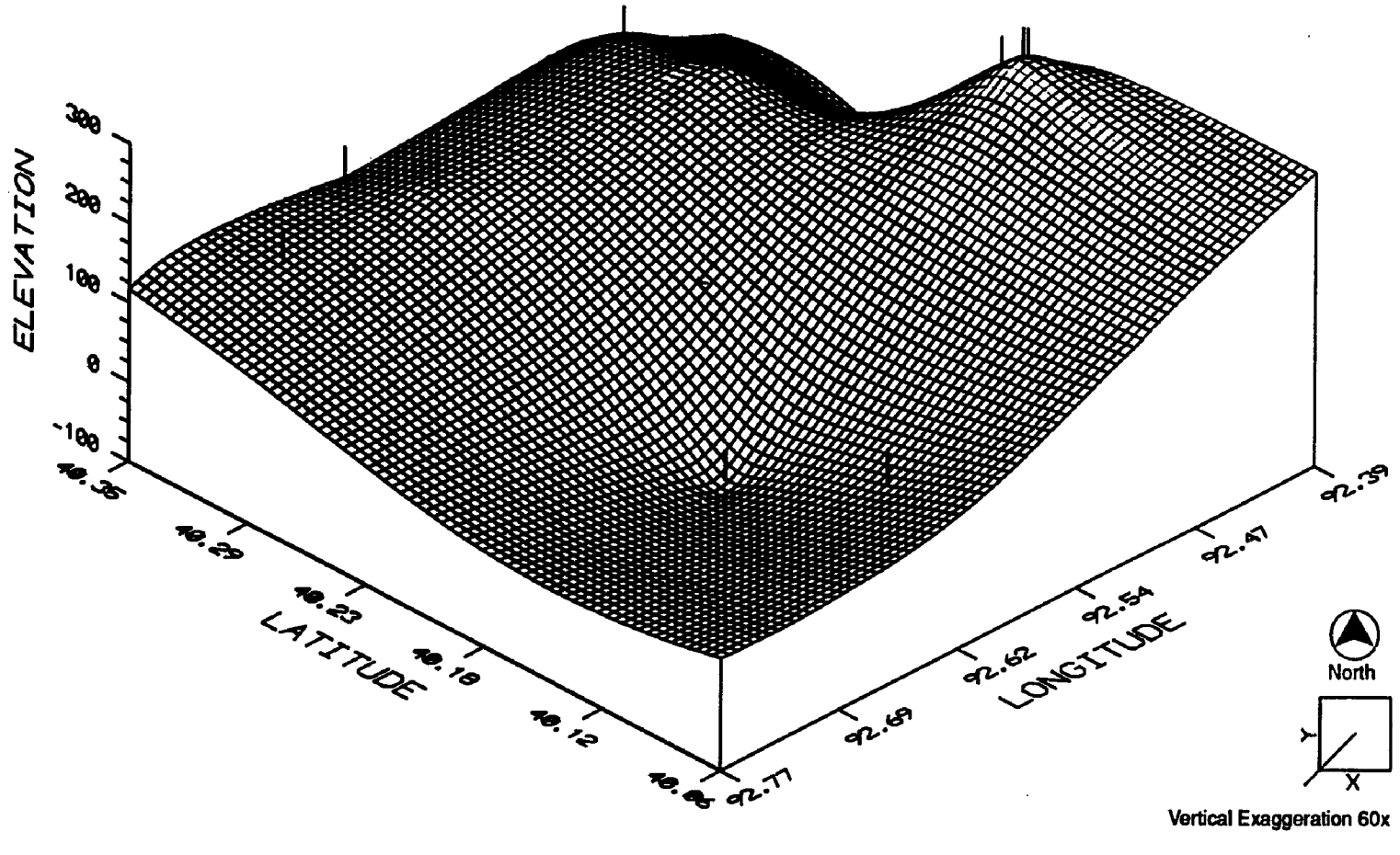
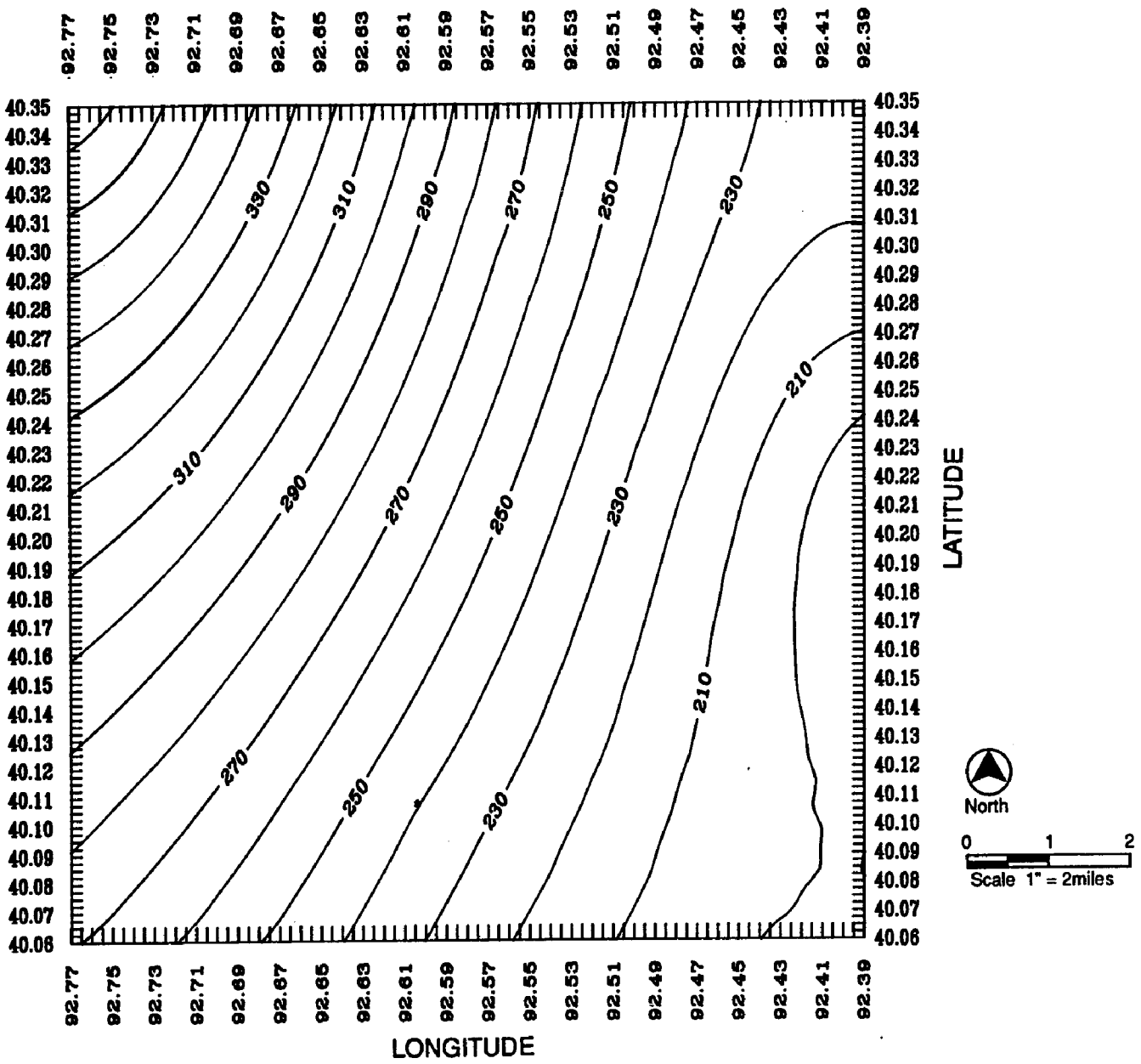


FIGURE 13
CALLAWAY-COOPER ELEVATION, KIRKSVILLE. LOCAL SCALE.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92.75
92.73
92.71
92.69
92.67
92.65
92.63
92.61
92.59
92.57
92.55
92.53
92.51
92.49
92.47
92.45
92.43
92.41
92.39
40.35
40.34
40.33
40.32
40.31
40.30
40.29
40.28
40.27
40.26
40.25
40.24
40.23
40.22
40.21
40.20
40.19
40.18
40.17
40.16
40.15
40.14
40.13
40.12
40.11
40.10
40.09
40.08
40.07
40.06
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310
290
270
250
230
210
LONGITUDE
LATITUDE
North
0
1
2
Scale 1" = 2miles

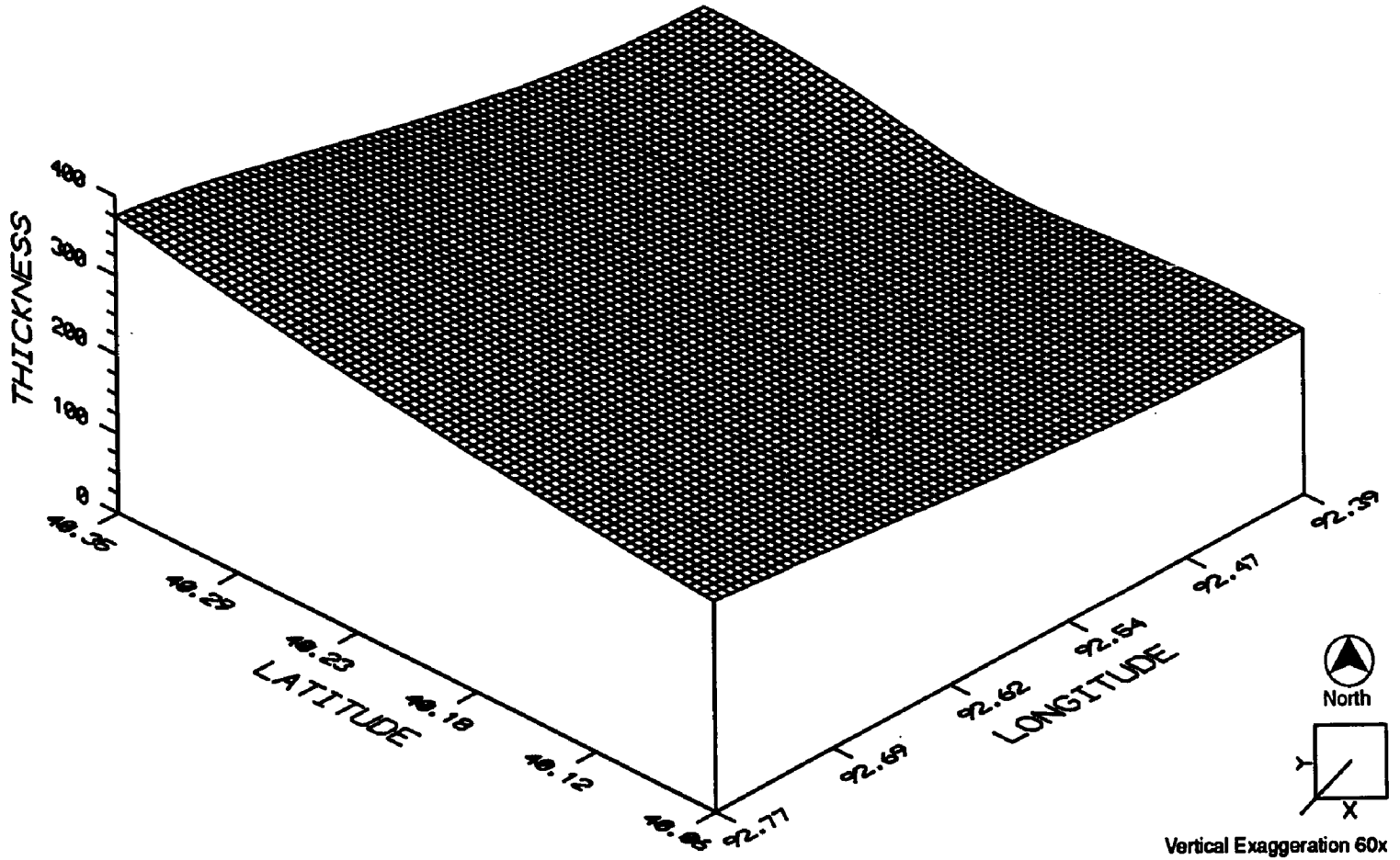
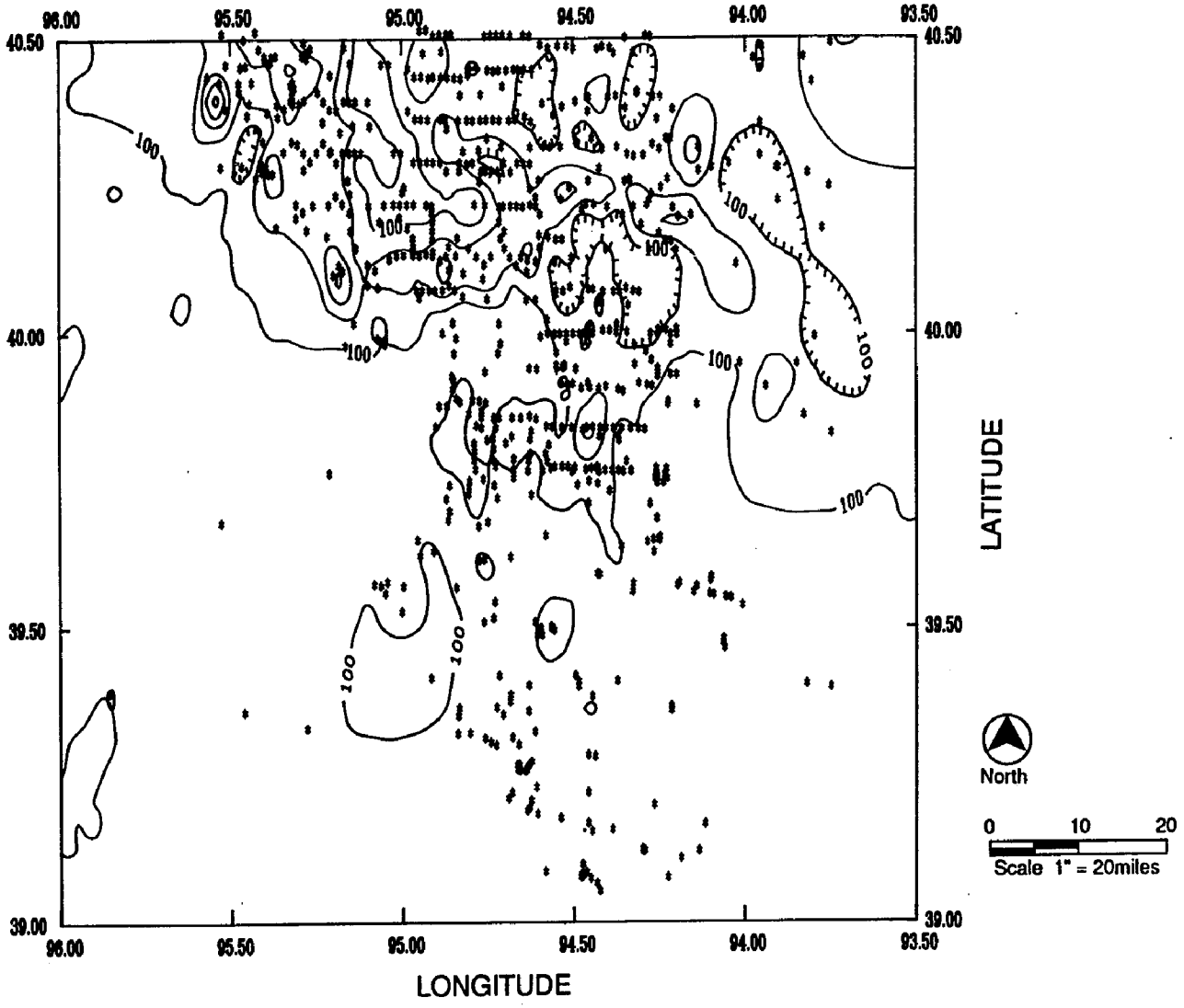


FIGURE 14
CALLAWAY-COOPER THICKNESS, KIRKSVILLE. LOCAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
100
LATITUDE
LONGITUDE
North
0
10
20
Scale 1" = 20miles

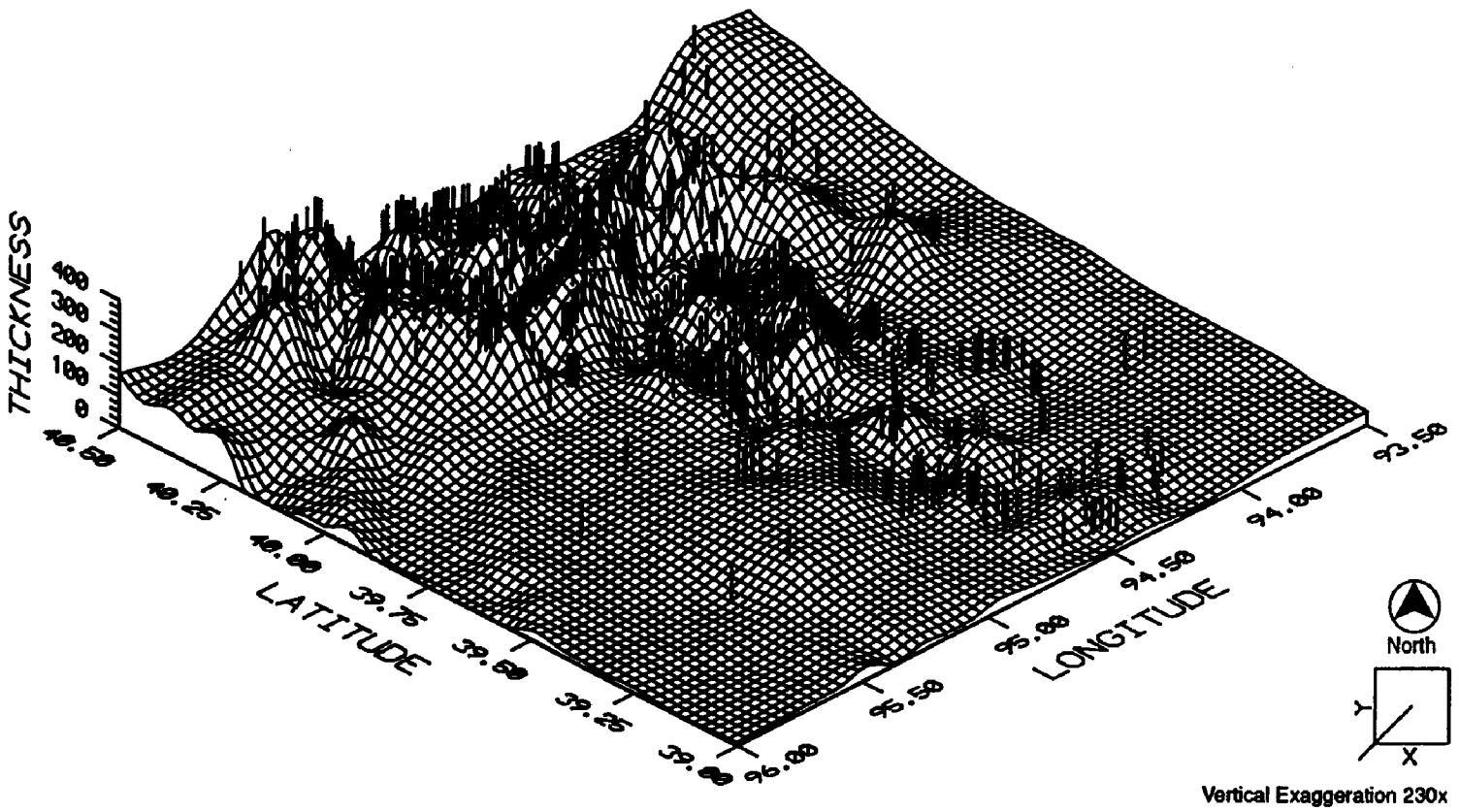
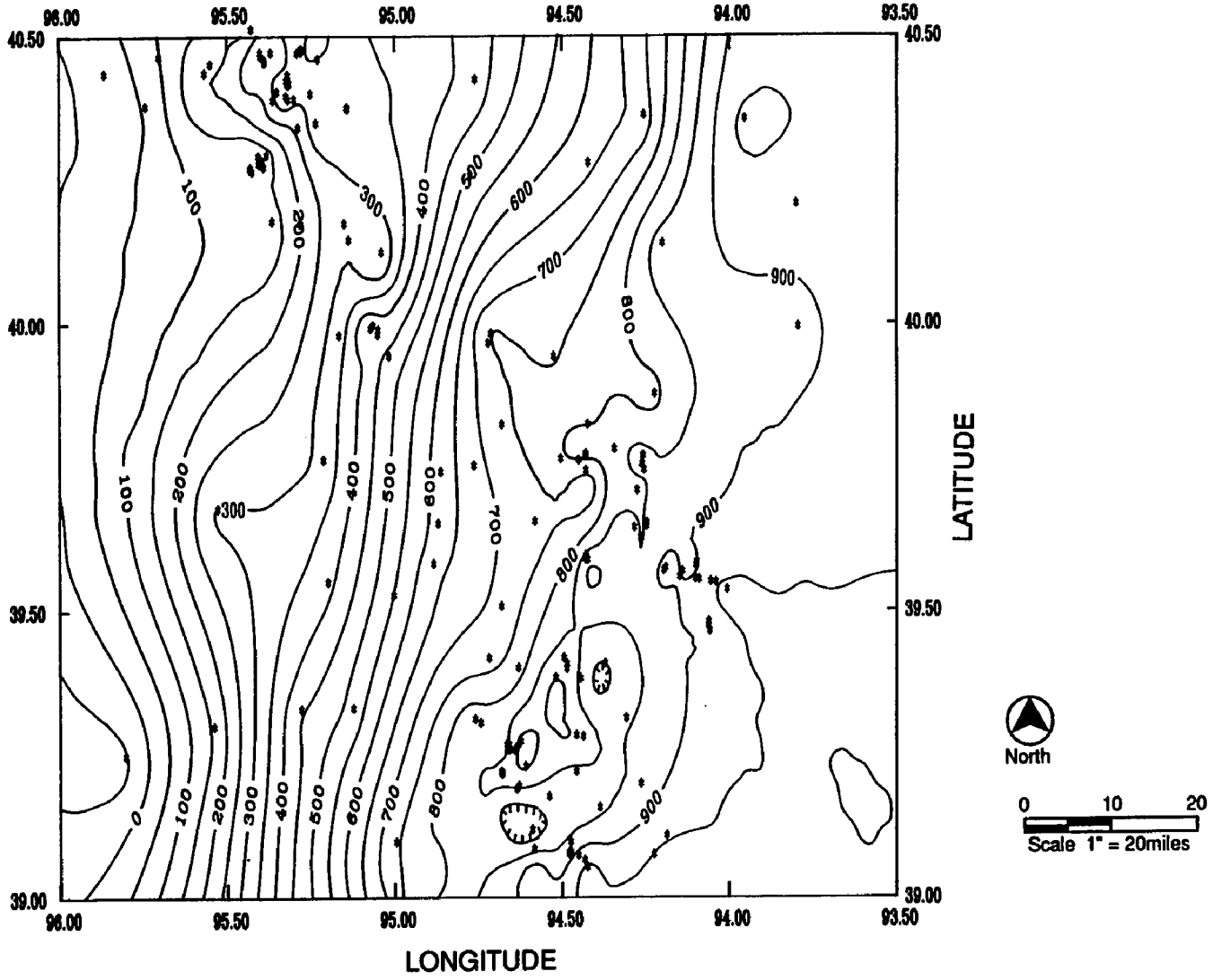


FIGURE 15
GLACIAL COVER, ST. JOSEPH. REGIONAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
LATITUDE
LONGITUDE
0
100
200
300
400
500
600
700
800
900
North
0
10
20
Scale 1" = 20miles

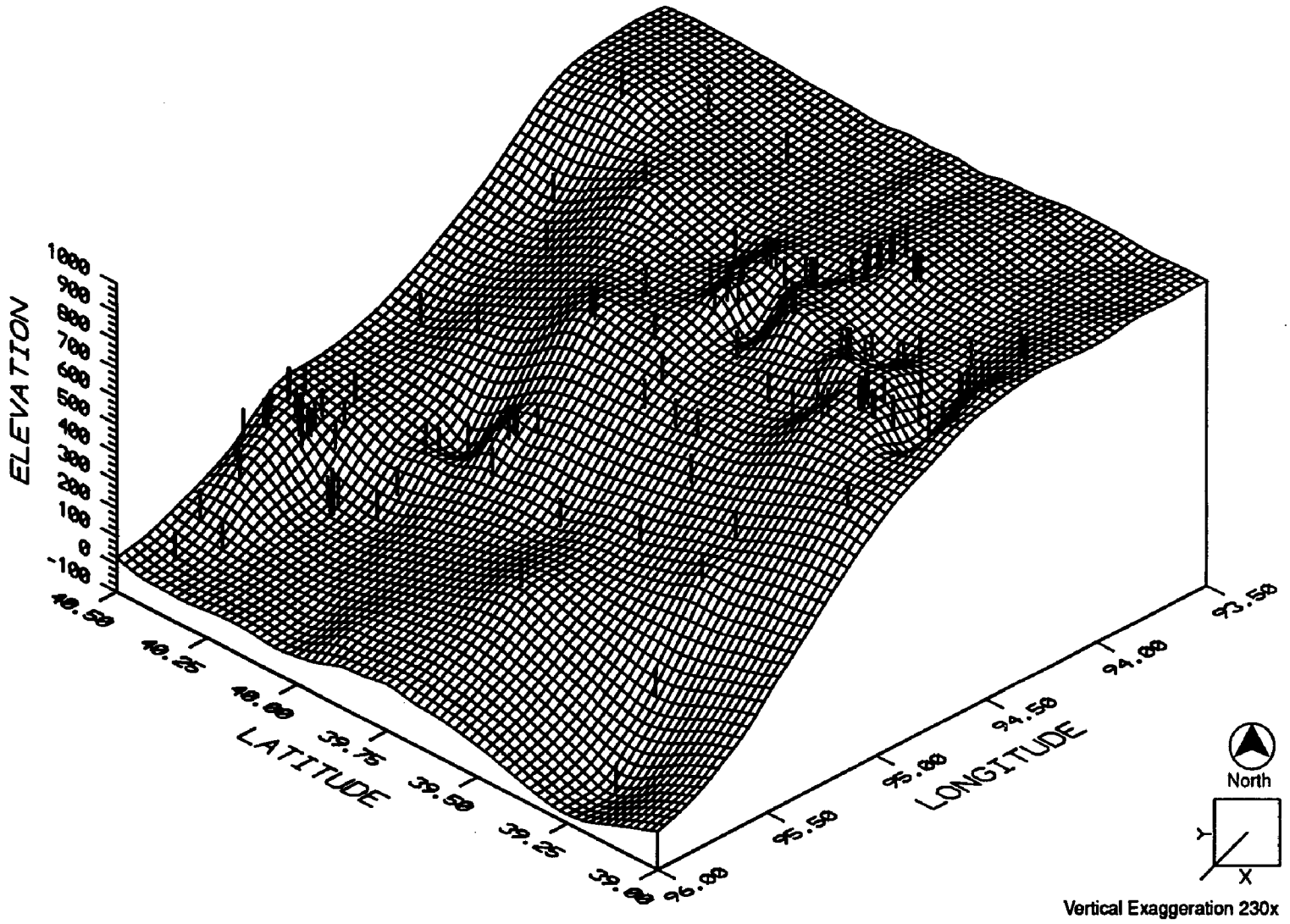
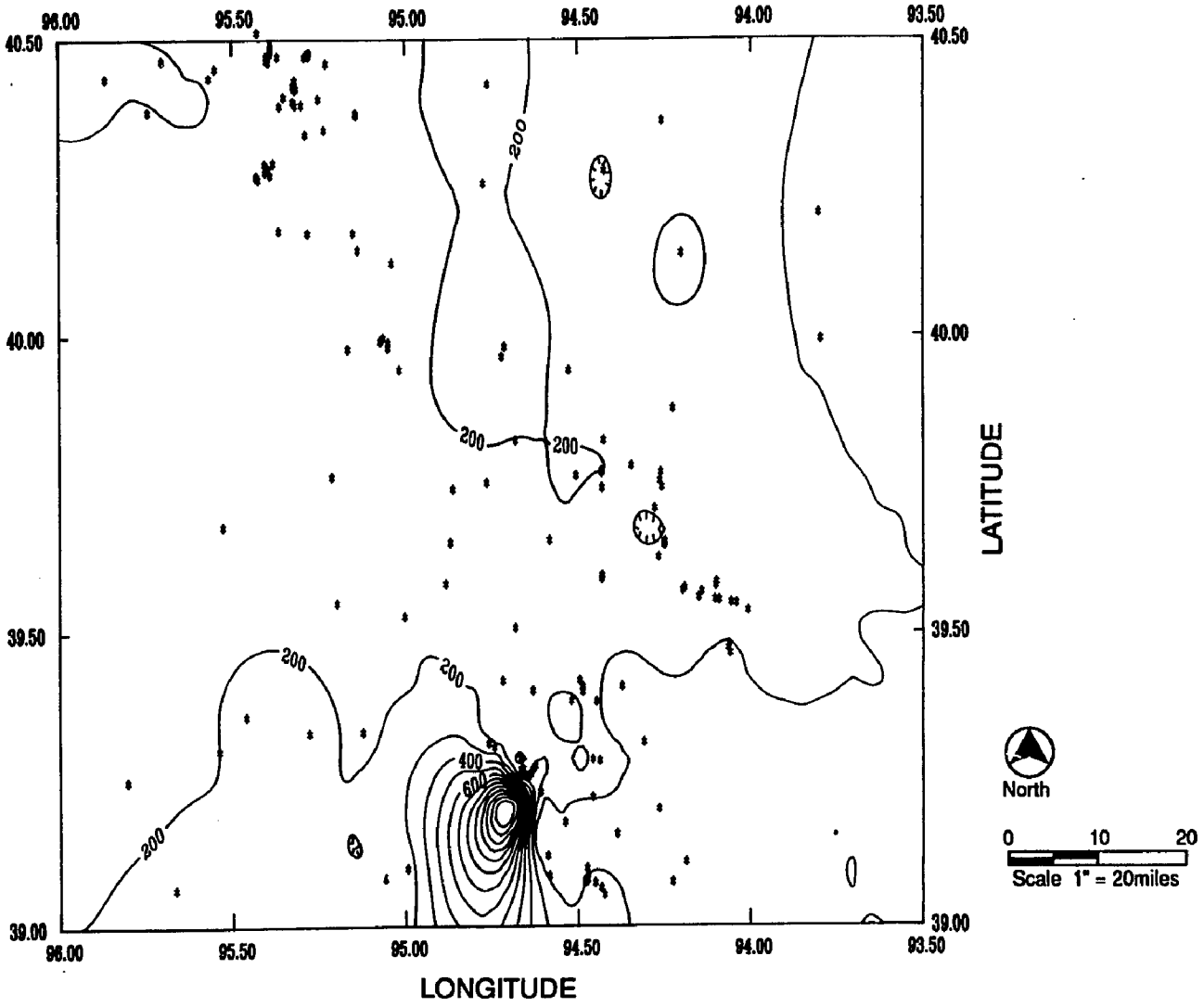


FIGURE 16
KANSAS CITY-LANSING ELEVATION, ST. JOSEPH. REGIONAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
200
200
200
200
400
600
LATITUDE
LONGITUDE
North
0
10
20
Scale 1" = 20miles

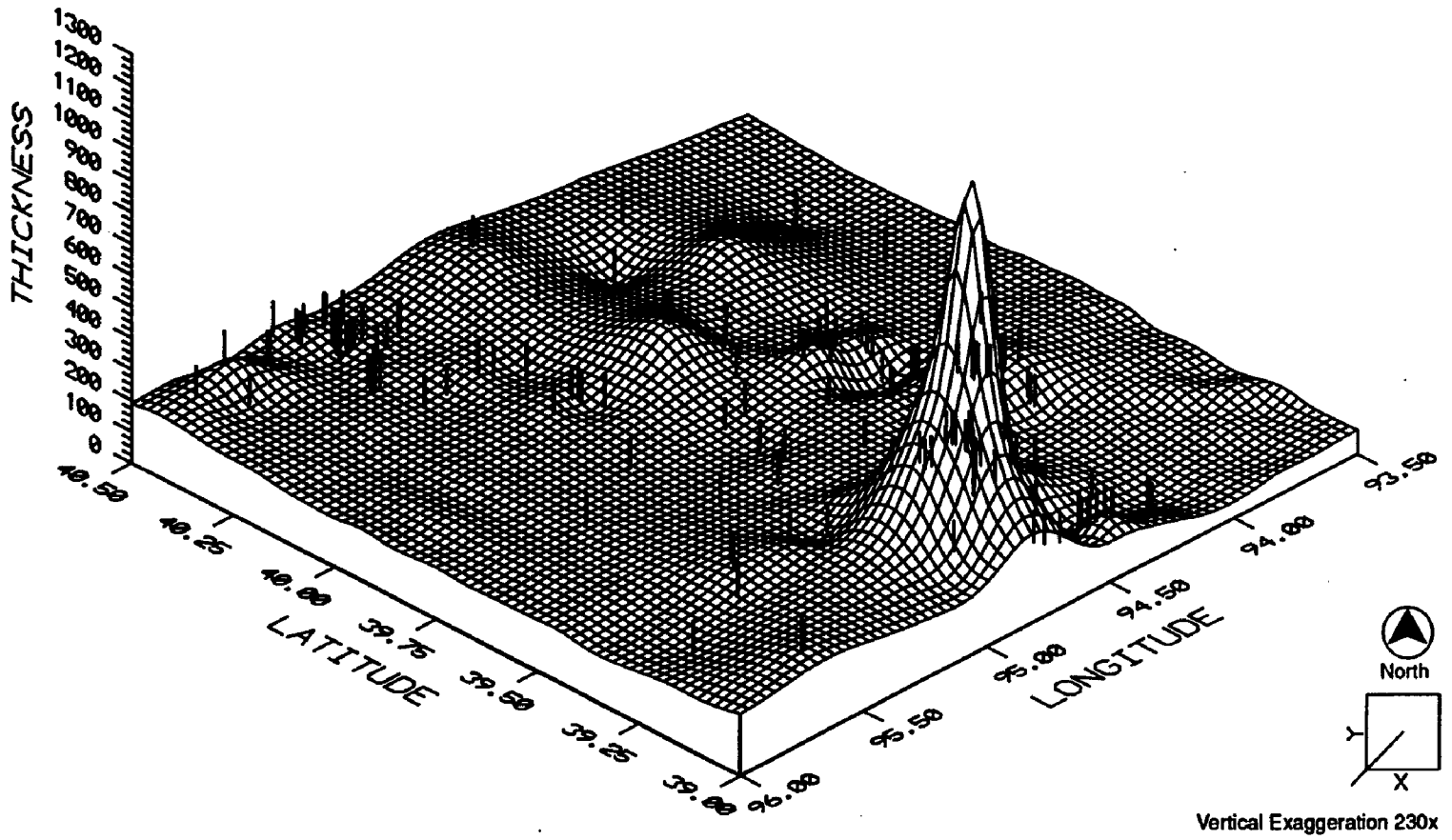
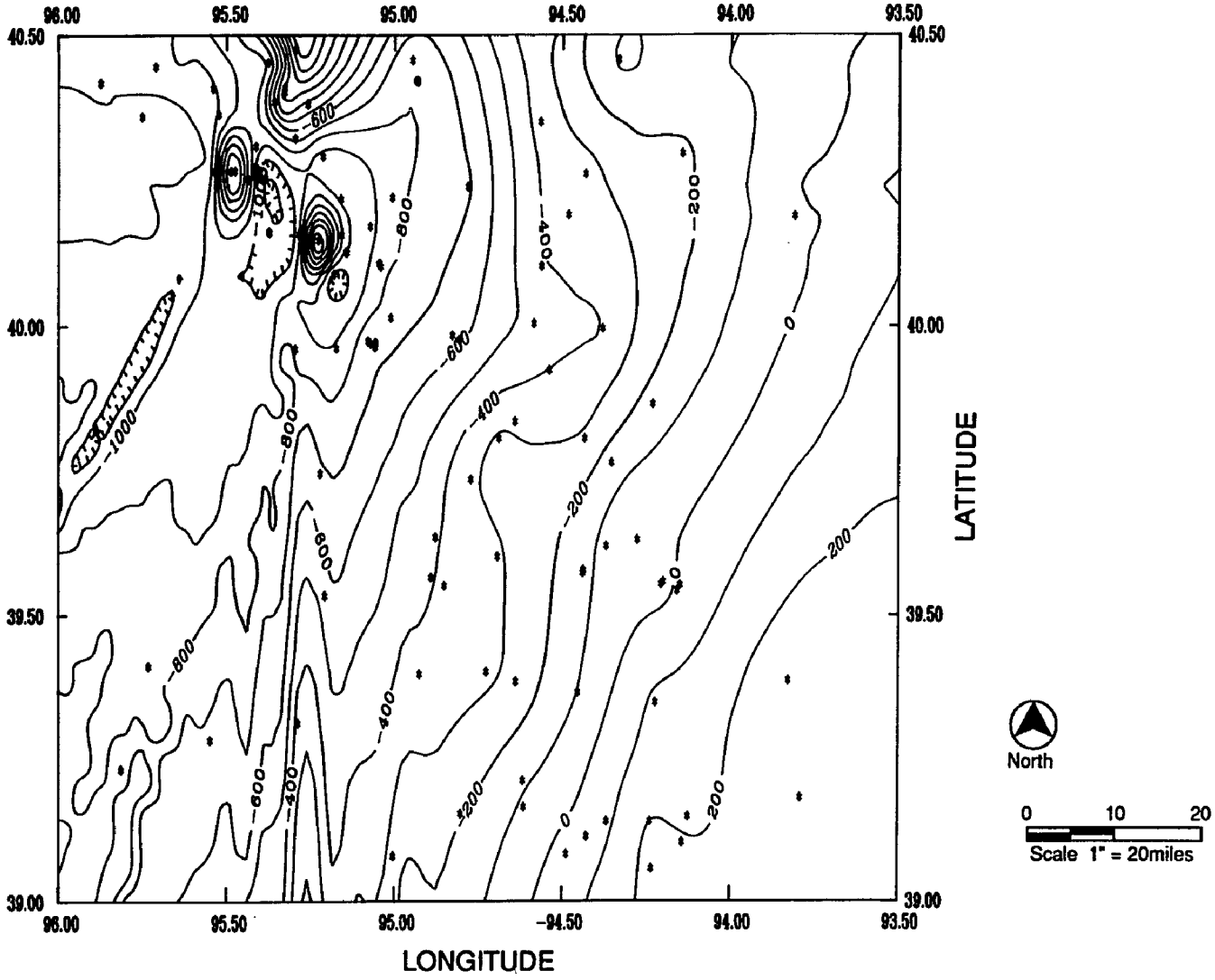


FIGURE 17
KANSAS CITY-LANSING THICKNESS, ST JOSEPH. REGIONAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
-600
-800
-400
-200
0
-1000
LATITUDE
LONGITUDE
North
0 10 20
Scale 1" = 20miles

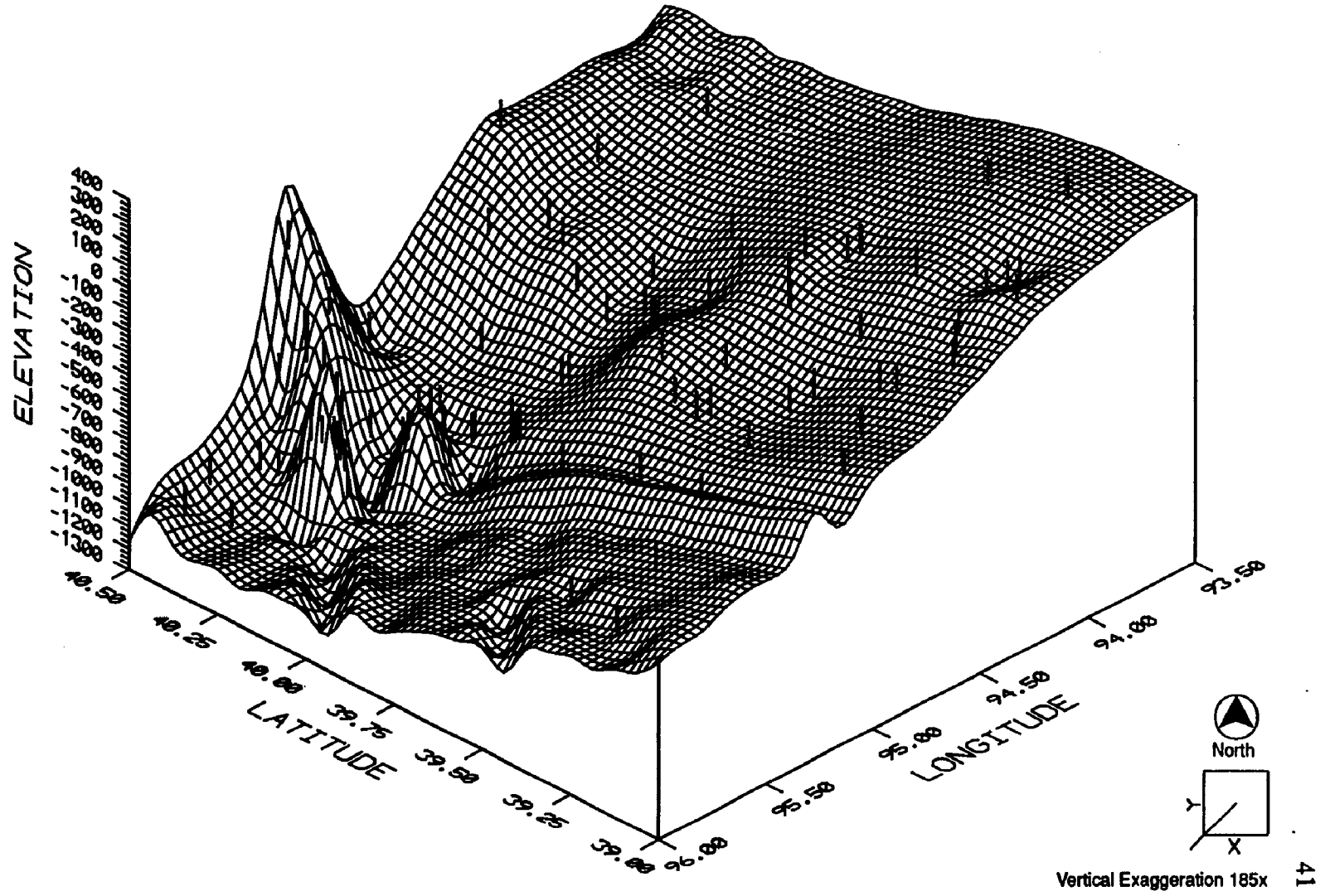
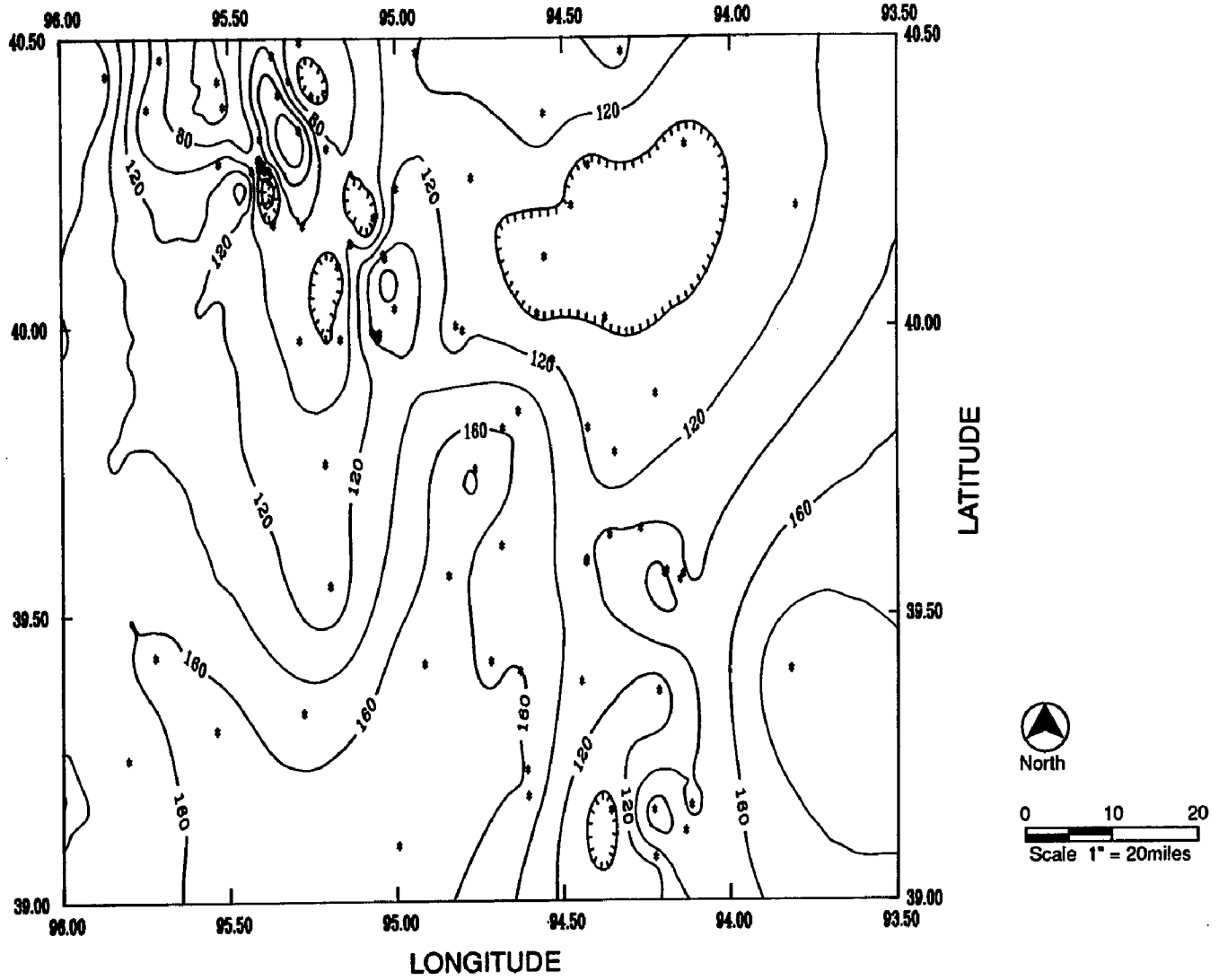


FIGURE 18
KEOKUK-BURLINGTON ELEVATION, ST. JOSEPH. REGIONAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
80
120
160
LATITUDE
LONGITUDE
North
0
10
20
Scale 1" = 20miles

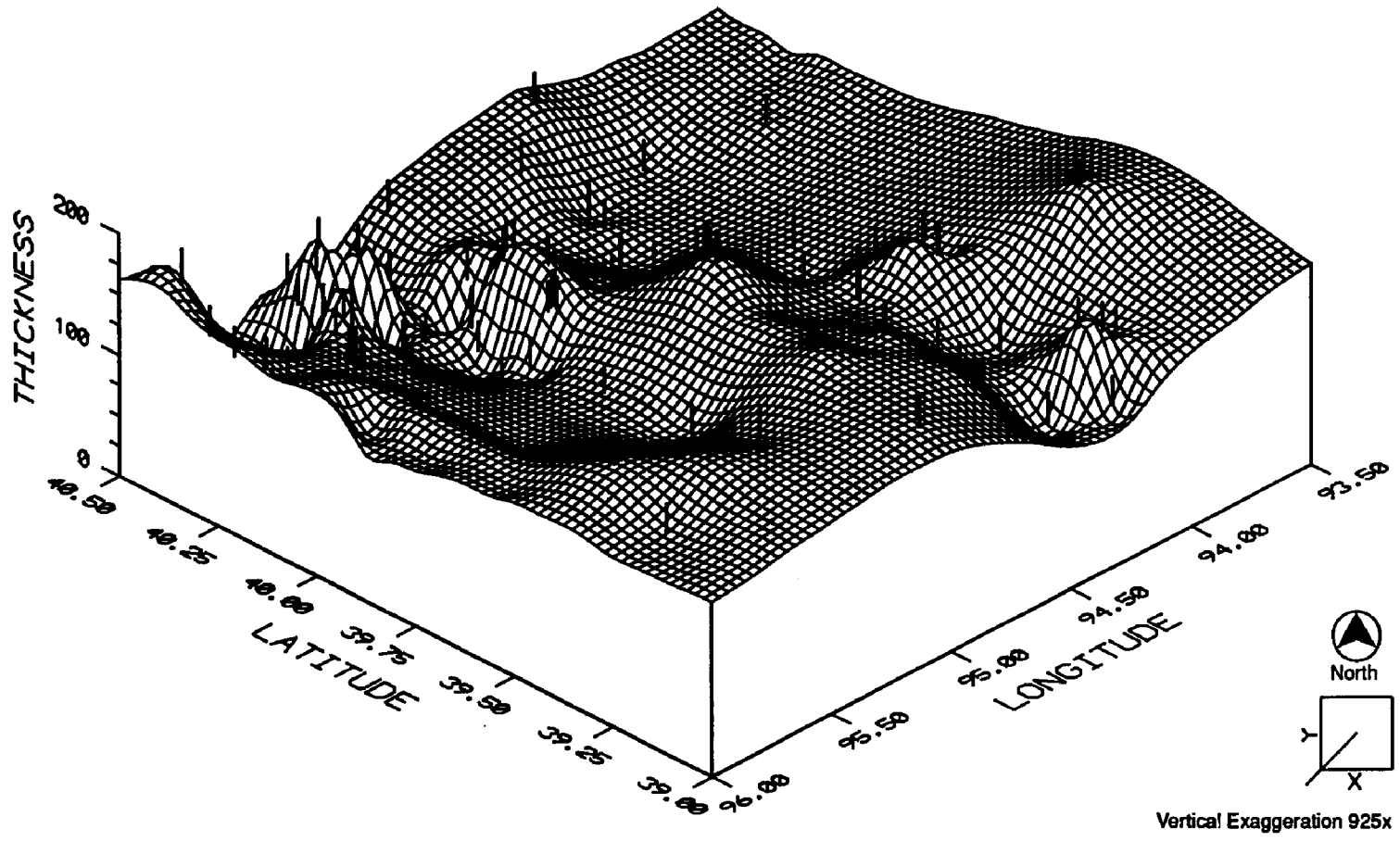
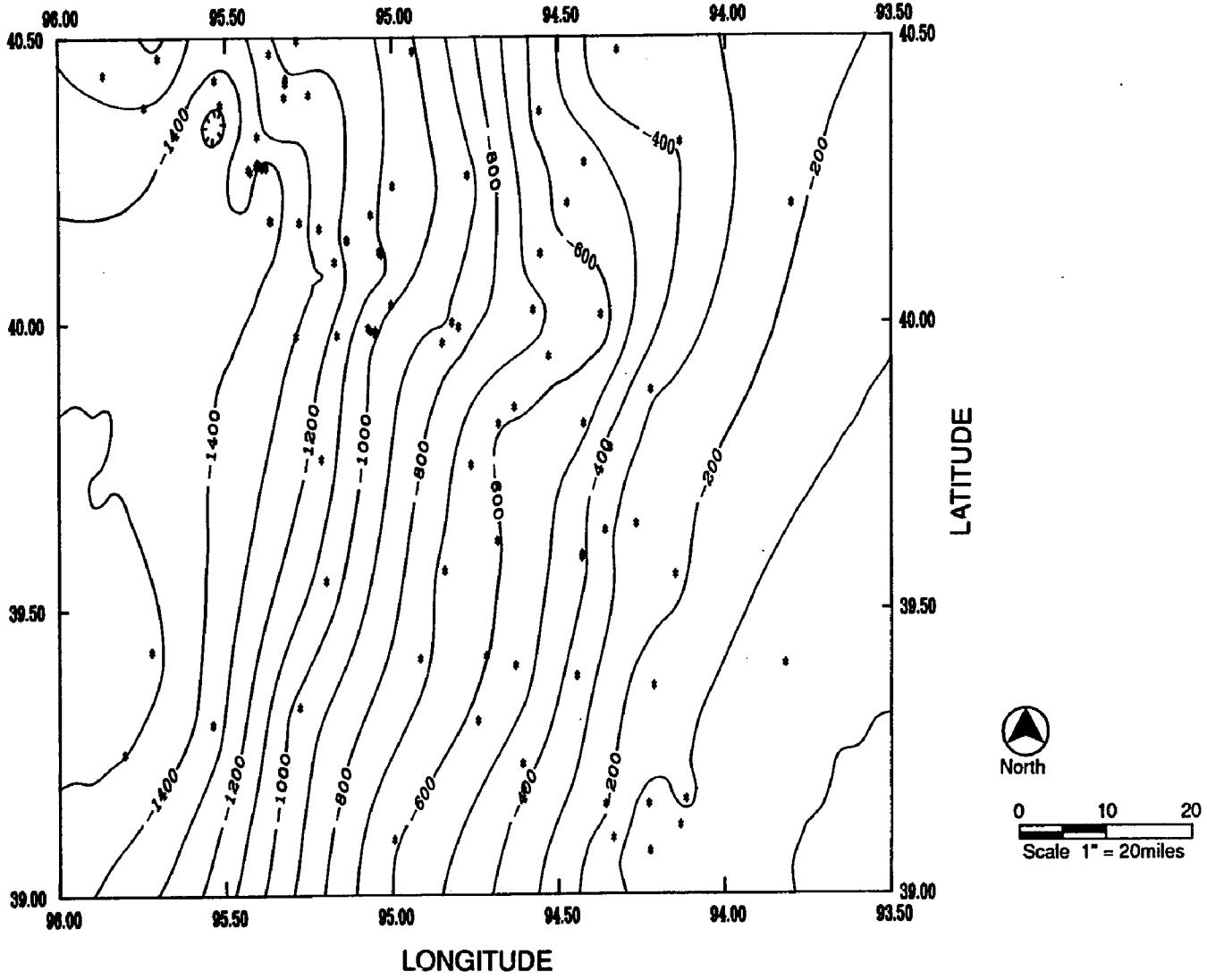


FIGURE 19
KEOKUK-BURLINGTON THICKNESS, ST. JOSEPH. REGIONAL SCALE.


96.00
95.50
95.00
94.50
94.00
93.50
40.50
40.00
39.50
39.00
1400
1200
1000
800
600
400
200
LATITUDE
LONGITUDE
North
0
10
20
Scale 1" = 20miles

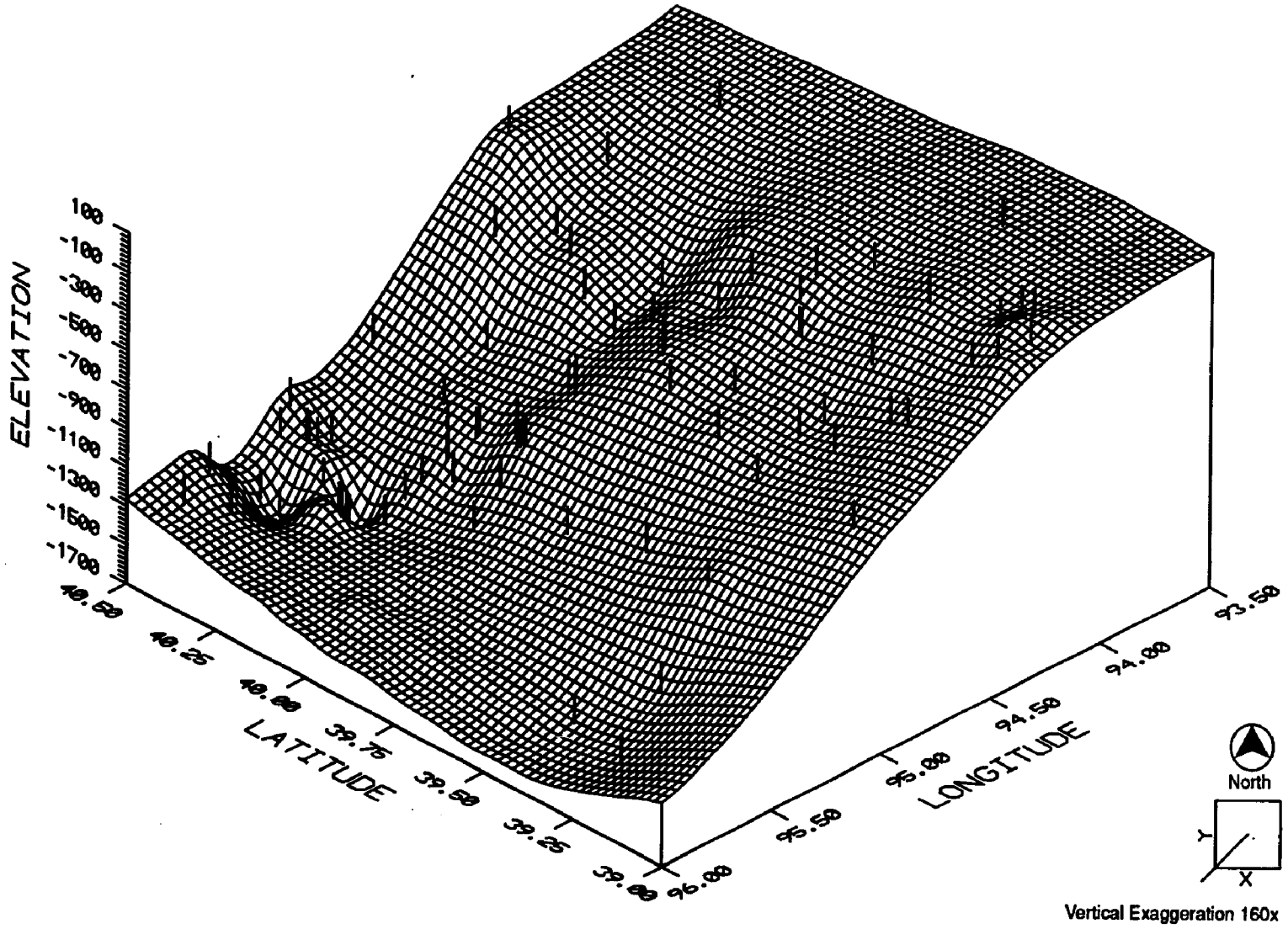
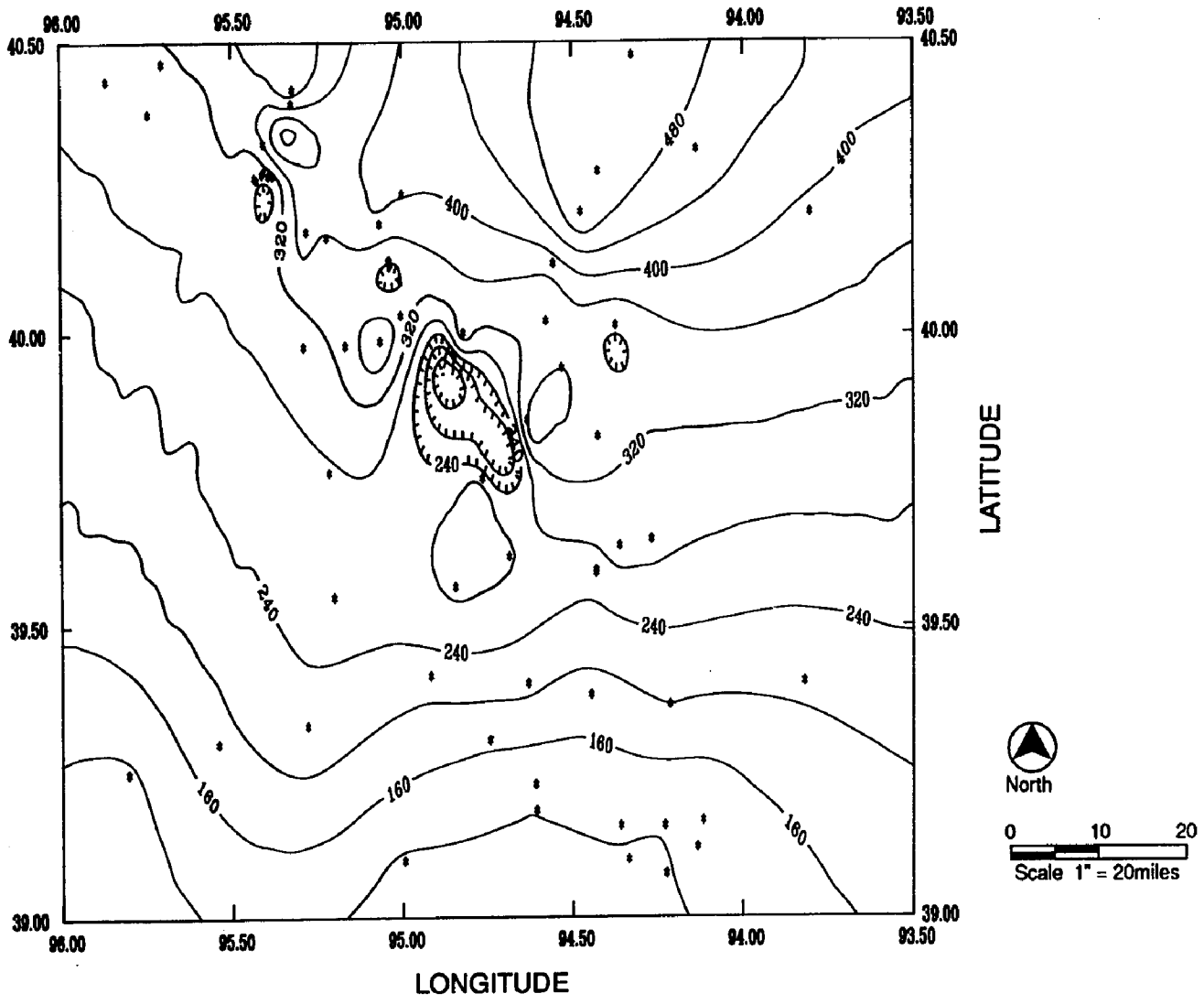


FIGURE 20
CALLAWAY-COOPER ELEVATION, ST. JOSEPH. REGIONAL SCALE.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94.50
94.00
93.50
40.50
40.00
39.50
39.00
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400
320
240
160
LATITUDE
LONGITUDE
North
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20
Scale 1" = 20miles

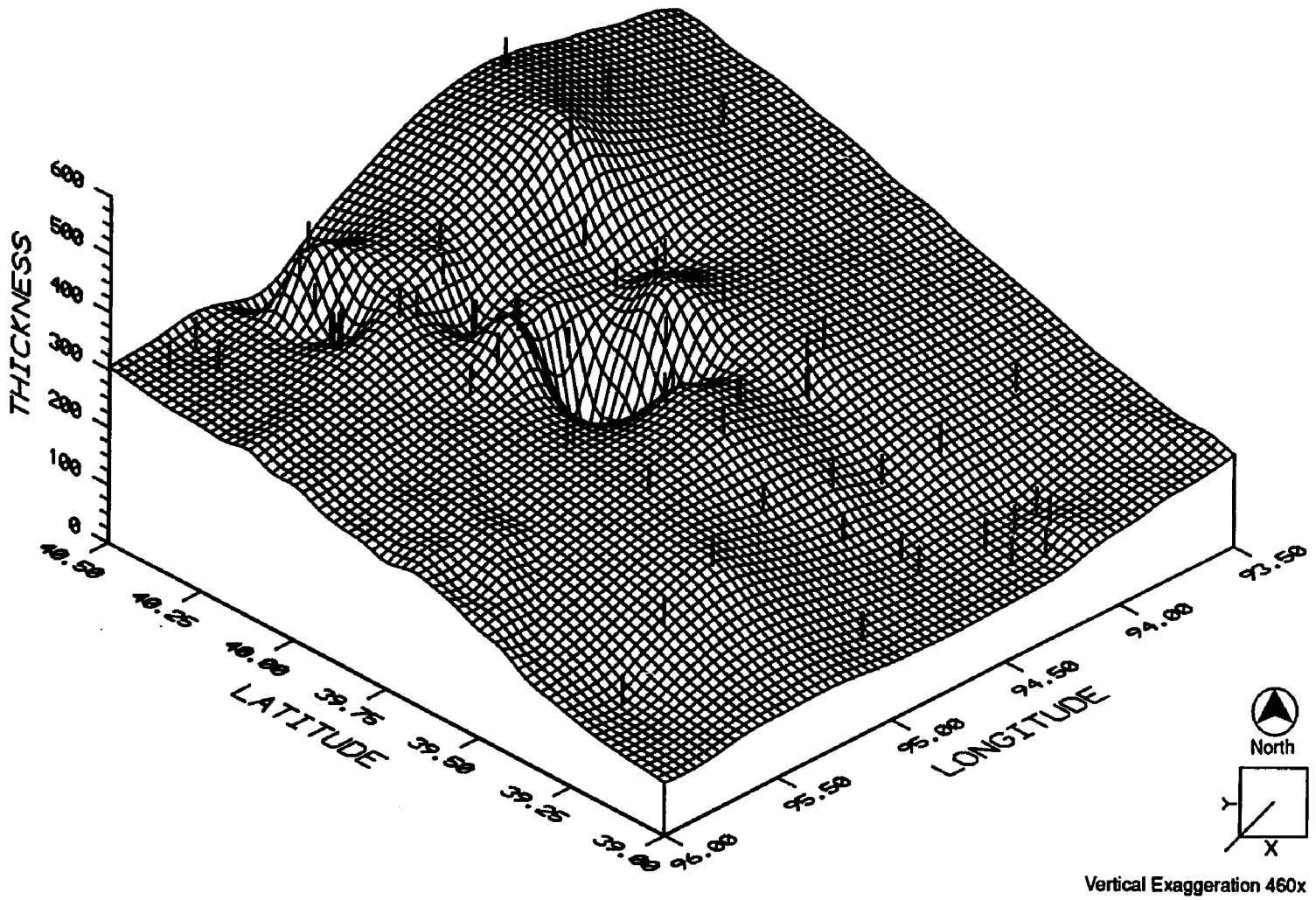
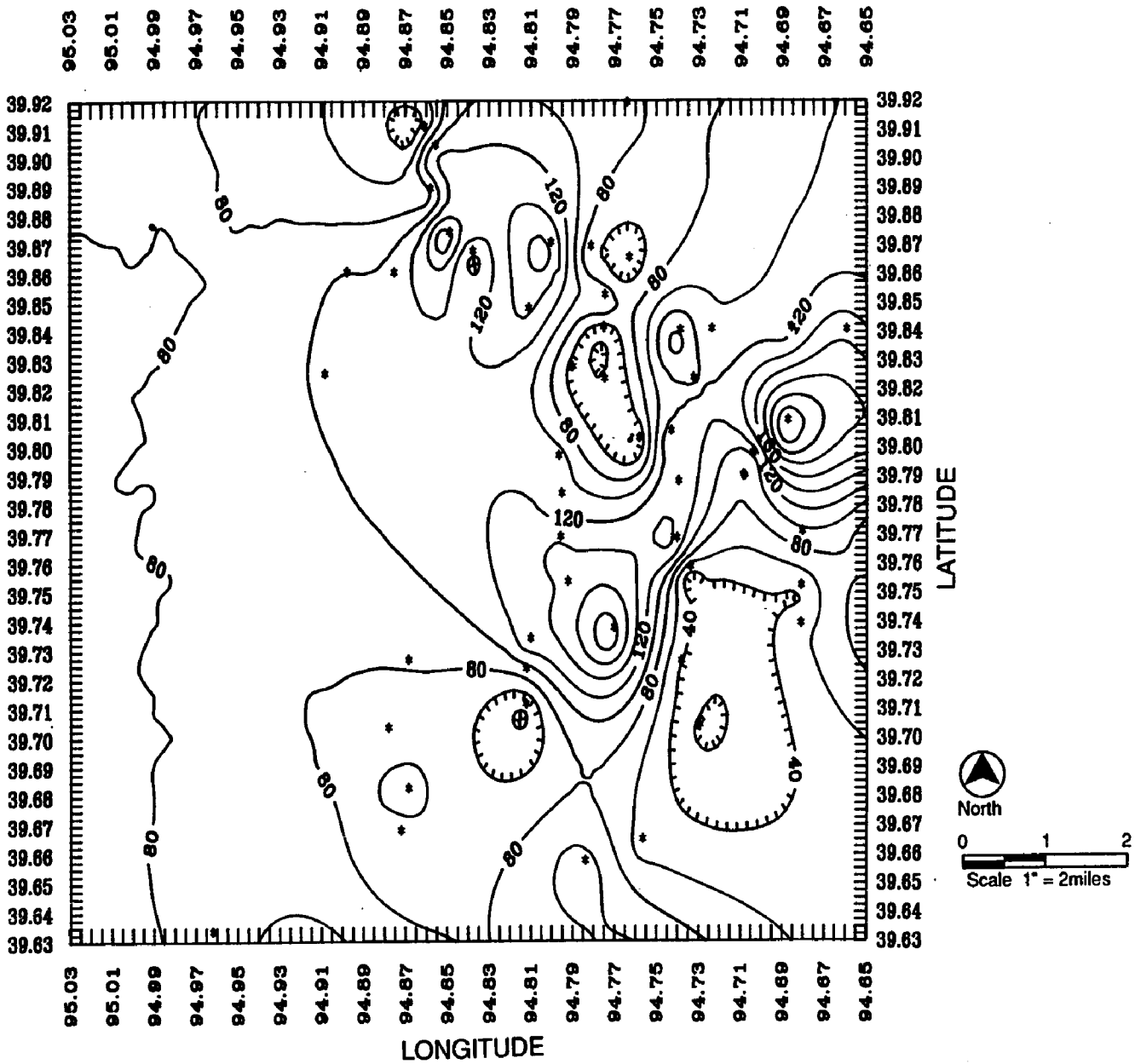


FIGURE 21
CALLAWAY-COOPER THICKNESS, ST. JOSEPH. REGIONAL SCALE.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LONGITUDE
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Scale 1" = 2miles

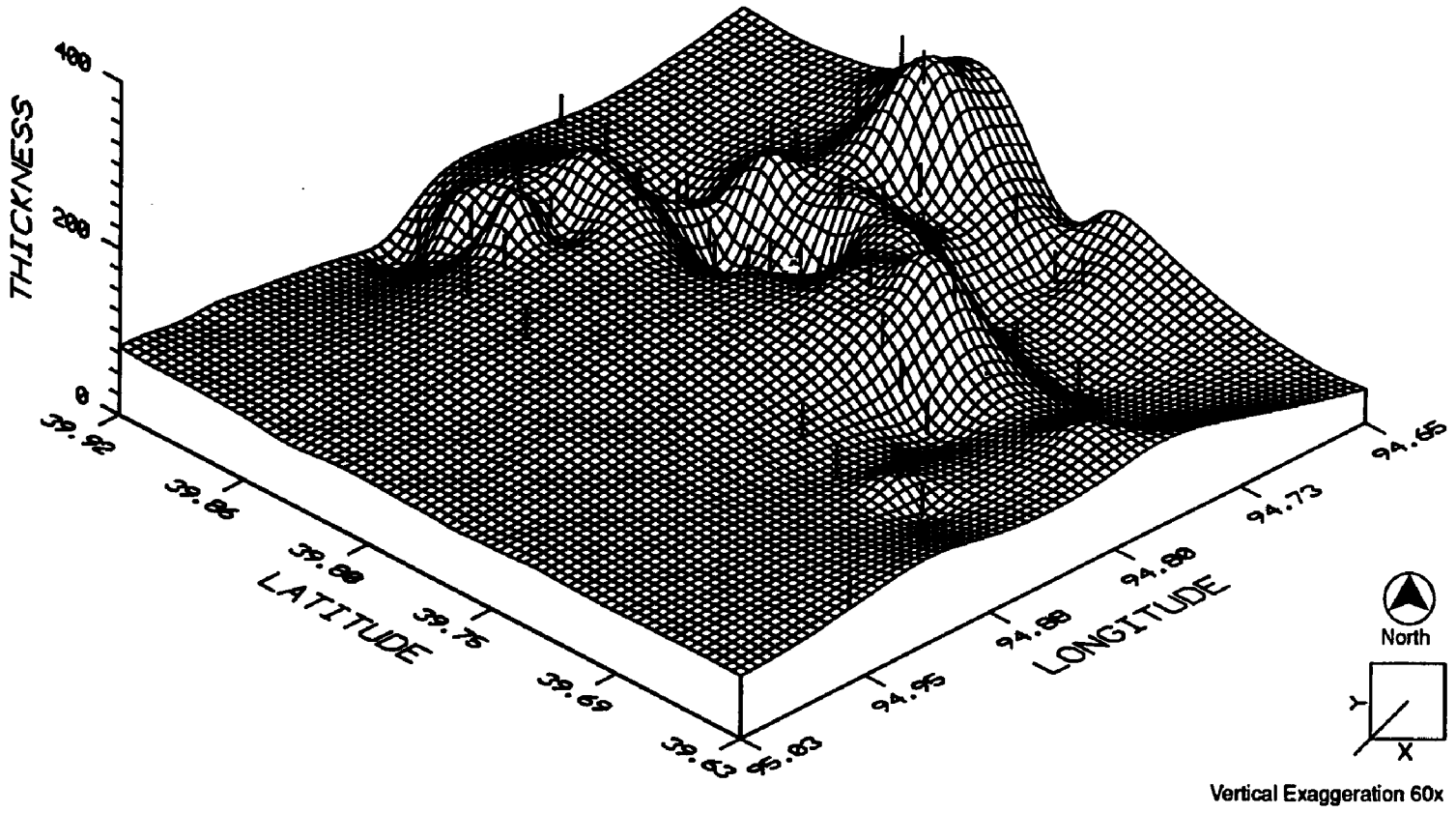
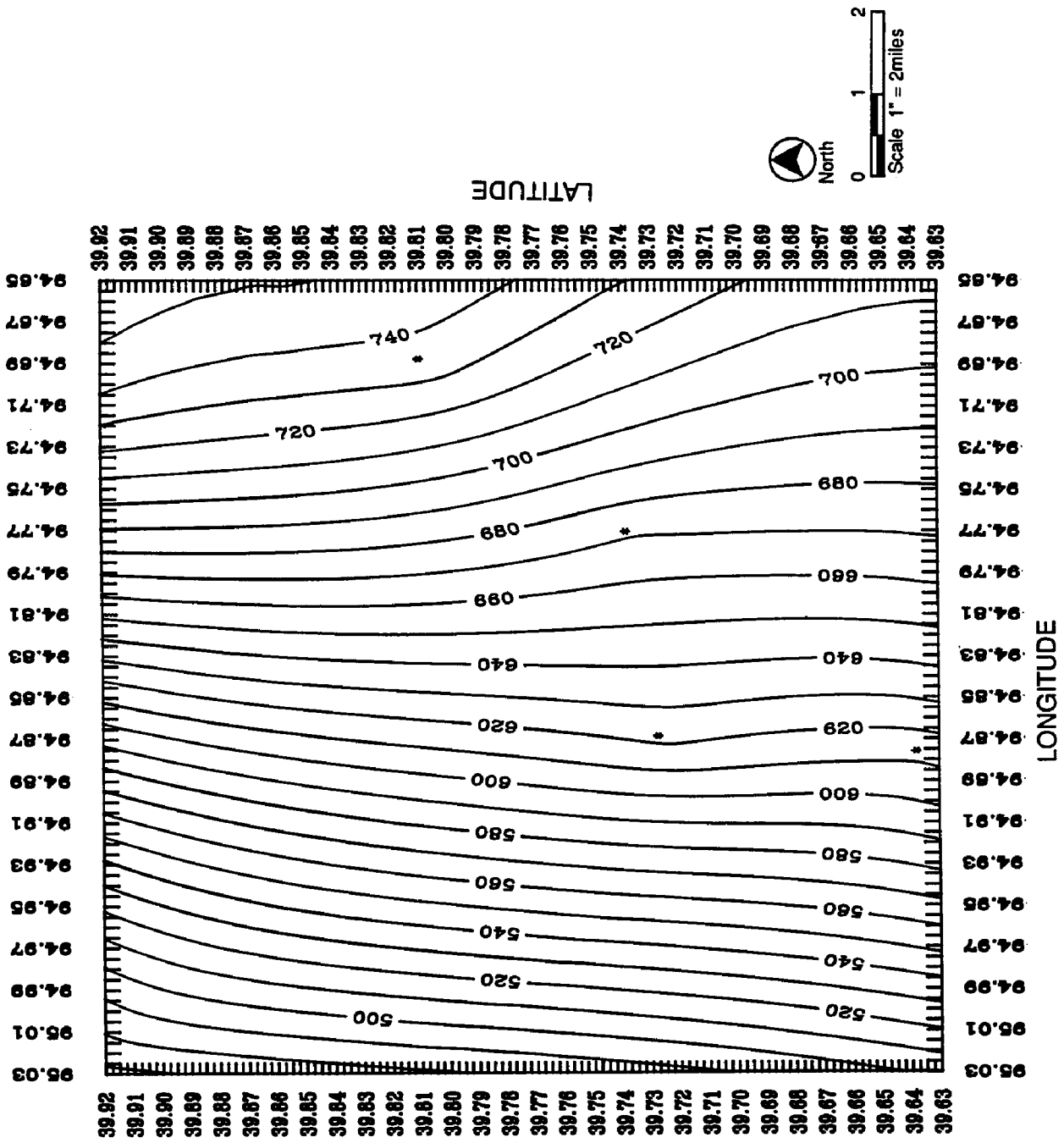


FIGURE 22
GLACIAL COVER, ST. JOSEPH. LOCAL SCALE.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Scale 1" = 2miles
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580
560
540
520
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39.92
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94.99
95.01
95.03

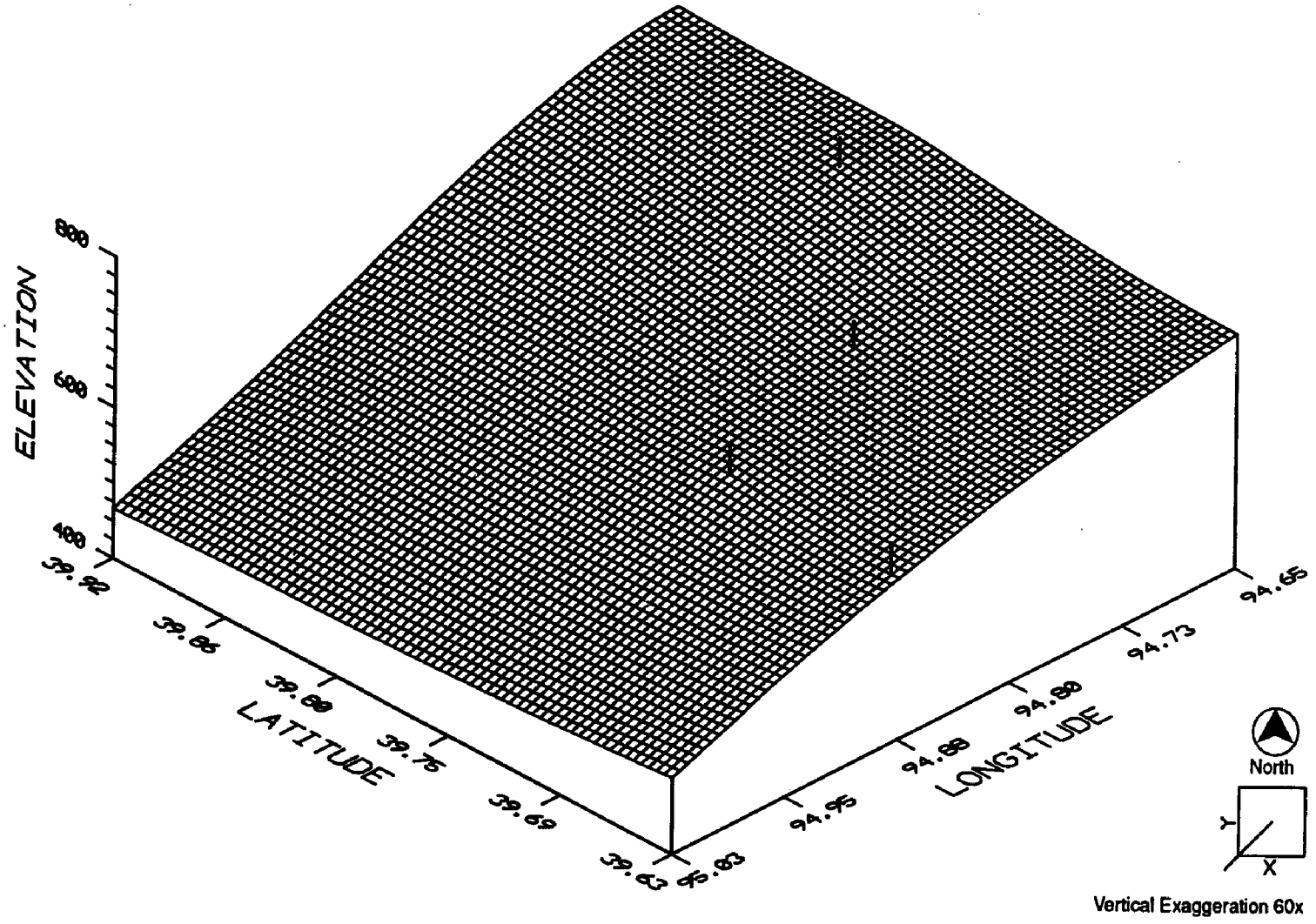
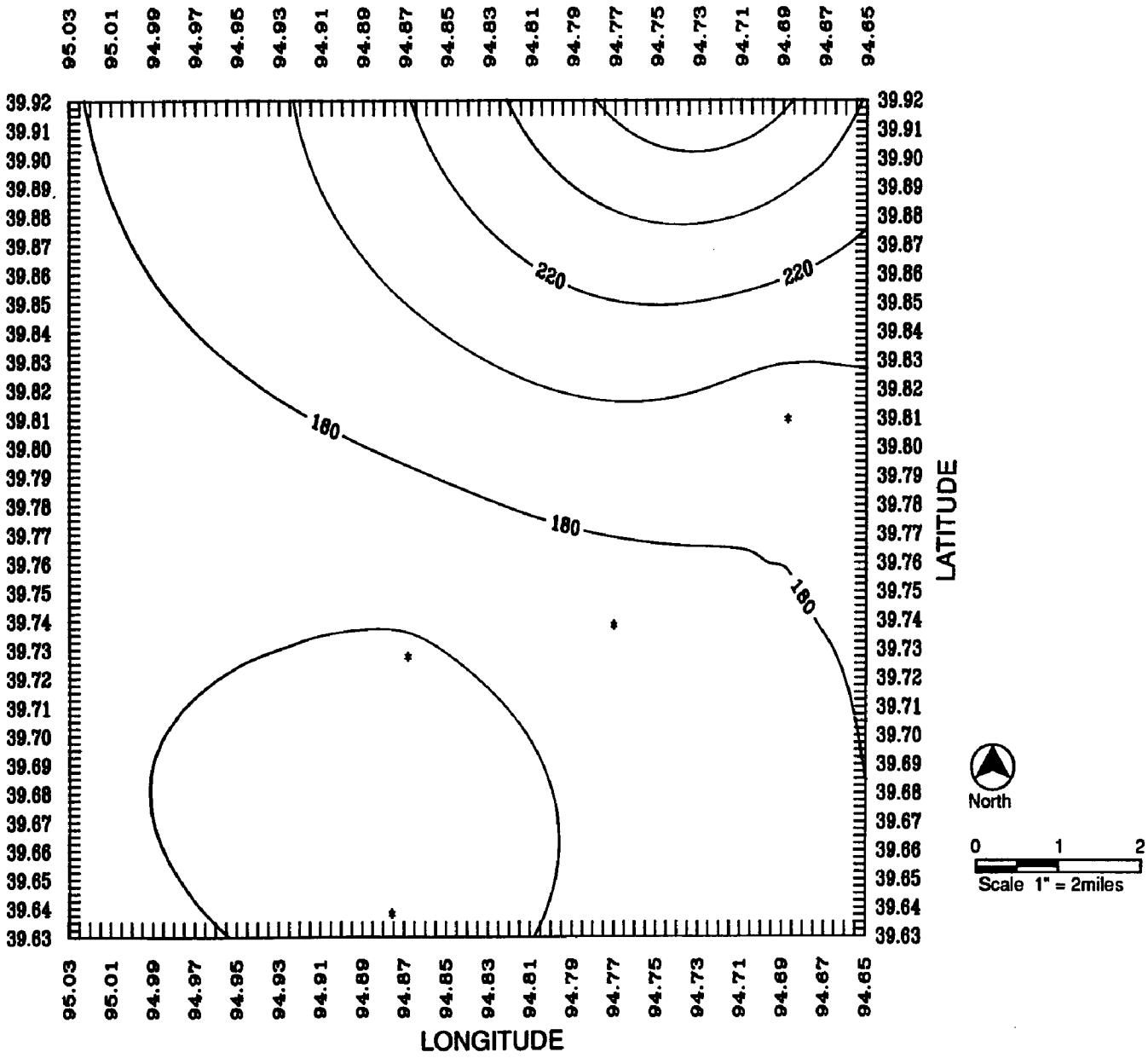


FIGURE 23
KANSAS CITY-LANSING ELEVATION, ST. JOSEPH. LOCAL SCALE.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220
180
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180
LONGITUDE
LATITUDE
North
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Scale 1" = 2miles

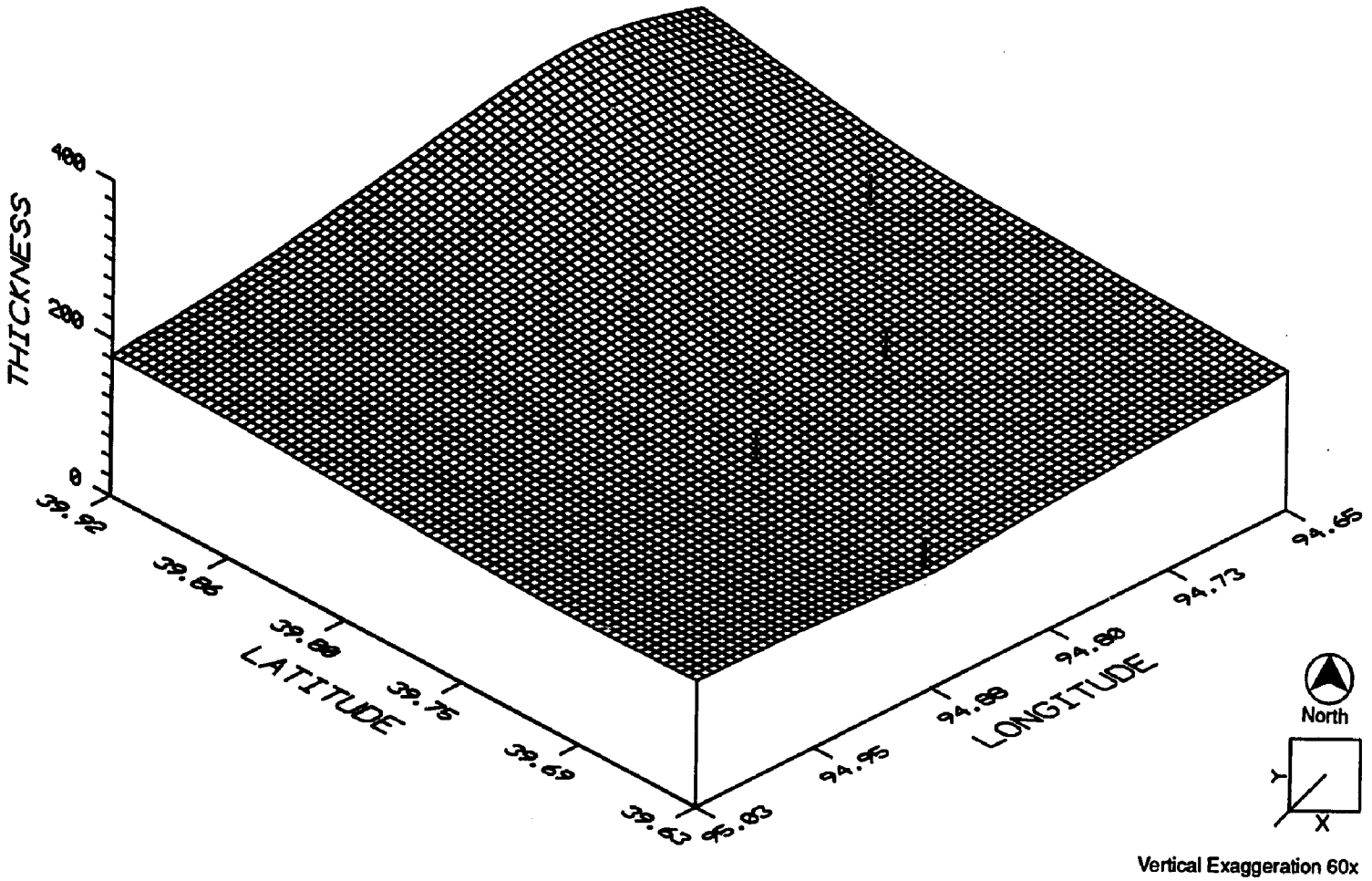
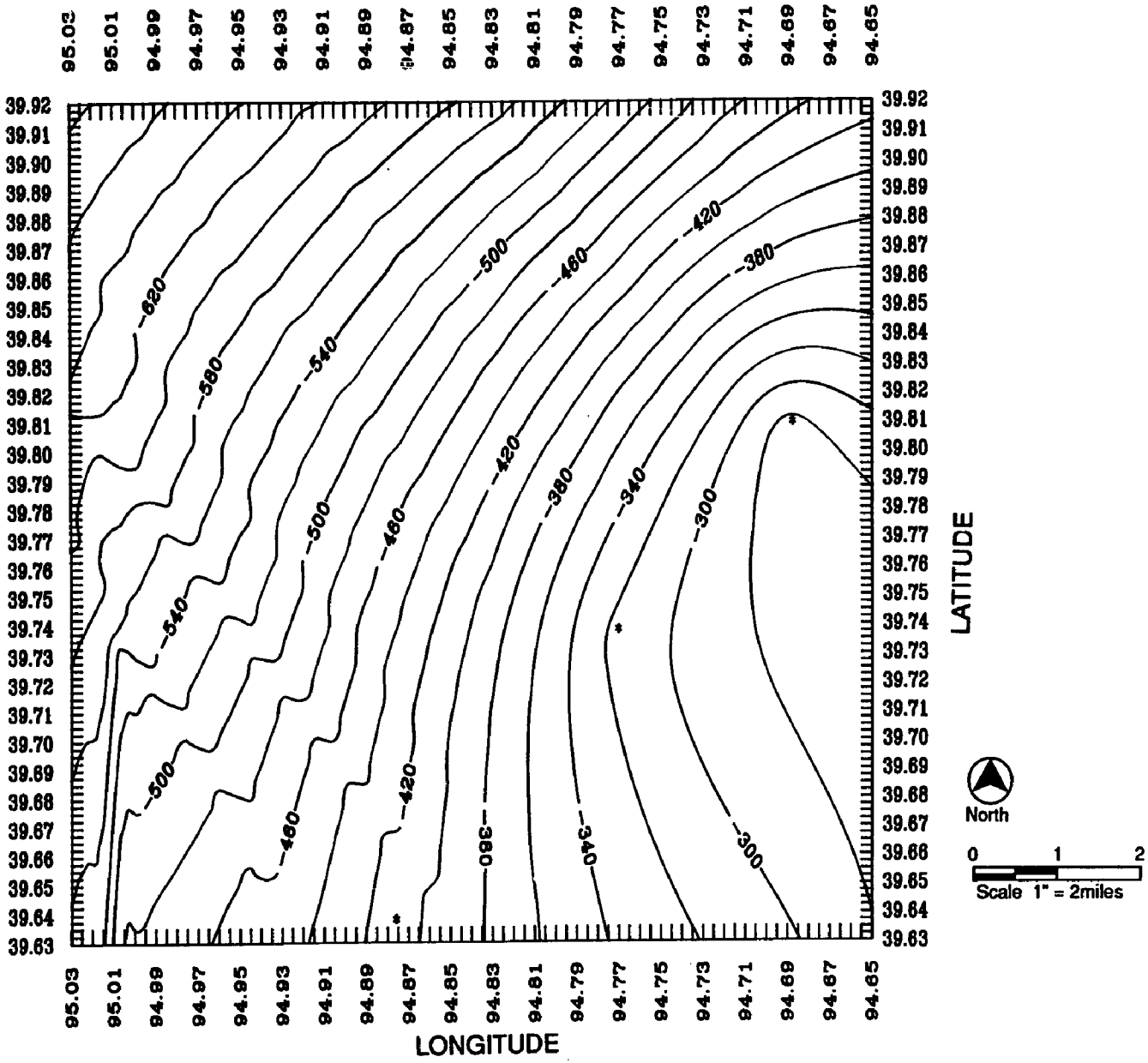


FIGURE 24
KANSAS CITY-LANSING THICKNESS, ST. JOSEPH. LOCAL SCALE.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340
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LONGITUDE
LATITUDE
North
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Scale 1" = 2miles

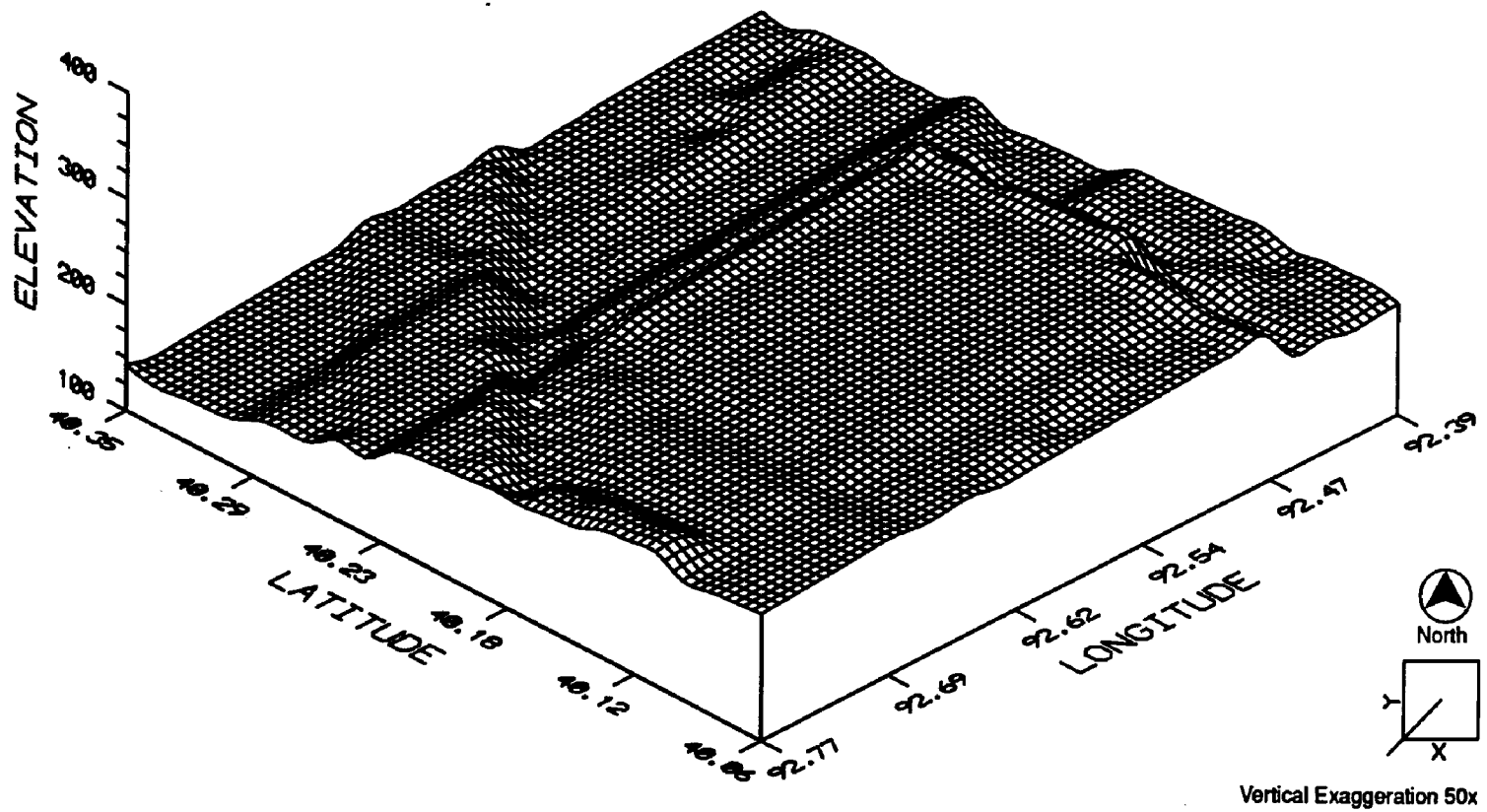
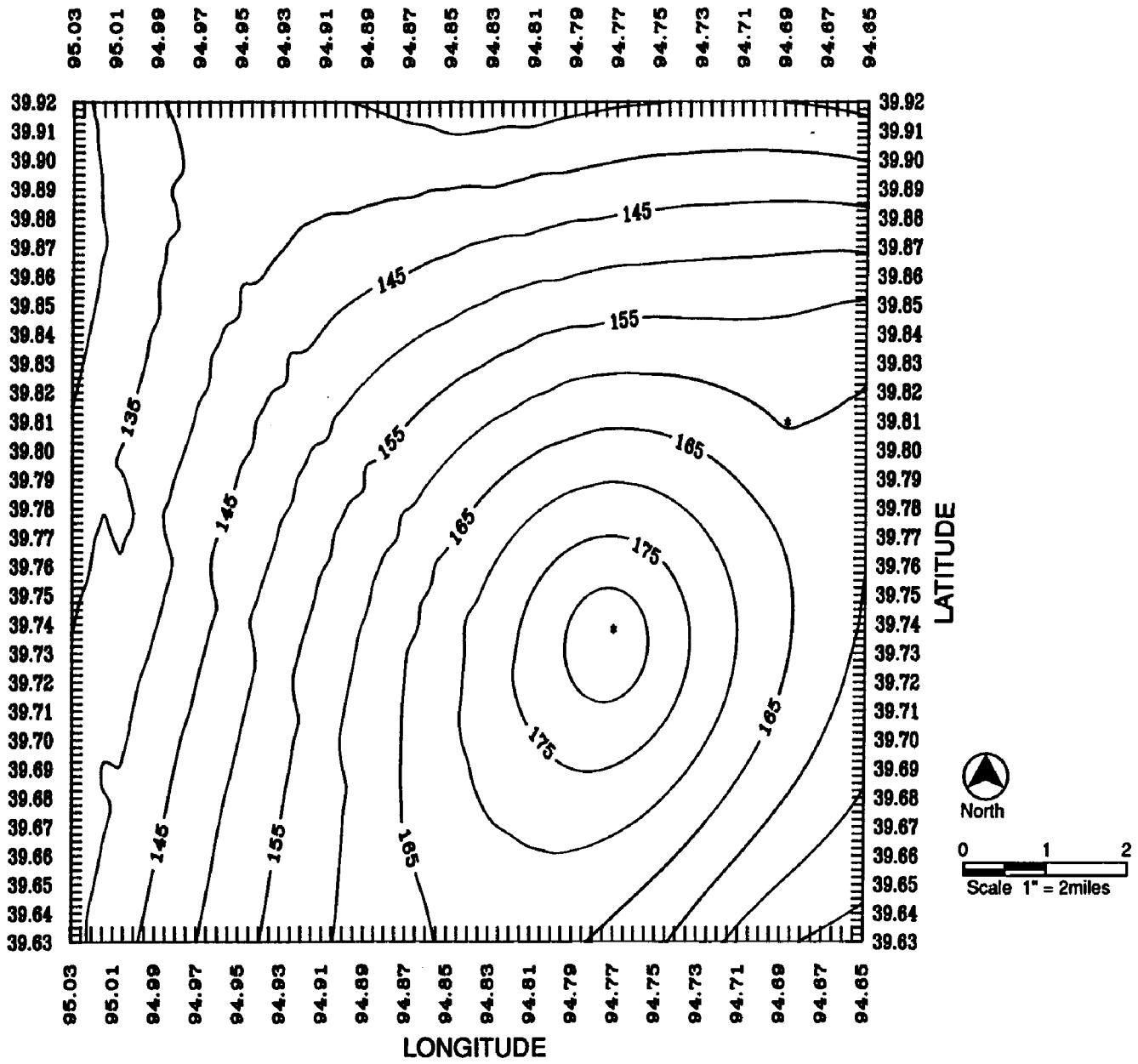


FIGURE 25
KEOKUK-BURLINGTON ELEVATION, ST. JOSEPH. LOCAL SCALE.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North
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Scale 1" = 2miles

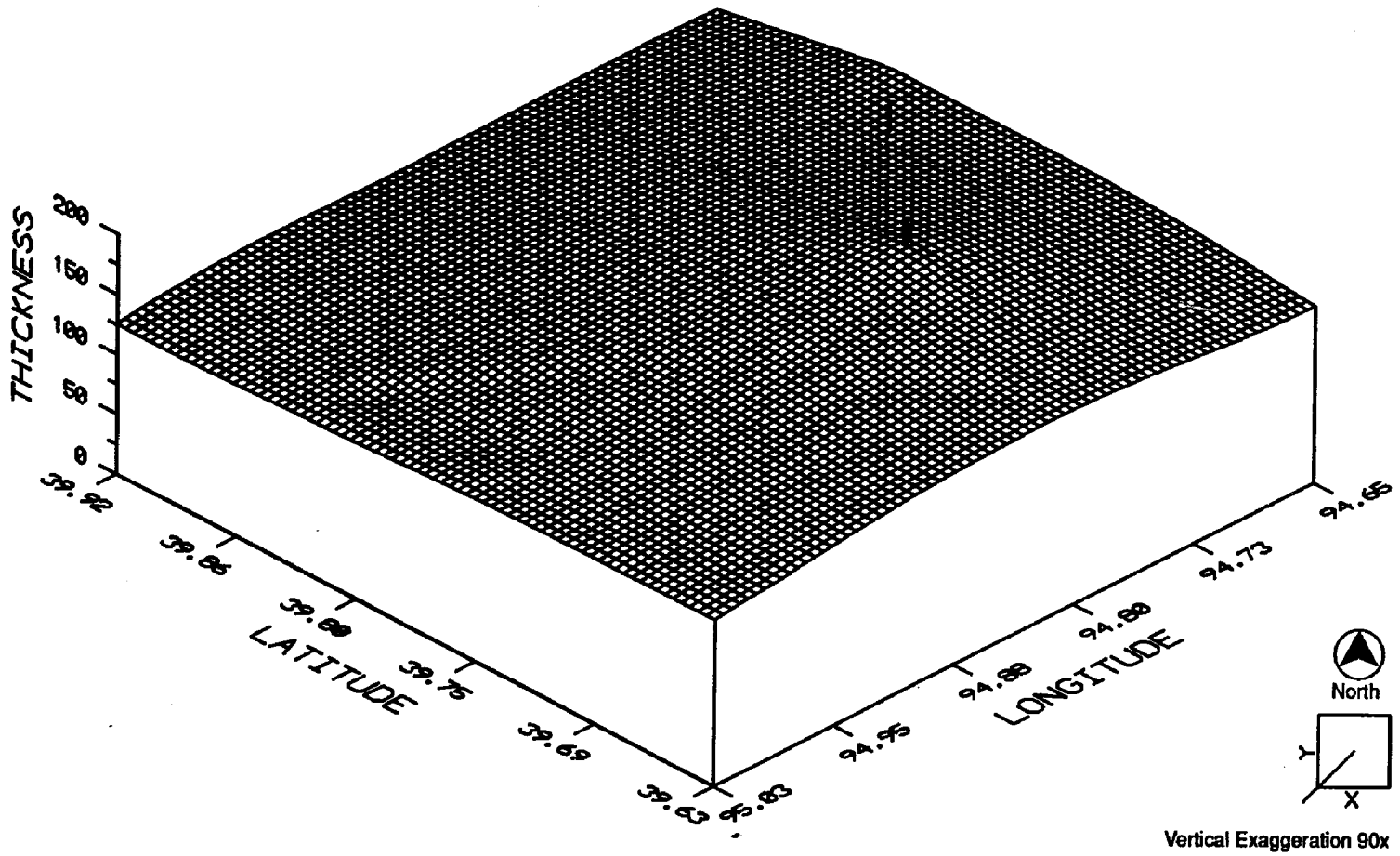
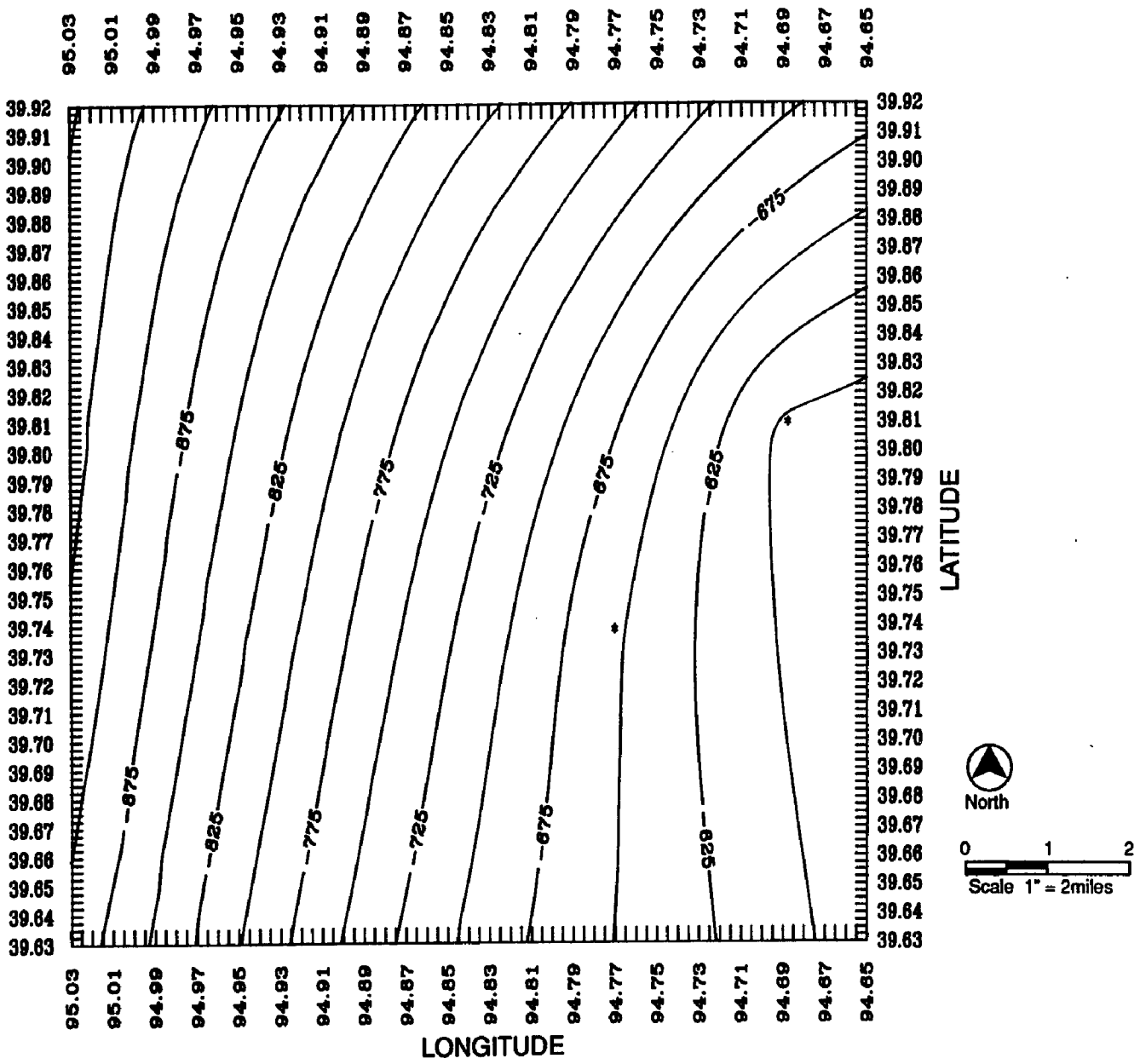


FIGURE 26
KEOKUK-BURLINGTON THICKNESS, ST. JOSEPH. LOCAL SCALE.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LONGITUDE
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North
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Scale 1" = 2miles

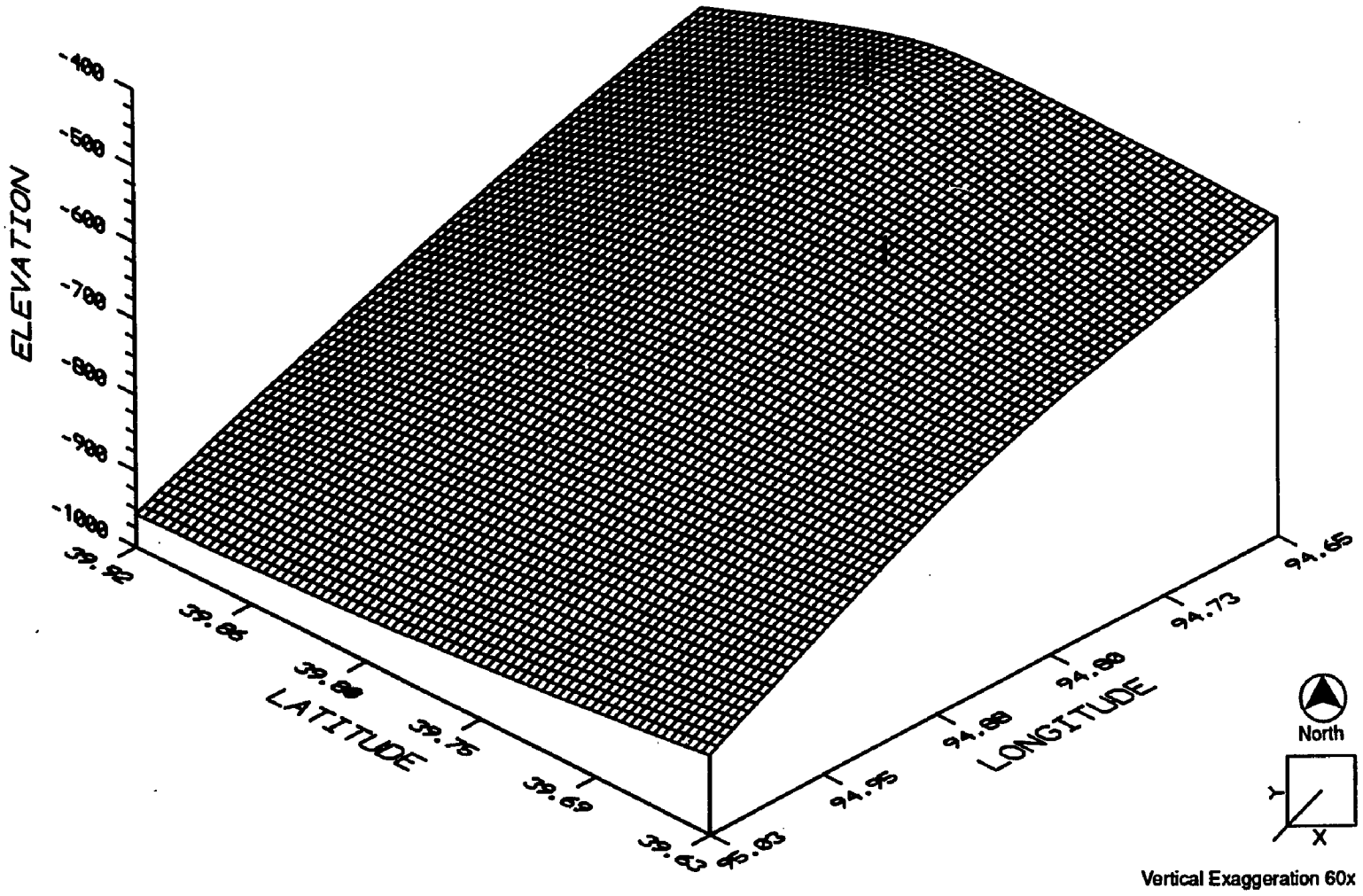
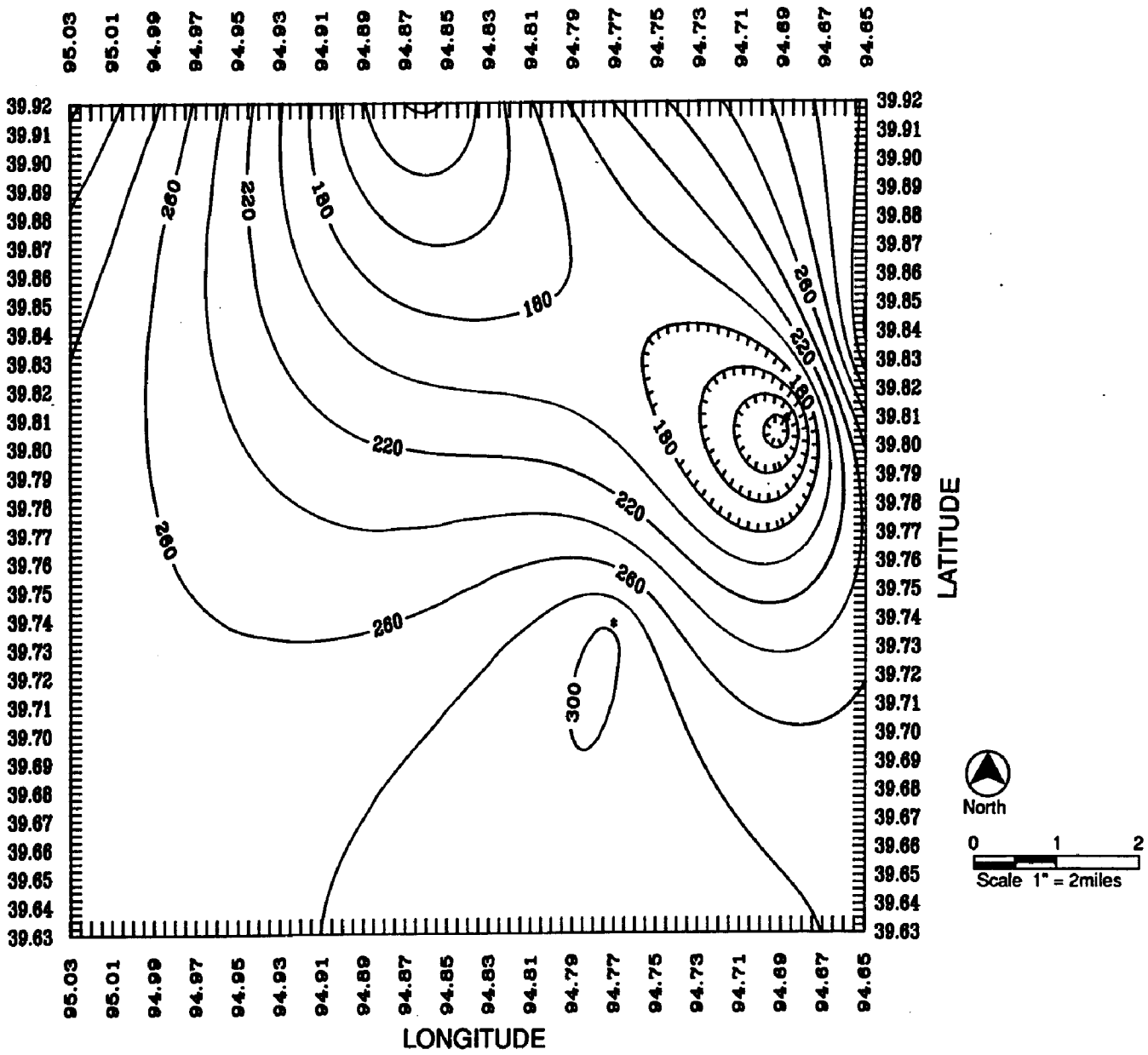


FIGURE 27
CALLAWAY-COOPER ELEVATION, ST. JOSEPH. LOCAL SCALE.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180
300
LONGITUDE
LATITUDE
North
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1
2
Scale 1" = 2miles

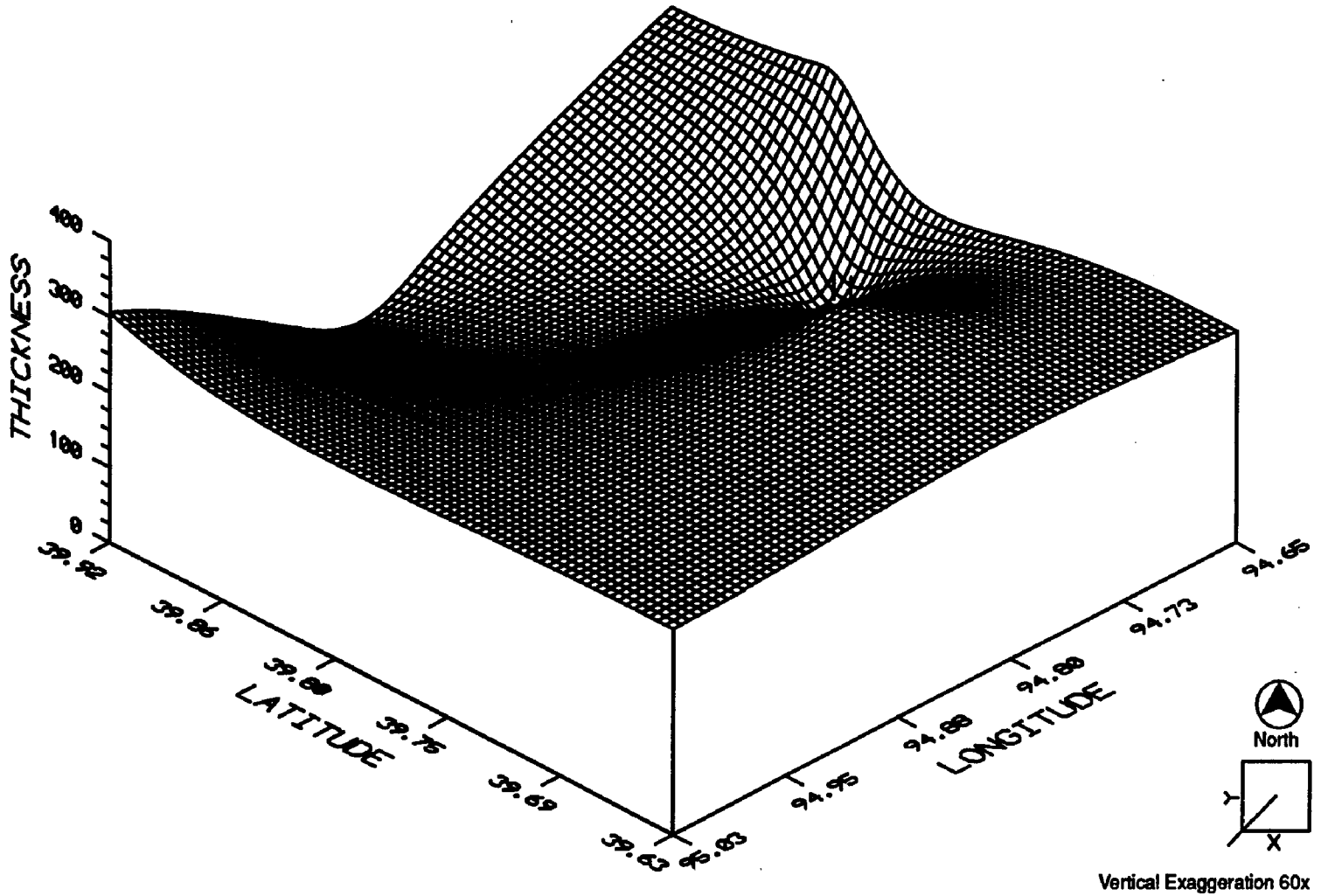


FIGURE 28
CALLAWAY-COOPER THICKNESS, ST. JOSEPH. LOCAL SCALE.

a. Kirksville Glacial cover in the regional Kirksville area ranges from approximately 25 to about 400 feet of thickness. Generally, the material is thickest to the north and northeast and thins to the south. Thickness of the material is erratic in all but the northeastern portion of the area where it appears to be of greatest and most uniform thickness.

Locally, the material ranges in thickness from just under 40 feet to greater than 380 feet. Generally, the material in the local area is thickest in the north and northeast and thins to the southwest.

The limestone target units in the regional and local Kirksville area are fairly uniform in both structure and thickness. Table II gives a tabulation of maximum and minimum thickness and elevation of the target units in the regional and local Kirksville area.

Table II
Spatial Orientation, Kirksville, Target Units

Kirksville	Physical Character		Target Units: Keokuk-Burlington	Latitude Degrees North	Longitude Degrees West	Callaway-Cooper	Latitude Degrees North	Longitude Degrees West
Regional								
	Thickness	Maximum	650	39.68	92.10	450	40.59	93.59
		Minimum	50	40.45	93.50	50	40.28	91.65
	Elevation (top of target)	Maximum	180	39.70 40.40	93.15 93.30	450	39.45	91.62
		Minimum	40	39.85	91.75	-250	40.45	93.60
Local								
	Thickness	Maximum	180	40.31	92.62	370	40.35	92.77
		Minimum	110	40.09	92.60	200	40.16	92.40
	Elevation (top of target)	Maximum	680	40.16	92.42	280	40.18	92.42
		Minimum	340	40.17	92.63	-20	40.17	92.63

Notes:
1. Latitude and longitude coordinates indicate central areas of maximum and minimum thickness and elevation. Refer to contours on the maps for more specific location information.
2. All thicknesses are measured in feet.
3. All elevations are referenced to mean sea level.

b. St. Joseph Glacial cover in the regional St. Joseph area ranges from approximately 20 to over 200 feet of thickness. Generally, the material is thickest to the north and thins to the south. Thickness of the material is erratic in the northern third of the area and more uniform in the southern two-thirds of the study area.

Locally, the material ranges in thickness from just under 20 feet to more than 200 feet. Generally, the material in the local area is thickest in the west and thins to the south and east.

Similar to those in the Kirksville area, the limestone units in the St. Joseph area are fairly uniform in both structure and thickness. Table III gives a tabulation of maximum and minimum thickness and elevation of the target units in the regional St. Joseph area.

F. POTENTIAL MINING METHOD

Optimization of the profitable mining system will depend on:

- Geometry of the target unit
- Geology of the target unit
- Economics of the mining method chosen

Once the geometry and geology of the underground environment have been estimated, the logical choice for economic mining methods will be narrowed. The method that will be most economically sound may be the one that requires the least amount of capital investment before production can begin and cost the least to operate on a daily basis.

Table III
Spatial Orientation, St. Joseph, Target Units

St. Joseph	Physical Character		Target Units: Kansas City-Lansing	Latitude Degrees North	Longitude Degrees West	Keokuk-Burlington	Latitude Degrees North	Longitude Degrees West	Callaway-Cooper	Latitude Degrees North	Longitude Degrees West
Regional											
	Thickness	Maximum	600	39.20	94.54	180	39.25	93.55	480	40.40	94.90
		Minimum	100	39.52 40.25	94.25 94.49	60	40.49	95.10	120	39.05	94.51
	Elevation (top of target)	Maximum	950	39.25	93.75	200	39.25	93.55	0	39.05	94.51
		Minimum	-50	39.25	96.00	-1,100	40.35	95.57	-1,500	39.50	95.58
Local											
	Thickness	Maximum	260	39.91	94.73	180	39.74	94.78	300	39.72	94.78
		Minimum	160	39.69	94.89	130	39.88	95.03	120	39.80	94.69
	Elevation (top of target)	Maximum	750	39.91	94.66	-280	39.75	94.67	-600	39.75	94.67
		Minimum	460	39.92	95.03	-680	39.92	95.03	-950	39.92	95.03

Notes:
1. Latitude and longitude coordinates indicate central areas of maximum and minimum thickness and elevation. Refer to contours on the maps for more specific location information.
2. All thicknesses are measured in feet.
3. All elevations are referenced to mean sea level.

sea100272F8.wp5

Through map development detailing the attitude, elevation, and thickness of the target limestone units in the aggregate short regions, the author has determined that the materials to be produced are relatively flat lying, extensive in horizontal extent, up to several hundred feet in thickness, and fairly uniform in composition. These characteristics indicate that the room-and-pillar mining method is applicable for limestone extraction.

Room-and-pillar methods can be adapted to extract material that dips up to 30 degrees from the horizontal. It is also the mining method that requires the least amount of capital to be invested in stope preparation prior to material production.

In this method, the rock is extracted as completely as possible leaving floor-to-back (roof) pillars as support for the ground. Pillars are usually arranged in a regular pattern to create large open spaces that aid in equipment mobility. The quality and competence of the material left in the back determine the pillar spacing. To ensure safe working conditions, pillars are more closely spaced as back material becomes a poorer quality.

Closer pillar spacing obviously results in smaller volumes of stone production (i.e., 60 percent extraction is about the maximum). Roof bolting of the back is a common practice to aid in maintaining stability and prevent caving while increasing the extraction ratio of the stone.

The room-and-pillar method is very flexible and can be adapted to changing ground conditions and target material thicknesses or qualities. This flexibility is particularly important in limestone mining. Horizontal or vertical changes in the stratigraphy may result in a

lower degree of unsuitablity for use in some engineering applications. When the room-and-pillar mining method is used, a mine can be managed to produce only the materials that will pass quality control standards and specifications as stipulated by the consumer. Material not meeting these standards can be left in place to be produced later if it can be used in other applications. Other mining methods do not have the flexibility to overcome variations in the quality of the limestone material and produce only the limestone "ledges" that will meet the specification dictated by the consumer.

The room-and-pillar mining method is also conducive to postmining underground development. Pillars can be arranged in patterns to provide continuous walls and dividers and create nearly any configuration of underground rooms and spaces. The mine should be designed in detail prior to development to consider post-mining uses. This design process will optimize efficiency of material removal, ground stability, and sufficient area usable for future developers of underground space.

G. DEVELOPMENT OF CAPITAL AND OPERATING COST-ESTIMATING MODELS

At present, limestone is a relatively low-cost mined material. Mining operations, to generate a profit, must be able to produce high volumes of the resource at sufficiently low cost to justify capital investment and operating costs. Because of the large volumes generated, several million tons per year in the larger operations, a cost change for production or retail sale of the product of only a few cents per ton can have a huge effect on the profitability of the mine. Multiple operators compete for the same market in many consuming areas. Companies in the industry are therefore very hesitant to disclose any information on mine design, operating procedures, or any information on costs.

The original intent of this research was to develop actual costs for capital investment and operating a limestone mine in northern Missouri. However, after discussions with several of the large limestone producers in the central United States, it became obvious that it would be impossible to determine detailed information on optimized mine designs and associated economics. Although handbooks on design and cost are in the literature, they do not contain the type of information that is isolated in the competitive environment of the industry. Each operator is continually optimizing a system for his mining environment to generate as much profit as possible. With this design information locked away and the uncertainty in determining detailed ground conditions until actual mine development begins, it is nearly impossible to model costs for an optimally designed northern Missouri operation. Without the real-world design criteria, associated cost figures, and detailed geological investigations to determine underground mining environment, a computer model would generate capital and operating cost figures that would be meaningless.

Therefore, the research effort was modified to create tools for cost-estimating. Two cost-estimating models, one for estimating capital costs and the other for estimating operation costs associated with underground room-and-pillar mines, are presented in the subsequent sections. Each of the models operates independently and provides a flexible framework that can be custom tailored by the user to model his specific mining project.

1. General Model Construction The cost-estimating models can be used to estimate capital and operating costs for underground limestone mining productions. The names of the two models and their functions are:

- UCAP.FOR – Estimation of capital investment costs associated with the pre-production development of an underground mine
- UOP.FOR – Estimation of cost of operating and producing limestone from an underground mine

Due to constraints of the program language used to write the model code, each model has been broken into two parts:

- UCAP.FOR
  - UCAP1.FOR
  - UCAP2.FOR
- UOP.FOR
  - UOP1.FOR
  - UOP2.FOR

In the following discussions these models will be referred to as "programs" or "executable programs."

All the programs are written in FORTRAN 77 programming language, and the construction and operation of each are very similar. Each program breaks its respective topic of cost-estimation into discreet operations that must be performed to develop or operate the mining project. Each one of these operations is considered in a separate subroutine within the respective executable program. The program user can select what operation he wishes to examine costs for by "turning on" that subroutine within the program.

In this discussion, for the purpose of description, the programs will be separated into two parts. One part of the program will be referred to as the "control structure" and the other, as the "subroutines." Note that these two parts are contained within one file under each of the program names listed above.

In addition to the executable programming, a data file and an output file are also associated with the programs listed. The executable programs get their input information from separate data files created by the user prior to program execution. All cost calculations are written into an outside output file that is accessed by the user at the termination of the program execution. The programs are not interactive. The data file and output file names associated with each of the program are as follows:

Executable Program	Data File	Output File
• UCAP.FOR		
- UCAP1.FOR	UCAP.DAT	UCAP1.OUT
- UCAP2.FOR	UCAP.DAT	UCAP2.OUT
• UOP.FOR		
- UOP1.FOR	UOP.DAT	UOP1.OUT
- UOP2.FOR	UOP.DAT	UOP2.OUT

A copy of the FORTRAN code for the executable and data file portion of each program file is included in Volume II of this text. Copies of the output files are not included since output files are generated only after the datafile is supplied with cost data and the program executed by the user. The generalized flow diagram shown in Figure 29 shows how the programs are structured and interact with data and output files.

2. Executable Programs

a. Functions of the Control Structure The control structure is responsible for data input and output file manipulation and "turning on" or managing the cost-estimating subroutines. No cost-estimation calculations are done within this portion of the program. This portion of the program acts as a function manager and makes up a very small part of the FORTRAN programming associated with the executable program.

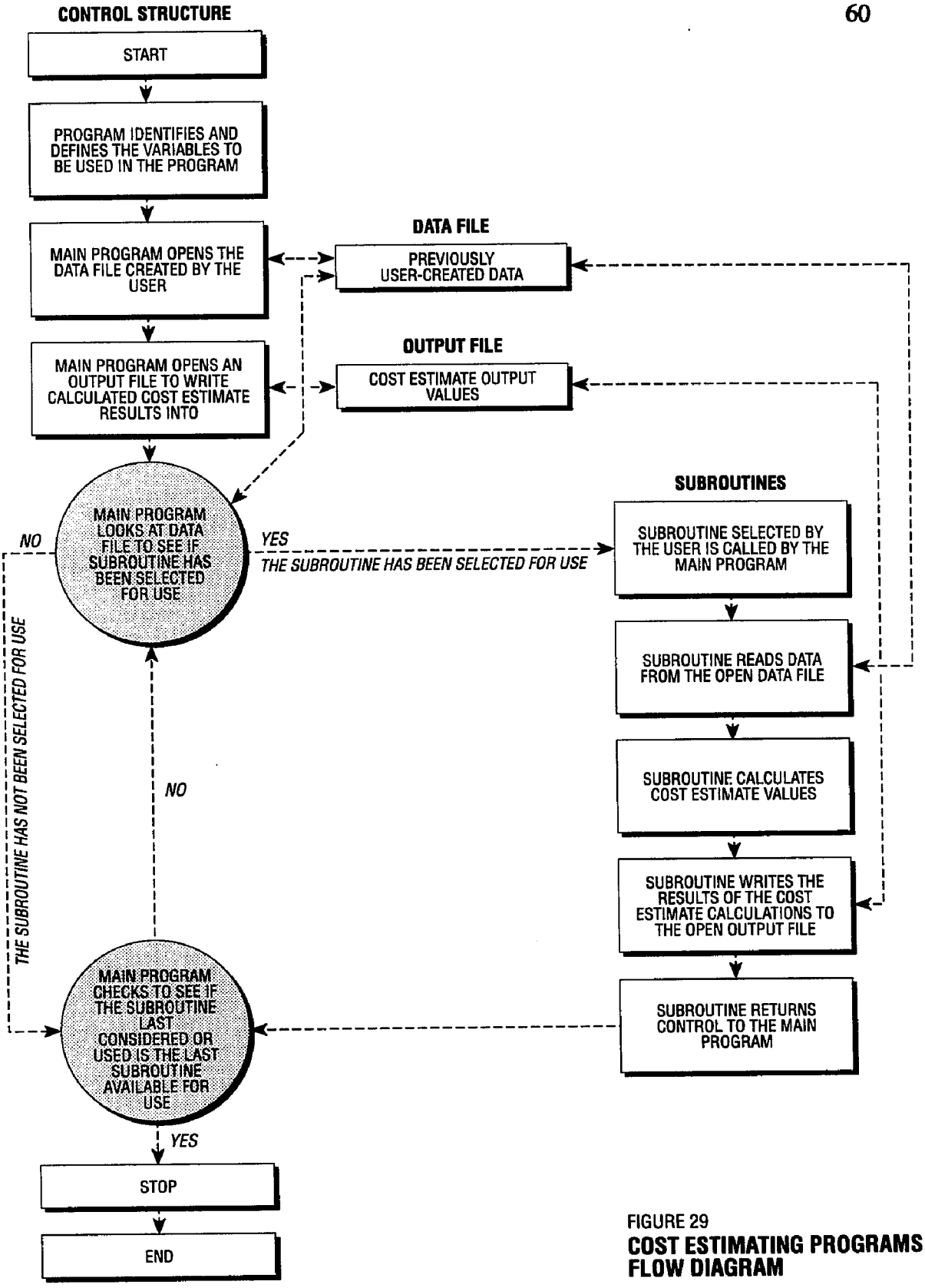


FIGURE 29
COST ESTIMATING PROGRAMS FLOW DIAGRAM

After the data file has been created, the selected program is executed with the appropriate FORTRAN command. The control structure views the data file and determines which of the cost-estimating subroutines the user has selected for use. It then directs the program to the chosen subroutine(s) for cost calculations.

After the required cost calculations are made, the selected subroutine returns control to the control structure. The control structure then determines the next subroutine to be used, and the process of cost calculation begins in that subroutine. This procedure of control continues until all of the subroutines selected for use have been run. The control structure then terminates the execution and closes the data and output files.

b. Functions of the Subroutines The subroutines read user-supplied data from the data file, perform cost-estimating calculations, and write the results to the output file. One to all of the subroutines within each of the programs may be selected for use, depending on what cost parameters the user wishes to analyze.

Each subroutine breaks costs involved in the respective operation into costs for labor, supplies, and equipment. These costs are referred to as the base costs for that procedure. This format is based on the Bureau of Mines Cost-Estimating System Handbook (United States Department of the Interior, Bureau of Mines Information Circular 9143, 1987). Costs for each of these elements, labor, supplies, and equipment, is represented by an algebraic expression. To solve this expression, a variable previously entered into the data file by the user is read and used in the expression.

The program subroutines included in these programs are set up with equations to calculate base costs with algebraic equations given by the Bureau of Mines in its cost-estimating system handbook. These equations are based on data gathered for capital and operating cost parameters associated with underground metal ore mining. Note that these equations should not be directly applicable to limestone mining; also, these equations calculate base costs in terms of 1987 dollars.

These base cost equations have been provided to illustrate how the program is structured. The programs can also be executed with these equations to help familiarize the user with program operations and results. Subsequent sections of this text will illustrate how to customize these programs by evaluating the user's cost history experience and modifying the base cost equations to represent a specific mining application.

The subroutines also include calculations for variables called "adjustment factors." Adjustment factors are modifiers applied to the base cost equations to take into consideration special circumstances that may affect costs. For example, consider operating load-haul-dump-type equipment in the underground passages of the mine. Costs for operating this equipment of flat grades may be accurately represented by the base cost equations; however, if there are areas of the mine where the equipment will be operated on inclines or declines, the cost for the equipment may change. This change can be reflected through the application of a correction factor to the base equation.

Correction factors are specified for a number of applications in each subroutine. Each subroutine also contains two generic correction factors the user may define if his situation

warrants their use. Independent correction factors can be applied to labor, supplies, and equipment base cost equations.

After the subroutine has calculated the base costs for labor, supplies, and equipment and corrected these costs with the user-defined correction factors, the subroutine sums the corrected base costs producing a "bottom line" cost for the operation. An example of the subroutine "LHD" (a subroutine that estimates costs for load-haul-dump transport equipment) used in UCAP1.FOR is shown in Figure 30.

c. Output File The output file for each subroutine is constructed to be very explanatory. The output file writes out all of the data read from the data file that were used in the calculations as well as each cost calculated within the subroutine. The user sees each number entered and each number calculated by the program as well as a "bottom line" cost for the operation being analyzed. This format provides the user with a checking mechanism to ensure the data were correctly entered and read by the program and that the cost numbers calculated are reasonable values. Example output from subroutine "LHD" contained in the program UCAP1.FOR is shown in Figure 31.

d. Data File The data file for each program is also written in an explanatory format. The comment statements within the file are designed to guide the user through the file, enabling him to enter the correct data in the correct positions within the file.

The data file is divided into two segments. In the first segment, the user defines which of the cost-estimating subroutines are to be used. To use a subroutine, the user places a number "1" in column 34 adjacent to the subroutine name. If the subroutine is not to be

```
      SUBROUTINE LHD
C
C
C  COSTS FOR ACQUISTION OF LOAD-HAUL-DUMP EQUIPMENT FOR USE IN
C  MATERIAL TRANSPORTATION
C
C  READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1977) TONS26
   10 FORMAT (15X,F17.2)
C
      IF (TONS26.LT.2000) THEN
C  CALCULATE BASE COSTS
      LHDL =      0.000
      LHDS =      0.000
      LHDE = 123893.086 * (TONS26 ** 0.231)
      ELSE
C  CALCULATE BASE COSTS
      LHDL =   0.000
      LHDS =   0.000
      LHDE = 370.020 * (TONS26 ** 1.000)
      ENDIF
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  SHIFT FACTOR.....SHFT26
      READ (7,20,REC=1984) SHFT26
   20 FORMAT (15X,F17.2)
C  SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT26.NE.2).AND.(TONS26.LT.2000) THEN
      LHDL =      0.000 * (TONS26 * (2.0 / SHFT26))
      LHDS =      0.000 * (TONS26 * (2.0 / SHFT26))
      LHDE = 123893.086 * ((TONS26 * (2.0 / SHFT26)) ** 0.231)
      ELSE
      LHDL =   0.000 * (TONS26 * (2.0 / SHFT26))
      LHDS =   0.000 * (TONS26 * (2.0 / SHFT26))
      LHDE = 370.020 * ((TONS26 * (2.0 / SHFT26)) ** 1.000)
      ENDIF
C
C  DISTANCE FACTOR....DFCT26
      READ (7,30,REC=1991) DFCT26
   30 FORMAT (15X,F17.2)
C  DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C  DSF26L.....DSF26S.....DSF26E
      DSF26L = 0.098 * (DFCT26 ** 0.382)
      DSF26S = 0.098 * (DFCT26 ** 0.382)
      DSF26E = 0.098 * (DFCT26 ** 0.382)
C  GRADE FACTOR....GFCT26
      READ (7,40,REC=1998) GFCT26
   40 FORMAT (15X,F17.2)
C  GRADE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C  GDF26L.....GDF26S.....GDF26E
      GDF26L = 0.929 * (1.037 ** GFCT26)
      GDF26S = 0.929 * (1.037 ** GFCT26)
      GDF26E = 0.929 * (1.037 ** GFCT26)
C
C  OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND EQUIPMENT..
C  AF26L.....AF26S.....AF26E
      READ (7,50,REC=2003) AF26L
      READ (7,50,REC=2017) AF26S
      READ (7,50,REC=2029) AF26E
   50 FORMAT (15X,F17.2)
C
C  OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND EQUIPMENT..
C  BF26L.....BF26S.....BF26E
      READ (7,60,REC=2010) BF26L
      READ (7,60,REC=2022) BF26S
      READ (7,60,REC=2034) BF26E
   60 FORMAT (15X,F17.2)
C
C  CALCULATE ADJUSTED COSTS
      ALHDL = LHDL * DSF26L * GDF26L * AF26L * BF26L
      ALHDS = LHDS * DSF26S * GDF26S * AF26S * BF26S
      ALHDE = LHDE * DSF26E * GDF26E * AF26E * BF26E
C
C  CALCULATE TOTAL ADJUSTED COST
      ALHDT = ALHDL + ALHDS + ALHDE
C
C  CALCULATE TOTAL COST
      LHDTT = ALHDT
C
C  PRINT ROUTINE FOR SUBROUTINE LHDHAUL.....
C
      WRITE (8,26010)
26010 FORMAT ('0','SUBROUTINE LHDAHUL, COSTS FOR ACQUISITION OF
     +LOAD-HAUL-DUMP EQUIPMENT FOR USE IN MATERIAL TRANSPORT,
     +USER DEFINED INPUT')
      WRITE (8,26020)
26020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE TRANSPORTED
     +PER DAY')
      WRITE (8,26030) TONS26
26030 FORMAT (8X,'TONS TRANSPORTED PER DAY,F17.2)
      WRITE (8,26040)
26040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,26050) SHFT26
26050 FORMAT (8X,'SHIFTS              ',F17.2)
      WRITE (8,26060)
26060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,26070) DFCT25
26070 FORMAT (8X,'DISTANCE            ',F17.2)
      WRITE (8,26080)
26080 FORMAT (4X,'GRADE FACTOR')
      WRITE (8,26090) GFCT26
26090 FORMAT (8X,'GRADE               ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26100)
26100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,26110) DSF26L
26110 FORMAT (8X,'DISTANCE            ',F17.2)
      WRITE (8,26120) GDF26L
26120 FORMAT (8X,'GRADE               ',F17.2)
      WRITE (8,26130) AF26L
26130 FORMAT (8X,'OTHER USER FACTOR A  ',F17.2)
      WRITE (8,26140) BF26L
26140 FORMAT (8X,'OTHER USER FACTOR B  ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26150)
26150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,26160) DSF26S
26160 FORMAT (8X,'DISTANCE            ',F17.2)
      WRITE (8,26170) GDF26S
26170 FORMAT (8X,'GRADE               ',F17.2)
      WRITE (8,26180) AF26S
26180 FORMAT (8X,'OTHER USER FACTOR A  ',F17.2)
      WRITE (8,26190) BF26S
26190 FORMAT (8X,'OTHER USER FACTOR B  ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26200)
26200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,26210) DSF26E
26210 FORMAT (8X,'DISTANCE            ',F17.2)
      WRITE (8,26220) GDF26E
26220 FORMAT (8X,'GRADE               ',F17.2)
      WRITE (8,26230) AF26E
26230 FORMAT (8X,'OTHER USER FACTOR A  ',F17.2)
      WRITE (8,26240) BF26E
26240 FORMAT (8X,'OTHER USER FACTOR B  ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,26250)
26250 FORMAT ('0','SUBROUTINE LHDHAUL, CALCULATED COSTS OUTPUT')
      WRITE (8,26260)
26260 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,26270) LHDL
26270 FORMAT (8X,'LABOR               ',F17.2)
      WRITE (8,26280) LHDS
26280 FORMAT (8X,'SUPPLIES            ',F17.2)
      WRITE (8,26290) LHDE
26290 FORMAT (8X,'EQUIPMENT           ',F17.2)
      WRITE (8,26300)
26300 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,26310) ALHDL
26310 FORMAT (8X,'LABOR               ',F17.2)
      WRITE (8,26320) ALHDS
26320 FORMAT (8X,'SUPPLIES            ',F17.2)
      WRITE (8,26330) ALHDE
26330 FORMAT (8X,'EQUIPMENT           ',F17.2)
      WRITE (8,26340)
26340 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,26350) ALHDT
26350 FORMAT (8X,'PER UNIT PRODUCTION  ',F17.2)
      WRITE (8,26360) LHDTT
26360 FORMAT (8X,'PROJECT             ',F17.2)
C
      RETURN
      END
```

FIGURE 30
THE UCAPI.FOR SUBROUTINE "LHD"

```
0SUBROUTINE LHD, COSTS FOR ACQUISITION OF LOAD-HAUL-DUMP
EQUIPMENT
0     UNITS CONSIDERED ARE TONS TO BE TRANSPORTED PER DAY
         TONS TRANSPORTED PER DAY                  11.00
      NUMBER OF SHIFTS OPERATED PER DAY
         SHIFTS                                    1.00
      DISTANCE FACTOR
         DISTANCE                                  0.00
      GRADE FACTOR
         GRADE                                     5.00
0     CORRECTION FACTORS APPLIED TO LABOR
         DISTANCE                                  0.74
         GRADE                                     1.11
         OTHER USER FACTOR A                       1.00
         OTHER USER FACTOR B                       1.00
0     CORRECTION FACTORS APPLIED TO SUPPLIES
         DISTANCE                                  0.74
         GRADE                                     1.11
         OTHER USER FACTOR A                       1.00
         OTHER USER FACTOR B                       1.00
0     CORRECTION FACTORS APPLIED TO EQUIPMENT
         DISTANCE                                  0.74
         GRADE                                     1.11
         OTHER USER FACTOR A                       1.00
         OTHER USER FACTOR B                       1.00
0SUBROUTINE LHDHAUL, CALCULATED COSTS OUTPUT
0     BASE COST TO MEET TRANSPORT REQUIREMENTS
         LABOR                                     0.00
         SUPPLIES                                  0.00
         EQUIPMENT                            253015.27
0     ADJUSTED COST TO MEET TRANSPORT REQUIREMENTS
         LABOR                                     0.00
         SUPPLIES                                  0.00
         EQUIPMENT                            209062.25
0     TOTAL COST
         PER UNIT PRODUCTION                  209062.25
         PROJECT                              209062.25
```

FIGURE 31
OUTPUT FROM "LHD"

used, a zero is placed in this column. This segment of the data file is the portion used by the control structure of the executable program to manage program operations.

The second segment of the data file consists of the data variables required for use in the subroutines used for cost-estimation calculations. The user must enter a data value for each variable listed in the subroutines he has chosen for use. No data need be entered for variables listed in subroutines the user has disregarded.

Data for the subroutines selected are entered in data file columns 16 through 32. The variable name, description, and required units are listed in the comment text lines above the space provided for data entry. Twelve spaces are provided for data entry; however, the space in column 30 is reserved for a decimal point, and because of the formatted read statements in the subroutines, this decimal should not be moved. Moving the decimal point will cause program execution and/or calculation errors. Note that the spaces reserved for data entry are surrounded with the "*" symbol in the data file.

An example of the portion of the data file, UCAP.DAT, required for execution of UCAP1.FOR for the subroutine "LHD" is shown in Figure 32.

e. Equipment and Software Requirements These programs are written in IBM Professional Fortran. The programs are designed to require a minimum amount of hardware and software for their use. Generally, any personal computer capable of processing IBM Professional Fortran commands can be used to run any of these estimating programs. A computer system of this type usually includes an 8088 processor equipped with an 8087 math

```
SUBROUTINE: LHD

...VARIABLES:

    NAME: TONS26
    DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
    UNITS: METRIC TONS PER DAY
    VALUE:*          . *******          RECORD=1977

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

    NAME: SHFT26
    DESCRIPTION: NUMBER OF SHIFTS 8 HR. SHIFTS PER 24 HR. DAY
    UNITS: INTEGER NUMBER 1, 2 OR 3
    VALUE:*          . *******          RECORD=1984

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

    NAME: DFCT26
    DESCRIPTION: TOTAL DISTANCE TRANSPORTED
    UNITS: METERS
    VALUE:*          . *******          RECORD=1991

...CORRECTION FACTOR FOR GRADE OF INCLINE OR DECLINE

    NAME: GFCT26
    DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
    UNITS: GRADE IN PERCENT OF INCLINE OR DECLINE (POSITIVE ONLY)
    VALUE:*          . *******          RECORD=1998

...CORRECTION FACTORS FOR LABOR:

    NAME: AF26L
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*          . *******          RECORD=2005

    NAME: BF26L
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*          . *******          RECORD=2010

...CORRECTION FACTORS FOR SUPPLIES:

    NAME: AF26S
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*          . *******          RECORD=2017

    NAME: BF26S
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*          . *******          RECORD=2022

...CORRECTION FACTORS FOR EQUIPMENT:

    NAME: AF26E
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*          . *******          RECORD=2029

    NAME: BF26E
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*          . *******          RECORD=2034
```

FIGURE 32
THE PORTION OF THE UCAP.DAT DATAFILE CORRESPONDING TO THE UCAPI.FOR SUBROUTINE "LHD"

coprocessor. The programs do not generate any graphics; so no special graphic capabilities or video equipment is required. A monochrome video monitor is suitable for use.

Because of the highly explanatory nature of the programs, they require a large amount of disk storage space. This is true not only for the executable portions of the programs but also for the data and output files. Each of the programs, which include the source code FORTRAN file, the complied executable FORTRAN file, and the datafile, requires the storage space provided by a 1.0-megabyte floppy disk. The programs are included on computer disks in the pocket at the end of Volume I of this document.

The user is required to supply a copy of IBM Professional FORTRAN to run these programs. Also, to edit the programs, including the entry of data, the user must have access to an editing program. Most standard disk operating systems (DOS) have built-in editors usually referred to as "EDLIN." It is recommended that a more powerful and versatile editor be used to modify these programs. An editor with capabilities similar to "KEDIT" or "SIDEKICK" is a good choice for this function.

III. WORKING AN EXAMPLE CAPITAL COST-ESTIMATION WITH UCAP.FOR

This section illustrates an example cost-estimating procedure for capital costs associated with an underground mining operation using the program UCAP.FOR. The cost-estimation has purposely been kept simple and will use only subroutines included in UCAP1.FOR, Part 1 of the UCAP.FOR model. This estimation is designed to show the user program features and how to manipulate them. The design incorporates only a few of the items that must be considered in the development of an underground mining system. It is not meant to be a model depicting costs and methods associated with an actual mine or mine plan.

A. THEORETICAL MINE DESIGN

An underground room-and-pillar limestone mine is used for illustrative purposes. The mine is located within a 10-mile radius of St. Joseph, and limestone is to be produced from the Kansas City-Lansing target unit; therefore, the mine workings will be located at an elevation of about 750 feet, or about 300 feet below ground surface. About 10 hectares of land above the mine will require clearing to provide space for construction operations and support buildings and roadways. In the beginning stages of development, the mine is to be accessed by a vertical shaft. About 500 feet of horizontal drifts are to be developed on the first level of the mine for stope access and development prior to limestone production. Jumbos are used to drift passages, and hauling in the mine is provided by load-haul dump equipment. Limestone and rock debris produced during

development is removed from the underground workings by a friction hoist installed in a second vertical shaft. This shaft is raise-bored to the surface. To estimate costs for the development of the items above, the following UCAP1.FOR subroutines are needed:

Subroutine	Function
LCLEAR	Land-clearing
SSHAFT	Sinking of access shaft
MEDTIRE	Driving horizontal drifts
RAISES	Raise-boring second shaft for hoist installation
HOISTF	Costs for installation of a friction hoist
JUMBOS	Costs for purchasing jumbos as primary drill and blast equipment

B. SETTING UP UCAP.DAT, THE UCAP1.FOR DATA FILE

The user should access the UCAP1.FOR data file, UCAP.DAT, using an editor program of choice. Next, the six subroutines selected for use in this analysis should be switched on. This is accomplished by replacing the "0" adjacent to the selected subroutine names with a numeral "1." Figure 33 shows the structure of the control portion of the program UCAP1.FOR properly configured for the cost-estimation in this example. The user should now scroll through the data file and provide data for all of the variables in the six subroutines selected for use. Table IV indicates the data values that have been selected for the required variables and correction

```
DATAFILE UCAP.DAT.....
DATA FILE FOR UCAP1 AND UCAP2.  A COST ESTIMATING PROGRAM TO ESTIMATE CAPITAL
COSTS TO BE INCURRED IN DEVELOPING AN UNDERGROUND ROOM AND PILLAR MINING
OPERATION.  FOLLOW THE DIRECTIONS OUTLINED ON THE FOLLOWING SCREENS TO
PROPERLY PREPARE THE DATA FILE FOR EXECUTION WITH THE MAIN PROGRAM UNDER.CAP

CHOOSE THE COST ESTIMATING SUBROUTINES YOU WISH TO USE FROM THE LIST
WHICH FOLLOWS.  TO ACTIVATE A SUBROUTINE YOU SHOULD ENTER A NUMERAL
"1" IN COLUMN 35 AFTER THE SUBROUTINE NAME ON THE SAME LINE.  IF YOU DO
NOT WISH TO USE A SUBROUTINE PLACE A NUMERAL "0" IN THIS LOCATION.  IF
YOU CHOSE TO ACTIVATE A COST ESTIMATING SUBROUTINE YOU MUST PROVIDE
ANSWERS TO ALL OF THE DATA INPUT QUESTIONS WHICH RELATE TO THAT SUBROUTINE.
FAILURE TO PROVIDE THIS DATA, IN THE UNITS SPECIFIED, WILL RESULT IN MAIN
PROGRAM EXECUTION ERROR....


YOUR COST ESTIMATING SUBROUTINE CHOICES ARE AS FOLLOWS:

                                  C
                                  O
                                  L
                                  U
                                  N
                                  M

                                  3
                                  5


 1) CLEAR.........................1        RECORD = 31    UCAP1
 2) CORING........................0                       SUBROUTINES
 3) SSHAFT........................1                       NUMBERS 1
 4) SMRAIL........................0                       THROUGH 30
 5) SMTIRE........................0                       (INCLUSIVE)
 6) MEDTIRE.......................1                            .
 7) LGRAIL........................0                            .
 8) LGTIRE........................0                            .
 9) DRIVES........................0                            .
10) DROP..........................0                            .
11) RAISES........................1                            .
12) DECLIN........................0                            .
13) LGROOM........................0                            .
14) HPANEL........................0                            .
15) SPANEL........................0                            .
16) PUMP1.........................0                            .
17) PUMP2.........................0                            .
18) HOISTD........................0                            .
19) HOISTF........................1                            .
20) JUMBOS........................1                            .
21) JKLEGS........................0                            .
22) MINERS........................0                            .
23) TMACH.........................0                            .
24) CONV1.........................0                            .
25) CONV2.........................0                            .
26) LHD...........................0                            .
27) RRHAUL........................0                            .
28) TRUCKS........................0                            .
29) LAYRR.........................0                            .
30) SFCONV........................0                       END UCAP1 SUBROUTINES
31) TALK..........................0                       UCAP2 SUBROUTINES
32) AIR...........................0                       NUMBERS 31
33) EPOWER........................0                       THROUGH 52
34) FUEL..........................0                       (INCLUSIVE)
35) OFFLAB........................0                            .
36) PPOWER........................0                            .
37) SHOPS.........................0                            .
38) STOCKP........................0                            .
39) BUILDS........................0                            .
40) VENT..........................0                            .
41) DRAIN.........................0                            .
42) WATER.........................0                            .
43) CROAD.........................0                            .
44) BLAST.........................0                            .
45) EXCAVE........................0                            .
46) GRAVEL........................0                            .
47) PAVE..........................0                            .
48) PLINES........................0                            .
49) WCLEAR........................0                            .
50) NEUTRL........................0                            .
51) ENGFEE........................0                            .
52) WCAP..........................0                       END UCAP2 SUBROUTINES

NOW THAT THE COST ESTIMATING SUBROUTINE(S) TO BE USED HAVE BEEN DEFINED
PROCEED THROUGH THIS DATA FILE AND PROVIDE ALL INFORMATION REQUIRED
UNDER EACH COST ESTIMATING SUBROUTINE YOU SELECTED FOR USE.
DATA MUST BE IN THE UNITS SPECIFIED AND PLACED IN COLUMNS 16
THROUGH 32.  THE "*" SYMBOL SURROUNDS THE COLUMNS RESERVED FOR
THE PLACEMENT OF YOUR DATA.  THE DECIMAL PLACE SHOULD NOT BE MOVED AND
ONLY 2 DIGITS SHOULD BE PROVIDED AFTER THE DECIMAL POINT.
SEE U.S. BUREAU OF MINES (1987) PUBLICATION LISTED IN THE REFERENCES
FOR RANGES OF VALUES TO BE USED AS CORRECTION FACTORS FOR THE
VARIABLES REQUESTED.
```

FIGURE 33

THE UCAP1.FOR DATAFILE UCAP.DAT SET TO RUN THE EXAMPLE ESTIMATION

Table IV
Example UCAP1.FOR Cost-Estimation Data Values

Variables	Name	Description		Units	Value	Record Number[a]
Subroutine: CLEAR						
	Acre 1	Hectacres to be cleared		Hectares	10	112
Correction Factors						
	EFCT1	Purchased equipment required		None	1.0	119
	BSF1L	Brush clearing	Labor	None	1.2	126
	BSF1S		Supplies		1.1	158
	BSF1E		Equipment		1.0	190
	SPF1L	Side slope clearing <20% or >50%	Labor	None	2.1	131
	SPF1S		Supplies		1.9	163
	SPF1E		Equipment		2.7	195
	BNF1L	Brush burning	Labor	None	1.0	136
	BNF1S		Supplies		1.0	168
	BNF1E		Equipment		1.0	200
	SBF1L	Work completed by subcontractor	Labor	None	1.0	141
	SBF1S		Supplies		1.0	173
	SBF1E		Equipment		1.0	205
	AF1L	Other user Factor A	Labor	None	1.0	146
	AF1S		Supplies		1.0	178
	AF1E		Equipment		1.0	210
	BF1L	Other user Factor B	Labor	None	1.0	151
	BF1S		Supplies		1.0	183
	BF1E		Equipment		1.0	215

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

Table IV
Example UCAP1.FOR Cost-Estimation Data Values

Variables	Name	Description		Units	Value	Record Number[a]
Subroutine: SSHAFT						
	Area 3	Face area of shaft		Square meters	100	287
	Long 3	Total length of shaft		Meters	110	292
Correction Factors						
	WFCT3	Timber lining		None	0.0	299
	HFCT3	Rock hardness		psi	30,000	306
	AF3L	Other user Factor A	Labor	None	1.0	313
	AF3S		Supplies			325
	AF3E		Equipment			337
	BF3L	Other user Factor B	Labor	None	1.0	318
	BF3S		Supplies			330
	BF3E		Equipment			342

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

Table IV
Example UCAP1.FOR Cost-Estimation Data Values

Subroutine: MEDTIRE						
Variables	**Name**	**Description**		**Units**	**Value**	**Record Number[a]**
	Area 6	Face area of drift		Square meters	80	510
	Long 6	Total length of drift		Meters	200	515
Correction Factors						
	HFCT6	Rock hardness		psi	30,000	522
	BTF6L	Rock bolt Installation	Labor	None	1.7	529
	BTF6S		Supplies		3.0	562
	BTF6E		Equipment		1.5	595
	STF6L	Shotcrete application	Labor	None	1.0	534
	STF6S		Supplies		1.0	567
	STF6E		Equipment		1.0	600
	CCF6L	Concrete liner installation	Labor	None	1.0	539
	CCF6S		Supplies		1.0	572
	CCF6E		Equipment		1.0	605
	SSF6L	Steel set installation	Labor	None	1.0	544
	SSF6S		Supplies		1.0	577
	SSF6E		Equipment		1.0	610
	AF6L	Other user Factor A	Labor	None	1.0	549
	AF6S		Supplies		1.0	582
	AF6E		Equipment		1.0	615
	BF6L	Other user Factor B	Labor	None	1.0	554
	BF6S		Supplies		1.0	587
	BF6E		Equipment		1.0	620

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

Table IV
Example UCAP1.FOR Cost-Estimation Data Values

Variables	Name	Description		Units	Value	Record Number[a]
Subroutine: RAISES						
	Area 11	Face area of raise		Square meters	80	1,035
	Long 11	Total length of raise		Meters	200	1,040
Correction Factors						
	HFCT11	Rock hardness		psi	30,000	1,047
	LFCT11	Proportioning of cost based on length		None	0.0	1,054
	LNF11L	Raise lining	Labor	None	1.0	1,061
	LNF11S		Supplies		1.0	1,083
	LNF11E		Equipment		1.0	1,105
	SRF11L	Service installa-tion	Labor	None	1.0	1,066
	SRF11S		Supplies		1.0	1,088
	SRF11E		Equipment		1.0	1,110
	AF11L	Other user Factor A	Labor	None	1.0	1,071
	AF11S		Supplies		1.0	1,093
	AF11E		Equipment		1.0	1,115
	BF11L	Other user Factor B	Labor	None	1.0	1,076
	BF11S		Supplies		1.0	1,098
	BF11L		Equipment		1.0	1,120

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

Table IV
Example UCAP1.FOR Cost-Estimation Data Values

Subroutine: HOISTF

Variables	Name	Description		Units	Value	Record Number[a]
	TONS 19	Total hoist capacity required		Metric tons per day	100	1,592
Correction Factors						
	VFCT19	Vertical height out of mine		Meters	110	1,599
	SFCT19	Service hoist use		None	0.0	1,606
	AF19L	Other user Factor A	Labor	None	1.0	1,613
	AF19S		Supplies		1.0	1,625
	AF19E		Equipment		1.0	1,637
	BF19L	Other user Factor B	Labor	None	1.0	1,630
	BF19S		Supplies		1.0	1,630
	BF19E		Equipment		1.0	1,642

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

Table IV
Example UCAP1.FOR Cost-Estimation Data Values
Page 6 of 6

Subroutine: JUMBOS

Variables	Name	Description		Units	Value	Record Number[a]
	TONS 20	Total production capacity required		Metric tons per day	125	1,651
Correction Factors						
	SHFT20	Number of 8-hour shifts per 24-hour day		8-hour shifts	3	1,658
	AF20L	Other user Factor A	Labor	None	1.0	1,665
	AF20S		Supplies		1.0	1,677
	AF20E		Equipment		1.0	1,689
	BF20L	Other user Factor B	Labor	None	1.0	1,670
	BF20S		Supplies		1.0	1,682
	BF20E		Equipment		1.0	1,694

[a]Record number indicates the line number of the data file containing the value of the variable or correction factor.

factors in each of the subroutines. A Table IV portion of the UCAP1.FOR data file, UCAP.DAT, corresponding to the subroutine SSHAFT is shown in Figure 34 with the data values selected for this portion of the economic analysis entered in the correct positions. The complete data file is presented in Appendix D, Volume II of this document.

C. RUNNING UCAP1.FOR

After completing the data file and saving it on the same disk as the main program under the filename UCAP.DAT, UCAP1.FOR can be run by entering the filename "UCAP1." The program will calculate cost-estimations for the subroutines chosen and write these values to an external output file on the same disk. The output file is named UCAP1.OUT. This output file can be accessed when the program has finished running by the editing program chosen for use. A printed copy of the output can be retrieved by using PRINT commands within the editing program. Output from this example is included in Appendix H, Volume II. Note that subsequent runs of the program will overwrite the output file. It is recommended that the output files generated and their corresponding data files be renamed and saved if the calculations are to be referenced at a later date.

D. CUSTOMIZING THE PROGRAMS

The equations used to estimate costs in UCAP.FOR and UOP.FOR can easily be modified to model a specific mining operation or system. It is recommended that backup copies of all the programs and datafiles presented be made prior to using or altering any of the material.

```
SUBROUTINE: SSHAFT

...VARIABLES:

    NAME: AREA3
    DESCRIPTION: FACE AREA OF SHAFT
    UNITS: SQUARE METERS
    VALUE:*        100.00*******              RECORD=287

    NAME: LONG3
    DESCRIPTION: TOTAL LENGTH OF SHAFT
    UNITS: METERS
    VALUE:*        110.00*******              RECORD=292

...TIMBER LINER FACTOR:

    NAME: WFCT3
    DESCRIPTION: TIMBER LINING FACTOR
    UNITS: ENTER A 1.00 IF SHAFT IS TIMBER LINED, OR 0.00 IF NOT
    VALUE:*        0.00*******               RECORD=299

...CORRECTION FACTOR FOR ROCK HARDNESS

    NAME: HFCT3
    DESCRIPTION: ROCK HARDNESS
    UNITS: POUNDS PER SQUARE INCH (PSI)
    VALUE:*        30000.00*******           RECORD=306

...CORRECTION FACTORS FOR LABOR:

    NAME: AF3L
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=313

    NAME: BF3L
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=318

...CORRECTION FACTORS FOR SUPPLIES:

    NAME: AF3S
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=325

    NAME: BF3S
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=330

...CORRECTION FACTORS FOR EQUIPMENT:

    NAME: AF3E
    DESCRIPTION: OTHER USER FACTOR A
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=337

    NAME: BF3E
    DESCRIPTION: OTHER USER FACTOR B
    UNITS: NONE
    VALUE:*        1.00*******               RECORD=342
```

FIGURE 34
THE PORTION OF THE UCAP.DAT DATAFILE CORRESPONDING TO THE UCAPI.FOR SUBROUTINE "SSHAFT" SET TO RUN THE EXAMPLE ESTIMATION

As indicated in Section IIF, Development of Capital and Operating Cost-Estimating Models, cost calculations are performed by base cost equations in each subroutine for labor, supplies, and equipment. These three costs are then modified with correction factors, defined by the user, as required. The modified costs for each operation are presented individually and as a total cost for the operation in the output file. Based on the user's experience, the base equations can be modified to represent costs for his mining conditions. The editing program chosen for use can be used to enter the main FORTRAN program and modify the cost equations. After the equations are modified as desired, the program should be resaved under the same filename UCAP1.FOR, UCAP2.FOR, or UOP1.FOR, UOP2.FOR as appropriate. The program must now be recompiled by using IBM Professional FORTRAN. This process is beyond the scope of this research; however, the commands and procedures are contained in the user's manual that accompanies the IBM programming.

IV. CONCLUSION

1. Supplies of near-surface limestone resources in northern Missouri usable for aggregate are severely limited because usable rock units are covered by up to 1,200 feet of younger rock and Pleistocene age glacial drift.

2. A series of maps has been developed from a total of 1,898 boring log records to represent the structure and thickness of limestone units in the subsurface of northern Missouri that may be economically producible as aggregate material.

3. The maps target the Kansas City-Lansing, Keokuk-Burlington, and Callaway-Cooper geologic members in the St. Joseph area and the Keokuk-Burlington and Callaway-Cooper members in the Kirksville area.

4. Isopach maps of the glacial till present in the St. Joseph and Kirksville area have also been developed as part of this research.

5. All the maps were contoured based on kriging statistical estimation techniques using the "Surfer" contouring package (Golden Software, 1988).

6. Two cost-estimating models that run on IBM compatible personal computers have been written. These models, which follow guidelines established by the

U.S. Department of Interior, Bureau of Mines (1987), estimate capital and operating costs for development and production from an underground room-and-pillar-type mining operation.

7. Both models are constructed to allow the user to modify the cost-estimate equation to represent costs associated with his particular mining program.

8. An example of a simple capital cost estimate is presented to demonstrate the operation of the programs. FORTRAN source code is given for both programs as well as the formatted datafiles required for running the programs in the appendices of this text. An executable version of the programs, as well as the source codes, is included on a 3.5-inch disk that accompanies this text.

BIBLIOGRAPHY

American Society of Civil Engineers, Underground Construction Research Council. Use of Underground Space to Achieve National Goals. New York: 1972.

Beus, M. J. Field Measurement of Rock Displacement During Sinking of a Deep Rectangular Shaft. Bureau of Mines. U.S. Department of the Interior, 1984.

Board, M. P. In Situ Measurements and Preliminary Design Analysis for Deep Mine Shafts in Highly Stressed Rock. Bureau of Mines, U.S. Department of the Interior, 1984.

Bossard, Floyd C. A Manual of Mine Ventilation Design Practices. Vol. 1, 2nd ed. Butte, Montana: Floyd C. Bossard and Associates, 1983.

Boynton, Robert S. Chemistry and Technology of Lime and Limestone. 2nd ed. Wiley-Interscience Publication. New York: John-Wiley and Sons Inc., 1980.

Branson, C. C. Geology and Petroleum of McIntosh County, Oklahoma. University of Oklahoma, 1923.

Bureau of Mines Cost Estimating System Handbook. Bureau of Mines Information Circular 9143. Parts 1 and 2. U.S. Department of the Interior. 1987.

Clark, I. Practical Geostatistics. Elsevic Inc., New York. 1979.

Cline, Robert L. Directory of Computer Models Applicable to the Coal Mining Industry. Golden, Colorado: CSM Press, 1981.

Extending Aggregate Resources. ASTM Special Technical Publication T14. 1981.

Foster, L. S. The Earth Through Time. New York: John Wiley and Sons, 1979.

Franklin, W. B. Geologic Map and Description of the Wapanucka Limestone, Oklahoma. Oklahoma Geologic Survey. 1:250,000 scale. 1915.

Gibbs, B. L. and J. Arcamore. Use of Microcomputers in Underground Mine Planning. Society of Mining Engineers Annual Meeting, Preprint 87-80, 1987.

Hershey, Robert E. and Stuart W. Maher. Limestone and Dolomite Resources of Tennessee. Tennessee Division of Geology. Nashville, Tennessee: 1963.

Holburg, Dave. Parksville Stone, Parksville, Missouri. Personal communiction, 1990.

Hunt, Roy E. Geotechnical Engineering Investigation Manual. McGray Hill Book Company, 1984.

Katell, Sidney. Basic Estimated Capital Investment and Operating Costs for Coal Strip Mines. U.S. Bureau of Mines Information Circular 8661. U.S. Bureau of Mines. Washington, D.C. 1974.

Leseman, Kelly. Personal communication. University of Missouri-Rolla, 1990.

Mayger, M. Martin Marietta, Inc., personal communication, 1989.

McQueen, H. S. and F. C. Greene. The Geology of Northwestern Missouri. Missouri Geological Survey and Water Resources, 1938.

National Stone Association. A Career in the Crushed Stone Industry. Promotional pamphlet. National Stone Association. Washington, D.C. 1989.

Nilsson, Dan S. Optimization of Underground Mine Development. Society of Mining Engineers Annual Meeting, Preprint 81-52, 1981.

Page, L. B. Geomechanics Applications in Underground Hardrock Mining. Ed. W. G. Pariseau. Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers Inc. New York: 1984.

Petrick, Alfred and Roger Dewey. Microcomputer Cost Models for Mining and Milling. Colorado School of Mines. Golden, Colorado: 1987.

Petrick Associates. The Economics of International Mineral Exploration and Development. Evergreen, Colorado: The Associates, 1987.

Rapid Excavation and Problems and Progress. Proceedings of the Tunnel and Shaft Conference. Ed. Donald H. Yardley. 1970.

Reu, L. S. Geologic Map and Description of the Baum Limestone, Oklahoma. Oklahoma Geologic Survey. 1:250,000 scale. 1955.

Rooney, Lawrence F. and Donald D. Carr. Applied Geology of Industrial Limestone and Dolomite. Geological Survey Bulletin 46. State of Indiana Geological Survey, 1975.

Rueff, A. Missouri Department of Geology and Land Survey, 1989.

Sand, Gravel and Crushed Rock Aggregates. Ed. L. Collis and R. A. Fox. Geological Society of America, 1985.

Seamen, D. Parksville Stone, personal communication, Parksville, Missouri, 1990.

Sholes, Mark A. The Economic Geology of the Upper Freeport Coal in the New Stanton Area of Westmoreland County, Pennsylvania, a Model for Coal Exploration. Pennsylvania Geological Survey, 1981.

Society of Mining Engineers. Symposium on Applied Mining Geology, Denver, Colorado. Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers. New York: 1984.

Stauffer, H. W. Underground Space: Inventory and Prospect in Greater Kansas City, Missouri. Missouri Geological Survey Guidebook, 1976.

Stauffer, H. W. Underground Space: Inventory and Prospect in Greater Kansas City, Missouri. Missouri Geological Survey Guidebook, 1972.

Surfer Software Package Version 3.0. Golden Software. Golden, Colorado, 1987.

The Geological Society of London. Annual Meeting Proceedings, The Working Party, London, England, 1985.

Underground Mining Methods Handbook. Ed. W. A. Hustrulid. Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers. New York: 1982.

Whitfield, W. Inventory and Prospects for Underground Development in Missouri. Rolla-Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey, 1981.

VITA

Kevin Scott Campbell was born November 2, 1961, in Roanoke, Virginia. After receiving his primary and secondary education in Salem, Virginia, public schools, he studied mechanical engineering at Virginia Western Community College, Roanoke, Virginia. In 1982 he transferred to Radford University, Radford, Virginia. He received a bachelor of science degree in geology from Radford University in 1985.

In 1985 he accepted an academic scholarship for the graduate studies program in Engineering Geology at Baylor University in Waco, Texas. He graduated from Baylor with a master's degree in engineering and hydrogeology in 1987. At that time he was accepted into the graduate studies Ph.D. program for Geotechnical Engineering at the University of Missouri-Rolla, Rolla, Missouri.

After completing his residency requirements and the majority of his research work, Mr. Campbell was employed by CH2M HILL in their Seattle, Washington, office. He currently holds the position of geotechnical engineer based in Seattle, Washington, and works on geotechnical, environmental, and heavy civil design projects as a member of the CH2M HILL North Pacific Environmental Business Line throughout the northwest United States and western Canada.

COMPUTER MODELING TO EVALUATE CAPITAL AND OPERATING COSTS ASSOCIATED WITH AGGREGATE RESOURCE POTENTIAL OF SUBSURFACE NORTHERN MISSOURI LIMESTONE UNITS

VOLUME II

by

KEVIN SCOTT CAMPBELL, 1961-

A DISSERTATION

Presented to the Faculty of the Graduate School of the

UNIVERSITY OF MISSOURI-ROLLA

In Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

in

GEOLOGICAL ENGINEERING

1994

C. Dale Elifrits, Advisor

John D. Rockaway

Allen W. Hatheway

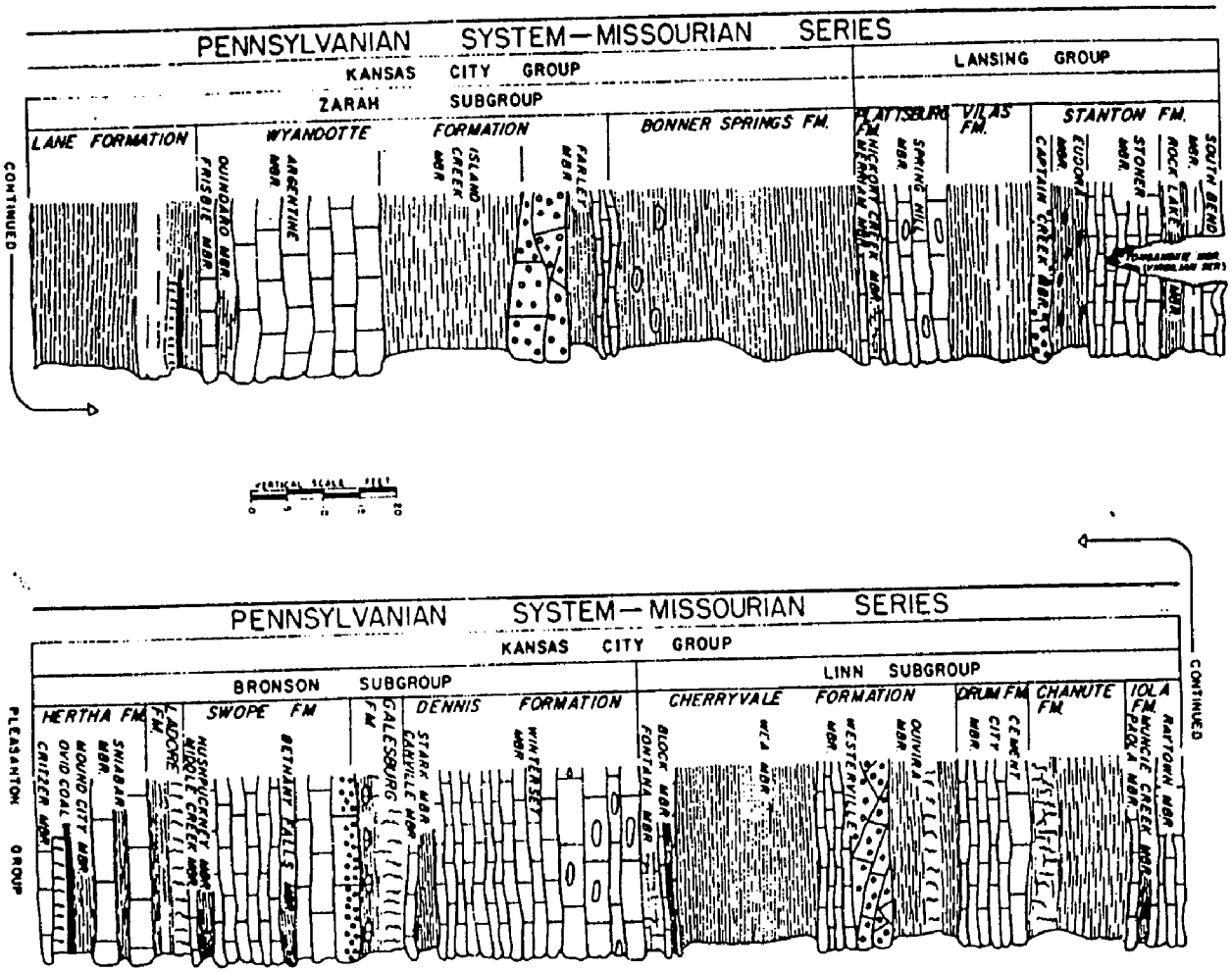
Jeffrey W. Cawlfield

Rodney W. Lentz

VOLUME II **Page**

APPENDICES

Appendix A
STRATIGRAPHY OF THE KANSAS CITY LANSING GROUPS, KANSAS CITY, MISSOURI


PENNSYLVANIAN SYSTEM—MISSOURIAN SERIES
KANSAS CITY GROUP
LANSING GROUP
ZARAH SUBGROUP
LANE FORMATION
WYANDOTTE FORMATION
BONNER SPRINGS FM.
PLATTSBURG FM.
VILAS FM.
STANTON FM.
FRISBIE MBR.
QUINDARO MBR.
ARGENTINE MBR.
ISLAND CREEK MBR.
FARLEY MBR.
HICKORY CREEK MBR.
SPRING HILL MBR.
CAPTAIN CREEK MBR.
EUDORA MBR.
STONER MBR.
ROCK LAKE MBR.
SOUTH BEND MBR.
CONTINUED
PENNSYLVANIAN SYSTEM—MISSOURIAN SERIES
KANSAS CITY GROUP
BRONSON SUBGROUP
LINN SUBGROUP
HERTHA FM.
SWOPE FM.
DENNIS FORMATION
CHERRYVALE FORMATION
ORUM FM.
CHANUTE FM.
IOLA FM.
CRITZER MBR.
SNIABAR MBR.
MOUND CITY MBR.
OVID COAL
LADORE FM.
MIDDLE CREEK MBR.
HUSHPUCKENEY MBR.
BETHANY FALLS MBR.
GALESBURG FM.
CANVILLE MBR.
STARK MBR.
WINTERSET MBR.
BLOCK MBR.
FONTANA MBR.
WCA MBR.
WESTERVILLE MBR.
OUIVIRA MBR.
CEMENT CITY MBR.
RANTOWN MBR.
PLEASANTON GROUP
CONTINUED

Appendix B
UCAP1.FOR, FORTRAN CODE

```
      PROGRAM UCAP1
C
C
C
C
      OPEN (UNIT=7,FILE='UCAP.DAT',ACCESS='DIRECT',STATUS='OLD',
     +      FORM='FORMATTED',RECL=80)
      OPEN (UNIT=8,FILE='UCAP1.OUT',STATUS='NEW')
C
C
C
C
C  UCAP1 CONTROL STATEMENTS FOR USER DEFINED SUBROUTINE
C  CHOICES
C
      LINE = 0
      DO 1000,I=1,30,1
      LINE=30+I
      READ (7,2000,REC=LINE) J
 2000 FORMAT (34X,I1)
      IF(J.EQ.1) THEN
      GOTO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,
     +18,19,20,21,22,23,24,25,26,27,28,29,30),I
      ENDIF
      GO TO 1000
C
C   SUBROUTINE CALL STATEMENTS
C
    1 CALL CLEAR
      GO TO 1000
    2 CALL CORING
      GO TO 1000
    3 CALL SSHAFT
      GO TO 1000
    4 CALL SMRAIL
      GO TO 1000
    5 CALL SMTIRE
      GO TO 1000
    6 CALL MEDTIRE
      GO TO 1000
    7 CALL LGRAIL
      GO TO 1000
    8 CALL LGTIRE
      GO TO 1000
```

```
 9 CALL DRIVES
   GO TO 1000
10 CALL DROP
   GO TO 1000
11 CALL RAISES
   GO TO 1000
12 CALL DECLIN
   GO TO 1000
13 CALL LGROOM
   GO TO 1000
14 CALL HPANEL
   GO TO 1000
15 CALL SPANEL
   GO TO 1000
16 CALL PUMP1
   GO TO 1000
17 CALL PUMP2
   GO TO 1000
18 CALL HOISTD
   GO TO 1000
19 CALL HOISTF
   GO TO 1000
20 CALL JUMBOS
   GO TO 1000
21 CALL JKLEGS
   GO TO 1000
22 CALL MINERS
   GO TO 1000
23 CALL TMACH
   GO TO 1000
24 CALL CONV1
   GO TO 1000
25 CALL CONV2
   GO TO 1000
26 CALL LHD
   GO TO 1000
27 CALL RRHAUL
   GO TO 1000
28 CALL TRUCKS
   GO TO 1000
29 CALL LAYRR
   GO TO 1000
30 CALL SRCONV
   GO TO 1000
```

```
1000 CONTINUE
     STOP
     END
C
C
     SUBROUTINE CLEAR
C
     REAL       ACRE1,
    +          CLRL, CLRS, CLRE,
    +          BSF1L, BSF1S, BSF1E,
    +          SLF1L, SLF1S, SLF1E,
    +          BNF1L, BNF1S, BNF1E,
    +          EFCT1,
    +          SBF1L, SBF1S, SBF1E,
    +          AF1L, AF1S, AF1E,
    +          BF1L, BF1S, BF1E,
    +          ACLRL, ACLRS, ACLRE,
    +          ACLRT, ALRTT
C
C   COSTS FOR LAND CLEARING DURING PREPRODUCTION
DEVELOPMENT
C
C   READ TOTAL HECTACRES TO BE CLEARED FROM DATA FILE
      READ (7,10,REC=112) ACRE1
   10 FORMAT (15X,F17.2)
      IF (ACRE1.GE.500) THEN
C   CALCULATE BASE COSTS FOR CLEARING LESS THAN 500 HECTACRES
      CLRL = 2171.220 * (ACRE1 ** (-0.1200))
      CLRS = 269.796  * (ACRE1 ** (-0.0303))
      CLRE = 667.618  * (ACRE1 ** (-0.0672))
      ELSE
C   CALCULATE BASE COSTS FOR CLEARING GREATER THAN 500
HECTACRES
      CLRL = 1029.977 * ACRE1
      CLRS = 223.489  * ACRE1
      CLRE = 439.701  * ACRE1
C
      ENDIF
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   BRUSH FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BSF1L.....BSF1S.....BSF1E
      READ (7,40,REC=126) BSF1L
```

```
      READ (7,40,REC=158) BSF1S
      READ (7,40,REC=190) BSF1E
   40 FORMAT (15X,F17.2)
C
C   SIDE SLOPE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SPF1L.....SPF1S.....SPF1E
      READ (7,70,REC=131) SPF1L
      READ (7,70,REC=163) SPF1S
      READ (7,70,REC=195) SPF1E
   70 FORMAT (15X,F17.2)
C
C   BURNING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BNF1L.....BNF1S.....BHF1E
      READ (7,100,REC=136) BNF1L
      READ (7,100,REC=168) BNF1S
      READ (7,100,REC=200) BNF1E
  100 FORMAT (15X,F17.2)
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT1
      READ (7,110,REC=119) EFCT1
  110 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF1L.....SBF1S.....SBF1E
      READ (7,140,REC=141) SBF1L
      READ (7,140,REC=173) SBF1S
      READ (7,140,REC=205) SBF1E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF1L.....AF1S.....AF1E
      READ (7,150,REC=146) AF1L
      READ (7,150,REC=178) AF1S
      READ (7,150,REC=210) AF1E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF1L.....BF1S.....BF1E
      READ (7,160,REC=151) BF1L
      READ (7,160,REC=183) BF1S
      READ (7,160,REC=215) BF1E
```

```
  160 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACLRL = CLRL * BSF1L * SPF1L * BNF1L *
     +SBF1L * AF1L * BF1L
      ACLRS = CLRS * BSF1S * SPF1S * BNF1S *
     +SBF1S * AF1S * BF1S
      ACLRE = CLRE * BSF1E * SPF1E * BNF1E * EFCT1 *
     +SBF1E * AF1E * BF1E
C
C   CALCULATE TOTAL ADJUSTED COST PER UNIT
      ACLRT = (CLRL + ACLRS + ACLRE)/ACRE1
C
C   CALCULATE TOTAL COST
      CLRTT = ACLRT*ACRE1
C
C
C  PRINT ROUTINE FOR SUBROUTINE CLEARING.....
C
      WRITE (8,01010)
 1010 FORMAT ('0','SUBROUTINE CLEARING, COSTS FOR LAND CLEARING
DURING
     +PREPRODUCTION DEVELOPMENT, USER DEFINED INPUT')
      WRITE (8,01020)
 1020 FORMAT ('0',4X,'UNITS CONSIDERED ARE HECTACRES')
      WRITE (8,01030) ACRE1
 1030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,01040)
 1040 FORMAT ('0',4X,'PURCHASED EQUIPMENT FACTOR')
      WRITE (8,01050) EFCT1
 1050 FORMAT (8X,'PURCHASED EQUIPMENT    ',F17.2)
      WRITE (8,01060)
 1060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,01070) BSF1L
 1070 FORMAT (8X,'BRUSH                  ',F17.2)
      WRITE (8,01080) SPF1L
 1080 FORMAT (8X,'SIDE SLOPE             ',F17.2)
      WRITE (8,01090) BNF1L
 1090 FORMAT (8X,'BURNING                ',F17.2)
      WRITE (8,01100) SBF1L
 1100 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
```

```
      WRITE (8,01110) AF1L
 1110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE  (8,01120) BF1L
 1120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,01130)
 1130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,01140) BSF1S
 1140 FORMAT (8X,'BRUSH                ',F17.2)
      WRITE (8,01150) SPF1S
 1150 FORMAT (8X,'SIDE SLOPE            ',F17.2)
      WRITE (8,01160) BNF1L
 1160 FORMAT (8X,'BURNING               ',F17.2)
      WRITE (8,01170) SBF1S
 1170 FORMAT (8X,'SUBCONTRACTOR         ',F17.2)
      WRITE (8,01180) AF1S
 1180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,01190) BF1S
 1190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,01200)
 1200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,01210) BSF1E
 1210 FORMAT (8X,'BRUSH                ',F17.2)
      WRITE (8,01220) SPF1E
 1220 FORMAT (8X,'SIDE SLOPE            ',F17.2)
      WRITE (8,01230) BNF1L
 1230 FORMAT (8X,'BURNING               ',F17.2)
      WRITE (8,01240) SBF1E
 1240 FORMAT (8X,'SUBCONTRACTOR         ',F17.2)
      WRITE (8,01250) AF1E
 1250 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,01260) BF1E
 1260 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,01270)
 1270 FORMAT ('0','SUBROUTINE CLEARING, CALCULATED COSTS
```

```
OUTPUT')
      WRITE (8,01280)
 1280 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,01290) CLRL
 1290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,01300) CLRS
 1300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,01310) CLRE
 1310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,01320)
 1320 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,01330) ACLRL
 1330 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,01340) ACLRS
 1340 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,01350) ACLRE
 1350 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,01360)
 1360 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,01370) ACLRT
 1370 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,01380) CLRTT
 1380 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE CORING
      REAL METR2,
     + COREL,  CORES,  COREE,
     + SBF2L,  SBF2S,  SBF2E,
     + AF2L,   AF2S,   AF2E,
     + BF2L,   BF2S,   BF2E,
     + ACOREL, ACORES, ACOREE,
     + ACORET, CORETT
C
C   COSTS FOR CORE DRILLING DURING PREPRODUCTION
C
C   READ DAILY METERS OF CORE TO BE DRILLED FROM DATA FILE
      READ (7,10,REC=225) METR2
   10 FORMAT (15X,F17.2)
C
```

```
C   CALCULATE BASE COSTS FOR CORE DRILLING
      COREL = 21.38 * METR2
      CORES = 20.67 * METR2
      COREE =  2.70 * METR2
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF2L.....SBF2S.....SBF2E.....
      READ (7,40,REC=232) SBF2L
      READ (7,40,REC=249) SBF2S
      READ (7,40,REC=266) SBF2E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF2L.....AF2S.....AF2E
      READ (7,50,REC=237) AF2L
      READ (7,50,REC=254) AF2S
      READ (7,50,REC=271) AF2E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF2L.....BF2S.....BF2E
      READ (7,60,REC=242) BF2L
      READ (7,60,REC=259) BF2S
      READ (7,60,REC=276) BF2E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACOREL = COREL * SBF2L * AF2L * BF2L
      ACORES = CORES * SBF2S * AF2S * BF2S
      ACOREE = COREE * SBF2E * AF2E * BF2E
C
C   CALCULATE TOTAL ADJUSTED COST PER UNIT
      ACORET = (ACOREL + ACORES + ACOREE)/METR2
C
C   CALCULATE TOTAL COST
      CORETT = ACORET*METR2
C
C
C  PRINT ROUTINE FOR SUBROUTINE CORING.....
```

```
C
      WRITE (8,2009)
 2009 FORMAT (//)
      WRITE (8,02010)
 2010 FORMAT ('0','SUBROUTINE CORING, COSTS FOR CORE DRILLING
DURING
     +PREPRODUCTION DEVELOPMENT, USER DEFINED INPUT')
      WRITE (8,02020)
 2020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS')
      WRITE (8,02030) METR2
 2030 FORMAT (8X,'UNITS TO BE DRILLED    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02040)
 2040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,02050) SBF2L
 2050 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,02060) AF2L
 2060 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02070) BF2L
 2070 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02080)
 2080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,02090) SBF2S
 2090 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,02100) AF2S
 2100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02110) BF2S
 2110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02120)
 2120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,02130) SBF2E
 2130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,02140) AF2E
 2140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02150) BF2E
 2150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
```

```
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,02160)
 2160 FORMAT ('0','SUBROUTINE CORING, CALCULATED COSTS OUTPUT')
      WRITE (8,02170)
 2170 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,02180) COREL
 2180 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,02190) CORES
 2190 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,02200) COREE
 2200 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,02210)
 2210 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,02220) ACOREL
 2220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,02230) ACORES
 2230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,02240) ACOREE
 2240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,02250)
 2250 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,02260) ACORET
 2260 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,02270) CORETT
 2270 FORMAT (8X,'PROJECT              ',F17.2)
      RETURN
      END
C
C
      SUBROUTINE SSHAFT
C
C
C     SSHAFT
      REAL          AREA3,
     +             LONG3,
     +             SINKL,  SINKS,  SINKE,
     +             HFCT3,
     +             HDF3L,  HDF3S,  HDF3E,
     +             WFCT3,  TFCT3,
     +             AF3L,   AF3S,   AF3E,
     +             BF3L,   BF3S,   BF3E,
```

```
ASINKS, ASINKE,
SINKTT

AREA AND TOTAL LENGTH FR( M DATA F
37) AREA3
.2)
92) LONG3
7.2)

SE COSTS
* (AREA3 ** 0.542)
* (AREA3 ** 0.558)
6 * (AREA3 ** 0.407)

USTMENT FACTORS

ESS FACTOR
HARDNESS.....HFCT3
REC=306) HFCT3
5X,F17.2)
NESS FACTORS.....HDF3L.....HDF3 .....DF3E
388 * (HFCT3 ** 0.093)
579 * (HFCT3 ** 0.054)
.715 * (HFCT3 ** 0.033)

ACTOR.....TFCT3
ITCH TURNING FACTOR ON OR ( ER ....WFC F
,40,REC=299) WFCT3
T (15X,F17.2)
ATE TIMBER FACTOR.....TFCT3
CT3.EQ.1) THEN
= 0.482 * (AREA3 ** 0.077)

, = 1.0
F

R USER APPLIED FACTORS "A" F R LABOR
ENT..
.....AF3S.....AF3E
AD (7,50,REC=313) AF3L
AD (7,50,REC=325) AF3S
AD (7,50,REC=337) AF3E
ORMAT (15X,F17.2)
```

```
     +            ASINKL, ASINKS, ASINKE,
     +            ASINKT, SINKTT
C
C   READ SHAFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=287) AREA3
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=292) LONG3
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      SINKL = 615.598 * (AREA3 ** 0.542)
      SINKS = 182.051 * (AREA3 ** 0.558)
      SINKE = 681.476 * (AREA3 ** 0.407)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ROCK HARDNESS FACTOR
C   READ ROCK HARDNESS.....HFCT3
      READ (7,30,REC=306) HFCT3
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF3L.....HDF3S.....HDF3E
      HDF3L = 0.388 * (HFCT3 ** 0.093)
      HDF3S = 0.579 * (HFCT3 ** 0.054)
      HDF3E = 0.715 * (HFCT3 ** 0.033)
C
C   TIMBER FACTOR.....TFCT3
C   READ SWITCH TURNING FACTOR ON OR OFF.....WFCT3
      READ (7,40,REC=299) WFCT3
   40 FORMAT (15X,F17.2)
C   CALCULATE TIMBER FACTOR.....TFCT3
      IF (WFCT3.EQ.1) THEN
      TFCT3 = 0.482 * (AREA3 ** 0.077)
      ELSE
      TFCT3 = 1.0
      ENDIF
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF3L.....AF3S.....AF3E
      READ (7,50,REC=313) AF3L
      READ (7,50,REC=325) AF3S
      READ (7,50,REC=337) AF3E
   50 FORMAT (15X,F17.2)
C
```

```
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF3L.....BF3S.....BF3E
      READ (7,60,REC=318) BF3L
      READ (7,60,REC=330) BF3S
      READ (7,60,REC=342) BF3E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASINKL = SINKL * HDF3L * TFCT3 * AF3L * BF3L
      ASINKS = SINKS * HDF3S * TFCT3 * AF3S * BF3S
      ASINKE = SINKE * HDF3E * TFCT3 * AF3E * BF3E
C
C   CALCULATE TOTAL ADJUSTED COST
      ASINKT = ASINKL + ASINKS + ASINKE
C
C   CALCULATE TOTAL COST
      SINKTT = ASINKT * LONG3
C
C
C  PRINT ROUTINE FOR SUBROUTINE SSHAFT.....
C
      WRITE (8,3009)
03009 FORMAT (//)
      WRITE (8,03010)
03010 FORMAT ('0','SUBROUTINE SSHAFT, COSTS FOR SINKING VERTICAL
     +SHAFTS, USER DEFINED INPUT')
      WRITE (8,03020)
03020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF SHAFT')
      WRITE (8,03030) LONG3
03030 FORMAT (8X,'UNITS TO BE SUNK       ',F17.2)
      WRITE (8,03040)
03040 FORMAT (4X,'SHAFT FACE AREA IN SQUARE METERS')
      WRITE (8,03050) AREA3
03050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,03060)
03060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,03070) HFCT3
03070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
      WRITE (8,03080)
03080 FORMAT (4X,'TIMBER FACTOR, YES=1, NO=0')
      WRITE (8,03090) WFCT3
03090 FORMAT (8X,'TIMBER FACTOR          ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,03100)
03100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,03110) HDF3L
03110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03120) TFCT3
03120 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,03130) AF3L
03130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03140) BF3L
03140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,03150)
03150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,03160) HDF3S
03160 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03170) TFCT3
03170 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,03180) AF3S
03180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03190) BF3S
03190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,03200)
03200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,03210) HDF1E
03210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03220) TFCT3
03220 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,03230) AF3E
03230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03240) BF3E
03240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,03250)
03250 FORMAT ('0','SUBROUTINE SSHAFT, CALCULATED COSTS OUTPUT')
```

```
      WRITE (8,03260)
03260 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,03270) SINKL
03270 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,03280) SINKS
03280 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,03290) SINKE
03290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,03300)
03300 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,03310) ASINKL
03310 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,03320) ASINKS
03320 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,03330) ASINKE
03330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,03340)
03340 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,03350) ASINKT
03350 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,03360) SINKTT
03360 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SMRAIL
C
C     COST FOR DEVELOPING SMALL SIZE DRIFTS USED FOR HAULAGE BY
RAIL
C
C     SMRAIL
      REAL        AREA4,
     +           LONG4,
     +           SMRRL,  SMRRS,   SMRRE,
     +           HFCT4,
     +           HDF4L,  HDF4S,  HDF4E,
     +           BTF4L,  BTF4S,  BTF4E,
     +           TMF4L,  TMF4S,  TMF4E,
     +           AF4L,   AF4S,   AF4E,
     +           BF4L,   BF4S,   BF4E,
     +           ASMRRL, ASMRRS, ASMRRE,
```

```
     +              ASMRRT, SMRRTT
C
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=351) AREA4
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=356) LONG4
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      SMRRL = 79.926 * (AREA4 ** 0.764)
      SMRRS = 73.283 * (AREA4 ** 0.602)
      SMRRE =  4.869 * (AREA4 ** 0.647)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ROCK HARDNESS FACTOR
C   READ ROCK HARDNESS.....HFCT4
      READ (7,30,REC=363) HFCT4
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF4L.....HDF4S.....HDF4E
      HDF4L = 0.388 * (HFCT4 ** 0.093)
      HDF4S = 0.579 * (HFCT4 ** 0.054)
      HDF4E = 0.715 * (HFCT4 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF4L.....BTF4S.....BTF4E
      READ (7,40,REC=370) BTF4L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=392) BTF4S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=414) BTF4E
   60 FORMAT (15X,F17.2)
C
C   TIMBERING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   TMF4L.....TMF4S.....TMF4E
      READ (7,70,REC=375) TMF4L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=397) TMF4S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=419) TMF4E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
```

```
EQUIPMENT..
C   AF4L.....AF4S.....AF4E
      READ (7,100,REC=380) AF4L
      READ (7,100,REC=402) AF4S
      READ (7,100,REC=424) AF4E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIES FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF4L.....BF4S.....BF4E
      READ (7,110,REC=385) BF4L
      READ (7,110,REC=407) BF4S
      READ (7,110,REC=429) BF4E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASMRRL = SMRRL * HDF4L * BTF4L * TMF4L * AF4L *
     +         BF4L
      ASMRRS = SMRRS * HDF4S * BTF4S * TMF4S * AF4S *
     +         BF4S
      ASMRRE = SMRRE * HDF4E * BTF4E * TMF4E * AF4E *
     +         BF4E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ASMRRT = ASMRRL + ASMRRS + ASMRRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      SMRRTT = ASMRRT * LONG4
C
C
C  PRINT ROUTINE FOR SUBROUTINE SMRAIL.....
C
      WRITE (8,4009)
 04009 FORMAT (//)
      WRITE (8,04010)
 04010 FORMAT ('0','SUBROUTINE SMRAIL, COSTS FOR DEVELOPING
SMALL
     +SIZED DRIFTS USED FOR HAULAGE BY RAIL, USER DEFINED INPUT')
      WRITE (8,04020)
 04020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,04030) LONG4
 04030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,04040)
 04040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
```

```
      WRITE (8,04050) AREA4
04050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,04060)
04060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,04070) HFCT4
04070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04080)
04080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,04090) HDF4L
04090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04100) BTF4L
04100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,04110) TMF4L
04110 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,04120) AF4L
04120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,04130) BF4L
04130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04140)
04140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,04150) HDF4S
04150 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04160) BTF4S
04160 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,04170) TMF4S
04170 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,04180) AF4S
04180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,04190) BF4S
04190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04200)
04200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,04210) HDF4E
04210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04220) BTF4E
```

```
04220 FORMAT (8X,'ROCK BOLTS              ',F17.2)
      WRITE (8,04230) TMF4E
04230 FORMAT (8X,'TIMBER LAGGING          ',F17.2)
      WRITE (8,04240) AF4E
04240 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,04250) BF4E
04250 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,04260)
04260 FORMAT ('0','SUBROUTINE SMRAIL, CALCULATED COSTS OUTPUT')
      WRITE (8,04270)
04270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,04280) SMRRL
04280 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,04290) SMRRS
04290 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,04300) SMRRE
04300 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,04310)
04310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,04320) ASMRRL
04320 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,04330) ASMRRS
04330 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,04340) ASMRRE
04340 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,04350)
04350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,04360) ASMRRT
04360 FORMAT (8X,'PER UNIT                ',F17.2)
      WRITE (8,04370) SMRRTT
04370 FORMAT (8X,'PROJECT                 ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SMTIRE

C
```

```
C   COSTS FOR DEVELOPING SMALL SIZE DRIFTS USED FOR HAULAGE BY
RUBBER
C   TIRED VEHICLES
C
C    SMTIRE
     REAL
    +            AREA5,  LONG5,
    +            STIRL,  STIRS,  STIRE,
    +            HFCT5,
    +            HDF5L,  HDF5S,  HDF5E,
    +            BTF5L,  BTF5S,  BTF5E,
    +            AF5L,   AF5S,   AF5E,
    +            BF5L,   BF5S,   BF5E,
    +            ASTIRL, ASTIRS, ASTIRE,
    +            ASTIRT, STIRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=438) AREA5
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=443) LONG5
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      STIRL = 72.721 * (AREA5 ** 0.685)
      STIRS = 43.313 * (AREA5 ** 0.687)
      STIRE =  1.360 * (AREA5 ** 1.188)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ROCK HARDNESS FACTOR
C   READ ROCK HARDNESS.....HFCT5
      READ (7,30,REC=450) HFCT5
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF5L.....HDF5S.....HCF5E
      HDF5L = 0.388 * (HFCT5 ** 0.093)
      HDF5S = 0.579 * (HFCT5 ** 0.054)
      HDF5E = 0.715 * (HFCT5 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF5L.....BTF5S.....BTF5E
      READ (7,40,REC=457) BTF5L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=474) BTF5S
   50 FORMAT (15X,F17.2)
```

```
      READ (7,60,REC=491) BTF5E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF5L.....AF5S.....AF5E
      READ (7,70,REC=462) AF5L
      READ (7,70,REC=479) AF5S
      READ (7,70,REC=496) AF5E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTOR "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF5L.....BF5S.....BF5E
      READ (7,80,REC=467) BF5L
      READ (7,80,REC=484) BF5S
      READ (7,80,REC=501) BF5E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASTIRL = STIRL * HDF5L * BTF5L * AF5L * BF5L
      ASTIRS = STIRS * HDF5S * BTF5S * AF5S * BF5S
      ASTIRE = STIRE * HDF5E * BTF5E * AF5E * BF5E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ASTIRT = ASTIRL + ASTIRS + ASTIRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      STIRTT = ASTIRT * LONG5
C
C
C  PRINT ROUTINE FOR SUBROUTINE SMTIRE.....
C
      WRITE (8,05009)
05009 FORMAT (//)
      WRITE (8,05010)
05010 FORMAT ('0','SUBROUTINE SMTIRE, COSTS FOR DEVELOPING
SMALL
     +SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,05020)
05020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,05030) LONG5
05030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
```

```
      WRITE (8,05040)
05040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,05050) AREA5
05050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,05060)
05060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,05070) HFCT5
05070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,05080)
05080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,05090) HDF5L
05090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,05100) BTF5L
05100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,05110) AF5L
05110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,05120) BF5L
05120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,05130)
05130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,05140) HDF5S
05140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,05150) BTF5S
05150 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,05160) AF5S
05160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,05170) BF5S
05170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,05180)
05180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,05190) HDF5E
05190 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,05200) BTF5E
05200 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,05210) AF5E
```

```
05210 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,05220) BF5E
05220 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,05230)
05230 FORMAT ('0','SUBROUTINE SMTIRE, CALCULATED COSTS OUTPUT')
      WRITE (8,05240)
05240 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,05250) STIRL
05250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,05260) STIRS
05260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,05270) STIRE
05270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,05280)
05280 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,05290) ASTIRL
05290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,05300) ASTIRS
05300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,05310) ASTIRE
05310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,05320)
05320 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,05330) ASTIRT
05330 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,05340) STIRTT
05340 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE MEDTIRE
C
C
C   COSTS FOR DEVELOPING MEDIUM SIZE DRIFTS USED FOR HAULAGE
BY
C   RUBBER TIRED VEHICLES
C
```

```
C    MEDTIRE
     REAL
     +          AREA6,  LONG6,
     +          MTIRL,  MTIRS,   MTIRE,
     +          HFCT6,
     +          HDF6L,  HDF6S,  HDF6E,
     +          BTF6L,  BTF6S,  BTF6E,
     +          STF6L,  STF6S,  STF6E,
     +          CCF6L,  CCF6S,  CCF6E,
     +          SSF6L,  SSF6S,  SSF6E,
     +          AF6L,   AF6S,   AF6E,
     +          BF6L,   BF6S,   BF6E,
     +          AMTIRL, AMTIRS, AMTIRE,
     +          AMTIRT, MTIRTT
C
C    READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
C
      READ (7,10,REC=510) AREA6
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=515) LONG6
   20 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      MTIRL = 86.960 * (AREA6 ** 0.349)
      MTIRS = 27.390 * (AREA6 ** 0.855)
      MTIRE =  4.497 * (AREA6 ** 0.648)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    READ ROCK HARDNESS.....HFCT6
      READ (7,30,REC=522) HFCT6
   30 FORMAT (15X,F17.2)
C    ROCK HARDNESS FACTORS.....HDF6L.....HDF6S.....HDF6E
      HDF6L = 0.388 * (HFCT6 ** 0.093)
      HDF6S = 0.579 * (HFCT6 ** 0.054)
      HDF6E = 0.715 * (HFCT6 ** 0.033)
C
C    ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C    BTF6L.....BTF6S.....BTF6E
      READ (7,40,REC=529) BTF6L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=562) BTF6S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=595) BTF6E
```

```
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF6L.....STF6S.....STF6E
      READ (7,70,REC=534) STF6L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=567) STF6S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=600) STF6E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   CCF6L.....CCF6S.....CCF6E
      READ (7,100,REC=539) CCF6L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=572) CCF6S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=605) CCF6E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF6L.....SSF6S.....SSF6E
      READ (7,130,REC=544) SSF6L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=577) SSF6S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=610) SSF6E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF6L.....AF6S.....AF6E
      READ (7,160,REC=549) AF6L
      READ (7,160,REC=582) AF6S
      READ (7,160,REC=615) AF6E
  160 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF6L.....BF6S.....BF6E
      READ (7,170,REC=554) BF6L
      READ (7,170,REC=587) BF6S
      READ (7,170,REC=620) BF6E
```

```
  170 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AMTIRL = MTIRL * HDF6L * BTF6L * STF6L * CCF6L *
     +         SSF6L * AF6L * BF6L
      AMTIRS = MTIRS * HDF6S * BTF6S * STF6S * CCF6S *
     +         SSF6S * AF6S * BF6S
      AMTIRE = MTIRE * HDF6E * BTF6E * STF6E * CCF6E *
     +         SSF6E * AF6E * BF6E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      AMTIRT = AMTIRL + AMTIRS + AMTIRE
C
C   CALCULATE COST FOR ENTIRE LENGTH OF DRIFT
      MTIRTT = AMTIRT * LONG6
C
C
C  PRINT ROUTINE FOR SUBROUTINE MEDTIRE.....
C
      WRITE (8,06009)
06009 FORMAT (//)
      WRITE (8,06010)
06010 FORMAT ('0','SUBROUTINE MEDTIRE, COSTS FOR DEVELOPING
MEDIUM
     +SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,06020)
06020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,06030) LONG6
06030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,06040)
06040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,06050) AREA6
06050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,06060)
06060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,06070) HFCT6
06070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06080)
06080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,06090) HDF6L
```

```
06090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06100) BTF6L
06100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06110) STF6L
06110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06120) CCF6L
06120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,06130) SSF6L
06130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,06140) AF6L
06140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,06150) BF6L
06150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06160)
06160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,06170) HDF6S
06170 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06180) BTF6S
06180 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06190) STF6L
06190 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06200) CCF6L
06200 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,06210) SSF6L
06210 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,06220) AF6S
06220 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,06230) BF6S
06230 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06240)
06240 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,06250) HDF6E
06250 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06260) BTF6E
06260 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06270) STF6L
06270 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06280) CCF6L
```

```
06280 FORMAT (8X,'CONCRETE LINER          ',F17.2)
      WRITE (8,06290) SSF6L
06290 FORMAT (8X,'STEEL SETS              ',F17.2)
      WRITE (8,06300) AF6E
06300 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,06310) BF6E
06310 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,06320)
06320 FORMAT ('0','SUBROUTINE MEDTIRE, CALCULATED COSTS
OUTPUT')
      WRITE (8,06330)
06330 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,06340) MTIRL
06340 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,06350) MTIRS
06350 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,06360) MTIRE
06360 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,06370)
06370 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,06380) AMTIRL
06380 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,06390) AMTIRS
06390 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,06400) AMTIRE
06400 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,06410)
06410 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,06420) AMTIRT
06420 FORMAT (8X,'PER UNIT                ',F17.2)
      WRITE (8,06430) MTIRTT
06430 FORMAT (8X,'PROJECT                 ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LGRAIL
C
```

```
C   COSTS FOR DEVELOPING LARGE SIZE DRIFTS FOR HAULAGE BY RAIL
C    LGRAIL
     REAL
     +          AREA7,  LONG7,
     +          LGRRL,  LGRRS,  LGRRE,
     +          HFCT7,
     +          HDF7L,  HDF7S,  HDF7E
     +          BTF7L,  BTF7S,  BTF7E,
     +          STF7L,  STF7S,  STF7E,
     +          CCF7L,  CCF7S,  CCF7E,
     +          SSF7L,  SSF7S,  SSF7E,
     +          DTF7L,  DTF7S,  DTF7E,
     +          AF7L,   AF7S,   AF7E,
     +          BF7L,   BF7S,   BF7E,
     +          ALGRRL, ALGRRS, ALGRRE,
     +          ALGRRT, LGRRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=629) AREA7
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=634) LONG7
   20 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      LGRRL = 27.037 * (AREA7 ** 0.857)
      LGRRS = 63.689 * (AREA7 ** 0.693)
      LGRRE =  1.437 * (AREA7 ** 1.056)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT7
      READ (7,30,REC=641) HFCT7
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF7L.....HDF7S.....HDF7E
      HDF7L = 0.388 * (HFCT7 ** 0.093)
      HDF7S = 0.579 * (HFCT7 ** 0.054)
      HDF7E = 0.715 * (HFCT7 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF7L.....BTF7S.....BTF7E
      READ (7,40,REC=648) BTF7L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=686) BTF7S
   50 FORMAT (15X,F17.2)
```

```
      READ (7,60,REC=724) BTF7E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF7L.....STF7S.....STF7E
      READ (7,70,REC=653) STF7L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=691) STF7S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=729) STF7E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   CCF7L.....CCF7S.....CCF7E
      READ (7,100,REC=658) CCF7L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=696) CCF7S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=734) CCF7E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF7L.....SSF7S.....SSF7E
      READ (7,130,REC=663) SSF7L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=701) SSF7S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=739) SSF7E
  150 FORMAT (15X,F17.2)
C
C   DUAL TRACK FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DTF7L.....DTF7S.....DTF7E
      READ (7,160,REC=668) DTF7L
  160 FORMAT (15X,F17.2)
      READ (7,170,REC=706) DTF7S
  170 FORMAT (15X,F17.2)
      READ (7,180,REC=744) DTF7E
  180 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF7L.....AF7S.....AF7E
      READ (7,190,REC=673) AF7L
```

```
      READ (7,190,REC=711) AF7S
      READ (7,190,REC=749) AF7E
  190 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF7L.....BF7S.....BF7E
      READ (7,200,REC=678) BF7L
      READ (7,200,REC=716) BF7S
      READ (7,200,REC=754) BF7E
  200 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ALGRRL = LGRRL * HDF7L * BTF7L * STF7L * CCF7L *
     +         SSF7L * DTF7L * AF7L * BF7L
      ALGRRS = LGRRS * HDF7S * BTF7S * STF7S * CCF7S *
     +         SSF7S * DTF7L * AF7S * BF7S
      ALGRRE = LGRRE * HDF7E * BTF7E * STF7E * CCF7E *
     +         SSF7E * DTF7E * AF7E * BF7E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ALGRRT = ALGRRL + ALGRRS + ALGRRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      LGRRTT = ALGRRT * LONG7
C
C
C  PRINT ROUTINE FOR SUBROUTINE LGRAIL.....
C
      WRITE (8,07009)
07009 FORMAT (//)
      WRITE (8,07010)
07010 FORMAT ('0','SUBROUTINE LGRAIL, COSTS FOR DEVELOPING
LARGE
     +SIZED DRIFTS USED FOR HAULAGE BY RAIL, USER DEFINED INPUT')
      WRITE (8,07020)
07020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,07030) LONG7
07030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,07040)
07040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,07050) AREA7
07050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,07060)
```

```
07060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,07070) HFCT7
07070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07080)
07080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,07090) HDF7L
07090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,07100) BTF7L
07100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,07110) STF7L
07110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,07120) CCF7L
07120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,07130) SSF7L
07130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,07140) DTF7L
07140 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,07150) AF7L
07150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,07160) BF7L
07160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07170)
07170 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,07180) HDF7S
07180 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,07190) BTF7S
07190 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,07200) STF7L
07200 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,07210) CCF7L
07210 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,07220) SSF7L
07220 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,07230) DTF7L
07230 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,07240) AF7S
07240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,07250) BF7S
```

```
07250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07260)
07260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,07270) HDF7E
07270 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,07280) BTF7E
07280 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,07290) STF7L
07290 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,07300) CCF7L
07300 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,07310) SSF7L
07310 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,07320) DTF7L
07320 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,07330) AF7E
07330 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,07340) BF7E
07340 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,07350)
07350 FORMAT ('0','SUBROUTINE LGRAIL, CALCULATED COSTS OUTPUT')
      WRITE (8,07360)
07360 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,07370) LGRRL
07370 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,07380) LGRRS
07380 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,07390) LGRRE
07390 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,07400)
07400 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,07410) ALGRRL
07410 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,07420) ALGRRS
07420 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,07430) ALGRRE
07430 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,07440)
07440 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,07450) ALGRRT
07450 FORMAT (8X,'PER UNIT              ',F17.2)
      WRITE (8,07460) LGRRTT
07460 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LGTIRE
C
C
C   COSTS FOR DEVELOPING LARGE SIZE DRIFTS FOR HAULAGE BY
RUBBER
C   TIRED VEHICLES
C
C    LGTIRE
      REAL
     +            AREA8,  LONG8,
     +            LTIRL,  LTIRS,  LTIRE,
     +            HFCT8,
     +            HDF8L,  HDF8S,  HDF8E,
     +            BTF8L,  BTF8S,  BTF8E,
     +            STF8L,  STF8S,  STF8E,
     +            AF8L,   AF8S,   AF8E,
     +            BF8L,   BF8S,   BF8E,
     +            ALTIRL, ALTIRS, ALTIRE,
     +            ALTIRT, LTIRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=763) AREA8
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=768) LONG8
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      LTIRL = 43.360 * (AREA8 ** 0.542)
      LTIRS = 57.018 * (AREA8 ** 0.617)
      LTIRE =  4.144 * (AREA8 ** 0.661)
C
C   CONSIDER ADJUSTMENT FACTORS
```

```
C
C   READ ROCK HARDNESS.....HFCT8
      READ (7,30,REC=775) HFCT8
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF8L.....HDF8S.....HDF8E
      HDF8L = 0.388 * (HFCT8 ** 0.093)
      HDF8S = 0.579 * (HFCT8 ** 0.054)
      HDF8E = 0.715 * (HFCT8 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF8L.....BTF8S.....BTF8E
      READ (7,40,REC=782) BTF8L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=805) BTF8S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=828) BTF8E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF8L.....STF8S.....STF8E
      READ (7,70,REC=787) STF8L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=810) STF8S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=833) STF8E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF8L.....AF8S.....AF8E
      READ (7,100,REC=792) AF8L
      READ (7,100,REC=815) AF8S
      READ (7,100,REC=838) AF8E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF8L.....BF8S.....BF8E
      READ (7,110,REC=797) BF8L
      READ (7,110,REC=820) BF8S
      READ (7,110,REC=843) BF8E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
```

```
      ALTIRL = LTIRL * HDF8L * BTF8L * STF8L * AF8L *
     +        BF8L
      ALTIRS = LTIRS * HDF8S * BTF8S * STF8S * AF8S *
     +        BF8S
      ALTIRE = LTIRE * HDF8E * BTF8E * STF8E * AF8E *
     +        BF8E
C
C   CALCULATE TOTAL ADJUSTED COST
      ALTIRT = ALTIRL + ALTIRS +ALTIRE
C
C   CALCULATE COST FOR ENTIRE LENGTH OF DRIFT
      LTIRTT = ALTIRT * LONG8
C
C  PRINT ROUTINE FOR SUBROUTINE LGTIRE.....
C
      WRITE (8,08009)
08009 FORMAT (//)
      WRITE (8,08010)
08010 FORMAT ('0','SUBROUTINE LGTIRE, COSTS FOR DEVELOPING
LARGE
     +SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,08020)
08020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,08030) LONG8
08030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,08040)
08040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,08050) AREA8
08050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,08060)
08060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,08070) HFCT8
08070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,08080)
08080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,08090) HDF8L
08090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,08100) BTF8L
08100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,08110) STF8L
```

```
08110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,08120) AF8L
08120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,08130) BF8L
08130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,08140)
08140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,08150) HDF8S
08150 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,08160) BTF8S
08160 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,08170) STF8S
08170 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,08180) AF8S
08180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,08190) BF8S
08190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,08200)
08200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,08210) HDF8E
08210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,08220) BTF8E
08220 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,08230) STF8E
08230 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,08240) AF8E
08240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,08250) BF8E
08250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,08260)
08260 FORMAT ('0','SUBROUTINE LGTIRE, CALCULATED COSTS OUTPUT')
      WRITE (8,08270)
08270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,08280) LTIRL
```

```
08280 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,08290) LTIRS
08290 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,08300) LTIRE
08300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,08310)
08310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,08320) ALTIRL
08320 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,08330) ALTIRS
08330 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,08340) ALTIRE
08340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,08350)
08350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,08360) ALTIRT
08360 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,08370) LTIRTT
08370 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE DRIVES
C
C
C  COSTS FOR DEVELOPING CONVENTIONALLY DRIVEN RAISES
C
C     DRIVES
      REAL
     +          AREA9,  LONG9,
     +          DRIVL,  DRIVS,  DRIVE,
     +          TMF9L,  TMF9S,  TMF9E,
     +          RCF9L,  RCF9S,  RCF9E,
     +          RTF9L,  RTF9S,  RTF9E,
     +          SCF9L,  SCF9S,  SCF9E,
     +          AF9L,   AF9S,   AF9E,
     +          BF9L,   BF9S,   BF9E,
     +          ADRIVL, ADRIVS, ADRIVE,
     +          ADRIVT, DRIVTT
C
C  READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
```

```
      READ (7,10,REC=852) AREA9
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=857) LONG9
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DRIVL = 134.819 * (AREA9 ** 0.438)
      DRIVS = 109.009 * (AREA9 ** 0.526)
      DRIVE =   2.267 * (AREA9 ** 0.757)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TIMBER FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   TMF9L.....TMF9S.....TMF9E
      READ (7,30,REC=864) TMF9L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=896) TMF9S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=929) TMF9E
   50 FORMAT (15X,F17.2)
C
C   RAISE CLIMBER FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   RCF9L.....RCF9S.....RCF9E
      READ (7,60,REC=869) RCF9L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=901) RCF9S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=934) RCF9E
   80 FORMAT (15X,F17.2)
C
C   RUBBER TIRED MUCK DISPOSAL FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....RTF9L.....RTF9S.....RTF9E
      READ (7,90,REC=874) RTF9L
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=906) RTF9S
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=939) RTF9E
  110 FORMAT (15X,F17.2)
C
C   STEEL CHUTE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SCF9L.....SCF9S.....SCF9E
      READ (7,120,REC=879) SCF9L
  120 FORMAT (15X,F17.2)
      READ (7,130,REC=911) SCF9S
```

```
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=944) SCF9E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF9L.....AF9S.....AF9E
      READ (7,150,REC=884) AF9L
      READ (7,150,REC=916) AF9S
      READ (7,150,REC=949) AF9E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF9L.....BF9S.....BF9E
      READ (7,160,REC=889) BF9L
      READ (7,160,REC=921) BF9S
      READ (7,160,REC=954) BF9E
  160 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRIVL = DRIVL * TMF9L * RCF9L * RTF9L * SCF9L *
     +         AF9L * BF9L
      ADRIVS = DRIVS * TMF9S * RCF9S * RTF9S * SCF9S *
     +         AF9S * BF9S
      ADRIVE = DRIVE * TMF9E * RCF9E * RTF9E * SCF9E *
     +         AF9E * BF9E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ADRIVT = ADRIVL + ADRIVS + ADRIVE
C
C   CALCULATE COST FOR DRIVING ENTIRE LENGTH OF RAISE
      DRIVTT = ADRIVT * LONG9
C
C  PRINT ROUTINE FOR SUBROUTINE DRIVES.....
C
      WRITE (8,09009)
09009 FORMAT (//)
      WRITE (8,09010)
09010 FORMAT ('0','SUBROUTINE DRIVES, COSTS FOR DEVELOPING
     +CONVENTIONALLY DRIVEN RAISES, USER DEFINED INPUT')
      WRITE (8,09020)
09020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,09030) LONG9
```

```
09030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,09040)
09040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,09050) AREA9
09050 FORMAT (8X,'FACE AREA              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09060)
09060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,09070) TMF9L
09070 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,09080) RCF9L
09080 FORMAT (8X,'RAISE CLIMBER          ',F17.2)
      WRITE (8,09090) RTF9L
09090 FORMAT (8X,'RUBBER TIRE MUCKING    ',F17.2)
      WRITE (8,09100) SCF9L
09100 FORMAT (8X,'STEEL CHUTE            ',F17.2)
      WRITE (8,09110) AF9L
09110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09120) BF9L
09120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09130)
09130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,09140) TMF9S
09140 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,09150) RCF9S
09150 FORMAT (8X,'RAISE CLIMBER          ',F17.2)
      WRITE (8,09160) RTF9S
09160 FORMAT (8X,'RUBBER TIRE MUCKING    ',F17.2)
      WRITE (8,09170) SCF9S
09170 FORMAT (8X,'STEEL CHUTE            ',F17.2)
      WRITE (8,09180) AF9S
09180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09190) BF9S
09190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09200)
09200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
```

```
      WRITE (8,09210) TMF9E
09210 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,09220) RCF9E
09220 FORMAT (8X,'RAISE CLIMBER          ',F17.2)
      WRITE (8,09230) RTF9E
09230 FORMAT (8X,'RUBBER TIRE MUCKING    ',F17.2)
      WRITE (8,09240) SCF9E
09240 FORMAT (8X,'STEEL CHUTE            ',F17.2)
      WRITE (8,09250) AF9E
09250 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09260) BF9E
09260 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,09270)
09270 FORMAT ('0','SUBROUTINE DRIVES, CALCULATED COSTS OUTPUT')
      WRITE (8,09280)
09280 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,09290) DRIVL
09290 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,09300) DRIVS
09300 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,09310) DRIVE
09310 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,09320)
09320 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,09330) ADRIVL
09330 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,09340) ADRIVS
09340 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,09350) ADRIVE
09350 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,09360)
09360 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,09370) ADRIVT
09370 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,09380) DRIVTT
09380 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
```

```
C
C
      SUBROUTINE DROP
C
C   COSTS FOR DEVELOPING RAISES BY LONGHOLE OR DROPRAISING
METHODS
C
C    DROP
      REAL
     +            AREA10, LONG10,
     +            DROPL,  DROPS,  DROPE,
     +            LFCT11,
     +            HFCT10,
     +            HDF10L, HDF10S, HDF10E,
     +            SRF10L, SRF10S, SRF10E,
     +            AF10L,  AF10S,  AF10E,
     +            BF10L,  BF10S,  BF10E,
     +            ADROPL, ADROPS, ADROPE,
     +            ADROPT, DROPTT
C
C   READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=963) AREA10
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=968) LONG10
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DROPL =  58.314 * (AREA10 ** 0.374)
      DROPS = 136.383 * (AREA10 ** 0.205)
      DROPE =   8.895 * (AREA10 ** 0.711)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT10
      READ (7,30,REC=975) HFCT10
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF10L.....HDF10S.....HDF10E
      HDF10L = 0.388 * (HFCT10 ** 0.093)
      HDF10S = 0.579 * (HFCT10 ** 0.054)
      HDF10E = 0.033 * (HFCT10 ** 0.033)
C
C  SERVICE INSTALLTION FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C  SRF10L.....SRF10S.....SRF10E
```

```
      READ (7,40,REC=982) SRF10L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=999) SRF10S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=1016) SRF10E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF10L.....AF10S.....AF10E
      READ (7,70,REC=987) AF10L
      READ (7,70,REC=1004) AF10S
      READ (7,70,REC=1021) AF10E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF10L.....BF10S.....BF10E
      READ (7,80,REC=992) BF10L
      READ (7,80,REC=1009) BF10S
      READ (7,80,REC=1026) BF10E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADROPL = DROPL * HDF10L * SRF10L * AF10L * BF10L
      ADROPS = DROPS * HDF10S * SRF10S * AF10S * BF10S
      ADROPE = DROPE * HDF10E * SRF10E * AF10E * BF10E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ADROPT = ADROPL + ADROPS + ADROPE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DROP RAISE
      DROPTT = ADROPT * LONG10
C
C  PRINT ROUTINE FOR SUBROUTINE DROP.....
C
      WRITE (8,10009)
10009 FORMAT (//)
      WRITE (8,10010)
10010 FORMAT ('0','SUBROUTINE DROP, COSTS FOR DEVELOPING RAISES
     +BY LONGHOLE OR DROP-RAISING METHODS, USER DEFINED INPUT')
      WRITE (8,10020)
10020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,10030) LONG10
```

```
10030 FORMAT (8X,'UNITS TO BE RAISED     ',F17.2)
      WRITE (8,10040)
10040 FORMAT (4X,'RAISE FACE AREA IN SQUARE METERS')
      WRITE (8,10050) AREA10
10050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,10060)
10060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,10070) HFCT10
10070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10080)
10080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,10090) HDF10L
10090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,10100) SRF10L
10100 FORMAT (8X,'SERVICE INSTALLATION   ',F17.2)
      WRITE (8,10110) AF10L
10110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,10120) BF10L
10120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10130)
10130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,10140) HDF10S
10140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,10150) SRF10S
10150 FORMAT (8X,'SERVICE INSTALLTION    ',F17.2)
      WRITE (8,10160) AF10S
10160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,10170) BF10S
10170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10180)
10180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,10190) HDF10E
10190 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,10200) SRF10E
10200 FORMAT (8X,'SERVICE INSTALLTION    ',F17.2)
```

```
      WRITE (8,10210) AF10E
10210 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,10220) BF10E
10220 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,10230)
10230 FORMAT ('0','SUBROUTINE DROP, CALCULATED COSTS OUTPUT')
      WRITE (8,10240)
10240 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,10250) DROPL
10250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,10260) DROPS
10260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,10270) DROPE
10270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,10280)
10280 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,10290) ADROPL
10290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,10300) ADROPS
10300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,10310) ADROPE
10310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,10320)
10320 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,10330) ADROPT
10330 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,10340) DROPTT
10340 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
      SUBROUTINE RAISES
C
C
C   COSTS FOR DEVELOPING RAISES WITH UPWARD REAMED RAISE
BORING
C   METHODS
C
C    RAISES
```

```
      REAL
     +            AREA11, LONG11,
     +            RAISL,  RAISS,  RAISE,
     +            HFCT11, LFCT11,
     +            HDF11L, HDF11S, HDF11E,
     +            LF11L,  LF11S,  LF11E,
     +            LNF11L, LNF11S, LNF11E,
     +            SRF11L, SRF11S, SRF11E,
     +            AF11L,  AF11S,  AF11E,
     +            BF11L,  BF11S,  BF11E,
     +            ARAISL, ARAISS, ARAISE,
     +            ARAIST, RAISTT
C
C    READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=1035) AREA11
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1040) LONG11
   20 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      RAISL =  81.941 * (AREA11 ** 1.376)
      RAISS = 180.595 * (AREA11 ** 1.097)
      RAISE =  46.568 * (AREA11 ** 1.759)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    READ ROCK HARDNESS.....HFCT11
      READ (7,30,REC=1047) HFCT11
   30 FORMAT (15X,F17.2)
C    ROCK HARDNESS FACTORS.....HDF11L.....HDF11S.....HDF11E
      HDF11L = 0.0000018 * (HFCT11 ** 1.231)
      HDF11S = 0.0000018 * (HFCT11 ** 1.231)
      HDF11E = 0.0000018 * (HFCT11 ** 1.231)
C
C    RAISE BORING LENGTH FACTORS
C    READ SWITCH TURNING FACTOR ON OR OFF.....LFCT11
      READ (7,40,REC=1054) LFCT11
   40 FORMAT (15X,F17.2)
      IF (LFCT11.EQ.1) THEN
C    LENGTH FACTORS.....LF11L.....LF11S.....LF11E
      LF11L = 1.468 * (LONG11 ** (-0.080))
      LF11S = 1.468 * (LONG11 ** (-0.080))
      LF11E = 1.468 * (LONG11 ** (-0.080))
      ELSE
```

```
      LF11L = 1.0
      LF11S = 1.0
      LF11E = 1.0
      ENDIF
C
C   LINING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   LNF11L.....LNF11S.....LNF11E
      READ (7,50,REC=1061) LNF11L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=1083) LNF11S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=1105) LNF11E
   70 FORMAT (15X,F17.2)
C
C   SERVICE INSTALLTION FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT....
C   SRF11L.....SRF11S.....SRF11E
      READ (7,80,REC=1066) SRF11L
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=1088) SRF11S
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=1110) SRF11E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF11L.....AF11S.....AF11E
      READ (7,110,REC=1071) AF11L
      READ (7,110,REC=1093) AF11S
      READ (7,110,REC=1115) AF11E
  110 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF11L.....BF11S.....BF11E
      READ (7,120,REC=1076) BF11L
      READ (7,120,REC=1098) BF11S
      READ (7,120,REC=1120) BF11E
  120 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ARAISL = RAISL * HDF11L * LF11L * LNF11L * SRF11L *
     +         AF11L * BF11L
      ARAISS = RAISS * HDF11S * LF11S * LNF11S * SRF11S *
```

```
     +          AF11S * BF11S
      ARAISE = RAISE * HDF11E * LF11E * LNF11E * SRF11E *
     +          AF11E * BF11E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ARAIST = ARAISL + ARAISS + ARAISE
C
C   CALCULATE COST OF TOTAL LENGHT OF RAISE
      RAISTT = ARAIST * LONG11
C
C
C  PRINT ROUTINE FOR SUBROUTINE RAISES.....
C
      WRITE (8,11009)
11009 FORMAT (//)
      WRITE (8,11010)
11010 FORMAT ('0','SUBROUTINE RAISES, COSTS FOR DEVELOPING
RAISES
     +WITH UPWARD REAMED RAISE BORING, USER DEFINED INPUT')
      WRITE (8,11020)
11020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,11030) LONG11
11030 FORMAT (8X,'UNITS TO BE RAISED     ',F17.2)
      WRITE (8,11040)
11040 FORMAT (4X,'RAISE FACE AREA IN SQUARE METERS')
      WRITE (8,11050) AREA11
11050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,11060)
11060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,11070) HFCT11
11070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
      WRITE (8,11080)
11080 FORMAT (4X,'LENGTH FACTOR, YES=1, NO=0')
      WRITE (8,11090) LFCT11
11090 FORMAT (8X,'LENGTH FACTOR          ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,11100)
11100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,11110) HDF11L
11110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11120) LNF11L
11120 FORMAT (8X,'LENGTH                 ',F17.2)
```

```
      WRITE (8,11130) SRF11L
11130 FORMAT (8X,'SERVICE INSTALLATION   ',F17.2)
      WRITE (8,11140) AF11L
11140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11150) BF11L
11150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,11160)
11160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,11170) HDF11S
11170 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11180) LNF11S
11180 FORMAT (8X,'LENGTH                 ',F17.2)
      WRITE (8,11190) SRF11S
11190 FORMAT (8X,'SERVICE INSTALLATION   ',F17.2)
      WRITE (8,11200) AF11S
11200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11210) BF11S
11210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,11220)
11220 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,11230) HDF11E
11230 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11240) LNF11E
11240 FORMAT (8X,'LENGTH                 ',F17.2)
      WRITE (8,11250) SRF11E
11250 FORMAT (8X,'SERVICE INSTALLATION   ',F17.2)
      WRITE (8,11260) AF11E
11260 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11270) BF11E
11270 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,11280)
11280 FORMAT ('0','SUBROUTINE RAISES, CALCULATED COSTS OUTPUT')
      WRITE (8,11290)
11290 FORMAT ('0',4X,'BASE COST PER UNIT')
```

```
      WRITE (8,11300) RAISL
11300 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,11310) RAISS
11310 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,11320) RAISE
11320 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,11330)
11330 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,11340) ARAISL
11340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,11350) ARAISS
11350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,11360) ARAISE
11360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,11370)
11370 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,11380) ARAIST
11380 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,11390) RAISTT
11390 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE DECLIN
C
C     DECLIN
      REAL
     +            AREA12, LONG12,
     +            RAMPL,  RAMPS,  RAMPE,
     +            HFCT12,
     +            HDF12L, HDF12S, HDF12E,
     +            BTF12L, BTF12S, BTF12E,
     +            STF12L, STF12S, STF12E,
     +            CCF12L, CCF12S, CCF12E,
     +            SSF12L, SSF12S, SSF12E,
     +            AF12L,  AF12S,  AF12E,
     +            BF12L,  BF12S,  BF12E,
     +            ARAMPL, ARAMPS, ARAMPE,
     +            ARAMPT, RAMPTT
C
C     COSTS FOR DEVELOPING INCLINE OR DECLINE PASSAGES
```

```
C
C   READ INCLINE-DECLINE FACE AREA AND TOTAL LENGHT FROM
DATA FILE
      READ (7,10,REC=1129) AREA12
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1134) LONG12
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      RAMPL = 42.779 * (AREA12 ** 0.789)
      RAMPS = 48.709 * (AREA12 ** 0.567)
      RAMPE =  1.498 * (AREA12 ** 1.303)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT12
      READ (7,30,REC=1141) HFCT12
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF12L.....HDF12S.....HDF12E
      HDF12L = 0.388 * (HFCT12 ** 0.093)
      HDF12S = 0.579 * (HFCT12 ** 0.054)
      HDF12E = 0.715 * (HFCT12 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF12L.....BTF12S.....BTF12E
      READ (7,40,REC=1148) BTF12L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=1180) BTF12S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=1212) BTF12E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF12L.....STF12S.....STF12E
      READ (7,70,REC=1153) STF12L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=1185) STF12S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=1217) STF12E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   CCF12L.....CCF12S.....CCF12E
```

```
      READ (7,100,REC=1158) CCF12L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=1190) CCF12S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=1222) CCF12E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF12L.....SSF12S.....SSF12E
      READ (7,130,REC=1163) SSF12L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=1195) SSF12S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=1227) SSF12E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF12L.....AF12S.....AF12E
      READ (7,160,REC=1168) AF12L
      READ (7,160,REC=1200) AF12S
      READ (7,160,REC=1232) AF12E
  160 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF12L.....BF12S.....BF12E
      READ (7,170,REC=1173) BF12L
      READ (7,170,REC=1205) BF12S
      READ (7,170,REC=1237) BF12E
  170 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ARAMPL = RAMPL * HDF12L * BTF12L * STF12L * CCF12L *
     +         SSF12L * AF12L * BF12L
      ARAMPS = RAMPS * HDF12S * BTF12S * STF12S * CCF12S *
     +         SSF12S * AF12S * BF12S
      ARAMPE = RAMPE * HDF12E * BTF12E * STF12E * CCF12E *
     +         SSF12E * AF12E * BF12E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF
INCLINE-DECLINE
      ARAMPT = ARAMPL + ARAMPS + ARAMPE
C
```

```
C   CALCULATE TOTAL COSTS FOR ENTIRE INCLINE-DECLINE LENGTH
      RAMPTT = ARAMPT * LONG12
C
C  PRINT ROUTINE FOR SUBROUTINE DECLIN.....
C
      WRITE (8,12009)
12009 FORMAT (//)
      WRITE (8,12010)
12010 FORMAT ('0','SUBROUTINE DECLIN, COSTS FOR DEVELOPING
     +INCLINE OR DECLINE RAMPS, USER DEFINED INPUT')
      WRITE (8,12020)
12020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DECLINE')
      WRITE (8,12030) LONG12
12030 FORMAT (8X,'UNITS TO BE DEVELOPED  ',F17.2)
      WRITE (8,12040)
12040 FORMAT (4X,'DECLINE FACE AREA IN SQUARE METERS')
      WRITE (8,12050) AREA12
12050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,12060)
12060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,12070) HFCT12
12070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,12080)
12080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,12090) HDF12L
12090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,12100) BTF12L
12100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,12110) STF12L
12110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,12120) CCF12L
12120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,12130) SSF12L
12130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,12140) AF12L
12140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12150) BF12L
12150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
```

```
      WRITE (8,12160)
12160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,12170) HDF12S
12170 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,12180) BTF12S
12180 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,12190) STF12S
12190 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,12200) CCF12S
12200 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,12210) SSF12S
12210 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,12220) AF12S
12220 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12230) BF12S
12230 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,12240)
12240 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,12250) HDF12E
12250 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,12260) BTF12E
12260 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,12270) STF12E
12270 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,12280) CCF12E
12280 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,12290) SSF12E
12290 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,12300) AF12E
12300 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12310) BF12E
12310 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,12320)
12320 FORMAT ('0','SUBROUTINE DECLIN, CALCULATED COSTS OUTPUT')
      WRITE (8,12330)
12330 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,12340) RAMPL
```

```
12340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,12350) RAMPS
12350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,12360) RAMPE
12360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,12370)
12370 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,12380) ARAMPL
12380 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,12390) ARAMPS
12390 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,12400) ARAMPE
12400 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,12410)
12410 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,12420) ARAMPT
12420 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,12430) RAMPTT
12430 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LGROOM
C
C     LGROOM
      REAL
     +            AREA13, LONG13,
     +            ROOML,  ROOMS,  ROOME,
     +            TKF13L, TKF13S, TKF13E,
     +            STF13L, STF13S, STF13E,
     +            AF13L,  AF13S,  AF13E,
     +            BF13L,  BF13S,  BF13E,
     +            AROOML, AROOMS, AROOME,
     +            AROOMT, ROOMTT
C
C     COSTS FOR DEVELOPING LARGE UNDERGROUND EXCAVATIONS
C
C     READ ROOM WALL FACE AREA AND TOTAL LENGTH OF EXCAVATION
FROM
C     DATA FILE
C
```

```
      READ (7,10,REC=1246) AREA13
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1251) LONG13
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      ROOML = 10.817 * (AREA13 ** 0.947)
      ROOMS = 23.050 * (AREA13 ** 0.793)
      ROOME =  1.739 * (AREA13 ** 0.917)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TRACK HAULAGE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   TKF13L.....TKF13S.....TKF13E
      READ (7,30,REC=1258) TKF13L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=1280) TKF13S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=1302) TKF13E
   50 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF13L.....STF13S.....STF13E
      READ (7,60,REC=1263) STF13L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=1285) STF13S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=1307) STF13E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF13L.....AF13S.....AF13E
      READ (7,90,REC=1268) AF13L
      READ (7,90,REC=1290) AF13S
      READ (7,90,REC=1312) AF13E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF13L.....BF13S.....BF13E
      READ (7,100,REC=1273) BF13L
      READ (7,100,REC=1295) BF13S
```

```
      READ (7,100,REC=1317) BF13E
  100 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AROOML = ROOML * TKF13L * STF13L * AF13L * BF13L
      AROOMS = ROOMS * TKF13S * STF13S * AF13S * BF13S
      AROOME = ROOME * TKF13E * STF13E * AF13E * BF13E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF EXCAVATION
      AROOMT = AROOML + AROOMS + AROOME
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF EXCAVATION
      ROOMTT = AROOMT * LONG13
C
C  PRINT ROUTINE FOR SUBROUTINE LGROOM.....
C
      WRITE (8,13009)
13009 FORMAT (//)
      WRITE (8,13010)
13010 FORMAT ('0','SUBROUTINE LGROOM, COSTS FOR DEVELOPING
LARGE
     +UNDERGROUND EXCAVATIONS, USER DEFINED INPUT')
      WRITE (8,13020)
13020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF ROOM')
      WRITE (8,13030) LONG13
13030 FORMAT (8X,'UNITS TO BE EXCAVATED  ',F17.2)
      WRITE (8,13040)
13040 FORMAT (4X,'ROOM WALL FACE AREA IN SQUARE METERS')
      WRITE (8,13050) AREA13
13050 FORMAT (8X,'FACE AREA             ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,13060)
13060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,13070) TKF13L
13070 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,13080) STF13L
13080 FORMAT (8X,'SHOTCRETE             ',F17.2)
      WRITE (8,13090) AF13L
13090 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13100) BF13L
13100 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,13110)
13110 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,13120) TKF13S
13120 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,13130) STF13S
13130 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,13140) AF13S
13140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13150) BF13S
13150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,13160)
13160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,13170) TKF13E
13170 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,13180) STF13E
13180 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,13190) AF13E
13190 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13200) BF13E
13200 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,13210)
13210 FORMAT ('0','SUBROUTINE LGROOM, CALCULATED COSTS
OUTPUT')
      WRITE (8,13220)
13220 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,13230) ROOML
13230 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,13240) ROOMS
13240 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,13250) ROOME
13250 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,13260)
13260 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,13270) AROOML
13270 FORMAT (8X,'LABOR                  ',F17.2)
```

```
      WRITE (8,13280) AROOMS
13280 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,13290) AROOME
13290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,13300)
13300 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,13310) AROOMT
13310 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,13320) ROOMTT
13320 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HPANEL
C
C     HPANEL
      REAL
     +            AREA14,
     +            HPANL,  HPANS,  HPANE,
     +            HFCT14,
     +            HDF14L, HDF14S, HDF14E,
     +            AF14L,  AF14S,  AF14E,
     +            BF14L,  BF14S,  BF14E,
     +            AHPANL, AHPANS, AHPANE,
     +            AHPANT, HPANTT
C
C   COSTS FOR PREPARING A PANEL FOR PRODUCTION IN HARD
MATERIAL
C
C   READ PLAN VIEW AREA OF PANEL FROM DATA FILE
      READ (7,10,REC=1326) AREA14
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      HPANL = 4.019 * (AREA14 ** 0.890)
      HPANS = 2.686 * (AREA14 ** 0.997)
      HPANE = 0.046 * (AREA14 ** 1.128)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT14
```

```
      READ (7,20,REC=1333) HFCT14
   20 FORMAT (15X,F17.2)
C    ROCK HARDNESS FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C    HDF14L.....HDF14S.....HDF14E
      HDF14L = 0.388 * (HFCT14 ** 0.093)
      HDF14S = 0.579 * (HFCT14 ** 0.054)
      HDF14E = 0.715 * (HFCT14 ** 0.033)
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C    AF14L.....AF14S.....AF14E
      READ (7,30,REC=1340) AF14L
      READ (7,30,REC=1352) AF14S
      READ (7,30,REC=1364) AF14E
   30 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C    BF14L.....BF14S.....BF14E
      READ (7,40,REC=1345) BF14L
      READ (7,40,REC=1357) BF14S
      READ (7,40,REC=1369) BF14E
   40 FORMAT (15X,F17.2)
C
C    CALCULATE ADJUSTED COSTS
      AHPANL = HPANL * HDF14L * AF14L * BF14L
      AHPANS = HPANS * HDF14S * AF14S * BF14S
      AHPANE = HPANE * HDF14E * AF14E * BF14E
C
C    CALCULATE TOTAL ADJUSTED COST FOR PANEL PLAN AREA
      AHPANT = (AHPANL + AHPANS + AHPANE)/AREA14
C
C    CALCULATE TOTAL COST FOR ENTIRE PANEL
      HPANTT = AHPANT*AREA14
C
C   PRINT ROUTINE FOR SUBROUTINE HPANEL.....
C
      WRITE (8,14009)
14009 FORMAT (//)
      WRITE (8,14010)
14010 FORMAT ('0','SUBROUTINE HPANEL, COSTS FOR DEVELOPING
PANELS
     +FOR PRODUCTION IN HARD ROCK, USER DEFINED INPUT')
      WRITE (8,14020)
```

```
14020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL SQUARE METERS
     +OF PANEL IN PLAN VIEW')
      WRITE (8,14030) AREA14
14030 FORMAT (4X,'PLAN VIEW AREA, SQ. METERS',F17.2)
      WRITE (8,14040) HFCT14
14040 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,14050)
14050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,14060) HDF14L
14060 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14070) AF14L
14070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14080) BF14L
14080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,14090)
14090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,14100) HDF14S
14100 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14110) AF14S
14110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14120) BF14S
14120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,14130)
14130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,14140) HDF14E
14140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14150) AF14E
14150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14160) BF14E
14160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,14170)
```

```
14170 FORMAT ('0','SUBROUTINE HPANEL, CALCULATED COSTS OUTPUT')
      WRITE (8,14180)
14180 FORMAT ('0',4X,'BASE COST FOR PANEL UNIT')
      WRITE (8,14190) HPANL
14190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,14200) HPANS
14200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,14210) HPANE
14210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,14220)
14220 FORMAT ('0',4X,'ADJUSTED COST PER PANEL UNIT')
      WRITE (8,14230) AHPANL
14230 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,14240) AHPANS
14240 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,14250) AHPANE
14250 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,14260)
14260 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,14270) AHPANT
14270 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,14280) HPANTT
14280 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SPANEL
C
C
C     SPANEL
      REAL
     +            AREA15,
     +            SPANL, SPANS, SPANE,
     +            HFCT15,
     +            HDF15L, HDF15S, HDF15E,
     +            AF15L, AF15S, AF15E,
     +            BF15L, BF15S, BF15E,
     +            ASPANL, ASPANS, ASPANE,
     +            ASPANT, SPANTT
C
C     COSTS FOR PREPARING A PANEL FOR PRODUCTION IN SOFT
```

```
MATERIAL
C
C   READ PLAN VIEW AREA OF PANEL FROM DATA FILE
      READ (7,10,REC=1378) AREA15
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      SPANL = 43.903 * (AREA15 ** 0.557)
      SPANS = 20.909 * (AREA15 ** 0.632)
      SPANE =  0.117 * (AREA15 ** 0.908)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT15
      READ (7,20,REC=1385) HFCT15
   20 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   HDF15L.....HDF15S.....HDF15E
      HDF15L = 0.388 * (HFCT15 ** 0.093)
      HDF15S = 0.579 * (HFCT15 ** 0.054)
      HDF15E = 0.715 * (HFCT15 ** 0.033)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF15L.....AF15S.....AF15E
      READ (7,30,REC=1392) AF15L
      READ (7,30,REC=1404) AF15S
      READ (7,30,REC=1416) AF15E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF15L.....BF15S.....BF15E
      READ (7,40,REC=1397) BF15L
      READ (7,40,REC=1409) BF15S
      READ (7,40,REC=1421) BF15E
   40 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASPANL = SPANL * HDF15L * AF15L * BF15L
      ASPANS = SPANS * HDF15S * AF15S * BF15S
      ASPANE = SPANE * HDF15E * AF15E * BF15E
C
C   CALCULATE TOTAL ADJUSTED COST FOR PANEL PLAN AREA
```

```
      ASPANT = (ASPANL + ASPANS + ASPANE)/AREA15
C
C   CALCULATE TOTAL COST FOR ENTIRE PANEL
      SPANTT = ASPANT*AREA15
C
C  PRINT ROUTINE FOR SUBROUTINE SPANEL.....
C
      WRITE (8,15009)
15009 FORMAT (//)
      WRITE (8,15010)
15010 FORMAT ('0','SUBROUTINE SPANEL, COSTS FOR DEVELOPING
PANELS
     +FOR PRODUCTION IN SOFT ROCK, USER DEFINED INPUT')
      WRITE (8,15020)
15020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL SQUARE METERS
     +OF PANEL IN PLAN VIEW')
      WRITE (8,15030) AREA15
15030 FORMAT (4X,'PLAN VIEW AREA, SQ. METERS,    ',F17.2)
      WRITE (8,15040) HFCT15
15040 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,15050)
15050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,15060) HDF15L
15060 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15070) AF15L
15070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,15080) BF15L
15080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,15090)
15090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,15100) HDF15S
15100 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15110) AF15S
15110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,15120) BF15S
15120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,15130)
15130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,15140) HDF15E
15140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15150) AF15E
15150 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,15160) BF15E
15160 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,15170)
15170 FORMAT ('0','SUBROUTINE SPANEL, CALCULATED COSTS OUTPUT')
      WRITE (8,15180)
15180 FORMAT ('0',4X,'BASE COST FOR PANEL UNIT')
      WRITE (8,15190) SPANL
15190 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,15200) SPANS
15200 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,15210) SPANE
15210 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,15220)
15220 FORMAT ('0',4X,'ADJUSTED COST PER PANEL UNIT')
      WRITE (8,15230) ASPANL
15230 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,15240) ASPANS
15240 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,15250) ASPANE
15250 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,15260)
15260 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,15270) ASPANT
15270 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,15280) SPANTT
15280 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE PUMP1
C
```

```
C   COSTS FOR ACQUISITION AND INSTALLATION OF VERTICAL TURBINE
PUMPS
C
C    PUMP1
     REAL
    +            FLOW16,
    +            PMP1L,  PMP1S,  PMP1E,
    +            AF16L,  AF16S,  AF16E,
    +            BF16L,  BF16S,  BF16E,
    +            APMP1L, APMP1S, APMP1E,
    +            APMP1T, PMP1TT
C
C   READ CUBIC METERS OF WATER TO BE PUMPED PER DAY FROM
DATA FILE
     READ (7,10,REC=1430) FLOW16
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
     PMP1L =  6.544 * (FLOW16 ** 0.718)
     PMP1S =  2.181 * (FLOW16 ** 0.718)
     PMP1E = 95.150 * (FLOW16 ** 0.718)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF16L.....AF16S.....AF16E
     READ (7,20,REC=1438) AF16L
     READ (7,20,REC=1450) AF16S
     READ (7,20,REC=1462) AF16E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF16L.....BF16S.....BF16E
     READ (7,30,REC=1443) BF16L
     READ (7,30,REC=1455) BF16S
     READ (7,30,REC=1467) BF16E
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
     APMP1L = PMP1L * AF16L * BF16L
     APMP1S = PMP1S * AF16S * BF16S
     APMP1E = PMP1E * AF16E * BF16E
C
C   CALCULATE TOTAL ADJUSTED COST
```

```
      APMP1T = APMP1L + APMP1S + APMP1E
C
C   CALCULATE TOTAL COST
      PMP1TT = APMP1T
C
C  PRINT ROUTINE FOR SUBROUTINE PUMP1.....
C
      WRITE (8,16009)
16009 FORMAT (//)
      WRITE (8,16010)
16010 FORMAT ('0','SUBROUTINE PUMP1, COSTS FOR ACQUISITION AND
     +INSTALLATION OF VERTICAL TURBINE PUMPS, USER DEFINED
INPUT')
      WRITE (8,16020)
16020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TOTAL CUBIC METERS OF
WATER
     +PUMPED PER DAY')
      WRITE (8,16030) FLOW16
16030 FORMAT (8X,'UNITS TO BE PUMPED      ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16040)
16040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,16050) AF16L
16050 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,16060) BF16L
16060 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16070)
16070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,16080) AF16S
16080 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,16090) BF16S
16090 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16100)
16100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,16110) AF16E
16110 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
```

```
      WRITE (8,16120) BF16E
16120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,16130)
16130 FORMAT ('0','SUBROUTINE PUMP1, CALCULATED COSTS OUTPUT')
      WRITE (8,16140)
16140 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,16150) PMP1L
16150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,16160) PMP1S
16160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,16170) PMP1E
16170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,16180)
16180 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,16190) APMP1L
16190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,16200) APMP1S
16200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,16210) APMP1E
16210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,16220)
16220 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,16230) APMP1T
16230 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,16240) PMP1TT
16240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE PUMP2
C
C   COSTS FOR DEWATERING THE MINE DURING PREPRODUCTION
DEVELOPMENT
C
C     PUMP2
      REAL
     +            FLOW17, DAYS17,
```

```
     +            PMP2L,  PMP2S,  PMP2E,
     +            VFCT17,
     +            DYF17L, DYF17S, DYF17E,
     +            DF17L,  DF17S,  DF17E,
     +            AF17L,  AF17S,  AF17E,
     +            BF17L,  BF17S,  BF17E,
     +            APMP2L, APMP2S, APMP2E,
     +            APMP2T, PMP2TT
C
C   READ CUBIC METERS OF WATER TO BE PUMPED PER DAY AND
NUMBER OF
C   DAYS ALLOWED FOR DEWATERING FROM DATA FILE
      READ (7,10,REC=1476) FLOW17
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1481) DAYS17
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      PMP2L = 3283.826 * (FLOW17 ** 0.368)
      PMP2S =    1.438 * (FLOW17 ** 1.177)
      PMP2E =    0.017 * (FLOW17 ** 1.143)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TOTAL PUMPING HEIGHT OUT OF MINE....VFCT17
      READ (7,30,REC=1488) VFCT17
   30 FORMAT (15X,F17.2)
C   DYNAMIC HEAD FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DYF17L.....DYF17S.....DYF17E
      DYF17L = 0.003 * VFCT17
      DYF17S = 0.003 * VFCT17
      DYF17E = 0.003 * VFCT17
C
C   PUMPING DAYS FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DF17L.....DF17S.....DF17E
      DF17L = 0.008333 * (DAYS17)
      DF17S = 0.008333 * (DAYS17)
      DF17E = 0.008333 * (DAYS17)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF17L.....AF17S.....AF17E
      READ (7,40,REC=1495) AF17L
      READ (7,40,REC=1507) AF17S
```

```
      READ (7,40,REC=1519) AF17E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF17L.....BF17S.....BF17E
      READ (7,50,REC=1500) BF17L
      READ (7,50,REC=1512) BF17S
      READ (7,50,REC=1524) BF17E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      APMP2L = PMP2L * DYF17L * DF17L * AF17L * BF17L
      APMP2S = PMP2S * DYF17S * DF17S * AF17S * BF17S
      APMP2E = PMP2E * DYF17E * DF17E * AF17E * BF17E
C
C   CALCULATE TOTAL ADJUSTED COST
      APMP2T = APMP2L + APMP2S + APMP2E
C
C   CALCULATE TOTAL COST
      PMP2TT = APMP2T
C
C  PRINT ROUTINE FOR SUBROUTINE PUMP2.....
C
      WRITE (8,17009)
17009 FORMAT (//)
      WRITE (8,17010)
17010 FORMAT ('0','SUBROUTINE PUMP2, COSTS FOR DEWATERING THE
MINE
     +DURING PREPRODUCTION DEVELOPMENT, USER DEFINED INPUT')
      WRITE (8,17020)
17020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL CUBIC METERS
     +OF WATER PUMPED PER DAY')
      WRITE (8,17030) FLOW17
17030 FORMAT (8X,'CUBIC METERS PER DAY    ',F17.2)
      WRITE (8,17040)
17040 FORMAT (4X,'DAYS ALLOWED FOR DEWATERING')
      WRITE (8,17050) DAYS17
17050 FORMAT (8X,'DAYS TO DEWATER        ',F17.2)
      WRITE (8,17060)
17060 FORMAT (4X,'DYNAMIC HEAD FACTOR')
      WRITE (8,17070) VFCT17
17070 FORMAT (8X,'HEIGHT OUT OF MINE     ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,17080)
17080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,17090) DYF17L
17090 FORMAT (8X,'DYNAMIC HEAD          ',F17.2)
      WRITE (8,17100) DF17L
17100 FORMAT (8X,'DAYS FOR PUMPING      ',F17.2)
      WRITE (8,17110) AF17L
17110 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,17120) BF17L
17120 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,17130)
17130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,17140) DYF17S
17140 FORMAT (8X,'DYNAMIC HEAD          ',F17.2)
      WRITE (8,17150) DF17S
17150 FORMAT (8X,'DAYS FOR PUMPING      ',F17.2)
      WRITE (8,17160) AF17S
17160 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,17170) BF17S
17170 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,17180)
17180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,17190) DYF17E
17190 FORMAT (8X,'DYNAMIC HEAD          ',F17.2)
      WRITE (8,17200) DF17E
17200 FORMAT (8X,'DAYS FOR PUMPING      ',F17.2)
      WRITE (8,17210) AF17E
17210 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,17220) BF17E
17220 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,17230)
17230 FORMAT ('0','SUBROUTINE PUMP2, CALCULATED COSTS OUTPUT.
```

```
     +NOTE: THESE COSTS ARE FOR PUMPING THE TOTAL CUBIC METER
     +      REQUIREMENT FOR THE TOTAL NUMBER OF DAYS SPECIFIED.
     +      i.e. COSTS ARE FOR TOTAL DEWATERING PROJECT.....')
      WRITE (8,17240)
17240 FORMAT ('0',4X,'BASE COST FOR DEWATERING')
      WRITE (8,17250) PMP2L
17250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,17260) PMP2S
17260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,17270) PMP2E
17270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,17280)
17280 FORMAT ('0',4X,'ADJUSTED COST FOR DEWATERING')
      WRITE (8,17290) APMP2L
17290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,17300) APMP2S
17300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,17310) APMP2E
17310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,17320)
17320 FORMAT ('0',4X,'TOTAL COSTS FOR DEWATERING')
      WRITE (8,17330) APMP2T
17330 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,17340) PMP2TT
17340 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HOISTD
C
C     HOISTD
      REAL
     +            TONS18,
     +            DRUML,  DRUMS,  DRUME,
     +            VFCT18,
     +            DPF18L, DPF18S, DPF18E,
     +            SFCT18,
     +            AF18L,  AF18S,  AF18E,
     +            BF18L,  BF18S,  BF18E,
     +            ADRUML, ADRUMS, ADRUME,
     +            ADRUMT, DRUMTT
```

```
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF DOUBLE DRUM
HOIST
C
C   READ TOTAL METRIC TONS CAPACITY PER DAY TO BE HOISTED
C
      READ (7,10,REC=1533) TONS18
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DRUML = 2426.354 * (TONS18 ** 1.026)
      DRUMS = 5216.661 * (TONS18 ** 1.026)
      DRUME = 4488.754 * (TONS18 ** 1.026)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TOTAL DEPTH TO BE HOISTED.....VFCT18
      READ (7,20,REC=1540) VFCT18
   20 FORMAT (15X,F17.2)
C   HOISTING DEPTH FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DPF18L.....DPF18S.....DPF18E
      DPF18L = 0.094 * (VFCT18 ** (0.345))
      DPF18S = 0.094 * (VFCT18 ** (0.345))
      DPF18E = 0.094 * (VFCT18 ** (0.345))
C
C   SERVICE HOIST FACTOR.....SFCT18
      READ (7,30,REC=1547) SFCT18
   30 FORMAT (15X,F17.2)
      IF (SFCT18.EQ.1) THEN
      DRUML = 2426.354 * ((TONS18 * 0.33) ** 1.026)
      DRUMS = 5216.661 * ((TONS18 * 0.33) ** 1.026)
      DRUME = 4488.754 * ((TONS18 * 0.33) ** 1.026)
      ELSE
      ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF18L.....AF18S.....AF18E
      READ (7,40,REC=1554) AF18L
      READ (7,40,REC=1566) AF18S
      READ (7,40,REC=1578) AF18E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
```

```
EQUIPMENT..
C   BF18L.....BF18S.....BF18E
      READ (7,50,REC=1559) BF18L
      READ (7,50,REC=1571) BF18S
      READ (7,50,REC=1583) BF18E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRUML = DRUML * DPF18L * AF18L * BF18L
      ADRUMS = DRUMS * DPF18S * AF18S * BF18S
      ADRUME = DRUME * DPF18E * AF18E * BF18E
C
C   CALCULATE TOTAL ADJUSTED COST
      ADRUMT = ADRUML + ADRUMS + ADRUME
C
C   CALCULATE TOTAL COST
      DRUMTT = ADRUMT
C
C  PRINT ROUTINE FOR SUBROUTINE HOISTD.....
C
      WRITE (8,18009)
18009 FORMAT (//)
      WRITE (8,18010)
18010 FORMAT ('0','SUBROUTINE HOISTD, COSTS FOR ACQUISITION AND
     +INSTALLATION OF DOUBLE DRUM HOIST, USER DEFINED INPUT')
      WRITE (8,18020)
18020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +HOISTED PER DAY')
      WRITE (8,18030) TONS18
18030 FORMAT (8X,'TONS TO BE HOISTED      ',F17.2)
      WRITE (8,18040)
18040 FORMAT (4X,'TOTAL DEPTH TO BE HOISTED IN METERS')
      WRITE (8,18050) VFCT18
18050 FORMAT (8X,'TOTAL DEPTH (meters)   ',F17.2)
      WRITE (8,18060)
18060 FORMAT (4X,'SERVICE HOIST FACTOR, YES=1, NO=0')
      WRITE (8,18070) SFCT18
18070 FORMAT (8X,'SERVICE FACTOR         ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,18080)
18080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,18090) DPF18L
```

```
18090 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,18100) AF18L
18100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,18110) BF18L
18110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,18120)
18120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,18130) DPF18S
18130 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,18140) AF18S
18140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,18150) BF18S
18150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,18160)
18160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,18170) DPF18E
18170 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,18180) AF18E
18180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,18190) BF18E
18190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,18200)
18200 FORMAT ('0','SUBROUTINE HOISTD, CALCULATED COSTS OUTPUT')
      WRITE (8,18210)
18210 FORMAT ('0',4X,'BASE COST PER HOIST')
      WRITE (8,18220) DRUML
18220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,18230) DRUMS
18230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,18240) DRUME
18240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,18250)
18250 FORMAT ('0',4X,'ADJUSTED COST PER HOIST')
      WRITE (8,18260) ADRUML
```

```
18260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,18270) ADRUMS
18270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,18280) ADRUME
18280 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,18290)
18290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,18300) ADRUMT
18300 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,18310) DRUMTT
18310 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HOISTF
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF FRICTION HOIST
C
C     HOISTF
      REAL
     +            TONS19,
     +            FRICL,  FRICS,  FRICE,
     +            VFCT19,
     +            DPF19L, DPF19S, DPF19E,
     +            SFCT19,
     +            AF19L,  AF19S,  AF19E,
     +            BF19L,  BF19S,  BF19E,
     +            AFRICL, AFRICS, AFRICE,
     +            AFRICT, FRICTT
C
C   READ TOTAL METRIC TONS CAPACITY PER DAY TO BE HOISTED
C
      READ (7,10,REC=1592) TONS19
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      FRICL = 1670.281 * (TONS19 ** 0.918)
      FRICS = 2783.801 * (TONS19 ** 0.918)
      FRICE = 4825.256 * (TONS19 ** 0.918)
C
```

```
C   CONSIDER ADJUSTMENT FACTORS
C
C   TOTAL DEPTH TO BE HOISTED.....VFCT19
      READ (7,20,REC=1599) VFCT19
   20 FORMAT (15X,F17.2)
C   HOISTING DEPTH FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DPF19L.....DPF19S.....DPF19E
      DPF19L = 0.112 * (VFCT19 ** (0.322))
      DPF19S = 0.112 * (VFCT19 ** (0.322))
      DPF19E = 0.112 * (VFCT19 ** (0.322))
C
C   SERVICE HOIST FACTOR.....SFCT19
      READ (7,30,REC=1606) SFCT19
   30 FORMAT (15X,F17.2)
      IF (SFCT19.EQ.1) THEN
      FRICL = 1670.281 * ((TONS19 * 0.33) ** 0.918)
      FRICS = 2783.801 * ((TONS19 * 0.33) ** 0.918)
      FRICE = 4825.256 * ((TONS19 * 0.33) ** 0.918)
      ELSE
      ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF19L.....AF19S.....AF19E
      READ (7,40,REC=1613) AF19L
      READ (7,40,REC=1625) AF19S
      READ (7,40,REC=1637) AF19E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF19L.....BF19S.....BF19E
      READ (7,50,REC=1618) BF19L
      READ (7,50,REC=1630) BF19S
      READ (7,50,REC=1642) BF19E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AFRICL = FRICL * DPF19L * AF19L * BF19L
      AFRICS = FRICS * DPF19S * AF19S * BF19S
      AFRICE = FRICE * DPF19E * AF19E * BF19E
C
C   CALCULATE TOTAL ADJUSTED COST
      AFRICT = AFRICL + AFRICS + AFRICE
```

```
C
C  CALCULATE TOTAL COST
      FRICTT = AFRICT
C
C  PRINT ROUTINE FOR SUBROUTINE HOISTF.....
C
      WRITE (8,19009)
19009 FORMAT (//)
      WRITE (8,19010)
19010 FORMAT ('0','SUBROUTINE HOISTF, COSTS FOR ACQUISITION AND
     +INSTALLATION OF FRICTION HOIST, USER DEFINED INPUT')
      WRITE (8,19020)
19020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +HOISTED PER DAY')
      WRITE (8,19030) TONS19
19030 FORMAT (8X,'TONS TO BE HOISTED     ',F17.2)
      WRITE (8,19040)
19040 FORMAT (4X,'TOTAL DEPTH TO BE HOISTED IN METERS')
      WRITE (8,19050) VFCT19
19050 FORMAT (8X,'TOTAL DEPTH (meters)   ',F17.2)
      WRITE (8,19060)
19060 FORMAT (4X,'SERVICE HOIST FACTOR, YES=1, NO=0')
      WRITE (8,19070) SFCT19
19070 FORMAT (8X,'SERVICE FACTOR         ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,19080)
19080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,19090) DPF19L
19090 FORMAT (8X,'DEPTH                  ',F17.2)
      WRITE (8,19100) AF19L
19100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,19110) BF19L
19110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,19120)
19120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,19130) DPF19S
19130 FORMAT (8X,'DEPTH                  ',F17.2)
      WRITE (8,19140) AF19S
19140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
```

```
      WRITE (8,19150) BF19S
19150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,19160)
19160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,19170) DPF19E
19170 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,19180) AF19E
19180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,19190) BF19E
19190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,19200)
19200 FORMAT ('0','SUBROUTINE HOISTF, CALCULATED COSTS OUTPUT')
      WRITE (8,19210)
19210 FORMAT ('0',4X,'BASE COST PER HOIST')
      WRITE (8,19220) FRICL
19220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,19230) FRICS
19230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,19240) FRICE
19240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,19250)
19250 FORMAT ('0',4X,'ADJUSTED COST PER HOIST')
      WRITE (8,19260) AFRICL
19260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,19270) AFRICS
19270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,19280) AFRICE
19280 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,19290)
19290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,19300) AFRICT
19300 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,19310) FRICTT
19310 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
```

```
C
      SUBROUTINE JUMBOS
C
C
C   COSTS FOR ACQUISTION OF DRILL AND BLAST EQUIPMENT FOR USE
WITH
C   JUMBOS AS PRIMARY PRODUCTION EQUIPMENT
C
C    JUMBOS
      REAL
     +            TONS20,
     +            JUMBL,  JUMBS,  JUMBE,
     +            SHFT20,
     +            AF20L,  AF20S,  AF20E,
     +            BF20L,  BF20S,  BF20E,
     +            AJUMBL, AJUMBS, AJUMBE,
     +            AJUMBT, JUMBTT
C
C   READ TOTAL METRIC TONS CAPACITY PER DAY TO BE PRODUCED
C
      READ (7,10,REC=1651) TONS20
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      JUMBL =    0.000
      JUMBS =    0.000
      JUMBE = 2047.370 * (TONS20 ** 0.839)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR
      READ (7,20,REC=1658) SHFT20
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT20.NE.2) THEN
      JUMBL = 0.0 * (TONS20 * (2.0 / SHFT20))
      JUMBS = 0.0 * (TONS20 * (2.0 / SHFT20))
      JUMBE = 2047.370 * ((TONS20 * (2.0 / SHFT20)) ** 0.839)
      ELSE
      ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF20L.....AF20S.....AF20E
```

```
      READ (7,40,REC=1665) AF20L
      READ (7,40,REC=1677) AF20S
      READ (7,40,REC=1689) AF20E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF20L.....BF20S.....BF20E
      READ (7,50,REC=1670) BF20L
      READ (7,50,REC=1682) BF20S
      READ (7,50,REC=1694) BF20E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AJUMBL = JUMBL * AF20L * BF20L
      AJUMBS = JUMBS * AF20S * BF20S
      AJUMBE = JUMBE * AF20E * BF20E
C
C   CALCULATE TOTAL ADJUSTED COST
      AJUMBT = AJUMBL + AJUMBS + AJUMBE
C
C   CALCULATE TOTAL COST
      JUMBTT = AJUMBT
C
C  PRINT ROUTINE FOR SUBROUTINE JUMBOS.....
C
      WRITE (8,20009)
20009 FORMAT (//)
      WRITE (8,20010)
20010 FORMAT ('0','SUBROUTINE JUMBOS, COSTS FOR ACQUISITION OF
     +DRILL AND BLAST EQUIPMENT FOR USE WITH JUMBOS AS
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,20020)
20020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +PRODUCED PER DAY')
      WRITE (8,20030) TONS20
20030 FORMAT (8X,'TONS TO BE PRODUCED    ',F17.2)
      WRITE (8,20040)
20040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,20050) SHFT20
20050 FORMAT (8X,'SHIFTS                ',F17.2)
C
C-----------------------------------------------------------------
C
```

```
      WRITE (8,20060)
20060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,20070) AF20L
20070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20080) BF20L
20080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,20090)
20090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,20100) AF20S
20100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20110) BF20S
20110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,20120)
20120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,20130) AF20E
20130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20140) BF20E
20140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,20150)
20150 FORMAT ('0','SUBROUTINE JUMBOS, CALCULATED COSTS OUTPUT')
      WRITE (8,20160)
20160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,20170) JUMBL
20170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,20180) JUMBS
20180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,20190) JUMBE
20190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,20200)
20200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,20210) AJUMBL
20210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,20220) AJUMBS
20220 FORMAT (8X,'SUPPLIES             ',F17.2)
```

```
      WRITE (8,20230) AJUMBE
20230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,20240)
20240 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,20250) AJUMBT
20250 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,20260) JUMBTT
20260 FORMAT (8X,'PROJECT PRODUCTION     ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE JKLEGS
C
C
C  COSTS FOR ACQUISTION OF DRILL AND BLAST EQUIPMENT FOR USE
WITH
C  JACKLEGS AS PRIMARY PRODUCTION EQUIPMENT
C
C   JKLEGS
      REAL
     +            TONS21,
     +            JLEGL,  JLEGS,  JLEGE,
     +            SHFT21,
     +            AF21L,  AF21S,  AF21E,
     +            BF21L,  BF21S,  BF21E,
     +            AJLEGL, AJLEGS, AJLEGE,
     +            AJLEGT, JLEGTT
C
C  READ TOTAL METRIC TONS CAPACITY PER DAY TO BE PRODUCED
C
      READ (7,10,REC=1703) TONS21
   10 FORMAT (15X,F17.2)
C
C  CALCULATE BASE COSTS
      JLEGL =    0.000
      JLEGS =    0.000
      JLEGE = 1204.235 * (TONS21 ** 0.994)
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  SHIFT FACTOR
```

```
      READ (7,20,REC=1710) SHFT21
   20 FORMAT (15X,F17.2)
C    SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT21.NE.2) THEN
      JUMBL = 0.0 * (TONS21 * (2.0 / SHFT21))
      JUMBS = 0.0 * (TONS21 * (2.0 / SHFT21))
      JUMBE = 1204.235 * ((TONS21 * (2.0 / SHFT21)) ** 0.994)
      ELSE
      ENDIF
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C    AF21L.....AF21S.....AF21E
      READ (7,40,REC=1717) AF21L
      READ (7,40,REC=1729) AF21S
      READ (7,40,REC=1741) AF21E
   40 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C    BF21L.....BF21S.....BF21E
      READ (7,50,REC=1722) BF21L
      READ (7,50,REC=1734) BF21S
      READ (7,50,REC=1746) BF21E
   50 FORMAT (15X,F17.2)
C
C    CALCULATE ADJUSTED COSTS
      AJLEGL = JLEGL * AF21L * BF21L
      AJLEGS = JLEGS * AF21S * BF21S
      AJLEGE = JLEGE * AF21E * BF21E
C
C    CALCULATE TOTAL ADJUSTED COST
      AJLEGT = AJLEGL + AJLEGS + AJLEGE
C
C    CALCULATE TOTAL COST
      JLEGTT = AJLEGT
C
C   PRINT ROUTINE FOR SUBROUTINE JKLEGS.....
C
      WRITE (8,21009)
21009 FORMAT (//)
      WRITE (8,21010)
21010 FORMAT ('0','SUBROUTINE JKLEGS, COSTS FOR ACQUISITION OF
     +DRILL AND BLAST EQUIPMENT FOR USE WITH JACKLEGS AS
```

```
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,21020)
21020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +PRODUCED PER DAY')
      WRITE (8,21030) TONS21
21030 FORMAT (8X,'TONS TO BE PRODUCED    ',F17.2)
      WRITE (8,21040)
21040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,21050) SHFT21
21050 FORMAT (8X,'SHIFTS                 ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21060)
21060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,21070) AF21L
21070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21080) BF21L
21080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21090)
21090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,21100) AF21S
21100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21110) BF21S
21110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21120)
21120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,21130) AF21E
21130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21140) BF21E
21140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,21150)
21150 FORMAT ('0','SUBROUTINE JKLEGS, CALCULATED COSTS OUTPUT')
      WRITE (8,21160)
```

```
21160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,21170) JLEGL
21170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,21180) JLEGS
21180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,21190) JLEGE
21190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,21200)
21200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,21210) AJLEGL
21210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,21220) AJLEGS
21220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,21230) AJLEGE
21230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,21240)
21240 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,21250) AJLEGT
21250 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,21260) JLEGTT
21260 FORMAT (8X,'PROJECT PRODUCTION     ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE MINERS
C
C
C   COSTS FOR ACQUISTION OF EQUIPMENT FOR USE WITH CONTINUOUS
MINERS
C   AS PRIMARY PRODUCTION EQUIPMENT
C
C    MINERS
      REAL
     +            TONS22,
     +            MINRL,  MINRS,  MINRE,
     +            SHFT22,
     +            AF22L,  AF22S,  AF22E,
     +            BF22L,  BF22S,  BF22E,
     +            AMINRL, AMINRS, AMINRE,
     +            AMINRT, MINRTT
C
```

```
C   READ TOTAL METRIC TONS CAPACITY PER DAY TO BE PRODUCED
C
      READ (7,10,REC=1755) TONS22
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      MINRL =    0.000
      MINRS =    0.000
      MINRE = 1899.425 * (TONS22 ** 0.969)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR
      READ (7,20,REC=1762) SHFT22
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT22.NE.2) THEN
      MINRL =    0.000 *  (TONS22 * (2.0 / SHFT22))
      MINRS =    0.000 *  (TONS22 * (2.0 / SHFT22))
      MINRE = 1899.425 * ((TONS22 * (2.0 / SHFT22)) ** 0.969)
      ELSE
      ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF22L.....AF22S.....AF22E
      READ (7,40,REC=1769) AF22L
      READ (7,40,REC=1781) AF22S
      READ (7,40,REC=1793) AF22E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF22L.....BF22S.....BF22E
      READ (7,50,REC=1774) BF22L
      READ (7,50,REC=1786) BF22S
      READ (7,50,REC=1798) BF22E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AMINRL = MINRL * AF22L * BF22L
      AMINRS = MINRS * AF22S * BF22S
      AMINRE = MINRE * AF22E * BF22E
C
```

```
C   CALCULATE TOTAL ADJUSTED COST
      AMINRT = AMINRL + AMINRS + AMINRE
C
C   CALCULATE TOTAL COST
      MINRTT = AMINRT
C
C  PRINT ROUTINE FOR SUBROUTINE MINERS.....
C
      WRITE (8,22009)
22009 FORMAT (//)
      WRITE (8,22010)
22010 FORMAT ('0','SUBROUTINE MINERS, COSTS FOR ACQUISITION OF
     +DRILL AND BLAST EQUIPMENT FOR USE WITH CONTINUOUS MINERS
AS
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,22020)
22020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +PRODUCED PER DAY')
      WRITE (8,22030) TONS22
22030 FORMAT (8X,'TONS TO BE PRODUCED    ',F17.2)
      WRITE (8,22040)
22040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,22050) SHFT22
22050 FORMAT (8X,'SHIFTS                ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,22060)
22060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,22070) AF22L
22070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,22080) BF22L
22080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,22090)
22090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,22100) AF22S
22100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,22110) BF22S
22110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,22120)
22120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,22130) AF22E
22130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,22140) BF22E
22140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,22150)
22150 FORMAT ('0','SUBROUTINE MINERS, CALCULATED COSTS OUTPUT')
      WRITE (8,22160)
22160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,22170) MINRL
22170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,22180) MINRS
22180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,22190) MINRE
22190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,22200)
22200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,22210) AMINRL
22210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,22220) AMINRS
22220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,22230) AMINRE
22230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,22240)
22240 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,22250) AMINRT
22250 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,22260) MINRTT
22260 FORMAT (8X,'PROJECT PRODUCTION     ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE TMACH
C
C
```

```
C   COSTS FOR ACQUISTION OF EQUIPMENT FOR USE WITH TUNNEL
BORING
C   MACHINES AS PRIMARY PRODUCTION EQUIPMENT
C
C    TMACH
     REAL
    +            DIA23,
    +            MACHL,  MACHS,  MACHE,
    +            SHFT23,
    +            AF23L,  AF23S,  AF23E,
    +            BF23L,  BF23S,  BF23E,
    +            AMACHL, AMACHS, AMACHE,
    +            AMACHT, MACHTT
C
C   READ TOTAL FACE DIAMETER, IN METERS, OF MACHINE IN USE
C
     READ (7,10,REC=1807) DIA23
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
     MACHL =      0.000
     MACHS =      0.000
     MACHE = 737914.900 * (DIA23 ** 1.119)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR
     READ (7,20,REC=1814) SHFT23
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
     IF (SHFT23.NE.2) THEN
     MACHL =      0.000 *  (DIA23 * (2.0 / SHFT23))
     MACHS =      0.000 *  (DIA23 * (2.0 / SHFT23))
     MACHE = 737914.900 * ((DIA23 * (2.0 / SHFT23)) ** 1.119)
     ELSE
     ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF23L.....AF23S.....AF23E
     READ (7,40,REC=1821) AF23L
     READ (7,40,REC=1833) AF23S
     READ (7,40,REC=1845) AF23E
   40 FORMAT (15X,F17.2)
```

```
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF23L.....BF23S.....BF23E
      READ (7,50,REC=1826) BF23L
      READ (7,50,REC=1838) BF23S
      READ (7,50,REC=1850) BF23E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AMACHL = MACHL * AF23L * BF23L
      AMACHS = MACHS * AF23S * BF23S
      AMACHE = MACHE * AF23E * BF23E
C
C   CALCULATE TOTAL ADJUSTED COST
      AMACHT = AMACHL + AMACHS + AMACHE
C
C   CALCULATE TOTAL COST
      MACHTT = AMACHT
C
C  PRINT ROUTINE FOR SUBROUTINE TMACH.....
C
      WRITE (8,23009)
23009 FORMAT (//)
      WRITE (8,23010)
23010 FORMAT ('0','SUBROUTINE TMACH, COSTS FOR ACQUISITION OF
     +EQUIPMENT FOR USE WITH TUNNEL BORING MACHINES AS
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,23020)
23020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL FACE DIAMETER
     +OF MACHINE IN METERS')
      WRITE (8,23030) DIA23
23030 FORMAT (8X,'FACE DIAMATER (meters) ',F17.2)
      WRITE (8,23040)
23040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,23050) SHFT23
23050 FORMAT (8X,'SHIFTS                ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23060)
23060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,23070) AF23L
23070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
```

```
      WRITE (8,23080) BF23L
23080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23090)
23090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,23100) AF23S
23100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,23110) BF23S
23110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23120)
23120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,23130) AF23E
23130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,23140) BF23E
23140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,23150)
23150 FORMAT ('0','SUBROUTINE TMACH, CALCULATED COSTS OUTPUT')
      WRITE (8,23160)
23160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,23170) MACHL
23170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,23180) MACHS
23180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,23190) MACHE
23190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,23200)
23200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,23210) AMACHL
23210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,23220) AMACHS
23220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,23230) AMACHE
23230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,23240)
23240 FORMAT ('0',4X,'TOTAL COST')
```

```
      WRITE (8,23250) AMACHT
23250 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,23260) MACHTT
23260 FORMAT (8X,'PROJECT PRODUCTION     ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE CONV1
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF MAIN CONVEYOR
C   EQUIPMENT FOR USE IN MATERIAL TRANSPORTATION
C
C    CONV1
      REAL
     +            TONS24,
     +            CON1L,  CON1S,  CON1E,
     +            SHFT24,
     +            DFCT24,
     +            DSF24L, DSF24S, DSF24E,
     +            AF24L,  AF24S,  AF24E,
     +            BF24L,  BF24S,  BF24E,
     +            ACON1L, ACON1S, ACON1E,
     +            ACON1T, CON1TT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1859) TONS24
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      CON1L =    0.000
      CON1S =    0.000
      CON1E = 5471.851 * (TONS24 ** 0.456)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR.....SHFT24
      READ (7,20,REC=1866) SHFT24
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
```

```
      IF (SHFT24.NE.2) THEN
      CON1L =    0.000 *  (TONS24 * (2.0 / SHFT24))
      CON1S =    0.000 *  (TONS24 * (2.0 / SHFT24))
      CON1E = 5471.851 * ((TONS24 * (2.0 / SHFT24)) ** 0.456)
      ELSE
      ENDIF
C
C   DISTANCE FACTOR....DFCT24
      READ (7,30,REC=1873) DFCT24
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   DSF24L.....DSF24S.....DSF24E
      DSF24L = 0.005 * (DFCT24 ** 0.944)
      DSF24S = 0.005 * (DFCT24 ** 0.944)
      DSF24E = 0.005 * (DFCT24 ** 0.944)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF24L.....AF24S.....AF24E
      READ (7,40,REC=1880) AF24L
      READ (7,40,REC=1892) AF24S
      READ (7,40,REC=1904) AF24E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF24L.....BF24S.....BF24E
      READ (7,50,REC=1885) BF24L
      READ (7,50,REC=1897) BF24S
      READ (7,50,REC=1909) BF24E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACON1L = CON1L * DSF24L * AF24L * BF24L
      ACON1S = CON1S * DSF24S * AF24S * BF24S
      ACON1E = CON1E * DSF24E * AF24E * BF24E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACON1T = ACON1L + ACON1S + ACON1E
C
C   CALCULATE TOTAL COST
      CON1TT = ACON1T
C
C  PRINT ROUTINE FOR SUBROUTINE CONV1.....
```

```
C
      WRITE (8,24009)
24009 FORMAT (//)
      WRITE (8,24010)
24010 FORMAT ('0','SUBROUTINE CONV1, COSTS FOR ACQUISITION AND
     +INSTALLATION OF MAIN CONVEYOR EQUIPMENT FOR USE IN
MATERIAL
     +TRANSPORT, USER DEFINED INPUT')
      WRITE (8,24020)
24020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,24030) TONS24
24030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,24040)
24040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,24050) SHFT24
24050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,24060)
24060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,24070) DFCT24
24070 FORMAT (8X,'DISTANCE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,24080)
24080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,24090) DSF24L
24090 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,24100) AF24L
24100 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,24110) BF24L
24110 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,24120)
24120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,24130) DSF24S
24130 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,24140) AF24S
24140 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,24150) BF24S
24150 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
```

```
C
C-----------------------------------------------------------------
C
      WRITE (8,24160)
24160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,24170) DSF24E
24170 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,24180) AF24E
24180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,24190) BF24E
24190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,24200)
24200 FORMAT ('0','SUBROUTINE CONV1, CALCULATED COSTS OUTPUT')
      WRITE (8,24210)
24210 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,24220) CON1L
24220 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,24230) CON1S
24230 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,24240) CON1E
24240 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,24250)
24250 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,24260) ACON1L
24260 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,24270) ACON1S
24270 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,24280) ACON1E
24280 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,24290)
24290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,24300) ACON1T
24300 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,24310) CON1TT
24310 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
```

```
C
C
C
      SUBROUTINE CONV2
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF CONVEYOR
EXTENSION
C   EQUIPMENT FOR USE IN MATERIAL TRANSPORTATION
C
C     CONV2
      REAL
     +            TONS25,
     +            CON2L,  CON2S,  CON2E,
     +            SHFT25,
     +            DFCT25,
     +            DSF25L, DSF25S, DSF25E,
     +            AF25L,  AF25S,  AF25E,
     +            BF25L,  BF25S,  BF25E,
     +            ACON2L, ACON2S, ACON2E,
     +            ACON2T, CON2TT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1918) TONS25
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      CON2L =    0.000
      CON2S =    0.000
      CON2E = 4933.633 * (TONS25 ** 0.455)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR.....SHFT25
      READ (7,20,REC=1925) SHFT25
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT25.NE.2) THEN
      CON2L =    0.000 *  (TONS25 * (2.0 / SHFT25))
      CON2S =    0.000 *  (TONS25 * (2.0 / SHFT25))
      CON2E = 4933.633 * ((TONS25 * (2.0 / SHFT25)) ** 0.455)
      ELSE
      ENDIF
```

```
C
C   DISTANCE FACTOR....DFCT25
      READ (7,30,REC=1932) DFCT25
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   DSF25L.....DSF25S.....DSF25E
      DSF25L = 0.005 * (DFCT25 ** 0.944)
      DSF25S = 0.005 * (DFCT25 ** 0.944)
      DSF25E = 0.005 * (DFCT25 ** 0.944)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF25L.....AF25S.....AF25E
      READ (7,40,REC=1939) AF25L
      READ (7,40,REC=1951) AF25S
      READ (7,40,REC=1963) AF25E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF25L.....BF25S.....BF25E
      READ (7,50,REC=1944) BF25L
      READ (7,50,REC=1956) BF25S
      READ (7,50,REC=1968) BF25E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACON2L = CON2L * DSF25L * AF25L * BF25L
      ACON2S = CON2S * DSF25S * AF25S * BF25S
      ACON2E = CON2E * DSF25E * AF25E * BF25E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACON2T = ACON2L + ACON2S + ACON2E
C
C   CALCULATE TOTAL COST
      CON2TT = ACON2T
C
C  PRINT ROUTINE FOR SUBROUTINE CONV2.....
C
      WRITE (8,25009)
25009 FORMAT (//)
      WRITE (8,25010)
25010 FORMAT ('0','SUBROUTINE CONV2, COSTS FOR ACQUISITION AND
     +INSTALLATION OF CONVEYOR EXTENSION EQUIPMENT FOR USE IN
```

```
MATERIAL
     +TRANSPORT, USER DEFINED INPUT')
      WRITE (8,25020)
25020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,25030) TONS25
25030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,25040)
25040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,25050) SHFT25
25050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,25060)
25060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,25070) DFCT25
25070 FORMAT (8X,'DISTANCE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,25080)
25080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,25090) DSF25L
25090 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,25100) AF25L
25100 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,25110) BF25L
25110 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,25120)
25120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,25130) DSF25S
25130 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,25140) AF25S
25140 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,25150) BF25S
25150 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,25160)
25160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,25170) DSF25E
```

```
25170 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,25180) AF25E
25180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,25190) BF25E
25190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,25200)
25200 FORMAT ('0','SUBROUTINE CONV2, CALCULATED COSTS OUTPUT')
      WRITE (8,25210)
25210 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,25220) CON2L
25220 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,25230) CON2S
25230 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,25240) CON2E
25240 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,25250)
25250 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,25260) ACON2L
25260 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,25270) ACON2S
25270 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,25280) ACON2E
25280 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,25290)
25290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,25300) ACON2T
25300 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,25310) CON2TT
25310 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE LHD
C
C  COSTS FOR ACQUISTION OF LOAD-HAUL-DUMP EQUIPMENT FOR USE IN
C  MATERIAL TRANSPORTATION
```

```
C
C   LHD
    REAL
   +            TONS26,
   +            LHDL,  LHDS,  LHDE,
   +            SHFT26,
   +            DFCT26,
   +            DSF26L, DSF26S, DSF26E,
   +            GFCT26,
   +            GDF26L, GDF26S, GDF26E,
   +            AF26L,  AF26S,  AF26E,
   +            BF26L,  BF26S,  BF26E,
   +            ALHDL,  ALHDS,  ALHDE,
   +            ALHDT,  LHDTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
    READ (7,10,REC=1977) TONS26
 10 FORMAT (15X,F17.2)
C
    IF (TONS26.LT.2000) THEN
C   CALCULATE BASE COSTS
    LHDL =      0.000
    LHDS =      0.000
    LHDE = 123893.086 * (TONS26 ** 0.231)
    ELSE
C   CALCULATE BASE COSTS
    LHDL =   0.000
    LHDS =   0.000
    LHDE = 370.020 * (TONS26 ** 1.000)
    ENDIF
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR.....SHFT26
    READ (7,20,REC=1984) SHFT26
 20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
    IF (SHFT26.NE.2) THEN
    IF (TONS26.LT.2000) THEN
    LHDL =      0.000 *  (TONS26 * (2.0 / SHFT26))
    LHDS =      0.000 *  (TONS26 * (2.0 / SHFT26))
    LHDE = 123893.086 * ((TONS26 * (2.0 / SHFT26)) ** 0.231)
    ELSE
```

```
      LHDL =   0.000 *  (TONS26 * (2.0 / SHFT26))
      LHDS =   0.000 *  (TONS26 * (2.0 / SHFT26))
      LHDE = 370.020 * ((TONS26 * (2.0 / SHFT26)) ** 1.000)
      ENDIF
      ELSE
      LHDL =   0.000 *  (TONS26 * (2.0 / SHFT26))
      LHDS =   0.000 *  (TONS26 * (2.0 / SHFT26))
      LHDE = 370.020 * ((TONS26 * (2.0 / SHFT26)) ** 1.000)
      ENDIF
C
C   DISTANCE FACTOR....DFCT26
      READ (7,30,REC=1991) DFCT26
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   DSF26L.....DSF26S.....DSF26E
      DSF26L = 0.098 * (DFCT26 ** 0.382)
      DSF26S = 0.098 * (DFCT26 ** 0.382)
      DSF26E = 0.098 * (DFCT26 ** 0.382)
C   GRADE FACTOR....GFCT26
      READ (7,40,REC=1998) GFCT26
   40 FORMAT (15X,F17.2)
C   GRADE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   GDF26L.....GDF26S.....GDF26E
      GDF26L = 0.929 * (1.037 ** GFCT26)
      GDF26S = 0.929 * (1.037 ** GFCT26)
      GDF26E = 0.929 * (1.037 ** GFCT26)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF26L.....AF26S.....AF26E
      READ (7,50,REC=2005) AF26L
      READ (7,50,REC=2017) AF26S
      READ (7,50,REC=2029) AF26E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF26L.....BF26S.....BF26E
      READ (7,60,REC=2010) BF26L
      READ (7,60,REC=2022) BF26S
      READ (7,60,REC=2034) BF26E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
```

```
      ALHDL = LHDL * DSF26L * GDF26L * AF26L * BF26L
      ALHDS = LHDS * DSF26S * GDF26S * AF26S * BF26S
      ALHDE = LHDE * DSF26E * GDF26E * AF26E * BF26E
C
C   CALCULATE TOTAL ADJUSTED COST
      ALHDT = ALHDL + ALHDS + ALHDE
C
C   CALCULATE TOTAL COST
      LHDTT = ALHDT
C
C  PRINT ROUTINE FOR SUBROUTINE LHD.....
C
      WRITE (8,26009)
26009 FORMAT (//)
      WRITE (8,26010)
26010 FORMAT ('0','SUBROUTINE LHD, COSTS FOR ACQUISITION OF
     +LOAD-HAUL-DUMP EQUIPMENT FOR USE IN MATERIAL TRANSPORT,
     +USER DEFINED INPUT')
      WRITE (8,26020)
26020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,26030) TONS26
26030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,26040)
26040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,26050) SHFT26
26050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,26060)
26060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,26070) DFCT25
26070 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,26080)
26080 FORMAT (4X,'GRADE FACTOR')
      WRITE (8,26090) GFCT26
26090 FORMAT (8X,'GRADE                 ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26100)
26100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,26110) DSF26L
26110 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,26120) GDF26L
```

```
26120 FORMAT (8X,'GRADE                ',F17.2)
      WRITE (8,26130) AF26L
26130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,26140) BF26L
26140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26150)
26150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,26160) DSF26S
26160 FORMAT (8X,'DISTANCE             ',F17.2)
      WRITE (8,26170) GDF26S
26170 FORMAT (8X,'GRADE                ',F17.2)
      WRITE (8,26180) AF26S
26180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,26190) BF26S
26190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26200)
26200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,26210) DSF26E
26210 FORMAT (8X,'DISTANCE             ',F17.2)
      WRITE (8,26220) GDF26E
26220 FORMAT (8X,'GRADE                ',F17.2)
      WRITE (8,26230) AF26E
26230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,26240) BF26E
26240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,26250)
26250 FORMAT ('0','SUBROUTINE LHD, CALCULATED COSTS OUTPUT')
      WRITE (8,26260)
26260 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,26270) LHDL
26270 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,26280) LHDS
26280 FORMAT (8X,'SUPPLIES             ',F17.2)
```

```
      WRITE (8,26290) LHDE
26290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,26300)
26300 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,26310) ALHDL
26310 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,26320) ALHDS
26320 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,26330) ALHDE
26330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,26340)
26340 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,26350) ALHDT
26350 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,26360) LHDTT
26360 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE RRHAUL
C
C
C   COSTS FOR ACQUISTION OF RAIL HAULAGE EQUIPMENT FOR USE IN
C   MATERIAL TRANSPORTATION BASED ON ELECTRIC LOCOMOTIVES
C
C     RRHAUL
      REAL
     +            TONS27,
     +            ELRRL,  ELRRS,  ELRRE,
     +            SHFT27,
     +            TF27L,  TF27S,  TF27E,
     +            DF27L,  DF27S,  DF27E,
     +            DFCT27,
     +            DSF27L, DSF27S, DSF27E,
     +            AEF27L, AEF27S, AEF27E,
     +            BEF27L, BEF27S, BEF27E,
     +            ATF27L, ATF27S, ATF27E,
     +            BTF27L, BTF27S, BTF27E,
     +            ADF27L, ADF27S, ADF27E,
     +            BDF27L, BDF27S, BDF27E,
```

```
     +            AELRRL, AELRRS, AELRRE,
     +            ATRRRL, ATRRRS, ATRRRE,
     +            ADSRRL, ADSRRS, ADSRRE,
     +            AELRRT, ELRRTT,
     +            ATRRRT, TRRRTT,
     +            ADSRRT, DSRRTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=2043) TONS27
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      ELRRL =     0.000
      ELRRS =     0.000
      ELRRE = 19697.330 * (TONS27 ** 0.539)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR.....SHFT27
      READ (7,20,REC=2050) SHFT27
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT27.NE.2) THEN
      ELRRL =     0.000 *  (TONS27 * (2.0 / SHFT27))
      ELRRS =     0.000 *  (TONS27 * (2.0 / SHFT27))
      ELRRE = 19697.330 * ((TONS27 * (2.0 / SHFT27)) ** 0.539)
      ELSE
      ENDIF
C
C   TROLLEY LOCOMOTIVE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   TF27L.....TF27S.....TF27E
      READ (7,30,REC=2065) TF27L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2107) TF27S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=2150) TF27E
   50 FORMAT (15X,F17.2)
C   DIESEL LOCOMOTIVE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   DF27L.....DF27S.....DF27E
      READ (7,60,REC=2070) DF27L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2113) DF27S
```

```
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=2155) DF27E
   80 FORMAT (15X,F17.2)
C
C   DISTANCE FACTOR....DFCT27
      READ (7,90,REC=2057) DFCT27
   90 FORMAT (15X,F17.2)
C   DISTANCE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DSF27L.....DSF27S.....DSF27E
      DSF27L = 0.0013 * (DFCT27 ** 0.968)
      DSF27S = 0.0013 * (DFCT27 ** 0.968)
      DSF27E = 0.0013 * (DFCT27 ** 0.968)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   FOR ELECTRIC RAIL HAULAGE.....A1F27L.....A1F27S.....A1F27E
      READ (7,100,REC=2075) A1F27L
      READ (7,100,REC=2118) A1F27S
      READ (7,100,REC=2160) A1F27E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   FOR ELECTRIC RAIL HAULAGE.....B1F27L.....B1F27S.....B1F27E
      READ (7,110,REC=2080) B1F27L
      READ (7,110,REC=2123) B1F27S
      READ (7,110,REC=2165) B1F27E
  110 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   FOR TROLLEY RAIL HAULAGE.....A2F27L.....A2F27S.....A2F27E
      READ (7,120,REC=2085) A2F27L
      READ (7,120,REC=2128) A2F27S
      READ (7,120,REC=2170) A2F27E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   FOR TROLLEY RAIL HAULAGE.....B2F27L.....B2F27S.....B2F27E
      READ (7,130,REC=2090) B2F27L
      READ (7,130,REC=2133) B2F27S
      READ (7,130,REC=2175) B2F27E
  130 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
```

```
EQUIPMENT..
C   FOR DIESEL RAIL HAULAGE.....A1F27L.....A1F27S.....A1F27E
      READ (7,140,REC=2095) A3F27L
      READ (7,140,REC=2138) A3F27S
      READ (7,140,REC=2180) A3F27E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   FOR DIESEL RAIL HAULAGE.....B1F27L.....B1F27S.....B1F27E
      READ (7,150,REC=2100) B3F27L
      READ (7,150,REC=2143) B3F27S
      READ (7,150,REC=2185) B3F27E
  150 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AELRRL = ELRRL * DSF27L * A1F27L * B1F27L
      AELRRS = ELRRS * DSF27S * A1F27S * B1F27S
      AELRRE = ELRRE * DSF27E * A1F27E * B1F27E
      ATRRRL = ELRRL * TF27L * DSF27L * A2F27L * B2F27L
      ATRRRS = ELRRS * TF27S * DSF27S * A2F27S * B2F27S
      ATRRRE = ELRRE * TF27E * DSF27E * A2F27E * B2F27E
      ADSRRL = ELRRL * DF27E * DSF27L * A3F27L * B3F27L
      ADSRRS = ELRRS * DF27S * DSF27S * A3F27S * B3F27S
      ADSRRE = ELRRE * DF27E * DSF27E * A3F27E * B3F27E
C
C   CALCULATE TOTAL ADJUSTED COST
      AELRRT = AELRRL + AELRRS + AELRRE
      ATRRRT = ATRRRL + ATRRRS + ATRRRE
      ADSRRT = ADSRRL + ADSRRS + ADSRRE
C
C   CALCULATE TOTAL COST
      ELRRTT = AELRRT
      TRRRTT = ATRRRT
      DSRRTT = ADSRRT
C
C  PRINT ROUTINE FOR SUBROUTINE RRHAUL.....
C
      WRITE (8,27009)
27009 FORMAT (//)
      WRITE (8,27010)
27010 FORMAT ('0','SUBROUTINE RRHAUL, COSTS FOR ACQUISITION OF
     +RAIL HAULAGE EQUIPMENT FOR USE IN MATERIAL TRANSPORT.
     +COSTS BASED ON ELECTRIC LOCOMOTIVES AND ADJUSTED TO
```

```
PROVIDE')
      WRITE (8,27011)
27011 FORMAT ('0','COST FOR DIESEL AND TROLLEY SYSTEMS.
     +ELECTRIC SYSTEMS ARE DESIGNATED AS TYPE 1 SYSTEMS,
     +TROLLEY SYSTEMS ARE TYPE 2, AND DIESEL SYSTEMS ARE TYPE
3.')
      WRITE (8,27012)
27012 FORMAT ('0','CORRECTION FACTORS A1, B1, A2, B2, A3, B3,
     +CORRESPOND WITH THE MATCHING TYPE SYSTEM.')
      WRITE (8,27020)
27020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,27030) TONS27
27030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,27040)
27040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,27050) SHFT27
27050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,27060)
27060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,27070) DFCT27
27070 FORMAT (8X,'DISTANCE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27080)
27080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,27090) TF27L
27090 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,27100) DF27L
27100 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,27110) DSF27L
27110 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,27120) A1F27L
27120 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,27130) B1F27L
27130 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,27140) A2F27L
27140 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,27150) B2F27L
27150 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,27160) A3F27L
27160 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
```

```
      WRITE (8,27170) B3F27L
27170 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27180)
27180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,27190) TF27S
27190 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,27200) DF27S
27200 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,27210) DSF27S
27210 FORMAT (8X,'DISTANCE               ',F17.2)
      WRITE (8,27220) A1F27S
27220 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,27230) B1F27S
27230 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,27240) A2F27S
27240 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,27250) B2F27S
27250 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,27260) A3F27S
27260 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,27270) B3F27S
27270 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27280)
27280 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,27290) TF27E
27290 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,27300) DF27E
27300 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,27310) DSF27E
27310 FORMAT (8X,'DISTANCE               ',F17.2)
      WRITE (8,27320) A1F27E
27320 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,27330) B1F27E
27330 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,27340) A2F27E
27340 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,27350) B2F27E
27350 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
```

```
      WRITE (8,27360) A3F27E
27360 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,27370) B3F27E
27370 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,27380)
27380 FORMAT ('0','SUBROUTINE RRHAUL, CALCULATED COSTS OUTPUT')
      WRITE (8,27390)
27390 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,27400)
27400 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,27410) ELRRL
27410 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,27420) ELRRS
27420 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,27430) ELRRE
27430 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,27440)
27440 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,27450) TRRRL
27450 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,27460) TRRRS
27460 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,27470) TRRRE
27470 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,27480)
27480 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,27490) DSRRL
27490 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,27500) DSRRS
27500 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,27510) DSRRE
27510 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,27520)
27520 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,27530)
27530 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,27540) AELRRL
27540 FORMAT (8X,'LABOR                ',F17.2)
```

```
      WRITE (8,27550) AELRRS
27550 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,27560) AELRRE
27560 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,27570)
27570 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,27580) ATRRRL
27580 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,27590) ATRRRS
27590 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,27600) ATRRRE
27600 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,27610)
27610 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,27620) ADSRRL
27620 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,27630) ADSRRS
27630 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,27640) ADSRRE
27640 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,27650)
27650 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,27660)
27660 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,27670) AELRRT
27670 FORMAT (8X,'PER UNIT PRODUCTION   ',F17.2)
      WRITE (8,27680) ELRRTT
27680 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,27690)
27690 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,27700) ATRRRT
27700 FORMAT (8X,'PER UNIT PRODUCTION   ',F17.2)
      WRITE (8,27710) TRRRTT
27710 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,27720)
27720 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,27730) ADSRRT
27730 FORMAT (8X,'PER UNIT PRODUCTION   ',F17.2)
      WRITE (8,27740) DSRRTT
27740 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
```

```
C
C
      SUBROUTINE TRUCKS
C
C
C   COSTS FOR ACQUISTION OF TRUCK EQUIPMENT FOR USE IN
C   MATERIAL TRANSPORTATION
C
C     TRUCKS
      REAL
     +            TONS28,
     +            TRUKL,  TRUKS,  TRUKE,
     +            SHFT28,
     +            DFCT28,
     +            DSF28L, DSF28S, DSF28E,
     +            IFCT28,
     +            INF28L, INF28S, INF28E,
     +            AF28L,  AF28S,  AF28E,
     +            BF28L,  BF28S,  BF28E,
     +            ATRUKL, ATRUKS, ATRUKE,
     +            ATRUKT, TRUKTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=2194) TONS28
   10 FORMAT (15X,F17.2)
C    CALCULATE BASE COSTS
      TRUKL =    0.000
      TRUKS =    0.000
      TRUKE = 2759.215 * (TONS28 ** 0.838)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   SHIFT FACTOR.....SHFT28
      READ (7,20,REC=2201) SHFT28
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT28.NE.2) THEN
      TRUKL =    0.000 *  (TONS28 * (2.0 / SHFT28))
      TRUKS =    0.000 *  (TONS28 * (2.0 / SHFT28))
      TRUKE = 2759.215 * ((TONS28 * (2.0 / SHFT28)) ** 0.838)
      ELSE
      ENDIF
C
```

```
C   DISTANCE FACTOR....DFCT28
      READ (7,30,REC=2208) DFCT28
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   DSF28L.....DSF28S.....DSF28E
      DSF28L = 0.040 * (DFCT28 ** 0.492)
      DSF28S = 0.040 * (DFCT28 ** 0.492)
      DSF28E = 0.040 * (DFCT28 ** 0.492)
C
C   INCLINE FACTOR....IFCT28
      READ (7,40,REC=2215) IFCT28
   40 FORMAT (15X,F17.2)
C   INCLINE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   INF28L.....INF28S.....INF28E
      INF28L = 1.0 + (0.016 * IFCT28)
      INF28S = 1.0 + (0.016 * IFCT28)
      INF28E = 1.0 + (0.016 * IFCT28)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF28L.....AF28S.....AF28E
      READ (7,50,REC=2222) AF28L
      READ (7,50,REC=2234) AF28S
      READ (7,50,REC=2246) AF28E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF28L.....BF28S.....BF28E
      READ (7,60,REC=2227) BF28L
      READ (7,60,REC=2239) BF28S
      READ (7,60,REC=2251) BF28E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ATRUKL = TRUKL * DSF28L * INF28L * AF28L * BF28L
      ATRUKS = TRUKS * DSF28S * INF28S * AF28S * BF28S
      ATRUKE = TRUKE * DSF28E * INF28E * AF28E * BF28E
C
C   CALCULATE TOTAL ADJUSTED COST
      ATRUKT = ATRUKL + ATRUKS + ATRUKE
C
C   CALCULATE TOTAL COST
      TRUKTT = ATRUKT
```

```
C
C  PRINT ROUTINE FOR SUBROUTINE TRUCKS.....
C
      WRITE (8,28009)
28009 FORMAT (//)
      WRITE (8,28010)
28010 FORMAT ('0','SUBROUTINE TRUCKS, COSTS FOR ACQUISITION OF
     +TRUCK EQUIPMENT FOR USE IN MATERIAL TRANSPORT,
     +USER DEFINED INPUT')
      WRITE (8,28020)
28020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,28030) TONS28
28030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,28040)
28040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,28050) SHFT28
28050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,28060)
28060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,28070) DFCT28
28070 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,28080)
28080 FORMAT (4X,'INCLINE FACTOR')
      WRITE (8,28090) IFCT28
28090 FORMAT (8X,'INCLINE (degrees)     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28100)
28100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,28110) DSF28L
28110 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,28120) INF28L
28120 FORMAT (8X,'INCLINE               ',F17.2)
      WRITE (8,28130) AF28L
28130 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,28140) BF28L
28140 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28150)
```

```
28150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,28160) DSF28S
28160 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,28170) INF28S
28170 FORMAT (8X,'INCLINE               ',F17.2)
      WRITE (8,28180) AF28S
28180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28190) BF28S
28190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28200)
28200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,28210) DSF28E
28210 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,28220) INF28E
28220 FORMAT (8X,'INCLINE               ',F17.2)
      WRITE (8,28230) AF28E
28230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28240) BF28E
28240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,28250)
28250 FORMAT ('0','SUBROUTINE TRUCKS, CALCULATED COSTS OUTPUT')
      WRITE (8,28260)
28260 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,28270) TRUKL
28270 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,28280) TRUKS
28280 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,28290) TRUKE
28290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28300)
28300 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,28310) ATRUKL
28310 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,28320) ATRUKS
28320 FORMAT (8X,'SUPPLIES              ',F17.2)
```

```
      WRITE (8,28330) ATRUKE
28330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28340)
28340 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,28350) ATRUKT
28350 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,28360) TRUKTT
28360 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LAYRR
C
C
C   COSTS FOR LAYING TRACKAGE FOR MAIN LINE AND HAULAGE SPURS
C
C     LAYRR
      REAL
     +            LONG29,
     +            LYRRL,  LYRRS,  LYRRE,
     +            BLF29L, BLF29S, BLF29E,
     +            EFCT29,
     +            SBF29L, SBF29S, SBF29E,
     +            AF29L,  AF29S,  AF29E,
     +            BF29L,  BF29S,  BF29E,
     +            ALYRRL, ALYRRS, ALYRRE,
     +            ALYRRT, LYRRTT
C
C   READ TOTAL TRACK LENGTH FROM DATA FILE
C
      READ (7,10,REC=2260) LONG29
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      LYRRL =  49017.800 * (LONG29 ** 1.000)
      LYRRS = 130085.700 * (LONG29 ** 1.000)
      LYRRE =   9426.500 * (LONG29 ** 1.000)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TRACK BALLAST FACTOR, TRACK WITHOUT BALLAST.....
```

```
C   BLF29L.....BLF29S.....BLF29E
      READ (7,30,REC=2274) BLF29L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2296) BLF29S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=2318) BLF29E
   50 FORMAT (15X,F17.2)
C
C   EQUIPMENT FACTOR, USED IF EQUIPMENT MUST BE PURCHASED.....
C   EFCT19
      READ (7,60,REC=2267) EFCT29
   60 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF29L.....SBF29S.....SBF29E
      READ (7,70,REC=2279) SBF29L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=2301) SBF29S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=2323) SBF29E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF29L.....AF29S.....AF29E
      READ (7,100,REC=2284) AF29L
      READ (7,100,REC=2306) AF29S
      READ (7,100,REC=2328) AF29E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF29L.....BF29S.....BF29E
      READ (7,110,REC=2289) BF29L
      READ (7,110,REC=2311) BF29S
      READ (7,110,REC=2333) BF29E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ALYRRL = LYRRL * BLF29L * SBF29L * AF29L * BF29L
      ALYRRS = LYRRS * BLF29S * SBF29S * AF29S * BF29S
      ALYRRE = LYRRE * BLF29E * EFCT29 * SBF29E * AF29E *
     +         BF29E
```

```
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF RAIL
      ALYRRT = ALYRRL + ALYRRS + ALYRRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF RAIL
      LYRRTT = ALYRRT
C
C  PRINT ROUTINE FOR SUBROUTINE LAYRR.....
C
      WRITE (8,29009)
29009 FORMAT (//)
      WRITE (8,29010)
29010 FORMAT ('0','SUBROUTINE LAYRR, COSTS FOR LAYING TRACKAGE
     +FOR MAIN LINES AND RAIL SPURS, USER DEFINED INPUT')
      WRITE (8,29020)
29020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TRACK LENGTH
     +IN METERS')
      WRITE (8,29030) LONG29
29030 FORMAT (8X,'TOTAL RAIL LENGTH      ',F17.2)
      WRITE (8,29040)
29040 FORMAT (4X,'PURCHASED EQUIPMENT FACTOR')
      WRITE (8,29050) EFCT29
29050 FORMAT (8X,'EQUIPMENT              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29060)
29060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,29070) BLF29L
29070 FORMAT (8X,'BALLAST                ',F17.2)
      WRITE (8,29080) SBF29L
29080 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,29090) AF29L
29090 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29100) BF29L
29100 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29110)
29110 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,29120) BLF29S
29120 FORMAT (8X,'BALLAST                ',F17.2)
      WRITE (8,29130) SBF29S
```

```
29130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,29140) AF29S
29140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29150) BF29S
29150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29160)
29160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,29170) BLF29E
29170 FORMAT (8X,'BALLAST                ',F17.2)
      WRITE (8,29180) SBF29E
29180 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,29190) AF29E
29190 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29200) BF29E
29200 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,29210)
29210 FORMAT ('0','SUBROUTINE LAYRR, CALCULATED COSTS OUTPUT')
      WRITE (8,29220)
29220 FORMAT ('0',4X,'BASE COST TO MEET TRACK REQUIREMENTS')
      WRITE (8,29230) LYRRL
29230 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,29240) LYRRS
29240 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,29250) LYRRE
29250 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,29260)
29260 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRACK
REQUIREMENTS')
      WRITE (8,29270) ALYRRL
29270 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,29280) ALYRRS
29280 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,29290) ALYRRE
29290 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,29300)
29300 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,29310) ALYRRT
```

```
29310 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,29320) LYRRTT
29320 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SRCONV
C
C
C   COSTS FOR ACQUISTION AND ERECTION OF A LONG DISTANCE
SURFACE
C   CONVEYOR FOR USE IN MATERIAL TRANSPORTATION
C
C    SRCONV
      REAL
     +            TONS30,
     +            SCONL,  SCONS,  SCONE,
     +            IFCT30,
     +            DFCT30,
     +            IDF30L, IDF30S, IDF30E,
     +            SFCT30,
     +            AF30L,  AF30S,  AF30E,
     +            BF30L,  BF30S,  BF30E,
     +            ASCONL, ASCONS, ASCONE,
     +            ASCONT, SCONTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=2342) TONS30
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      CONVL = 25200.607 * (TONS30 ** 0.309)
      CONVS =  4064.614 * (TONS30 ** 0.309)
      CONVE = 52027.060 * (TONS30 ** 0.309)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   LENGTH AND SLOPE FACTOR....IFCT30.....DFCT30
      READ (7,30,REC=2349) IFCT30
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2356) DFCT30
```

```
  40 FORMAT (15X,F17.2)
C   LENGTH AND SLOPE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT
C   IDF30L.....IDF30S.....IDF30E
      IDF30L = (0.917 + (0.00940 * IFCT30)) * DFCT30
      IDF30S = (0.917 + (0.00940 * IFCT30)) * DFCT30
      IDF30E = (0.917 + (0.00940 * IFCT30)) * DFCT30
C
C   STACKER-TRIPPER COST FACTOR.....SFCT30
      READ (7,50,REC=2363) SFCT30
  50 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF30L.....AF30S.....AF30E
      READ (7,60,REC=2370) AF30L
      READ (7,60,REC=2382) AF30S
      READ (7,60,REC=2394) AF30E
  60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF30L.....BF30S.....BF30E
      READ (7,70,REC=2375) BF30L
      READ (7,70,REC=2387) BF30S
      READ (7,70,REC=2399) BF30E
  70 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACONVL = CONVL * IDF30L * AF30L * BF30L
      ACONVS = CONVS * IDF30S * AF30S * BF30S
      ACONVE = CONVE * IDF30E * AF30E * BF30E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACONVT = ACONVL + ACONVS + ACONVE
C
C   CALCULATE TOTAL COST
      CONVTT = ACONVT + SFCT30
C
C  PRINT ROUTINE FOR SUBROUTINE SRCONV.....
C
      WRITE (8,30009)
30009 FORMAT (//)
      WRITE (8,30010)
```

```
30010 FORMAT ('0','SUBROUTINE SRCONV, COSTS FOR ACQUISITION AND
     +ERECTION OF LONG DISTANCE SURFACE CONVEYOR FOR USE IN
     +MATERIAL TRANSPORT, USER DEFINED INPUT')
      WRITE (8,30020)
30020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
TRANSPORTED
     +PER DAY')
      WRITE (8,30030) TONS30
30030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,30040)
30040 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,30050) DFCT30
30050 FORMAT (8X,'DISTANCE (meters)      ',F17.2)
      WRITE (8,30060)
30060 FORMAT (4X,'GRADE FACTOR')
      WRITE (8,30070) IFCT30
30070 FORMAT (8X,'GRADE (degrees)        ',F17.2)
      WRITE (8,30080)
30080 FORMAT (4X,'STACKER-TRIPPER FACTOR')
      WRITE (8,30090) SFCT30
30090 FORMAT (8X,'STACKER (dollars)      ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,30100)
30100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,30110) IDF30L
30110 FORMAT (8X,'DISTANCE AND GRADE     ',F17.2)
      WRITE (8,30120) AF30L
30120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,30130) BF30L
30130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,30140)
30140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,30150) IDF30S
30150 FORMAT (8X,'DISTANCE AND GRADE     ',F17.2)
      WRITE (8,30160) AF30S
30160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,30170) BF30S
30170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,30180)
30180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,30190) IDF30E
30190 FORMAT (8X,'DISTANCE AND GRADE     ',F17.2)
      WRITE (8,30200) AF30E
30200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,30210) BF30E
30210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,30220)
30220 FORMAT ('0','SUBROUTINE SRCONV, CALCULATED COSTS OUTPUT')
      WRITE (8,30230)
30230 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,30240) CONVL
30240 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,30250) CONVS
30250 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,30260) CONVE
30260 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,30270)
30270 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,30280) ACONVL
30280 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,30290) ACONVS
30290 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,30300) ACONVE
30300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,30310)
30310 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,30320) ACONVT
30320 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,30330) CONVTT
30330 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
```

C
C

Appendix C
UCAP2.FOR, FORTRAN CODE

```
      PROGRAM UCAP2
C
C
C
C
      OPEN (UNIT=7,FILE='UCAP.DAT',ACCESS='DIRECT',STATUS='OLD',
     +      FORM='FORMATTED',RECL=80)
      OPEN (UNIT=8,FILE='UCAP2.OUT',STATUS='NEW')
C
C
C
C
C  UNDERX CONTROL STATEMENTS FOR USER DEFINED SUBROUTINE
C  CHOICES
C
      LINE = 0
      DO 1000,I=1,22,1
      LINE=60+I
      READ (7,2000,REC=LINE) J
 2000 FORMAT (34X,I1)
      IF(J.EQ.1) THEN
      GOTO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,
     +21,22),I
      ENDIF
      GO TO 1000
C
C   SUBROUTINE CALL STATEMENTS
C
    1 CALL TALK
      GO TO 1000
    2 CALL AIR
      GO TO 1000
    3 CALL EPOWER
      GO TO 1000
    4 CALL FUEL
      GO TO 1000
    5 CALL OFFLAB
      GO TO 1000
    6 CALL PPOWER
      GO TO 1000
    7 CALL SHOPS
      GO TO 1000
    8 CALL STOCKP
      GO TO 1000
```

```
  9 CALL BUILDS
    GO TO 1000
 10 CALL VENT
    GO TO 1000
 11 CALL DRAIN
    GO TO 1000
 12 CALL WATER
    GO TO 1000
 13 CALL CROAD
    GO TO 1000
 14 CALL BLAST
    GO TO 1000
 15 CALL EXCAVE
    GO TO 1000
 16 CALL GRAVEL
    GO TO 1000
 17 CALL PAVE
    GO TO 1000
 18 CALL PLINES
    GO TO 1000
 19 CALL WCLEAR
    GO TO 1000
 20 CALL NEUTRL
    GO TO 1000
 21 CALL ENGFEE
    GO TO 1000
 22 CALL WCAP
    GO TO 1000
1000 CONTINUE
     STOP
     END
C
C
C
     SUBROUTINE TALK
C
C
C  COSTS FOR ACQUISTION AND INSTALLATION OF COMPLETE SURFACE
AND
C  UNDERGROUND COMMUNICATIONS SYSTEM
C
C    TALK
     REAL
    +            TONS31,
```

```
     +            TALKL,  TALKS,  TALKE,
     +            AF31L,  AF31S,  AF31E,
     +            BF31L,  BF31S,  BF31E,
     +            ATALKL, ATALKS, ATALKE,
     +            ATALKT, TALKTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE PRODUCED
C
      READ (7,10,REC=2408) TONS31
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      TALKL = 134.539 * (TONS31 ** 0.459)
      TALKS = 206.983 * (TONS31 ** 0.459)
      TALKE = 693.392 * (TONS31 ** 0.459)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF31L.....AF31S.....AF31E
      READ (7,20,REC=2415) AF31L
      READ (7,20,REC=2427) AF31S
      READ (7,20,REC=2439) AF31E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF31L.....BF31S.....BF31E
      READ (7,30,REC=2420) BF31L
      READ (7,30,REC=2432) BF31S
      READ (7,30,REC=2444) BF31E
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ATALKL = TALKL * AF31L * BF31L
      ATALKS = TALKS * AF31S * BF31S
      ATALKE = TALKE * AF31E * BF31E
C
C   CALCULATE TOTAL ADJUSTED COST
      ATALKT = ATALKL + ATALKS + ATALKE
C
C   CALCULATE TOTAL COST
      TALKTT = ATALKT
C
```

```
C  PRINT ROUTINE FOR SUBROUTINE TALK.....
C
      WRITE (8,31009)
31009 FORMAT (//)
      WRITE (8,31010)
31010 FORMAT ('0','SUBROUTINE TALK, COSTS FOR ACQUISITION AND
     +INSTALLATION OF COMPLETE SURFACE AND UNDERGROUND
COMMUNICATIONS
     +SYSTEM, USER DEFINED INPUT')
      WRITE (8,31020)
31020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE PRODUCED
     +PER DAY')
      WRITE (8,31030) TONS31
31030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
C-----------------------------------------------------------------
C
      WRITE (8,31040)
31040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,31050) AF31L
31050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,31060) BF31L
31060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,31070)
31070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,31080) AF31S
31080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,31090) BF31S
31090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,31100)
31100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,31110) AF31E
31110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,31120) BF31E
31120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
```

```
      WRITE (8,31130)
31130 FORMAT ('0','SUBROUTINE TALK, CALCULATED COSTS OUTPUT')
      WRITE (8,31140)
31140 FORMAT ('0',4X,'BASE COST TO MEET REQUIREMENTS')
      WRITE (8,31150) TALKL
31150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,31160) TALKS
31160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,31170) TALKE
31170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,31180)
31180 FORMAT ('0',4X,'ADJUSTED COST TO MEET REQUIREMENTS')
      WRITE (8,31190) ATALKL
31190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,31200) ATALKS
31200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,31210) ATALKE
31210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,31220)
31220 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,31230) ATALKT
31230 FORMAT (8X,'PER TOTAL SYSTEM       ',F17.2)
      WRITE (8,31240) TALKTT
31240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE AIR
C
C
C  COSTS FOR ACQUISTION AND INSTALLATION OF A COMPRESSED AIR
C  SUPPLY SYSTEM
C
C   AIR
      REAL
     +          AIR32,
     +          AIRL,  AIRS,  AIRE,
     +          AFCT32,
     +          ALF32L, ALF32S, ALF32E,
     +          AF32L,  AF32S,  AF32E,
     +          BF32L,  BF32S,  BF32E,
```

```
     +            AAIRL,  AAIRS,  AAIRE,
     +            AAIRT,  AIRTT
C
C   READ TOTAL COMPRESSOR CAPACITY NEEDED IN CUBIC METERS
INSTALLED
C   CAPACITY PER MINUTE
C
      READ (7,10,REC=2453) AIR32
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      AIRL =  691.915 * (AIR32 ** 0.695)
      AIRS =  492.225 * (AIR32 ** 0.695)
      AIRE = 8698.695 * (AIR32 ** 0.695)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ALTITUDE FACTOR....AFCT32
      READ (7,20,REC=2460) AFCT32
   20 FORMAT (15X,F17.2)
C   ALTITUDE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT
C   ALF32L.....ALF32S.....ALF32E
      ALF32L = (0.823 + (0.0001 * AFCT32))
      ALF32S = (0.823 + (0.0001 * AFCT32))
      ALF32E = (0.823 + (0.0001 * AFCT32))
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF32L.....AF32S.....AF32E
      READ (7,30,REC=2467) AF32L
      READ (7,30,REC=2479) AF32S
      READ (7,30,REC=2491) AF32E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF32L.....BF32S.....BF32E
      READ (7,40,REC=2472) BF32L
      READ (7,40,REC=2484) BF32S
      READ (7,40,REC=2496) BF32E
   40 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AAIRL = AIRL * ALF32L * AF32L * BF32L
      AAIRS = AIRS * ALF32S * AF32S * BF32S
```

```
      AAIRE = AIRE * ALF32E * AF32E * BF32E
C
C   CALCULATE TOTAL ADJUSTED COST
      AAIRT = AAIRL + AAIRS + AAIRE
C
C   CALCULATE TOTAL COST
      AIRTT = AAIRT
C
C  PRINT ROUTINE FOR SUBROUTINE AIR.....
C
      WRITE (8,32009)
32009 FORMAT (//)
      WRITE (8,32010)
32010 FORMAT ('0','SUBROUTINE AIR, COSTS FOR ACQUISITION AND
     +INSTALLATION OF A COMPRESSED AIR SUPPLY SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,32020)
32020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY IN
     +CUBIC METERS PER MINUTE')
      WRITE (8,32030) AIR32
32030 FORMAT (8X,'CUBIC METERS PER MINUTE',F17.2)
      WRITE (8,32040) AFCT32
32040 FORMAT (4X,'ALTITUDE FACTOR (meters)',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,32050)
32050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,32060) ALF32L
32060 FORMAT (8X,'ALTITUDE                ',F17.2)
      WRITE (8,32070) AF32L
32070 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,32080) BF32L
32080 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,32090)
32090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,32100) ALF32S
32100 FORMAT (8X,'ALTITUDE                ',F17.2)
      WRITE (8,32110) AF32S
32110 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,32120) BF32S
```

```
32120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,32130)
32130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,32140) ALF32E
32140 FORMAT (8X,'ALTITUDE              ',F17.2)
      WRITE (8,32150) AF32E
32150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,32160) BF32E
32160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,32170)
32170 FORMAT ('0','SUBROUTINE AIR, CALCULATED COSTS OUTPUT')
      WRITE (8,32180)
32180 FORMAT ('0',4X,'BASE COST TO MEET AIR REQUIREMENTS')
      WRITE (8,32190) AIRL
32190 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,32200) AIRS
32200 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,32210) AIRE
32210 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,32220)
32220 FORMAT ('0',4X,'ADJUSTED COST TO MEET AIR REQUIREMENTS')
      WRITE (8,32230) AAIRL
32230 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,32240) AAIRS
32240 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,32250) AAIRE
32250 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,32260)
32260 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,32270) AAIRT
32270 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,32280) AIRTT
32280 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
```

```
C
C
      SUBROUTINE EPOWER
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF AN ELECTRIC
POWER
C   SUPPLY SYSTEM
C
C    EPOWER
      REAL
     +            KWT33,   TONS33,
     +            KWT1L,   KWT1S,  KWT1E,
     +            KWT2L,   KWT2S,  KWT2E,
     +            ESF33L,  ESF33S, ESF33E,
     +            AEF331L, AEF33S, AEF33E,
     +            AF33L,   AF33S,  AF33E,
     +            BF33L,   BF33S,  BF33E,
     +            AKWT1L,  AKWT1S, AKWT1E,
     +            AKWT2L,  AKWT2S, AKWT2E,
     +            AKWT1T,  KWT1TT,
     +            AKWT2T,  KWT2TT
C
C   READ TOTAL POWER CAPACITY NEEDED IN KILOWATTS AND
C   METRIC TONS MINED PER DAY
C
      READ (7,10,REC=2505) KWT33
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=2510) TONS33
   20 FORMAT (15X,F17.2)

C   CALCULATE BASE COSTS, BASED ON USER ESTIMATED POWER
REQUIREMTNS
      KWT1L = 626.117 * (KWT33 ** 0.720)
      KWT1S = 112.140 * (KWT33 ** 0.720)
      KWT1E = 196.246 * (KWT33 ** 0.720)
C
C   CALCULATE BASE COSTS, BASED ON TONNAGE PER DAY PRODUCED
      POWER  = 46.610 * (TONS33 ** 0.640)
      KWT2L = 626.117 * (POWER  ** 0.720)
      KWT2S = 112.140 * (POWER  ** 0.720)
      KWT2E = 196.246 * (POWER  ** 0.720)
C
C   CONSIDER ADJUSTMENT FACTORS
```

```
C
C   SUBSTATION FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   ESF33L.....ESF33S.....ESF33E
      READ (7,30,REC=2517) ESF33L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2539) ESF33S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=2561) ESF33E
   50 FORMAT (15X,F17.2)
C
C   ADIT ENTRY FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   AEF33L.....AEF33S.....AEF33E
      READ (7,60,REC=2522) AEF33L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2544) AEF33S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=2566) AEF33E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF33L.....AF33S.....AF33E
      READ (7,90,REC=2527) AF33L
      READ (7,90,REC=2549) AF33S
      READ (7,90,REC=2571) AF33E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF33L.....BF33S.....BF33E
      READ (7,100,REC=2532) BF33L
      READ (7,100,REC=2554) BF33S
      READ (7,100,REC=2576) BF33E
  100 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AKWT1L  = KWT1L * ESF33L * AEF33L * AF33L * BF33L
      AKWT1S  = KWT1S * ESF33S * AEF33S * AF33S * BF33S
      AKWT1E  = KWT1E * ESF33E * AEF33E * AF33E * BF33E
      AKWT2L  = KWT2L * ESF33L * AEF33L * AF33L * BF33L
      AKWT2S  = KWT2S * ESF33S * AEF33S * AF33S * BF33S
      AKWT2E  = KWT2E * ESF33E * AEF33E * AF33E * BF33E
C
C   CALCULATE TOTAL ADJUSTED COST
```

```
      AKWT1T = AKWT1L + AKWT1S + AKWT1E
      AKWT2T = AKWT2L + AKWT2S + AKWT2E
C
C   CALCULATE TOTAL COST
      KWT1TT = AKWT1T
      KWT2TT = AKWT2T
C
C  PRINT ROUTINE FOR SUBROUTINE EPOWER.....
C
      WRITE (8,33009)
33009 FORMAT (//)
      WRITE (8,33010)
33010 FORMAT ('0','SUBROUTINE EPOWER, COSTS FOR ACQUISITION AND
     +INSTALLATION OF AN ELECTRIC SUPPLY SYSTEM, ESTIMATES
BASED ON
     +AND GIVEN FOR BOTH USER DEFINED NEEDS AND TONS TO BE
     +MINED PER DAY, USER DEFINED INPUT')
      WRITE (8,33020)
33020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY IN
     +KILOWATTS')
      WRITE (8,33030) KWT33
33030 FORMAT (8X,'KILOWATTS (maximum)    ',F17.2)
      WRITE (8,33040)
33040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY')
      WRITE (8,33050) TONS33
33050 FORMAT (8X,'TONS MINED PER DAY     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33060)
33060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,33070) ESF33L
33070 FORMAT (8X,'SUBSTATION             ',F17.2)
      WRITE (8,33080) AF33L
33080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,33090) BF33L
33090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33100)
33100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,33110) ESF33S
```

```
33110 FORMAT (8X,'SUBSTATION              ',F17.2)
      WRITE (8,33120) AF33S
33120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,33130) BF33S
33130 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33140)
33140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,33150) ESF33E
33150 FORMAT (8X,'SUBSTATION              ',F17.2)
      WRITE (8,33160) AF33E
33160 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,33170) BF33E
33170 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,33180)
33180 FORMAT ('0','SUBROUTINE EPOWER, CALCULATED COSTS OUTPUT')
      WRITE (8,33190)
33190 FORMAT ('0',4X,'BASE COST BASED ON TOTAL KILOWATTS')
      WRITE (8,33200) KWT1L
33200 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,33210) KWT1S
33210 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,33220) KWT1E
33220 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,33230)
33230 FORMAT ('0',4X,'BASE COST BASED ON TONNAGE MINED')
      WRITE (8,33240) KWT2L
33240 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,33250) KWT2S
33250 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,33260) KWT2E
33260 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,33270)
33270 FORMAT ('0',4X,'ADJUSTED COST BASED ON TOTAL KILOWATTS')
      WRITE (8,33280) AKWT1L
33280 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,33290) AKWT1S
33290 FORMAT (8X,'SUPPLIES                ',F17.2)
```

```
      WRITE (8,33300) AKWT1E
33300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,33310)
33310 FORMAT ('0',4X,'ADJUSTED COST BASED ON TONNAGE MINED')
      WRITE (8,33320) AKWT2L
33320 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,33330) AKWT2S
33330 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,33340) AKWT2E
33340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,33350)
33350 FORMAT ('0',4X,'TOTAL COST BASED ON TOTAL KILOWATTS')
      WRITE (8,33360) AKWT1T
33360 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,33370) KWT1TT
33370 FORMAT (8X,'PROJECT                ',F17.2)
      WRITE (8,33380)
33380 FORMAT ('0',4X,'TOTAL COST BASED ON TONNAGE MINED')
      WRITE (8,33390) AKWT2T
33390 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,33400) KWT2TT
33400 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE FUEL
C
C
C  COSTS FOR ACQUISTION AND INSTALLATION OF A FUELING STORAGE
AND
C  DISTRIBUTION SYSTEM
C
C   FUEL
      REAL
     +            TONS34,
     +            FUELL,  FUELS,  FUELE,
     +            NDF34L, NDF34S, NDF34E,
     +            AEF34L, AEF34S, AEF34E,
     +            AF34L,  AF34S,  AF34E,
     +            BF34L,  BF34S,  BF34E,
     +            AFUELL, AFUELS, AFUELE,
```

```
     +              AFUELT, FUELTT
C
C   READ TOTAL METRIC TONS PER DAY MINED
C
      READ (7,10,REC=2585) TONS34
   10 FORMAT (15X,F17.2)
      IF (TONS34.LE.375) THEN
C   CALCULATE BASE COSTS
      FUELL = 2424.953 * (TONS34 ** 0.000)
      FUELS = 8891.493 * (TONS34 ** 0.000)
      FUELE =  230.948 * (TONS34 ** 0.000)
      ELSE
C   CALCULATE BASE COSTS
      FUELL = 2176.103 + (TONS34 * 0.664)
      FUELS = 7979.043 + (TONS34 * 2.434)
      FUELE =  207.248 + (TONS34 * 0.063)
      ENDIF
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   NONDIESEL MINE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   NDF34L.....NDF34S.....NDF34E
      READ (7,20,REC=2592) NDF34L
   20 FORMAT (15X,F17.2)
      READ (7,30,REC=2614) NDF34S
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2636) NDF34E
   40 FORMAT (15X,F17.2)
C
C   ADIT ENTRY FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   AEF34L.....AEF34S.....AEF34E
      READ (7,50,REC=2597) AEF34L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=2619) AEF34S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2641) AEF34E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF34L.....AF34S.....AF34E
      READ (7,80,REC=2602) AF34L
      READ (7,80,REC=2624) AF34S
```

```
      READ (7,80,REC=2646) AF34E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF34L.....BF34S.....BF34E
      READ (7,90,REC=2607) BF34L
      READ (7,90,REC=2629) BF34S
      READ (7,90,REC=2651) BF34E
   90 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AFUELL = FUELL * NDF34L * AEF34L * AF34L * BF34L
      AFUELS = FUELS * NDF34S * AEF34S * AF34S * BF34S
      AFUELE = FUELE * NDF34E * AEF34E * AF34E * BF34E
C
C   CALCULATE TOTAL ADJUSTED COST
      AFUELT = AFUELL + AFUELS + AFUELE
C
C   CALCULATE TOTAL COST
      FUELTT = AFUELT
C
C  PRINT ROUTINE FOR SUBROUTINE FUEL.....
C
      WRITE (8,34009)
 34009 FORMAT (//)
      WRITE (8,34010)
 34010 FORMAT ('0','SUBROUTINE FUEL, COSTS FOR ACQUISITION AND
     +INSTALLATION OF A FUELING STORAGE AND DISTRIBUTION
 SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,34020)
 34020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONS PRODUCED
     +PER DAY')
      WRITE (8,34030) TONS34
 34030 FORMAT (8X,'TONS PER DAY          ',F17.2)
 C
 C-----------------------------------------------------------
 C
      WRITE (8,34040)
 34040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,34050) NDF34L
 34050 FORMAT (8X,'NONDIESEL MINE        ',F17.2)
      WRITE (8,34060) AEF34L
```

```
34060 FORMAT (8X,'ADIT ENTRY              ',F17.2)
      WRITE (8,34070) AF34L
34070 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,34080) BF34L
34080 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,34090)
34090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,34100) NDF34S
34100 FORMAT (8X,'NONDIESEL MINE          ',F17.2)
      WRITE (8,34110) AEF34S
34110 FORMAT (8X,'ADIT ENTRY              ',F17.2)
      WRITE (8,34120) AF34S
34120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,34130) BF34S
34130 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,34140)
34140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,34150) NDF34E
34150 FORMAT (8X,'NONDIESEL MINE          ',F17.2)
      WRITE (8,34160) AEF34E
34160 FORMAT (8X,'ADIT ENTRY              ',F17.2)
      WRITE (8,34170) AF34E
34170 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,34180) BF34E
34180 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,34190)
34190 FORMAT ('0','SUBROUTINE FUEL, CALCULATED COSTS OUTPUT')
      WRITE (8,34200)
34200 FORMAT ('0',4X,'BASE COST TO MEET REQUIREMENTS')
      WRITE (8,34210) FUELL
34210 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,34220) FUELS
34220 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,34230) FUELE
```

```
34230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,34240)
34240 FORMAT ('0',4X,'ADJUSTED COST TO MEET REQUIREMENTS')
      WRITE (8,34250) AFUELL
34250 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,34260) AFUELS
34260 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,34270) AFUELE
34270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,34280)
34280 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,34290) AFUELT
34290 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,34300) FUELTT
34300 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE OFFLAB
C
C
C  COSTS FOR BUILDING AND FURNISHING OF SURFACE OFFICES
C
C     OFFLAB
      REAL
     +          OFFA35, OFFT35,
     +          OFF1L,  OFF1S,  OFF1E,
     +          OSQMTR,
     +          OFFSL,  OFFSS,  OFF2E,
     +          LABA35, LABT35,
     +          LAB1L,  LAB1S,  LAB1E,
     +          LSQMTR,
     +          LAB2L,  LAB2S,  LAB2E,
     +          WOF1L,  WOF1S,  WOF1E,
     +          WLF1L,  WLF1S,  WLF1E,
     +          AOF1L,  AOF1S,  AOF1E,
     +          BOF1L,  BOF1S,  BOF1E,
     +          ALF1L,  ALF1S,  ALF1E,
     +          BLF1L,  BLF1S,  BLF1E,
     +          AOFF1L, AOFF1S, AOFF1E,
     +          AOFF2L, AOFF2S, AOFF2E,
```

```
     +            ALAB1L, ALAB1S, ALAB1E,
     +            ALAB2L, ALAB2S, ALAB2E,
     +            AOFF1T, AOFF2T,
     +            ALAB1T, ALAB2T,
     +            OFF1TT, OFF2TT,
     +            LAB1TT, LAB2TT
C
C   READ TOTAL OFFICE AREA NEEDED IN SQUARE METERS AND
C   METRIC TONS MINED PER DAY
C
      READ (7,10,REC=2660) OFFA35
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=2665) OFFT35
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS FOR OFFICES BASED ON USER ESTIMATED
C   AREA REQUIREMENTS
C
      OFF1L = 316.704 * (OFFA35 ** 0.965)
      OFF1S = 406.031 * (OFFA35 ** 0.965)
      OFF1E =  89.327 * (OFFA35 ** 0.965)
C
C   CALCULATE BASE COSTS FOR OFFICES BASED ON TONNAGE PER DAY
PRODUCED
C
      OSQMTR =     4.332 * (OFFT35 ** 0.588)
      OFF2L  =  1155.164 * (OFFT35 ** 0.595)
      OFF2S  =  1480.980 * (OFFT35 ** 0.595)
      OFF2E  =   325.815 * (OFFT35 ** 0.595)
C
C   READ TOTAL LAB AREA NEEDED IN SQUARE METERS AND
C   METRIC TONS MINED PER DAY
C
      READ (7,30,REC=2670) LABA35
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2675) LABT35
   40 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS FOR LABS BASED ON USER ESTIMATED
C   AREA REQUIREMENTS
C
      LAB1L =  529.088 * (LABA35 ** 0.901)
      LAB1S =  581.996 * (LABA35 ** 0.901)
      LAB1E = 1534.354 * (LABA35 ** 0.901)
```

```
C
C   CALCULATE BASE COSTS FOR LABS BASED ON TONNAGE PER DAY
PRODUCED
C
      LSQMTR  =    0.687 * (LABT35 ** 0.628)
      LAB2L   =  374.844 * (LABT35 ** 0.565)
      LAB2S   =  412.328 * (LABT35 ** 0.565)
      LAB2E   = 1087.047 * (LABT35 ** 0.565)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   WEATHER FACTORS FOR OFFICES FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   WOF35L.....WOF35S.....WOF35E
      READ (7,50,REC=2682) WOF35L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=2714) WOF35S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2746) WOF35E
   70 FORMAT (15X,F17.2)
C
C   WEATHER FACTORS FOR LABS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   WLF35L.....WLF35S.....WLF35E
      READ (7,80,REC=2687) WLF35L
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=2719) WLF35S
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=2751) WLF35E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR OFFICES FOR LABOR,
SUPPLIES
C   AND EQUIPMENT.....AOF35L.....AOF35S.....AOF35E
      READ (7,110,REC=2692) AOF35L
      READ (7,110,REC=2724) AOF35S
      READ (7,110,REC=2756) AOF35E
  110 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "B" FOR OFFICES FOR LABOR,
SUPPLIES
C   AND EQUIPMENT.....BOF35L.....BOF35S.....BOF35E
      READ (7,120,REC=2697) BOF35L
      READ (7,120,REC=2729) BOF35S
```

```
      READ (7,120,REC=2761) BOF35E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABS FOR LABOR, SUPPLIES
C   AND EQUIPMENT.....ALF35L.....ALF35S.....ALF35E
      READ (7,130,REC=2702) ALF35L
      READ (7,130,REC=2734) ALF35S
      READ (7,130,REC=2766) ALF35E
  130 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABS FOR LABOR, SUPPLIES
C   AND EQUIPMENT.....BLF35L.....BLF35S.....BLF35E
      READ (7,140,REC=2707) BLF35L
      READ (7,140,REC=2739) BLF35S
      READ (7,140,REC=2771) BLF35E
  140 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS FOR OFFICES
C
      AOFF1L = OFF1L * WOF35L * AOF35L * BOF35L
      AOFF1S = OFF1S * WOF35S * AOF35S * BOF35S
      AOFF1E = OFF1E * WOF35E * AOF35E * BOF35E
      AOFF2L = OFF2L * WOF35L * AOF35L * BOF35L
      AOFF2S = OFF2S * WOF35S * AOF35S * BOF35S
      AOFF2E = OFF2E * WOF35E * AOF35E * BOF35E
      ALAB1L = LAB1L * WLF35L * ALF35L * BLF35L
      ALAB1S = LAB1S * WLF35S * ALF35S * BLF35S
      ALAB1E = LAB1E * WLF35E * ALF35E * BLF35E
      ALAB2L = LAB2L * WLF35L * ALF35L * BLF35L
      ALAB2S = LAB2S * WLF35S * ALF35S * BLF35S
      ALAB2E = LAB2E * WLF35E * ALF35E * BLF35E
C
C   CALCULATE TOTAL ADJUSTED COST
      AOFF1T = AOFF1L + AOFF1S + AOFF1E
      AOFF2T = AOFF2L + AOFF2S + AOFF2E
      ALAB1T = ALAB1L + ALAB1S + ALAB1E
      ALAB2T = ALAB2L + ALAB2S + ALAB2E
C
C   CALCULATE TOTAL COST
      OFF1TT = AOFF1T
      OFF2TT = AOFF2T
      LAB1TT = ALAB1T
      LAB2TT = ALAB2T
C
```

```
C  PRINT ROUTINE FOR SUBROUTINE OFFLAB.....
C
      WRITE (8,35009)
35009 FORMAT (//)
      WRITE (8,35010)
35010 FORMAT ('0','SUBROUTINE OFFLAB, COSTS FOR BUILDING AND
     +FURNISHING SURFACE OFFICES AND LABS, ESTIMATES BASED ON
     +AND GIVEN FOR BOTH USER DEFINED NEEDS IN SQUARE METERS
     +AND TONS TO BE MINED PER DAY, USER DEFINED INPUT')
      WRITE (8,35020)
35020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY
     +FOR OFFICE SPACE IN SQUARE METERS')
      WRITE (8,35030) OFFA35
35030 FORMAT (8X,'OFFICE AREA(sqmeters ) ',F17.2)
      WRITE (8,35040)
35040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY, VALUE APPLIED TO OFFICE SPACE')
      WRITE (8,35050) OFFT35
35050 FORMAT (8X,'TONS PER DAY (offices) ',F17.2)
      WRITE (8,35060)
35060 FORMAT (8X,'SQ METERS OF OFFICE REQUIRED BASED ON
TONNAGE')
      WRITE (8,35070) OSQMTR
35070 FORMAT (8X,'SQ METERS OF OFFICE    ',F17.2)
      WRITE (8,35080)
35080 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY
     +FOR LAB SPACE IN SQUARE METERS')
      WRITE (8,35090) LABA35
35090 FORMAT (8X,'LAB AREA (sqmeters)    ',F17.2)
      WRITE (8,35100)
35100 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY, VALUE APPLIED TO LAB SPACE')
      WRITE (8,35110) LABT35
35110 FORMAT (8X,'TONS PER DAY (labs)    ',F17.2)
      WRITE (8,35120)
35120 FORMAT (8X,'SQ METERS OF LAB REQUIRED BASED ON TONNAGE')
      WRITE (8,35130) LSQMTR
35130 FORMAT (8X,'SQ METERS OF LAB       ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35140)
35140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
(offices)')
```

```
      WRITE (8,35150) WOF35L
35150 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35160) AOF35L
35160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35170) BOF35L
35170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35180)
35180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(offices)')
      WRITE (8,35190) WOF35S
35190 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35200) AOF35S
35200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35210) BOF35S
35210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35220)
35220 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(offices)')
      WRITE (8,35230) WOF35E
35230 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35240) AOF35E
35240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35250) BOF35E
35250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C
      WRITE (8,35260)
35260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR (labs)')
      WRITE (8,35270) WLF35L
35270 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35280) ALF35L
35280 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35290) BLF35L
35290 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35300)
```

```
35300 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(labs)')
      WRITE (8,35310) WLF35S
35310 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35320) ALF35S
35320 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35330) BLF35S
35330 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35340)
35340 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(labs)')
      WRITE (8,35350) WLF35E
35350 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,35360) ALF35E
35360 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,35370) BLF35E
35370 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,35380)
35380 FORMAT ('0','SUBROUTINE OFFLAB, CALCULATED COSTS OUTPUT')
      WRITE (8,35390)
35390 FORMAT ('0',4X,'BASE COST FOR OFFICES BASED ON TOTAL
     +SQ METERS')
      WRITE (8,35400) OFF1L
35400 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,35410) OFF1S
35410 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,35420) OFF1E
35420 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,35430)
35430 FORMAT ('0',4X,'BASE COST FOR OFFICES BASED ON TONNAGE
MINED')
      WRITE (8,35440) OFF2L
35440 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,35450) OFF2S
35450 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,35460) OFF2E
35460 FORMAT (8X,'EQUIPMENT                ',F17.2)
```

```
      WRITE (8,35470)
35470 FORMAT ('0',4X,'ADJUSTED COST FO OFFICES BASED ON
     +TOTAL SQ METERS')
      WRITE (8,35480) AOFF1L
35480 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35490) AOFF1S
35490 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35500) AOFF1E
35500 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,35510)
35510 FORMAT ('0',4X,'ADJUSTED COST FOR OFFICES BASED ON
TONNAGE
     +MINED')
      WRITE (8,35520) AOFF2L
35520 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35530) AOFF2S
35530 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35540) AOFF2E
35540 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,35550)
35550 FORMAT ('0',4X,'TOTAL COST FOR OFFICES BASED ON TOTAL
     +SQ METERS')
      WRITE (8,35560) AOFF1T
35560 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,35570) OFF1TT
35570 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,35580)
35580 FORMAT ('0',4X,'TOTAL COST FOR OFFICES BASED ON TONNAGE
MINED')
      WRITE (8,35590) AOFF2T
35590 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,35600) OFF2TT
35600 FORMAT (8X,'PROJECT              ',F17.2)
C
C
      WRITE (8,35610)
35610 FORMAT ('0',4X,'BASE COST FOR LABS BASED ON TOTAL
     +SQ METERS')
      WRITE (8,35620) LAB1L
35620 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35630) LAB1S
35630 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35640) LAB1E
35640 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,35650)
35650 FORMAT ('0',4X,'BASE COST FOR LABS BASED ON TONNAGE
MINED')
      WRITE (8,35660) LAB2L
35660 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35670) LAB2S
35670 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35680) LAB2E
35680 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,35690)
35690 FORMAT ('0',4X,'ADJUSTED COST FOR LABS BASED ON
     +TOTAL SQ METERS')
      WRITE (8,35700) ALAB1L
35700 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35710) ALAB1S
35710 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35720) ALAB1E
35720 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,35730)
35730 FORMAT ('0',4X,'ADJUSTED COST FOR LABS BASED ON TONNAGE
     +MINED')
      WRITE (8,35740) ALAB2L
35740 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,35750) ALAB2S
35750 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,35760) ALAB2E
35760 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,35770)
35770 FORMAT ('0',4X,'TOTAL COST FOR LABS BASED ON TOTAL
     +SQ METERS')
      WRITE (8,35780) ALAB1T
35780 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,35790) LAB1TT
35790 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,35800)
35800 FORMAT ('0',4X,'TOTAL COST FOR LABS BASED ON TONNAGE
MINED')
      WRITE (8,35810) ALAB2T
35810 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,35820) LAB2TT
35820 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
```

```
C
C
      SUBROUTINE PPOWER
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF A PRIMARY POWER
C   SOURCE
C
C     PPOWER
      REAL
     +            KWT36,
     +            DIESL,  DIESS,  DIESE,
     +            TURBL,  TURBS,  TURBE,
     +            ADF1L,  ADF1S,  ADF1E,
     +            BDF1L,  BDF1S,  BDF1E,
     +            ATF1L,  ATF1S,  ATF1E,
     +            BTF1L,  BTF1S,  BTF1E,
     +            ADIESL, ADIESS, ADIESE,
     +            ATURBL, ATURBS, ATURBE,
     +            ADIEST, DIESTT,
     +            ATURBT, TURBTT
C
C   READ TOTAL POWER CAPACITY NEEDED IN KILOWATTS
C
      READ (7,10,REC=2780) KWT36
   10 FORMAT (15X,F17.2)

C   CALCULATE BASE COSTS, FOR DIESEL GENERATORS
      DIESL = 167.491 * (KWT36 ** 0.876)
      DIESS = 159.514 * (KWT36 ** 0.876)
      DIESE = 470.568 * (KWT36 ** 0.876)
C
C   CALCULATE BASE COSTS, FOR GAS TURBINE GENERATORS
      TURBL =  472.756 * (KWT36 ** 0.872)
      TURBS =  450.244 * (KWT36 ** 0.872)
      TURBE = 1328.219 * (KWT36 ** 0.872)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR DIESEL GENERATORS FOR
LABOR,
C   SUPPLIES AND EQUIPMENT.....ADF36L.....ADF36S.....ADF36E
      READ (7,20,REC=2787) ADF36L
      READ (7,20,REC=2809) ADF36S
```

```
      READ (7,20,REC=2831) ADF36E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR DIESEL GENERATORS FOR
LABOR,
C   SUPPLIES AND EQUIPMENT.....BDF36L.....BDF36S.....BDF36E
      READ (7,30,REC=2792) BDF36L
      READ (7,30,REC=2814) BDF36S
      READ (7,30,REC=2836) BDF36E
   30 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR GAS TURBINE GENERATORS
FOR
C   LABOR, SUPPLIES AND EQUIPMENT...ATF36L.....ATF36S.....ATF36E
      READ (7,40,REC=2797) ATF36L
      READ (7,40,REC=2819) ATF36S
      READ (7,40,REC=2841) ATF36E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR GAS TURBINE GENERATORS
FOR
C   LABOR, SUPPLIES AND EQUIPMENT...BTF36L.....BTF36S.....BTF36E
      READ (7,50,REC=2802) BTF36L
      READ (7,50,REC=2824) BTF36S
      READ (7,50,REC=2846) BTF36E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADIESL = DIESL * ADF36L * BDF36L
      ADIESS = DIESS * ADF36S * BDF36S
      ADIESE = DIESE * ADF36E * BDF36E
      ATURBL = TURBL * ATF36L * BTF36L
      ATURBS = TURBS * ATF36S * BTF36S
      ATURBE = TURBE * ATF36E * BTF36E
C
C   CALCULATE TOTAL ADJUSTED COST
      ADIEST = ADIESL + ADIESS + ADIESE
      ATURBT = ATURBL + ATURBS + ATURBE
C
C   CALCULATE TOTAL COST
      DIESTT = ADIEST
      TURBTT = ATURBT
C
C  PRINT ROUTINE FOR SUBROUTINE PPOWER.....
C
```

```
      WRITE (8,36009)
36009 FORMAT (//)
      WRITE (8,36010)
36010 FORMAT ('0','SUBROUTINE PPOWER, COSTS FOR ACQUISITION AND
     +INSTALLATION OF A PRIMARY PORTABLE POWER SOURCE, COSTS
ARE
     +PROVIDED FOR BOTH DEISEL AND TURBINE GENERATORS,
     +USER DEFINED INPUT')
      WRITE (8,36020)
36020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL KILOWATTS
NEEDED')
      WRITE (8,36030) KWT36
36030 FORMAT (8X,'KILOWATTS              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,36040)
36040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
     +(DIESEL GENERATORS')
      WRITE (8,36050) ADF36L
36050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36060) BDF36L
36060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,36070)
36070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(DIESEL GENERATORS)')
      WRITE (8,36080) ADF36S
36080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36090) BDF36S
36090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,36100)
36100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(DIESEL GENERATORS) ')
      WRITE (8,36110) ADF36E
36110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36120) BDF36E
36120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C
      WRITE (8,36130)
36130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
     +(TURBINE GENERATORS')
      WRITE (8,36140) ATF36L
36140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36150) BTF36L
36150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,36160)
36160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(TURBINE GENERATORS)')
      WRITE (8,36170) ATF36S
36170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36180) BTF36S
36180 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,36190)
36190 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(TURBINE GENERATORS) ')
      WRITE (8,36200) ATF36E
36200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,36210) BTF36E
36210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,36220)
36220 FORMAT ('0','SUBROUTINE PPOWER, CALCULATED COSTS OUTPUT')
      WRITE (8,36230)
36230 FORMAT ('0',4X,'BASE COST TO MEET POWER REQUIREMENTS')
      WRITE (8,36240)
36240 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,36250) DIESL
36250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,36260) DIESS
36260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,36270) DIESE
36270 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,36280)
36280 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,36290) TURBL
36290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,36300) TURBS
36300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,36310) TURBE
36310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,36320)
36320 FORMAT ('0',4X,'ADJUSTED COST TO MEET POWER
REQUIREMENTS')
      WRITE (8,36330)
36330 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,36340) ADIESL
36340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,36350) ADIESS
36350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,36360) ADIESE
36360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,36370)
36370 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,36380) ATURBL
36380 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,36390) ATURBS
36390 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,36400) ATURBE
36400 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,36410)
36410 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,36420)
36420 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,36430) ADIEST
36430 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,36440) DIESTT
36440 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,36450)
36450 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,36460) ATURBT
36460 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,36470) TURBTT
36470 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
```

```
C
C
C
      SUBROUTINE SHOPS
C
C
C   COSTS FOR BUILDING AND EQUIPPING SHOP AND WAREHOUSE
FACILITIES
C
C     SHOPS
      REAL
     +            SURA37, SURT37,
     +            SSW1L,  SSW1S,  SSW1E,
     +            SSQMTR,
     +            SSW2L,  SSW2S,  SSW2E,
     +            UNDA37, UNDT37,
     +            USW1L,  USW1S,  USW1E,
     +            USQMTR,
     +            USW2L,  USW2S,  USW2E,
     +            WSF37L, WSF37S, WSF37E,
     +            RPF37L, RPF37S, RPF37E,
     +            LFCT37,
     +            SATF37,
     +            ASF37L, ASF37S, ASF37E,
     +            BSF37L, BSF37S, BSF37E,
     +            AUF37L, AUF37S, AUF37E,
     +            BUF37L, BUF37S, BUF37E,
     +            ASSW1L, ASSW1S, ASSW1E,
     +            ASSW2L, ASSW2S, ASSW2E,
     +            AUSW1L, AUSW1S, AUSW1E,
     +            AUSW2L, AUSW2S, AUSW2E,
     +            ASSW1T, ASSW2T,
     +            AUSW1T, AUSW2T,
     +            SSW1TT, SSW2TT,
     +            USW1TT, USW2TT
C
C   READ TOTAL SURFACE SHOP AREA NEEDED IN SQUARE METERS AND
C   METRIC TONS MINED PER DAY
C
      READ (7,10,REC=2855) SURA37
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=2860) SURT37
   20 FORMAT (15X,F17.2)
C
```

```
C   CALCULATE BASE COSTS FOR SURFACE SHOPS AND WAREHOUSES
BASED
C   ON USER ESTIMATED AREA REQUIREMENTS
C
      SSW1L = 370.319 * (SURA37 ** 0.856)
      SSW1S = 446.561 * (SURA37 ** 0.856)
      SSW1E = 272.294 * (SURA37 ** 0.856)
C
C   CALCULATE BASE COSTS FOR SURFACE SHOPS BASED ON TONNAGE
C   PER DAY PRODUCED
C
      SSQMTR =   0.500 * (SURT37 ** 0.952)
      SSW2L  = 293.270 * (SURT37 ** 0.792)
      SSW2S  = 353.649 * (SURT37 ** 0.792)
      SSW2E  = 215.640 * (SURT37 ** 0.792)
C
C   READ TOTAL UNDERGROUND SHOP AND WAREHOUSE NEEDED IN
SQUARE
C   METERS AND METRIC TONS MINED PER DAY
C
      READ (7,30,REC=2865) UNDA37
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2870) UNDT37
   40 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS FOR UNDERGROUND SHOPS AND
WAREHOUSES
C   BASED ON USER ESTIMATED AREA REQUIREMENTS
C
      USW1L = 18.323 * (UNDA37 ** 1.189)
      USW1S = 25.492 * (UNDA37 ** 1.189)
      USW1E = 35.849 * (UNDA37 ** 1.189)
C
C   CALCULATE BASE COSTS FOR UNDERGROUND SHOPS AND
WAREHOUSES
C   BASED ON TONNAGE PER DAY PRODUCED
C
      USQMTR =   53.646 * (UNDT37 ** 0.376)
      USW2L  = 1937.894 * (UNDT37 ** 0.457)
      USW2S  = 2696.200 * (UNDT37 ** 0.457)
      USW2E  = 3791.531 * (UNDT37 ** 0.457)
C
C   CONSIDER ADJUSTMENT FACTORS
C
```

```
C   WEATHER FACTORS FOR OFFICES FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   WSF37L.....WSF37S.....WSF37E
      READ (7,50,REC=2884) WSF37L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=2916) WSF37S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2948) WSF37E
   70 FORMAT (15X,F17.2)
C
C   ROOM AND PILLAR FACTORS FOR UNDERGROUND SHOPS AND
WAREHOUSES FOR
C   LABOR, SUPPLIES AND EQUIPMENT...RPF37L.....RPF37S.....RPF37E
      READ (7,80,REC=2889) RPF37L
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=2921) RPF37S
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=2953) RPF37E
  100 FORMAT (15X,F17.2)
C
C   MULTILEVEL MINE FACTOR FOR SATELITE UNDERGROUND SHOPS
AND
C   WAREHOUSES
C   READ NUMBER OF PRODUCING LEVELS FROM DATA FILE.....LFCT37
      READ (7,110,REC=2877) LFCT37
  110 FORMAT (15X,F17.2)
C   CALCULATE COSTS FOR ONE SHOP ON EACH PRODUCING
LEVEL....SATF37
      SATF37 = LFCT37 * (9.710 * (TONS37 ** 0.914))
C
C   OTHER USER APLLIED FACTORS "A" FOR SURFACE SHOPS AND
WAREHOUSES
C   FOR LABOR, SUPPLIES AND EQUIPMENT.....ASF37L.....ASF37S.....
C   ASF37E
      READ (7,120,REC=2894) ASF37L
      READ (7,120,REC=2926) ASF37S
      READ (7,120,REC=2958) ASF37E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "B" FOR SURFACE SHOPS AND
WAREHOUSES
C   FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BSF37L.....BSF37S.....BSF37E
      READ (7,130,REC=2899) BSF37L
```

```
      READ (7,130,REC=2931) BSF37S
      READ (7,130,REC=2963) BSF37E
  130 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR UNDERGROUND SHOPS AND
C   WAREHOUSES FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   AUF37L.....AUF37S.....AUF37E
      READ (7,140,REC=2904) AUF37L
      READ (7,140,REC=2936) AUF37S
      READ (7,140,REC=2968) AUF37E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "B" FOR UNDERGROUND SHOPS AND
C   WAREHOUSES FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BUF37L.....BUF37S.....BUF37E
      READ (7,150,REC=2909) BUF37L
      READ (7,150,REC=2941) BUF37S
      READ (7,150,REC=2973) BUF37E
  150 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS FOR OFFICES
C
      ASSW1L = SSW1L * WSF37L  * ASF37L * BSF37L
      ASSW1S = SSW1S * WSF37S  * ASF37S * BSF37S
      ASSW1E = SSW1E * WSF37E  * ASF37E * BSF37E
      ASSW2L = SSW2L * WSF37L  * ASF37L * BSF37L
      ASSW2S = SSW2S * WSF37S  * ASF37S * BSF37S
      ASSW2E = SSW2E * WSF37E  * ASF37E * BSF37E
      AUSW1L = USW1L * AUF37L * BUF37L
      AUSW1S = USW1S * AUF37S * BUF37S
      AUSW1E = USW1E * AUF37E * BUF37E
      AUSW2L = USW2L * AUF37L * BUF37L
      AUSW2S = USW2S * AUF37S * BUF37S
      AUSW2E = USW2E * AUF37E * BUF37E
C
C   CALCULATE TOTAL ADJUSTED COST
      ASSW1T = ASSW1L + ASSW1S + ASSW1E
      ASSW2T = ASSW2L + ASSW2S + ASSW2E
      AUSW1T = AUSW1L + AUSW1S + AUSW1E
      AUSW2T = AUSW2L + AUSW2S + AUSW2E
C
C   CALCULATE TOTAL COST
      SSW1TT = ASSW1T
      SSW2TT = ASSW2T
```

```
      USW1TT = AUSW1T + SATF37
      USW2TT = AUSW2T + SATF37
C
C  PRINT ROUTINE FOR SUBROUTINE SHOPS.....
C
      WRITE (8,37009)
37009 FORMAT (//)
      WRITE (8,37010)
37010 FORMAT ('0','SUBROUTINE SHOPS, COSTS FOR BUILDING AND
     +EQUIPPING SURFACE AND UNDERGROUND SHOP AND WAREHOUSE
     +FACILITIES')
      WRITE (8,37011)
37011 FORMAT ('0',' ESTIMATES BASED ON AND GIVEN FOR BOTH
     +USER DEFINED NEEDS IN SQUARE METERS AND TONS TO BE
     +MINED PER DAY, USER DEFINED INPUT')
      WRITE (8,37020)
37020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY
     +FOR SURFACE SHOP/WAREHOUSE SPACE IN SQUARE METERS')
      WRITE (8,37030) SURA37
37030 FORMAT (8X,'SHOP/WARE  (sqmeters)  ',F17.2)
      WRITE (8,37040)
37040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY, APPLIED TO SURFACE SHOP/WAREHOUSES ')
      WRITE (8,37050) SURT37
37050 FORMAT (8X,'TONS PER DAY(shop/ware)',F17.2)
      WRITE (8,37060)
37060 FORMAT (8X,'SQ METERS OF SURFACE SPACE REQUIRED BASED ON
     +TONNAGE')
      WRITE (8,37070) SSQMTR
37070 FORMAT (8X,'SQ METERS SHOP/WARE    ',F17.2)
      WRITE (8,37080)
37080 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY
     +FOR UNDERGROUND SHOP/WAREHOUSE SPACE IN SQUARE METERS')
      WRITE (8,37090) UNDA37
37090 FORMAT (8X,'SHOP/WARE (sqmeters)  ',F17.2)
      WRITE (8,37100)
37100 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY, VALUE APPLIED TO UNDERGROUND SHOP/WAREHOUSES')
      WRITE (8,37110) UNDT37
37110 FORMAT (8X,'TONS PER DAY)shop/ware)',F17.2)
      WRITE (8,37120)
37120 FORMAT (8X,'SQ METERS OF UNDERGROUND SPACE REQUIRED
     +BASED ON TONNAGE')
      WRITE (8,37130) USQMTR
```

```
37130 FORMAT (8X,'SQ METERS SHOP/WARE    ',F17.2)
      WRITE (8,37140)
37140 FORMAT ('0',4X,'NUMBER OF UNDERGROUND PRODUCING LEVELS')
      WRITE (8,37150) LFCT37
37150 FORMAT (8X,'ACTIVE LEVELS          ',F17.2)
      WRITE (8,37160)
37160 FORMAT (8X,'TOTAL COST FOR ONE SHOP ON EACH ACTIVE
LEVEL')
      WRITE (8,37170) SATF37
37170 FORMAT (8X,'SATELITE COST (dollars)',F17.2)
C
C
C-----------------------------------------------------------------
C
      WRITE (8,37180)
37180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
(surface)')
      WRITE (8,37190) WSF37L
37190 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,37200) ASF37L
37200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37210) BSF37L
37210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,37220)
37220 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(surface)')
      WRITE (8,37230) WSF37S
37230 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,37240) ASF37S
37240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37250) BSF37S
37250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,37260)
37260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(surface)')
      WRITE (8,37270) WSF37E
37270 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,37280) ASF37E
```

```
37280 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37290) BSF37E
37290 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C
      WRITE (8,37300)
37300 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
     +(underground)')
      WRITE (8,37310) RPF37L
37310 FORMAT (8X,'ROOM AND PILLAR        ',F17.2)
      WRITE (8,37320) AUF37L
37320 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37330) BUF37L
37330 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,37340)
37340 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(underground)')
      WRITE (8,37350) RPF37S
37350 FORMAT (8X,'ROOM AND PILLAR        ',F17.2)
      WRITE (8,37360) AUF37S
37360 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37370) BUF37S
37370 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,37380)
37380 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(underground)')
      WRITE (8,37390) RPF37E
37390 FORMAT (8X,'ROOM AND PILLAR        ',F17.2)
      WRITE (8,37400) AUF37E
37400 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,37410) BUF37E
37410 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,37420)
37420 FORMAT ('0','SUBROUTINE SHOPS, CALCULATED COSTS OUTPUT')
```

```
      WRITE (8,37430)
37430 FORMAT ('0',4X,'BASE COST FOR SURFACE SHOP/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37440) SSW1L
37440 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,37450) SSW1S
37450 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,37460) SSW1E
37460 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37470)
37470 FORMAT ('0',4X,'BASE COST FOR SURFACE SHOPS/WAREHOUSES
     +BASED ON TONNAGE MINED')
      WRITE (8,37480) SSW2L
37480 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,37490) SSW2S
37490 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,37500) SSW2E
37500 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37510)
37510 FORMAT ('0',4X,'ADJUSTED COST FOR SURFACE
SHOPS/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37520) ASSW1L
37520 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,37530) ASSW1S
37530 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,37540) ASSW1E
37540 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37550)
37550 FORMAT ('0',4X,'ADJUSTED COST FOR SURFACE
SHOP/WAREHOUSES
     +BASED ON TONNAGE MINED')
      WRITE (8,37560) ASSW2L
37560 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,37570) ASSW2S
37570 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,37580) ASSW2E
37580 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37590)
37590 FORMAT ('0',4X,'TOTAL COST FOR SURFACE SHOP/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37600) ASSW1T
37600 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,37610) SSW1TT
```

```
37610 FORMAT (8X,'PROJECT                ',F17.2)
      WRITE (8,37620)
37620 FORMAT ('0',4X,'TOTAL COST FOR SURFACE SHOP/WAREHOUSES
     +BASED ON TONNAGE MINED')
      WRITE (8,37630) ASSW2T
37630 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,37640) SSW2TT
37640 FORMAT (8X,'PROJECT                ',F17.2)
C
C
      WRITE (8,37650)
37650 FORMAT ('0',4X,'BASE COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37660) USW1L
37660 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,37670) USW1S
37670 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,37680) USW1E
37680 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37690)
37690 FORMAT ('0',4X,'BASE COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TONNAGE MINED')
      WRITE (8,37700) USW2L
37700 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,37710) USW2S
37710 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,37720) USW2E
37720 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37730)
37730 FORMAT ('0',4X,'ADJUSTED COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37740) AUSW1L
37740 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,37750) AUSW1S
37750 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,37760) AUSW1E
37760 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37770)
37770 FORMAT ('0',4X,'ADJUSTED COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TONNAGE MINED')
```

```
      WRITE (8,37780) AUSW2L
37780 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,37790) AUSW2S
37790 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,37800) AUSW2E
37800 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,37810)
37810 FORMAT ('0',4X,'TOTAL COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TOTAL SQ METERS')
      WRITE (8,37820) AUSW1T
37820 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,37830) USW1TT
37830 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,37840)
37840 FORMAT ('0',4X,'TOTAL COST FOR UNDERGROUND
SHOP/WAREHOUSES
     +BASED ON TONNAGE MINED')
      WRITE (8,37850) AUSW2T
37850 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,37860) USW2TT
37860 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE STOCKP
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF A STOCKPILIE
STORAGE
C   FACILITY
C
C    STOCKP
      REAL
     +            TONS38,
     +            PILEL,  PILES,  PILEE,
     +            AF38L,  AF38S,  AF38E,
     +            BF38L,  BF38S,  BF38E,
     +            APILEL, APILES, APILEE,
     +            APILET, PILETT
C
```

```
C   READ TOTAL LIVE STORAGE CAPACITY IN METRIC TONS
C
      READ (7,10,REC=2982) TONS38
   10 FORMAT (15X,F17.2)

C   CALCULATE BASE COSTS
      PILEL = 182.132 * (TONS38 ** 0.598)
      PILES = 504.365 * (TONS38 ** 0.598)
      PILEE = 714.516 * (TONS38 ** 0.598)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF38L.....AF38S.....AF38E
      READ (7,20,REC=2889) AF38L
      READ (7,20,REC=3001) AF38S
      READ (7,20,REC=3013) AF38E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF38L.....BF38S.....BF38E
      READ (7,30,REC=2994) BF38L
      READ (7,30,REC=3006) BF38S
      READ (7,30,REC=3018) BF38E
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      APILEL = PILEL * AF38L * BF38L
      APILES = PILES * AF38S * BF38S
      APILEE = PILEE * AF38E * BF38E
C
C   CALCULATE TOTAL ADJUSTED COST
      APILET = APILEL + APILES + APILEE
C
C   CALCULATE TOTAL COST
      PILETT = APILET
C
C  PRINT ROUTINE FOR SUBROUTINE STOCKP.....
C
      WRITE (8,38009)
38009 FORMAT (//)
      WRITE (8,38010)
```

```
38010 FORMAT ('0','SUBROUTINE STOCKP, COSTS FOR ACQUISITION AND
     +INSTALLATION OF A STOCKPILE STORAGE FACILITY,
     +USER DEFINED INPUT')
      WRITE (8,38020)
38020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL LIVE STORAGE
     +CAPACITY IN METRIC TONS')
      WRITE (8,38030) TONS38
38030 FORMAT (8X,'TONS LIVE STORAGE      ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,38040)
38040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,38050) AF38L
38050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,38060) BF38L
38060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,38070)
38070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,38080) AF38S
38080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,38090) BF38S
38090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,38100)
38100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,38110) AF38E
38110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,38120) BF38E
38120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,38130)
38130 FORMAT ('0','SUBROUTINE STOCKP, CALCULATED COSTS OUTPUT')
      WRITE (8,38140)
38140 FORMAT ('0',4X,'BASE COST')
      WRITE (8,38150) PILEL
```

```
38150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,38160) PILES
38160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,38170) PILEE
38170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,38180)
38180 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,38190) APILEL
38190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,38200) APILES
38200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,38210) APILEE
38210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,38220)
38220 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,38230) APILET
38230 FORMAT (8X,'PER FACILITY           ',F17.2)
      WRITE (8,38240) PILETT
38240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE BUILDS
C
C
C   COSTS FOR BUILDING GENERAL SURFACE SUPPORT FACILITIES
C
C     BUILDS
      REAL
     +          AREA39, TONS39, RAT39,
     +          BLD1L,  BLD1S,  BLD1E,
     +          SQMETR,
     +          BLD2L,  BLD2S,  BLD2E,
     +          WF39L,  WF39S,  WF39E,
     +          AF39L,  AF39S,  AF39E,
     +          BF39L,  BF39S,  BF39E,
     +          ABLD1L, ABLD1S, ABLD1E,
     +          ABLD2L, ABLD2S, ABLD2E,
     +          ABLD1T, BLD1TT,
     +          ABLD2T, BLD2TT
C
```

```
C   READ TOTAL OFFICE AREA NEEDED IN SQUARE METERS,
C   METRIC TONS MINED PER DAY AND METRIC TONS PER WORKER
SHIFT RATIO
C
     READ (7,10,REC=3027) AREA39
   10 FORMAT (15X,F17.2)
     READ (7,20,REC=3032) TONS39
   20 FORMAT (15X,F17.2)
     READ (7,30,REC=3037) RAT39
   30 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS FOR BUILDINGS BASED ON USER
ESTIMATED
C   AREA REQUIREMENTS
C
     BLD1L = 2875.840 * (AREA39 ** 0.684)
     BLD1S = 4583.370 * (AREA39 ** 0.684)
     BLD1E = 1527.790 * (AREA39 ** 0.684)
C
C   CALCULATE BASE COSTS FOR OFFICES BASED ON TONNAGE PER DAY
PRODUCED
C
     SQMTR  =    0.743 * (TONS39  / RAT39)
     BLD2L  =  4336.708 * (TONS39 ** 0.436)
     BLD2S  =  6911.628 * (TONS39 ** 0.436)
     BLD2E  =  2303.876 * (TONS39 ** 0.436)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   WEATHER FACTORS FOR OFFICES FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   WF39L.....WF39S.....WF39E
     READ (7,40,REC=3044) WF39L
   40 FORMAT (15X,F17.2)
     READ (7,50,REC=3061) WF39S
   50 FORMAT (15X,F17.2)
     READ (7,60,REC=3078) WF39E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF39L.....AF39S.....AF39E
     READ (7,70,REC=3049) AF39L
     READ (7,70,REC=3066) AF39S
```

```
      READ (7,70,REC=3078) AF39E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF39L.....BF39S.....BF39E
      READ (7,80,REC=3054) BF39L
      READ (7,80,REC=3071) BF39S
      READ (7,80,REC=3088) BF39E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS FOR SUPPORT BUILDINGS
C
      ABLD1L = BLD1L * WF39L * AF39L * BF39L
      ABLD1S = BLD1S * WF39S * AF39S * BF39S
      ABLD1E = BLD1E * WF39E * AF39E * BF39E
      ABLD2L = BLD2L * WF39L * AF39L * BF39L
      ABLD2S = BLD2S * WF39S * AF39S * BF39S
      ABLD2E = BLD2E * WF39E * AF39E * BF39E
C
C   CALCULATE TOTAL ADJUSTED COST
      ABLD1T = ABLD1L + ABLD1S + ABLD1E
      ABLD2T = ABLD2L + ABLD2S + ABLD2E
C
C   CALCULATE TOTAL COST
      BLD1TT = ABLD1T
      BLD2TT = ABLD2T
C
C  PRINT ROUTINE FOR SUBROUTINE BUILDS.....
C
      WRITE (8,39009)
39009 FORMAT (//)
      WRITE (8,39010)
39010 FORMAT ('0','SUBROUTINE BUILDS, COSTS FOR BUILDING
     +GENERAL SURFACE SUPPORT FACILITIES, ESTIMATES BASED ON
     +AND GIVEN FOR BOTH USER DEFINED NEEDS IN SQUARE METERS
     +AND TONS TO BE MINED PER DAY, USER DEFINED INPUT')
      WRITE (8,39020)
39020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY
     +FOR BUILDINGS IN SQUARE METERS')
      WRITE (8,39030) AREA39
39030 FORMAT (8X,'BUILDING AREA(sqmeters)',F17.2)
      WRITE (8,39040)
39040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
```

```
    +DAY')
      WRITE (8,39050) TONS39
39050 FORMAT (8X,'TONS PER DAY          ',F17.2)
      WRITE (8,39060)
39060 FORMAT (8X,'TOTAL SQMETERS REQUIRED BASED ON TONNAGE
MINED')
      WRITE (8,39070) SQMTR
39070 FORMAT (8X,'TOTAL AREA            ',F17.2)
      WRITE (8,39080)
39080 FORMAT ('0',4X,'METRIC TONS PER DAY PER WORKER SHIFT
RATIO')
      WRITE (8,39090) RAT39
39090 FORMAT (8X,'TON/SHIFT RATIO       ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,39100)
39100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,39110) WF39L
39110 FORMAT (8X,'WEATHER               ',F17.2)
      WRITE (8,39120) AF39L
39120 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,39130) BF39L
39130 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,39140)
39140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,39150) WF39S
39150 FORMAT (8X,'WEATHER               ',F17.2)
      WRITE (8,39160) AF39S
39160 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,39170) BF39S
39170 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,39180)
39180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,39190) WF39E
39190 FORMAT (8X,'WEATHER               ',F17.2)
      WRITE (8,39200) AF39E
39200 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
```

```
      WRITE (8,39210) BF39E
39210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,39220)
39220 FORMAT ('0','SUBROUTINE BUILDS, CALCULATED COSTS OUTPUT')
      WRITE (8,39230)
39230 FORMAT ('0',4X,'BASE COST FOR BUILDINGS BASED ON TOTAL
     +SQ METERS')
      WRITE (8,39240) BLD1L
39240 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,39250) BLD1S
39250 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,39260) BLD1E
39260 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,39270)
39270 FORMAT ('0',4X,'BASE COST FOR BUILDINGS BASED ON TONNAGE
MINED')
      WRITE (8,39280) BLD2L
39280 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,39290) BLD2S
39290 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,39300) BLD2E
39300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,39310)
39310 FORMAT ('0',4X,'ADJUSTED COST FOR BUILDINGS BASED ON
     +TOTAL SQ METERS')
      WRITE (8,39320) ABLD1L
39320 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,39330) ABLD1S
39330 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,39340) ABLD1E
39340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,39350)
39350 FORMAT ('0',4X,'ADJUSTED COST FOR BUILDINGS BASED ON
TONNAGE
     +MINED')
      WRITE (8,39360) ABLD2L
39360 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,39370) ABLD2S
39370 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,39380) ABLD2E
39380 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,39390)
```

```
39390 FORMAT ('0',4X,'TOTAL COST FOR BUILDINGS BASED ON TOTAL
     +SQ METERS')
      WRITE (8,39400) ABLD1T
39400 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,39410) BLD1TT
39410 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,39420)
39420 FORMAT ('0',4X,'TOTAL COST FOR BUILDINGS BASED ON TONNAGE
     +MINED')
      WRITE (8,39430) ABLD2T
39430 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,39440) BLD2TT
39440 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE VENT
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF A MINE
VENTILATION
C   SYSTEM
C
C    VENT
      REAL
     +            AIR40,
     +            VENTL,  VENTS,  VENTE,
     +            ACF40L, ACF40S, ACF40E,
     +            AWF40L, AWF40S, AWF40E,
     +            AF40L,  AF40S,  AF40E,
     +            BF40L,  BF40S,  BF40E,
     +            AVENTL, AVENTS, AVENTE,
     +            AVENTT, VENTTT
C
C   READ TOTAL AIR QUANITIY DEMAND IN CUBIC METERS PER MINUTE
C
      READ (7,10,REC=3097) AIR40
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      VENTL =  52842.621 * (EXP ** (0.00004 * AIR40))
```

```
      VENTS =  36155.478 * (EXP ** (0.00004 * AIR40))
      VENTE = 189120.959 * (EXP ** (0.00004 * AIR40))
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   AIR COOLING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   ACF40L.....ACF40S.....ACF40E
      READ (7,20,REC=3104) ACF40L
   20 FORMAT (15X,F17.2)
      READ (7,30,REC=3126) ACF40S
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=3148) ACF40E
   40 FORMAT (15X,F17.2)
C
C   AIR WARMING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   AWF40L.....AWF40S.....AWF40E
      READ (7,50,REC=3109) AWF40L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=3131) AWF40S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=3153) AWF40E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF40L.....AF40S.....AF40E
      READ (7,80,REC=3114) AF40L
      READ (7,80,REC=3136) AF40S
      READ (7,80,REC=3158) AF40E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF40L.....BF40S.....BF40E
      READ (7,90,REC=3119) BF40L
      READ (7,90,REC=3141) BF40S
      READ (7,90,REC=3163) BF40E
   90 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AVENTL = VENTL * ACF40L * AWF40L * AF40L * BF40L
      AVENTS = VENTS * ACF40S * AWF40S * AF40S * BF40S
      AVENTE = VENTE * ACF40E * AWF40E * AF40E * BF40E
C
```

```
C  CALCULATE TOTAL ADJUSTED COST
     AVENTT = AVENTL + AVENTS + AVENTE
C
C  CALCULATE TOTAL COST
     VENTTT = AVENTT
C
C  PRINT ROUTINE FOR SUBROUTINE VENT.....
C
     WRITE (8,40009)
40009 FORMAT (//)
     WRITE (8,40010)
40010 FORMAT ('0','SUBROUTINE VENT, COSTS FOR ACQUISITION AND
    +INSTALLATION OF A MINE VENTALATION SYSTEM,
    +USER DEFINED INPUT')
     WRITE (8,40020)
40020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL AIR DEMAND
QUANTITY
    +IN CUBIC METER PER MINUTE')
     WRITE (8,40030) AIR40
40030 FORMAT (8X,'AIR DEMAND              ',F17.2)
C
C-----------------------------------------------------------------
C
     WRITE (8,40040)
40040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
     WRITE (8,40050) ACF40L
40050 FORMAT (8X,'AIR COOLING             ',F17.2)
     WRITE (8,40060) AWF40L
40060 FORMAT (8X,'AIR WARMING              ',F17.2)
     WRITE (8,40070) AF40L
40070 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
     WRITE (8,40080) BF40L
40080 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
     WRITE (8,40090)
40090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
     WRITE (8,40100) ACF40S
40100 FORMAT (8X,'AIR COOLING             ',F17.2)
     WRITE (8,40110) AWF40S
40110 FORMAT (8X,'AIR WARMING              ',F17.2)
     WRITE (8,40120) AF40S
40120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
```

```
      WRITE (8,40130) BF40S
40130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,40140)
40140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,40150) ACF40E
40150 FORMAT (8X,'AIR COOLING           ',F17.2)
      WRITE (8,40160) AWF40E
40160 FORMAT (8X,'AIR WARMING           ',F17.2)
      WRITE (8,40170) AF40E
40170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,40180) BF40E
40180 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,40190)
40190 FORMAT ('0','SUBROUTINE VENT, CALCULATED COSTS OUTPUT')
      WRITE (8,40200)
40200 FORMAT ('0',4X,'BASE COST')
      WRITE (8,40210) VENTL
40210 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,40220) VENTS
40220 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,40230) VENTE
40230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,40240)
40240 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,40250) AVENTL
40250 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,40260) AVENTS
40260 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,40270) AVENTE
40270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,40280)
40280 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,40290) AVENTT
40290 FORMAT (8X,'PER FACILITY           ',F17.2)
      WRITE (8,40300) VENTTT
40300 FORMAT (8X,'PROJECT               ',F17.2)
C
```

```
      RETURN
      END
C
C
C
      SUBROUTINE DRAIN
C
C
C  COSTS FOR ACQUISTION AND INSTALLATION OF A MINE DRAINAGE
C  SYSTEM
C
C     DRAIN
      REAL
     +            H2O41,
     +            DRANL,  DRANS,  DRANE,
     +            VFCT41,
     +            PF41L,  PF41S,  PF41E,
     +            HSF41L, HSF41S, HSF41E,
     +            HNF41L, HNF41S, HNF41E,
     +            AF41L,  AF41S,  AF41E,
     +            BF41L,  BF41S,  BF41E,
     +            ADRANL, ADRANS, ADRANE,
     +            ADRANT, DRANTT
C
C  READ TOTAL WATER PUMPING QUANITIY IN CUBIC METERS PER DAY
C
      READ (7,10,REC=3172) H2O41
   10 FORMAT (15X,F17.2)
C
C  CALCULATE BASE COSTS
      DRANL =  163.959 * (H2O41 ** 0.690)
      DRANS =  207.681 * (H2O41 ** 0.690)
      DRANE =  721.418 * (H2O41 ** 0.690)
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  READ PUMPING HEIGHT FROM DATA FILE.....VFCT41
      READ (7,20,REC=3179) VFCT41
   20 FORMAT (15X,F17.2)
C
C  PUMPING HEAD FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C  PF41L.....PF41S.....PF41E
C
      PF41L = 0.642 * (EXP ** (0.0008 * VFCT41))
```

```
      PF41S = 0.642 * (EXP ** (0.0008 * VFCT41))
      PF41E = 0.642 * (EXP ** (0.0008 * VFCT41))
C
C   HORIZONTAL DRAINAGE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT IF
C   SETTLING TAKES PLACE.....HSF41L.....HSF41S.....HSF41E
      READ (7,30,REC=3186) HSF41L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=3208) HSF41S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3230) HSF41E
   50 FORMAT (15X,F17.2)
C
C   HORIZONTAL DRAINAGE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT IF
C   NO SETTLING TAKES PLACE.....HNF41L.....HNF41S.....HNF41E
      READ (7,60,REC=3191) HNF41L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=3213) HNF41S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=3235) HNF41E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF41L.....AF41S.....AF41E
      READ (7,90,REC=3196) AF41L
      READ (7,90,REC=3218) AF41S
      READ (7,90,REC=3240) AF41E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF41L.....BF41S.....BF41E
      READ (7,100,REC=3201) BF41L
      READ (7,100,REC=3223) BF41S
      READ (7,100,REC=3245) BF41E
  100 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRANL = DRANL * PF41L * HSF41L * HNF41L * AF41L *
     +         BF41L
      ADRANS = DRANS * PF41S * HSF41S * HNF41S * AF41S *
     +         BF41S
```

```
      ADRANE = DRANE * PF41E * HSF41E * HNF41E * AF41E *
     +          BF41E
C
C   CALCULATE TOTAL ADJUSTED COST
      ADRANT = ADRANL + ADRANS + ADRANE
C
C   CALCULATE TOTAL COST
      DRANTT = ADRANT
C
C  PRINT ROUTINE FOR SUBROUTINE DRAIN.....
C
      WRITE (8,41009)
41009 FORMAT (//)
      WRITE (8,41010)
41010 FORMAT ('0','SUBROUTINE DRAIN, COSTS FOR ACQUISITION AND
     +INSTALLATION OF A MINE DRAINAGE SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,41020)
41020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL WATER PUMPING
     +QUANTITY IN CUBIC METERS PER DAY')
      WRITE (8,41030) H2O41
41030 FORMAT (8X,'PUMPING QUANITY (mpd)  ',F17.2)
      WRITE (8,41040)
41040 FORMAT ('0',4X,'TOTAL VERTICAL PUMPING HEIGHT FACTOR IN
METERS')
      WRITE (8,41050) VFCT41
41050 FORMAT (8X,'PUMPING HEIGHT (meters)',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,41060)
41060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,41070) PF41L
41070 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,41080) HSF41L
41080 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,41090) HNF41L
41090 FORMAT (8X,'HORIZONTAL NO SETTLING ',F17.2)
      WRITE (8,41100) AF41L
41100 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,41110) BF41L
41110 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,41120)
41120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,41130) PF41S
41130 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,41140) HSF41S
41140 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,41150) HNF41S
41150 FORMAT (8X,'HORIZONTAL NO SETTLING ',F17.2)
      WRITE (8,41160) AF41S
41160 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,41170) BF41S
41170 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,41180)
41180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,41190) PF41E
41190 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,41200) HSF41E
41200 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,41210) HNF41E
41210 FORMAT (8X,'HORIZONTAL NO SETTLING ',F17.2)
      WRITE (8,41220) AF41E
41220 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,41230) BF41E
41230 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,41240)
41240 FORMAT ('0','SUBROUTINE DRAIN, CALCULATED COSTS OUTPUT')
      WRITE (8,41250)
41250 FORMAT ('0',4X,'BASE COST')
      WRITE (8,41260) DRANL
41260 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,41270) DRANS
41270 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,41280) DRANE
41280 FORMAT (8X,'EQUIPMENT                 ',F17.2)
      WRITE (8,41290)
41290 FORMAT ('0',4X,'ADJUSTED COST')
```

```
      WRITE (8,41300) ADRANL
41300 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,41310) ADRANS
41310 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,41320) ADRANE
41320 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,41330)
41330 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,41340) ADRANT
41340 FORMAT (8X,'PER FACILITY           ',F17.2)
      WRITE (8,41350) DRANTT
41350 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE WATER
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF A WATER SUPPLY
C   SYSTEM
C
C    WATER
      REAL
     +            H2O42,  TONS42,
     +            WAT1L,  WAT1S,  WAT1E,
     +            JBWAT,
     +            WAT2L,  WAT2S,  WAT2E,
     +            ALWAT,
     +            WAT3L,  WAT3S,  WAT3E,
     +            PWF42L, PWF42S, PWF42E,
     +            A1F42L, A1F42S, A1F42E,
     +            B1F42L, B1F42S, B1F42E,
     +            A2F42L, A2F42S, A2F42E,
     +            B2F42L, B2F42S, B2F42E,
     +            A3F42L, A3F42S, A3F42E,
     +            B3F42L, B3F42S, B3F42E,
     +            AWAT1L, AWAT1S, AWAT1E,
     +            AWAT2L, AWAT2S, AWAT2E,
     +            AWAT3L, AWAT3S, AWAT3E,
     +            AWAT1T, WAT1TT,
     +            AWAT2T, WAT2TT,
```

```
     +            AWAT3T, WAT3TT
C
C   READ TOTAL WATER DEMAND QUANITIY IN CUBIC METERS PER DAY
C
      READ (7,10,REC=3254) H2O42
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3259) TONS42
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON USER ESTIMATE
      WAT1L =  546.786 * (H2O42 ** 0.693)
      WAT1S =  207.681 * (H2O42 ** 0.693)
      WAT1E =  721.418 * (H2O42 ** 0.693)
C
C   CALCULATE BASE COSTS, BASED ON TONNAGE PRODUCED PER DAY
AND
C   DRILLING METHODS
C
C   WATER NEEDED FOR JUMBO OPERATION, CUBIC METERS PER 16
HOURS
      JBWAT =     0.049 * (TONS42 ** 0.889)
      WAT2L =  546.786 * (JBWAT ** 0.693)
      WAT2S =  207.681 * (JBWAT ** 0.693)
      WAT2E =  721.418 * (JBWAT ** 0.693)
C
C   WATER NEEDED FOR AIR-LEG DRILL OPERATION, CUBIC METERS
C   PER 16 HOURS
      ALWAT =    0.025 * (TONS42  ** 0.749)
      WAT3L =  546.786 * (ALWAT ** 0.693)
      WAT3S =  207.681 * (ALWAT ** 0.693)
      WAT3E =  721.418 * (ALWAT ** 0.693)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   PURCHASED WATER FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   PWF42L.....PWF42S.....PWF42E
      READ (7,30,REC=3266) PWF42L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=3303) PWF42S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3340) PWF42E
   50 FORMAT (15X,F17.2)
C
```

```
C   OTHER USER APLLIED FACTORS "A" APPLIED TO USER SPECIFIED
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A1F42L.....A1F42S.....A1F42E
      READ (7,60,REC=3271) A1F42L
      READ (7,60,REC=3308) A1F42S
      READ (7,60,REC=3345) A1F42E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO USER SPECIFIED
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B1F42L.....B1F42S.....B1F42E
      READ (7,70,REC=3276) B1F42L
      READ (7,70,REC=3313) B1F42S
      READ (7,70,REC=3350) B1F42E
   70 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" APPLIED TO ESTIMATED JUMBO
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A2F42L.....A2F42S.....A2F42E
      READ (7,80,REC=3281) A2F42L
      READ (7,80,REC=3318) A2F42S
      READ (7,80,REC=3355) A2F42E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO ESTIMATED JUMBO
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B2F42L.....B2F42S.....B2F42E
      READ (7,90,REC=3286) B2F42L
      READ (7,90,REC=3323) B2F42S
      READ (7,90,REC=3360) B2F42E
   90 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" APPLIED TO ESTIMATED AIR-LEG
DRILL
C   WATER DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A3F42L.....A3F42S.....A3F42E
      READ (7,100,REC=3291) A3F42L
      READ (7,100,REC=3328) A3F42S
      READ (7,100,REC=3365) A3F42E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO ESTIMATED AIR-LEG
```

```
DRILL
C   WATER DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B3F42L.....B3F42S.....B3F42E
      READ (7,110,REC=3296) B3F42L
      READ (7,110,REC=3333) B3F42S
      READ (7,110,REC=3370) B3F42E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AWAT1L = WAT1L * PWF42L * A1F42L * B1F42L
      AWAT1S = WAT1S * PWF42S * A1F42S * B1F42S
      AWAT1E = WAT1E * PWF42E * A1F42E * B1F42E
      AWAT2L = WAT2L * PWF42L * A2F42L * B2F42L
      AWAT2S = WAT2S * PWF42S * A2F42S * B2F42S
      AWAT2E = WAT2E * PWF42E * A2F42E * B2F42E
      AWAT3L = WAT3L * PWF42L * A3F42L * B3F42L
      AWAT3S = WAT3S * PWF42S * A3F42S * B3F42S
      AWAT3E = WAT3E * PWF42E * A3F42E * B3F42E
C
C   CALCULATE TOTAL ADJUSTED COST
      AWAT1T = AWAT1L + AWAT1S + AWAT1E
      AWAT2T = AWAT2L + AWAT2S + AWAT2E
      AWAT3T = AWAT3L + AWAT3S + AWAT3E
C
C   CALCULATE TOTAL COST
      WAT1TT = AWAT1T
      WAT2TT = AWAT2T
      WAT3TT = AWAT3T
C
C  PRINT ROUTINE FOR SUBROUTINE WATER.....
C
      WRITE (8,42009)
42009 FORMAT (//)
      WRITE (8,42010)
42010 FORMAT ('0','SUBROUTINE WATER, COSTS FOR AQUISITION AND
     +INSTALLATION OF A WATER SUPPLY SYSTEM:')
      WRITE (8,42011)
42011 FORMAT ('0','ESTIMATES BASED ON AND GIVEN FOR BOTH USER
DEFINED
     +NEEDS IN CUBIC METERS PER DAY AND TONS TO BE MINED PER
DAY
     +BY A SPECIFED PRODUCTION METHOD, USER DEFINED INPUT.')
      WRITE (8,42012)
42012 FORMAT ('0','ESTIMATES BASED ON USER DEFINED NEED ARE
```

```
     +CONSIDERED SYSTEM 1, THOSE BASED ON PRODUCTION WITH
JUMBOS ARE
     +SYSTEM 2 AND THOSE FOR AIR-LEG DRILLS ARE SYSTEM 3.')
      WRITE (8,42013)
42013 FORMAT ('0','CORRECTION FACTORS FOR A1, B1, A2, B2, A3, B3,
     +CORRESPOND TO SYSTEM 1, 2 OR 3 USE.')
      WRITE (8,42020)
42020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED WATER
CAPACITY
     +IN CUBIC METERS PER DAY')
      WRITE (8,42030) H2O42
42030 FORMAT (8X,'WATER NEED ESTIMATED   ',F17.2)
      WRITE (8,42040)
42040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY')
      WRITE (8,42050) TONS42
42050 FORMAT (8X,'TONS PER DAY          ',F17.2)
      WRITE (8,42060)
42060 FORMAT (8X,'TOTAL WATER REQUIRED BASED ON TONNAGE
MINED
     +USING JUMBOS, 16 HOUR OPERATION')
      WRITE (8,42070) JBWAT
42070 FORMAT (8X,'JUMBO WATER NEED       ',F17.2)
      WRITE (8,42080)
42080 FORMAT (8X,'TOTAL WATER REQUIRED BASED ON TONNAGE
MINED
     +USING AIR-LEG DRILLS, 16 HOUR OPERATION')
      WRITE (8,42090) ALWAT
42090 FORMAT (8X,'AIR-LEG WATER NEED     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,42100)
42100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,42110) PWF42L
42110 FORMAT (8X,'PURCHASED WATER        ',F17.2)
      WRITE (8,42120) A1F42L
42120 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,42130) B1F42L
42130 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,42140) A2F42L
42140 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,42150) B2F42L
42150 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
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      WRITE (8,42160) A3F42L
42160 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,42170) B3F42L
42170 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,42180)
42180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,42190) PWF42S
42190 FORMAT (8X,'PURCHASED WATER        ',F17.2)
      WRITE (8,42200) A1F42S
42200 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,42210) B1F42S
42210 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,42220) A2F42S
42220 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,42230) B2F42S
42230 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,42240) A3F42S
42240 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,42250) B3F42S
42250 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,42260)
42260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,42270) PWF42E
42270 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,42280) A1F42E
42280 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,42290) B1F42E
42290 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,42300) A2F42E
42300 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,42310) B2F42E
42310 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,42320) A3F42E
42320 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,42330) B3F42E
42330 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
```

```
      WRITE (8,42340)
42340 FORMAT ('0','SUBROUTINE WATER, CALCULATED COSTS OUTPUT')
      WRITE (8,42350)
42350 FORMAT ('0',4X,'BASE COST FOR WATER SYSTEM BASED ON TOTAL
     +CUBIC METERS REQUIRED')
      WRITE (8,42360) WAT1L
42360 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,42370) WAT1S
42370 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,42380) WAT1E
42380 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,42390)
42390 FORMAT ('0',4X,'BASE COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,42400) WAT2L
42400 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,42410) WAT2S
42410 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,42420) WAT2E
42420 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,42430)
42430 FORMAT ('0',4X,'BASE COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,42440) WAT3L
42440 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,42450) WAT3S
42450 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,42460) WAT3E
42460 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,42470)
42470 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON
     +TOTAL CUBIC METERS REQUIRED')
      WRITE (8,42480) AWAT1L
42480 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,42490) AWAT1S
42490 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,42500) AWAT1E
42500 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,42510)
42510 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,42520) AWAT2L
42520 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,42530) AWAT2S
```

```
42530 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,42540) AWAT2E
42540 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,42550)
42550 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,42560) AWAT3L
42560 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,42570) AWAT3S
42570 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,42580) AWAT3E
42580 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,42590)
42590 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TOTAL
     +CUBIC METER REQUIRED')
      WRITE (8,42600) AWAT1T
42600 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,42610) WAT1TT
42610 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,42620)
42620 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,42630) AWAT2T
42630 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,42640) WAT2TT
42640 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,42650)
42650 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,42660) AWAT3T
42660 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,42670) WAT3TT
42670 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE CROAD
C
C
C  COSTS FOR CLEARING BRUSH FOR ACCESS ROAD DEVELOPMENT
C
```

```
C    CROAD
     REAL
    +            WIDE43, LONG43,
    +            ROADL,  ROADS,  ROADE,
    +            BRF43L, BRF43S, BRF43E,
    +            SPF43L, SPF43S, SPF43E,
    +            EFCT43,
    +            SBF43L, SBF43S, SBF43E,
    +            AF43L,  AF43S,  AF43E,
    +            BF43L,  BF43S,  BF43E,
    +            AROADL, AROADS, AROADE,
    +            AROADT, ROADTT
C
C   READ TOTAL ROADWAY WIDTH IN METERS AND LENGTH IN
KILOMETERS
C
      READ (7,10,REC=3379) WIDE43
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3384) LONG43
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      ROADL = 1135.467 *  (WIDE43 ** 0.711)
      ROADS =  269.796 * ((WIDE43 *  0.100) ** (-0.0303))
      ROADE =  467.945 *  (WIDE43 ** 0.711)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   BRUSH FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BRF43L.....BRF43S.....BRF43E
      READ (7,30,REC=3398) BRF43L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=3425) BRF43S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3452) BRF43E
   50 FORMAT (15X,F17.2)
C
C   SIDE SLOPE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SPF43L.....SPF43S.....SPF43E
      READ (7,60,REC=3403) SPF43L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=3430) SPF43S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=3457) SPF43E
```

```
   80 FORMAT (15X,F17.2)
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT43
      READ (7,90,REC=3391) EFCT43
   90 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF43L.....SBF43S.....SBF43E
      READ (7,100,REC=3408) SBF43L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=3435) SBF43S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=3462) SBF43E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF43L.....AF43S.....AF43E
      READ (7,130,REC=3413) AF43L
      READ (7,130,REC=3440) AF43S
      READ (7,130,REC=3467) AF43E
  130 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF43L.....BF43S.....BF43E
      READ (7,140,REC=3418) BF43L
      READ (7,140,REC=3445) BF43S
      READ (7,140,REC=3472) BF43E
  140 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AROADL = ROADL * BRF43L * SPF43L * SBF43L * AF43L *
     +         BF43L
      AROADS = ROADS * BRF43S * SPF43S * SBF43S * AF43S *
     +         BF43S
      AROADE = ROADE * BRF43E * SPF43E * SBF43E * EFCT43 *
     +         AF43E * BF43E
C
C   CALCULATE TOTAL ADJUSTED COST
      AROADT = AROADL + AROADS + AROADE
C
C   CALCULATE TOTAL COST
```

```
      ROADTT = AROADT * LONG43
C
C  PRINT ROUTINE FOR SUBROUTINE CROAD.....
C
      WRITE (8,43009)
43009 FORMAT (//)
      WRITE (8,43010)
43010 FORMAT ('0','SUBROUTINE CROAD, COSTS FOR CLEARING BRUSH
     +FOR ACCESS ROAD DEVELOPMENT, USER DEFINED INPUT')
      WRITE (8,43020)
43020 FORMAT ('0',4X,'UNITS CONSIDERED ARE LENGTH OF ROAD IN
METRES')
      WRITE (8,43030) LONG43
43030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
      WRITE (8,43040)
43040 FORMAT (4X,'WIDTH OF ACCESS ROAD IN METERS')
      WRITE (8,43050) WIDE43
43050 FORMAT (8X,'ROAD WIDTH             ',F17.2)
      WRITE (8,43060)
43060 FORMAT (4X,'EQUIPMENT FACTOR FOR PURCHUSED EQUIPMENT')
      WRITE (8,43070) EFCT43
43070 FORMAT (8X,'PURCHUSED EQUIPMENT    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,43080)
43080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,43090) BRF43L
43090 FORMAT (8X,'BRUSH                  ',F17.2)
      WRITE (8,43100) SPF43L
43100 FORMAT (8X,'SIDE SLOPE             ',F17.2)
      WRITE (8,43110) SBF43L
43110 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,43120) AF43L
43120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,43130) BF43L
43130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,43140)
43140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,43150) BRF43S
43150 FORMAT (8X,'BRUSH                  ',F17.2)
```

```
      WRITE (8,43160) SPF43S
43160 FORMAT (8X,'SIDE SLOPE              ',F17.2)
      WRITE (8,43170) SBF43S
43170 FORMAT (8X,'SUBCONTRACTOR           ',F17.2)
      WRITE (8,43180) AF43S
43180 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,43190) BF43S
43190 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,43200)
43200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,43210) BRF43E
43210 FORMAT (8X,'BRUSH                   ',F17.2)
      WRITE (8,43220) SPF43E
43220 FORMAT (8X,'SIDE SLOPE              ',F17.2)
      WRITE (8,43230) SBF43E
43230 FORMAT (8X,'SUBCONTRACTOR           ',F17.2)
      WRITE (8,43240) AF43E
43240 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,43250) BF43E
43250 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,43260)
43260 FORMAT ('0','SUBROUTINE CROAD, CALCULATED COSTS OUTPUT')
      WRITE (8,43270)
43270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,43280) ROADL
43280 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,43290) ROADS
43290 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,43300) ROADE
43300 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,43310)
43310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,43320) AROADL
43320 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,43330) AROADS
43330 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,43340) AROADE
```

```
43340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,43350)
43350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,43360) AROADT
43360 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,43370) ROADTT
43370 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE BLAST
C
C
C   COSTS FOR DRILL AND BLAST FOR CLEARING ROCK FOR ACCESS
C   ROAD DEVELOPMENT
C
C     BLAST
      REAL
     +            WIDE44, LONG44,
     +            BLSTL,  BLSTS,  BLSTE,
     +            RKF44L, RKF44S, RKF44E,
     +            SPF44L, SPF44S, SPF44E,
     +            EFCT44,
     +            SBF44L, SBF44S, SBF44E,
     +            AF44L,  AF44S,  AF44E,
     +            BF44L,  BF44S,  BF44E,
     +            ABLSTL, ABLSTS, ABLSTE,
     +            ABLSTT, BLSTTT
C
C   READ TOTAL ROADWAY WIDTH IN METERS AND LENGTH IN
KILOMETERS
C
      READ (7,10,REC=3481) WIDE44
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3486) LONG44
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      BLSTL = 9633.822 * (WIDE44 ** 0.496)
      BLSTS = 7247.524 * (WIDE44 ** 0.644)
      BLSTE = 4109.384 * (WIDE44 ** 0.496)
```

```
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ROCK PERCENT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   RKF44L.....RKF44S.....RKF44E
      READ (7,30,REC=3500) RKF44L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=3527) RKF44S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3554) RKF44E
   50 FORMAT (15X,F17.2)
C
C   SIDE SLOPE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SPF44L.....SPF44S.....SPF44E
      READ (7,60,REC=3505) SPF44L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=3532) SPF44S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=3559) SPF44E
   80 FORMAT (15X,F17.2)
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT44
      READ (7,90,REC=3493) EFCT44
   90 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF44L.....SBF44S.....SBF44E
      READ (7,100,REC=3510) SBF44L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=3537) SBF44S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=3564) SBF44E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF44L.....AF44S.....AF44E
      READ (7,130,REC=3515) AF44L
      READ (7,130,REC=3542) AF44S
      READ (7,130,REC=3569) AF44E
  130 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
```

```
EQUIPMENT..
C   BF44L.....BF44S.....BF44E
      READ (7,140,REC=3520) BF44L
      READ (7,140,REC=3547) BF44S
      READ (7,140,REC=3574) BF44E
  140 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ABLSTL = BLSTL * RKF44L * SPF44L * SBF44L * AF44L *
     +         BF44L
      ABLSTS = BLSTS * RKF44S * SPF44S * SBF44S * AF44S *
     +         BF44S
      ABLSTE = BLSTE * RKF44E * SPF44E * SBF44E * EFCT44 *
     +         AF44E * BF44E
C
C   CALCULATE TOTAL ADJUSTED COST
      ABLSTT = ABLSTL + ABLSTS + ABLSTE
C
C   CALCULATE TOTAL COST
      BLSTTT = ABLSTT * LONG44
C
C  PRINT ROUTINE FOR SUBROUTINE BLAST.....
C
      WRITE (8,44009)
44009 FORMAT (//)
      WRITE (8,44010)
44010 FORMAT ('0','SUBROUTINE BLAST, COSTS FOR DRILL AND BLAST
     +OPERATIONS FOR ACCESS ROAD DEVELOPMENT, USER DEFINED
INPUT')
      WRITE (8,44020)
44020 FORMAT ('0',4X,'UNITS CONSIDERED ARE LENGTH OF ROAD IN
METERS')
      WRITE (8,44030) LONG44
44030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
      WRITE (8,44040)
44040 FORMAT (4X,'WIDTH OF ACCESS ROAD IN METERS')
      WRITE (8,44050) WIDE44
44050 FORMAT (8X,'ROAD WIDTH             ',F17.2)
      WRITE (8,44060)
44060 FORMAT (4X,'EQUIPMENT FACTOR FOR PURCHUSED EQUIPMENT')
      WRITE (8,44070) EFCT44
44070 FORMAT (8X,'PURCHUSED EQUIPMENT    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,44080)
44080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,44090) RKF44L
44090 FORMAT (8X,'ROCK                    ',F17.2)
      WRITE (8,44100) SPF44L
44100 FORMAT (8X,'SIDE SLOPE              ',F17.2)
      WRITE (8,44110) SBF44L
44110 FORMAT (8X,'SUBCONTRACTOR           ',F17.2)
      WRITE (8,44120) AF44L
44120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,44130) BF44L
44130 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,44140)
44140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,44150) RKF44S
44150 FORMAT (8X,'ROCK                    ',F17.2)
      WRITE (8,44160) SPF44S
44160 FORMAT (8X,'SIDE SLOPE              ',F17.2)
      WRITE (8,44170) SBF44S
44170 FORMAT (8X,'SUBCONTRACTOR           ',F17.2)
      WRITE (8,44180) AF44S
44180 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,44190) BF44S
44190 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,44200)
44200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,44210) RKF44E
44210 FORMAT (8X,'ROCK                    ',F17.2)
      WRITE (8,44220) SPF44E
44220 FORMAT (8X,'SIDE SLOPE              ',F17.2)
      WRITE (8,44230) SBF44E
44230 FORMAT (8X,'SUBCONTRACTOR           ',F17.2)
      WRITE (8,44240) AF44E
44240 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,44250) BF44E
44250 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
```

```
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,44260)
44260 FORMAT ('0','SUBROUTINE BLAST, CALCULATED COSTS OUTPUT')
      WRITE (8,44270)
44270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,44280) BLSTL
44280 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,44290) BLSTS
44290 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,44300) BLSTE
44300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,44310)
44310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,44320) ABLSTL
44320 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,44330) ABLSTS
44330 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,44340) ABLSTE
44340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,44350)
44350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,44360) ABLSTT
44360 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,44370) BLSTTT
44370 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE EXCAVE
C
C
C   COSTS FOR EXCAVATION IN CLEARING FOR ACCESS ROAD
DEVELOPMENT
C
C     EXCAVE
      REAL
     +            WIDE45, LONG45,
     +            EXCAL,  EXCAS,  EXCAE,
     +            SFCT45,
```

```
     +            SPF45L, SPF45S, SPF45E,
     +            MTF45L, MTF45S, MTF45E,
     +            EFCT45,
     +            SBF45L, SBF45S, SBF45E,
     +            AF45L,  AF45S,  AF45E,
     +            BF45L,  BF45S,  BF45E,
     +            AEXCAL, AEXCAS, AEXCAE,
     +            AEXCAT, EXCATT
C
C   READ TOTAL ROADWAY WIDTH IN METERS AND LENGTH IN
KILOMETERS
C
      READ (7,10,REC=3583) WIDE45
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3588) LONG45
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      EXCAL = 29.843 * (WIDE45 ** 1.870)
      EXCAS =  0.000
      EXCAE = 27.128 * (WIDE45 ** 1.870)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ PERCENT SIDE SLOPE FROM DATA FILE.....SFCT45
      READ (7,30,REC=3595) SFCT45
   30 FORMAT (15X,F17.2)
C
C   SIDE SLOPE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SPF45L.....SPF45S.....SPF45E
      IF (SFCT45.LE.20) THEN
      SPF45L = (0.800 * SFCT45) ** ((0.600 * WIDE45) ** 0.756)
      SPF45S = (0.800 * SFCT45) ** ((0.600 * WIDE45) ** 0.756)
      SPF45E = (0.800 * SFCT45) ** ((0.600 * WIDE45) ** 0.756)
      ELSEIF (SFCT45.GE.30) THEN
      SPF45L = (0.800 * SFCT45) ** ((3.958 * WIDE45) ** 0.087)
      SPF45S = (0.800 * SFCT45) ** ((3.958 * WIDE45) ** 0.087)
      SPF45E = (0.800 * SFCT45) ** ((3.958 * WIDE45) ** 0.087)
      ELSE
      SPF45L = 1.000
      SPF45S = 1.000
      SPF45E = 1.000
      ENDIF
C
```

```
C   MATERIAL FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   MTF45L.....MTF45S.....MTF45E
      READ (7,40,REC=3609) MTF45L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3631) MTF45S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=3653) MTF45E
   60 FORMAT (15X,F17.2)
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT45
      READ (7,70,REC=3602) EFCT45
   70 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF45L.....SBF45S.....SBF45E
      READ (7,80,REC=3614) SBF45L
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=3636) SBF45S
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=3658) SBF45E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF45L.....AF45S.....AF45E
      READ (7,110,REC=3619) AF45L
      READ (7,110,REC=3641) AF45S
      READ (7,110,REC=3663) AF45E
  110 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF45L.....BF45S.....BF45E
      READ (7,120,REC=3624) BF45L
      READ (7,120,REC=3646) BF45S
      READ (7,120,REC=3668) BF45E
  120 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AEXCAL = EXCAL * SPF45L * MTF45L * SBF45L * AF45L *
     +         BF45L
      AEXCAS = EXCAS * SPF45S * MTF45S * SBF45S * AF45S *
     +         BF45S
```

```
      AEXCAE = EXCAE * SPF45E * MTF45E * SBF45E * EFCT45 *
     +          AF45E * BF45E
C
C   CALCULATE TOTAL ADJUSTED COST
      AEXCAT = AEXCAL + AEXCAS + AEXCAE
C
C   CALCULATE TOTAL COST
      EXCATT = AEXCAT * LONG45
C
C  PRINT ROUTINE FOR SUBROUTINE EXCAVE.....
C
      WRITE (8,45009)
45009 FORMAT (//)
      WRITE (8,45010)
45010 FORMAT ('0','SUBROUTINE EXCAVE, COSTS FOR EXCAVATION
     +OPERATIONS FOR ACCESS ROAD DEVELOPMENT, USER DEFINED
INPUT')
      WRITE (8,45020)
45020 FORMAT ('0',4X,'UNITS CONSIDERED ARE LENGTH OF ROAD IN
METERS')
      WRITE (8,45030) LONG45
45030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
      WRITE (8,45040)
45040 FORMAT (4X,'WIDTH OF ACCESS ROAD IN METERS')
      WRITE (8,45050) WIDE45
45050 FORMAT (8X,'ROAD WIDTH             ',F17.2)
      WRITE (8,45060)
45060 FORMAT (4X,'EQUIPMENT FACTOR FOR PURCHUSED EQUIPMENT')
      WRITE (8,45070) EFCT44
45070 FORMAT (8X,'PURCHUSED EQUIPMENT    ',F17.2)
      WRITE (8,45080)
45080 FORMAT (4X,'SIDE SLOPE FACTOR FOR EXCAVATION')
      WRITE (8,45090) SFCT45
45090 FORMAT (8X,'SIDE SLOPES (degrees)  ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,45100)
45100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,45110) SPF45L
45110 FORMAT (8X,'SIDE SLOPE             ',F17.2)
      WRITE (8,45120) MTF45L
45120 FORMAT (8X,'MATERIALS              ',F17.2)
      WRITE (8,45130) SBF45L
```

```
45130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,45140) AF45L
45140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,45150) BF45L
45150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,45160)
45160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,45170) SPF45S
45170 FORMAT (8X,'SIDE SLOPE             ',F17.2)
      WRITE (8,45180) MTF45S
45180 FORMAT (8X,'MATERIALS              ',F17.2)
      WRITE (8,45190) SBF45S
45190 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,45200) AF45S
45200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,45210) BF45S
45210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,45220)
45220 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,45230) SPF45E
45230 FORMAT (8X,'SIDE SLOPE             ',F17.2)
      WRITE (8,45240) MTF45E
45240 FORMAT (8X,'MATERIALS              ',F17.2)
      WRITE (8,45250) SBF45E
45250 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,45260) AF45E
45260 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,45270) BF45E
45270 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,45280)
45280 FORMAT ('0','SUBROUTINE EXCAVE, CALCULATED COSTS OUTPUT')
      WRITE (8,45290)
45290 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,45300) EXCAL
```

```
45300 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,45310) EXCAS
45310 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,45320) EXCAE
45320 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,45330)
45330 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,45340) AEXCAL
45340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,45350) AEXCAS
45350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,45360) AEXCAE
45360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,45370)
45370 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,45380) AEXCAT
45380 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,45390) EXCATT
45390 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE GRAVEL
C
C
C   COSTS FOR GRAVEL SURFACING OF ACCESS ROADS
C
C     GRAVEL
      REAL
     +            WIDE46, LONG46,
     +            GRAVL,  GRAVS,  GRAVE,
     +            EFCT46,
     +            SBF46L, SBF46S, SBF46E,
     +            AF46L,  AF46S,  AF46E,
     +            BF46L,  BF46S,  BF46E,
     +            AGRAVL, AGRAVS, AGRAVE,
     +            AGRAVT, GRAVTT
C
C   READ TOTAL ROADWAY WIDTH IN METERS AND LENGTH IN
KILOMETERS
C
```

```
      READ (7,10,REC=3677) WIDE46
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3682) LONG46
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      GRAVL =  293.304 * (WIDE46 ** 0.667)
      GRAVS = 6880.012 * (WIDE46 ** 1.006)
      GRAVE =  135.032 * (WIDE46 ** 0.667)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT46
      READ (7,30,REC=3689) EFCT46
   30 FORMAT (15X,F17.2)
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF46L.....SBF46S.....SBF46E
      READ (7,40,REC=3696) SBF46L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3713) SBF46S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=3730) SBF46E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF46L.....AF46S.....AF46E
      READ (7,70,REC=3701) AF46L
      READ (7,70,REC=3718) AF46S
      READ (7,70,REC=3735) AF46E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF46L.....BF46S.....BF46E
      READ (7,80,REC=3706) BF46L
      READ (7,80,REC=3723) BF46S
      READ (7,80,REC=3740) BF46E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AGRAVL = GRAVL * SBF46L * AF46L * BF46L
```

```
      AGRAVS = GRAVS * SBF46S * AF46S * BF46S
      AGRAVE = GRAVE * SBF46E * EFCT46 * AF46E * BF46E
C
C   CALCULATE TOTAL ADJUSTED COST
      AGRAVT = AGRAVL + AGRAVS + AGRAVE
C
C   CALCULATE TOTAL COST
      GRAVTT = AGRAVT * LONG46
C
C  PRINT ROUTINE FOR SUBROUTINE GRAVEL.....
C
      WRITE (8,46009)
46009 FORMAT (//)
      WRITE (8,46010)
46010 FORMAT ('0','SUBROUTINE GRAVEL, COSTS FOR GRAVEL
SURFACING
     +OPERATIONS FOR ACCESS ROAD DEVELOPMENT, USER DEFINED
INPUT')
      WRITE (8,46020)
46020 FORMAT ('0',4X,'UNITS CONSIDERED ARE LENGTH OF ROAD IN
METERS')
      WRITE (8,46030) LONG46
46030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
      WRITE (8,46040)
46040 FORMAT (4X,'WIDTH OF ACCESS ROAD IN METERS')
      WRITE (8,46050) WIDE46
46050 FORMAT (8X,'ROAD WIDTH             ',F17.2)
      WRITE (8,46060)
46060 FORMAT (4X,'EQUIPMENT FACTOR FOR PURCHUSED EQUIPMENT')
      WRITE (8,46070) EFCT46
46070 FORMAT (8X,'PURCHUSED EQUIPMENT    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,46080)
46080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,46090) SBF46L
46090 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,46100) AF46L
46100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,46110) BF46L
46110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,46120)
46120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,46130) SBF46S
46130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,46140) AF46S
46140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,46150) BF46S
46150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,46160)
46160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,46170) SBF46E
46170 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,46180) AF46E
46180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,46190) BF46E
46190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,46200)
46200 FORMAT ('0','SUBROUTINE GRAVEL, CALCULATED COSTS OUTPUT')
      WRITE (8,46210)
46210 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,46220) GRAVL
46220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,46230) GRAVS
46230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,46240) GRAVE
46240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,46250)
46250 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,46260) AGRAVL
46260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,46270) AGRAVS
46270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,46280) AGRAVE
46280 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,46290)
46290 FORMAT ('0',4X,'TOTAL COSTS')
```

```
      WRITE (8,46300) AGRAVT
46300 FORMAT (8X,'PER UNIT              ',F17.2)
      WRITE (8,46310) GRAVTT
46310 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE PAVE
C
C
C   COSTS FOR ASPHALT SURFACING OF ACCESS ROADS
C
C     PAVE
      REAL
     +            WIDE47, LONG47,
     +            PAVEL,  PAVES,  PAVEE,
     +            EFCT47,
     +            SBF47L, SBF47S, SBF47E,
     +            AF47L,  AF47S,  AF47E,
     +            BF47L,  BF47S,  BF47E,
     +            APAVEL, APAVES, APAVEE,
     +            APAVET, PAVETT
C
C   READ TOTAL ROADWAY WIDTH IN METERS AND LENGTH IN
KILOMETERS
C
      READ (7,10,REC=3749) WIDE47
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=3754) LONG47
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      PAVEL =  117.710 * (WIDE47 ** 1.005)
      PAVES = 2661.382 * (WIDE47 ** 1.005)
      PAVEE =   68.436 * (WIDE47 ** 1.005)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   EQUIPMENT FACTOR FOR EQUIPMENT.....EFCT46
      READ (7,30,REC=3761) EFCT47
   30 FORMAT (15X,F17.2)
```

```
C
C   SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT.....
C   SBF47L.....SBF47S.....SBF47E
      READ (7,40,REC=3768) SBF47L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=3785) SBF47S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=3802) SBF47E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF47L.....AF47S.....AF47E
      READ (7,70,REC=3773) AF47L
      READ (7,70,REC=3790) AF47S
      READ (7,70,REC=3807) AF47E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF47L.....BF47S.....BF47E
      READ (7,80,REC=3778) BF47L
      READ (7,80,REC=3795) BF47S
      READ (7,80,REC=3812) BF47E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      APAVEL = PAVEL * SBF47L * AF47L * BF47L
      APAVES = PAVES * SBF47S * AF47S * BF47S
      APAVEE = PAVEE * SBF47E * EFCT47 * AF47E * BF47E
C
C   CALCULATE TOTAL ADJUSTED COST
      APAVET = APAVEL + APAVES + APAVEE
C
C   CALCULATE TOTAL COST
      PAVETT = APAVET * LONG47
C
C  PRINT ROUTINE FOR SUBROUTINE PAVE.....
C
      WRITE (8,47009)
47009 FORMAT (//)
      WRITE (8,47010)
47010 FORMAT ('0','SUBROUTINE PAVE, COSTS FOR ASPHALT SURFACING
```

```
   +OPERATIONS FOR ACCESS ROAD DEVELOPMENT, USER DEFINED
INPUT')
     WRITE (8,47020)
47020 FORMAT ('0',4X,'UNITS CONSIDERED ARE LENGTH OF ROAD IN
METERS')
     WRITE (8,47030) LONG47
47030 FORMAT (8X,'UNITS TO BE CLEARED    ',F17.2)
     WRITE (8,47040)
47040 FORMAT (4X,'WIDTH OF ACCESS ROAD IN METERS')
     WRITE (8,47050) WIDE47
47050 FORMAT (8X,'ROAD WIDTH             ',F17.2)
     WRITE (8,47060)
47060 FORMAT (4X,'EQUIPMENT FACTOR FOR PURCHUSED EQUIPMENT')
     WRITE (8,47070) EFCT47
47070 FORMAT (8X,'PURCHUSED EQUIPMENT    ',F17.2)
C
C-----------------------------------------------------------------
C
     WRITE (8,47080)
47080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
     WRITE (8,47090) SBF47L
47090 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
     WRITE (8,47100) AF47L
47100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
     WRITE (8,47110) BF47L
47110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
     WRITE (8,47120)
47120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
     WRITE (8,47130) SBF47S
47130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
     WRITE (8,47140) AF47S
47140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
     WRITE (8,47150) BF47S
47150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
     WRITE (8,47160)
47160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
     WRITE (8,47170) SBF47E
47170 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
```

```
      WRITE (8,47180) AF47E
47180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,47190) BF47E
47190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,47200)
47200 FORMAT ('0','SUBROUTINE PAVE, CALCULATED COSTS OUTPUT')
      WRITE (8,47210)
47210 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,47220) PAVEL
47220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,47230) PAVES
47230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,47240) PAVEE
47240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,47250)
47250 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,47260) APAVEL
47260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,47270) APAVES
47270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,47280) APAVEE
47280 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,47290)
47290 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,47300) APAVET
47300 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,47310) PAVETT
47310 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE PLINES
C
C
C   COSTS FOR CONSTRUCTION OF POWER DISTRIBUTION LINES
C
C    PLINES
```

```
      REAL
     +            POWR48,
     +            SM10L,  SM10S,  SM10E,
     +            LG10L,  LG10S,  LG10E,
     +            SM25L,  SM25S,  SM25E,
     +            LG25L,  LG25S,  LG25E,
     +            SM50L,  SM50S,  SM50E,
     +            LG50L,  LG50S,  LG50E,
     +            A1F48L, A1F48S, A1F48E,
     +            B1F48L, B1F48S, B1F48E,
     +            A2F48L, A2F48S, A2F48E,
     +            B2F48L, B2F48S, B2F48E,
     +            A3F48L, A3F48S, A3F48E,
     +            B3F48L, B3F48S, B3F48E,
     +            A4F48L, A4F48S, A4F48E,
     +            B4F48L, B4F48S, B4F48E,
     +            A5F48L, A5F48S, A5F48E,
     +            B5F48L, B5F48S, B5F48E,
     +            A6F48L, A6F48S, A6F48E,
     +            B6F48L, B6F48S, B6F48E,
     +            ASM10L, ASM10S, ASM10E,
     +            ALG10L, ALG10S, ALG10E,
     +            ASM25L, ASM25S, ASM25E,
     +            ALG25L, ALG25S, ALG25E,
     +            ASM50L, ASM50S, ASM50E,
     +            ALG50L, ALG50S, ALG50E,
     +            ASM10T, ASM25T, ASM50T,
     +            ALG10T, ALG25T, ALG50T,
     +            SM10TT, SM25TT, SM50TT,
     +            LG10TT, LG25TT, LG50TT
C
C    READ TOTAL LINE LOAD IN MV*A
C
      READ (7,10,REC=3821) PWR48
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
C    2 TO 20 MV*A LINES 10 KILOMETERS IN LENGTH
      SM10L = 103913.304 * (PWR48 * 0.563)
      SM10S = 103913.304 * (PWR48 * 0.563)
      SM10E = 0.000
C    20 TO 40 MV*A LINES 10 KILOMETERS IN LENGTH
      LG10L = 97678.506 * (PWR48 * 0.536)
      LG10S = 76895.844 * (PWR48 * 0.563)
```

```
      LG10E = 33252.257 * (PWR48 * 0.563)
C   2 TO 20 MV*A LINES 25 KILOMETERS IN LENGTH
      SM25L = 322495.125 * (PWR48 * 0.370)
      SM25S = 322495.125 * (PWR48 * 0.370)
      SM25E = 0.000
C   20 TO 40 MV*A LINES 25 KILOMETERS IN LENGTH
      LG25L = 303145.418 * (PWR48 * 0.370)
      LG25S = 238646.392 * (PWR48 * 0.370)
      LG25E = 103198.440 * (PWR48 * 0.370)
C   2 TO 20 MV*A LINES 50 KILOMETERS IN LENGTH
      SM50L = 763181.694 * (PWR48 * 0.278)
      SM50S = 763181.694 * (PWR48 * 0.278)
      SM50E = 0.000
C   20 TO 40 MV*A LINES 50 KILOMETERS IN LENGTH
      LG50L = 717390.792 * (PWR48 * 0.278)
      LG50S = 564754.453 * (PWR48 * 0.278)
      LG50E = 244218.142 * (PWR48 * 0.278)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 10 KILOMETERS LONG
C   A1F48L.....A1F48S.....A1F48E
      READ (7,20,REC=3828) A1F48L
      READ (7,20,REC=3890) A1F48S
      READ (7,20,REC=3952) A1F48E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 10 KILOMETERS LONG
C   B1F48L.....B1F48S.....B1F48E
      READ (7,30,REC=3833) B1F48L
      READ (7,30,REC=3895) B1F48S
      READ (7,30,REC=3957) B1F48E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 10 KILOMETERS LONG
C   A2F48L.....A2F48S.....A2F48E
      READ (7,40,REC=3838) A2F48L
      READ (7,40,REC=3900) A2F48S
```

```
      READ (7,40,REC=3962) A2F48E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 10 KILOMETERS LONG
C   B2F48L.....B2F48S.....B2F48E
      READ (7,50,REC=3843) B2F48L
      READ (7,50,REC=3905) B2F48S
      READ (7,50,REC=3967) B2F48E
   50 FORMAT (15X,F17.2)

C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 25 KILOMETERS LONG
C   A3F48L.....A3F48S.....A3F48E
      READ (7,60,REC=3848) A3F48L
      READ (7,60,REC=3910) A3F48S
      READ (7,60,REC=3972) A3F48E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 25 KILOMETERS LONG
C   B3F48L.....B3F48S.....B3F48E
      READ (7,70,REC=3853) B3F48L
      READ (7,70,REC=3915) B3F48S
      READ (7,70,REC=3977) B3F48E
   70 FORMAT (15X,F17.2)

C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 25 KILOMETERS LONG
C   A4F48L.....A4F48S.....A4F48E
      READ (7,80,REC=3858) A4F48L
      READ (7,80,REC=3920) A4F48S
      READ (7,80,REC=3982) A4F48E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 25 KILOMETERS LONG
C   B4F48L.....B4F48S.....B4F48E
      READ (7,90,REC=3863) B4F48L
```

```
      READ (7,90,REC=3925) B4F48S
      READ (7,90,REC=3987) B4F48E
   90 FORMAT (15X,F17.2)

C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 50 KILOMETERS LONG
C   A5F48L.....A5F48S.....A5F48E
      READ (7,100,REC=3868) A5F48L
      READ (7,100,REC=3930) A5F48S
      READ (7,100,REC=3992) A5F48E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   2 TO 20 MV*A LINES 50 KILOMETERS LONG
C   B5F48L.....B5F48S.....B5F48E
      READ (7,110,REC=3873) B5F48L
      READ (7,110,REC=3935) B5F48S
      READ (7,110,REC=3997) B5F48E
  110 FORMAT (15X,F17.2)

C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 50 KILOMETERS LONG
C   A6F48L.....A6F48S.....A6F48E
      READ (7,120,REC=3883) A6F48L
      READ (7,120,REC=3940) A6F48S
      READ (7,120,REC=4002) A6F48E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   20 TO 40 MV*A LINES 50 KILOMETERS LONG
C   B6F48L.....B6F48S.....B6F48E
      READ (7,130,REC=3883) B6F48L
      READ (7,130,REC=3945) B6F48S
      READ (7,130,REC=4007) B6F48E
  130 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASM10L = SM10L * A1F48L * B1F48L
      ASM10S = SM10S * A1F48S * B1F48S
      ASM10E = SM10E * A1F48E * B1F48E
```

```
      ALG10L = LG10L * A2F48L * B2F48L
      ALG10S = LG10S * A2F48S * B2F48S
      ALG10E = LG10E * A2F48E * B2F48E
      ASM25L = SM25L * A3F48L * B3F48L
      ASM25S = SM25S * A3F48S * B3F48S
      ASM25E = SM25E * A3F48E * B3F48E
      ALG25L = LG25L * A4F48L * B4F48L
      ALG25S = LG25S * A4F48S * B4F48S
      ALG25E = LG25E * A4F48E * B4F48E
      ASM50L = SM50L * A5F48L * B5F48L
      ASM50S = SM50S * A5F48S * B5F48S
      ASM50E = SM50E * A5F48E * B5F48E
      ALG50L = LG50L * A6F48L * B6F48L
      ALG50S = LG50S * A6F48S * B6F48S
      ALG50E = LG50E * A6F48E * B6F48E
C
C   CALCULATE TOTAL ADJUSTED COST
      ASM10T = ASM10L + ASM10S + ASM10E
      ALG10T = ALG10L + ALG10S + ALG10E
      ASM25T = ASM25L + ASM25S + ASM25E
      ALG25T = ALG25L + ALG25S + ALG25E
      ASM50T = ASM50L + ASM50S + ASM50E
      ALG50T = ALG50L + ALG50S + ALG50E
C
C   CALCULATE TOTAL COST
      SM10TT = ASM10T
      LG10TT = ALG10T
      SM25TT = ASM25T
      LG25TT = ALG25T
      SM50TT = ASM50T
      LG50TT = ALG50T
C
C  PRINT ROUTINE FOR SUBROUTINE PLINES.....
C
      WRITE (8,48004)
48004 FORMAT (//)
      WRITE (8,48005)
48005 FORMAT ('0','SUBROUTINE PLINES, COSTS FOR CONSTRUCTION OF
     +POWER DISTRIBUTION LINES, USER DEFINED INPUT')
      WRITE (8,48010)
48010 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL LINE LOAD IN MV*A')
      WRITE (8,48015) PWR48
48015 FORMAT (8X,'POWER MV*A              ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,48020)
48020 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,48025)
48025 FORMAT (8X,'2 TO 20 MV*V LINES 10 KILOMETERS LONG')
      WRITE (8,48030) A1F48L
48030 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48035) B1F48L
48035 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48040)
48040 FORMAT (8X,'20 TO 40 MV*V LINES 10 KILOMETERS LONG')
      WRITE (8,48045) A2F48L
48045 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48050) B2F48L
48050 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48055)
48055 FORMAT (8X,'2 TO 20 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48060) A3F48L
48060 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48065) B3F48L
48065 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48070)
48070 FORMAT (8X,'20 TO 40 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48075) A4F48L
48075 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48080) B4F48L
48080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48085)
48085 FORMAT (8X,'2 TO 20 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48090) A5F48L
48090 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48095) B5F48L
48095 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48100)
48100 FORMAT (8X,'20 TO 40 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48105) A6F48L
48105 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48110) B6F48L
48110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,48115)
```

```
48115 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,48120)
48120 FORMAT (8X,'2 TO 20 MV*V LINES 10 KILOMETERS LONG')
      WRITE (8,48125) A1F48S
48125 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48130) B1F48S
48130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48135)
48135 FORMAT (8X,'20 TO 40 MV*V LINES 10 KILOMETERS LONG')
      WRITE (8,48140) A2F48S
48140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48145) B2F48S
48145 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48150)
48150 FORMAT (8X,'2 TO 20 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48155) A3F48S
48155 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48160) B3F48S
48160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48165)
48165 FORMAT (8X,'20 TO 40 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48170) A4F48S
48170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48175) B4F48S
48175 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48180)
48180 FORMAT (8X,'2 TO 20 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48185) A5F48S
48185 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48190) B5F48S
48190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48195)
48195 FORMAT (8X,'20 TO 40 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48200) A6F48S
48200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48205) B6F48S
48205 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,48210)
48210 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,48215)
48215 FORMAT (8X,'2 TO 20 MV*V LINES 10 KILOMETERS LONG')
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      WRITE (8,48220) A1F48E
48220 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48225) B1F48E
48225 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48230)
48230 FORMAT (8X,'20 TO 40 MV*V LINES 10 KILOMETERS LONG')
      WRITE (8,48235) A2F48E
48235 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48240) B2F48E
48240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48245)
48245 FORMAT (8X,'2 TO 20 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48250) A3F48E
48250 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48255) B3F48E
48255 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48260)
48260 FORMAT (8X,'20 TO 40 MV*V LINES 25 KILOMETERS LONG')
      WRITE (8,48265) A4F48E
48265 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48270) B4F48E
48270 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48275)
48275 FORMAT (8X,'2 TO 20 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48280) A5F48E
48280 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48285) B5F48E
48285 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
      WRITE (8,48290)
48290 FORMAT (8X,'20 TO 40 MV*V LINES 50 KILOMETERS LONG')
      WRITE (8,48295) A6F48E
48295 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,48300) B6F48E
48300 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,48305)
48305 FORMAT ('0','SUBROUTINE PLINES, CALCULATED COSTS OUTPUT')
      WRITE (8,48310)
48310 FORMAT ('0',4X,'BASE COST, 2 TO 20 MV*A LINE, 10 KILOMETERS
     +LONG')
      WRITE (8,48315) SM10L
```

```
48315 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48320) SM10S
48320 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48325) SM10E
48325 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48330)
48330 FORMAT ('0',4X,'ADJUSTED COST, 2 TO 20 MV*A LINE, 10
KILOMETERS
     +LONG')
      WRITE (8,48335) ASM10L
48335 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48340) ASM10S
48340 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48345) ASM10E
48345 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48350)
48350 FORMAT ('0',4X,'TOTAL COSTS, 2 TO 20 MV*A LINE, 10 KILOMETERS
     +LONG')
      WRITE (8,48355) ASM10T
48355 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,48360) SM10TT
48360 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,48365)
48365 FORMAT ('0',4X,'BASE COST, 20 TO 40 MV*A LINE, 10 KILOMETERS
     +LONG')
      WRITE (8,48370) LG10L
48370 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48375) LG10S
48375 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48380) LG10E
48380 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48385)
48385 FORMAT ('0',4X,'ADJUSTED COST, 20 TO 40 MV*A LINE, 10
KILOMETERS
     +LONG')
      WRITE (8,48390) ALG10L
48390 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48395) ALG10S
48395 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48400) ALG10E
48400 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48405)
48405 FORMAT ('0',4X,'TOTAL COSTS, 20 TO 40 MV*A LINE, 10
KILOMETERS
```

```
    +LONG')
     WRITE (8,48410) ALG10T
48410 FORMAT (8X,'PER UNIT              ',F17.2)
     WRITE (8,48415) LG10TT
48415 FORMAT (8X,'PROJECT               ',F17.2)
     WRITE (8,48420)
48420 FORMAT ('0',4X,'BASE COST, 2 TO 20 MV*A LINE, 25 KILOMETERS
    +LONG')
     WRITE (8,48425) SM25L
48425 FORMAT (8X,'LABOR                 ',F17.2)
     WRITE (8,48430) SM25S
48430 FORMAT (8X,'SUPPLIES              ',F17.2)
     WRITE (8,48435) SM25E
48435 FORMAT (8X,'EQUIPMENT               ',F17.2)
     WRITE (8,48440)
48440 FORMAT ('0',4X,'ADJUSTED COST, 2 TO 20 MV*A LINE, 25
KILOMETERS
    +LONG')
     WRITE (8,48445) ASM25L
48445 FORMAT (8X,'LABOR                 ',F17.2)
     WRITE (8,48450) ASM25S
48450 FORMAT (8X,'SUPPLIES              ',F17.2)
     WRITE (8,48455) ASM25E
48455 FORMAT (8X,'EQUIPMENT               ',F17.2)
     WRITE (8,48460)
48460 FORMAT ('0',4X,'TOTAL COSTS, 2 TO 20 MV*A LINE, 25 KILOMETERS
    +LONG')
     WRITE (8,48465) ASM25T
48465 FORMAT (8X,'PER UNIT              ',F17.2)
     WRITE (8,48470) SM25TT
48470 FORMAT (8X,'PROJECT               ',F17.2)
     WRITE (8,48475)
48475 FORMAT ('0',4X,'BASE COST, 20 TO 40 MV*A LINE, 25 KILOMETERS
    +LONG')
     WRITE (8,48480) LG25L
48480 FORMAT (8X,'LABOR                 ',F17.2)
     WRITE (8,48485) LG25S
48485 FORMAT (8X,'SUPPLIES              ',F17.2)
     WRITE (8,48490) LG25E
48490 FORMAT (8X,'EQUIPMENT               ',F17.2)
     WRITE (8,48495)
48495 FORMAT ('0',4X,'ADJUSTED COST, 20 TO 40 MV*A LINE, 25
KILOMETERS
    +LONG')
```

```
      WRITE (8,48500) ALG25L
48500 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48505) ALG25S
48505 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48510) ALG25E
48510 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48515)
48515 FORMAT ('0',4X,'TOTAL COSTS, 20 TO 40 MV*A LINE, 25
KILOMETERS
     +LONG')
      WRITE (8,48520) ALG25T
48520 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,48525) LG25TT
48525 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,48530)
48530 FORMAT ('0',4X,'BASE COST, 2 TO 20 MV*A LINE, 50 KILOMETERS
     +LONG')
      WRITE (8,48535) SM50L
48535 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48540) SM50S
48540 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48545) SM50E
48545 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48550)
48550 FORMAT ('0',4X,'ADJUSTED COST, 2 TO 20 MV*A LINE, 50
KILOMETERS
     +LONG')
      WRITE (8,48555) ASM50L
48555 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48560) ASM50S
48560 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48565) ASM50E
48565 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48570)
48570 FORMAT ('0',4X,'TOTAL COSTS, 2 TO 20 MV*A LINE, 50 KILOMETERS
     +LONG')
      WRITE (8,48575) ASM50T
48575 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,48580) SM50TT
48580 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,48585)
48585 FORMAT ('0',4X,'BASE COST, 20 TO 40 MV*A LINE, 50 KILOMETERS
     +LONG')
      WRITE (8,48590) LG50L
```

```
48590 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48595) LG50S
48595 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48600) LG50E
48600 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48605)
48605 FORMAT ('0',4X,'ADJUSTED COST, 20 TO 40 MV*A LINE, 50
KILOMETERS
     +LONG')
      WRITE (8,48610) ALG50L
48610 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,48615) ALG50S
48615 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,48620) ALG50E
48620 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,48625)
48625 FORMAT ('0',4X,'TOTAL COSTS, 20 TO 40 MV*A LINE, 50
KILOMETERS
     +LONG')
      WRITE (8,48630) ALG50T
48630 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,48635) LG50TT
48635 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE WCLEAR
C
C
C   COSTS FOR ACQUISITION AND INSTALLATION OF EQUIPMENT FOR
C   WATER CLARIFICATION
C
C    WCLEAR
      REAL
     +            DIA49,  RISE49, FLOW49,
     +            CLR1L,  CLR1S,  CLR1E,
     +            TANK49,
     +            CLR2L,  CLR2S,  CLR2E,
     +            AF49L,  AF49S,  AF49E,
     +            BF49L,  BF49S,  BF49E,
     +            ACLR1L, ACLR1S, ACLR1E,
```

```
     +            ACLR2L, ACLR2S, ACLR2E,
     +            ACLR1T, CLR1TT,
     +            ACLR2T, CLR2TT
C
C   READ CLARIFICATION TANK DIAMETER IN METERS, DESIGN RISE
RATE
C   IN METERS PER MINUTE AND DESIGN FLOW RATE IN CUBIC METERS
PER
C   MINUTE
C
      READ (7,10,REC=4016) DIA49
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=4021) RISE49
   20 FORMAT (15X,F17.2)
      READ (7,30,REC=4026) FLOW49
   30 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON USER DEFINED TANK DIAMETER
      CLR1L =  2969.910 * (DIA49 ** 0.991)
      CLR1S =   781.550 * (DIA49 ** 0.991)
      CLR1E = 11879.601 * (DIA49 ** 0.991)
C
C   CALCULATE BASE COSTS, BASED ON TANK SIZING ESTIMATION
USING
C   DESIGN RISE AND FLOW RATES
      TANK49 =     1.128 * ((FLOW49 / RISE49) ** 0.500)
      CLR2L  =  2969.910 *  (TANK49 ** 0.991)
      CLR2S  =   781.550 *  (TANK49 ** 0.991)
      CLR2E  = 11879.601 *  (TANK49 ** 0.991)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF49L.....AF49S.....AF49E
      READ (7,40,REC=4033) AF49L
      READ (7,40,REC=4045) AF49S
      READ (7,40,REC=4057) AF49E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF49L.....BF49S.....BF49E
      READ (7,50,REC=4038) BF49L
```

```
      READ (7,50,REC=4050) BF49S
      READ (7,50,REC=4062) BF49E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ACLR1L = CLR1L * AF49L * BF49L
      ACLR1S = CLR1S * AF49S * BF49S
      ACLR1E = CLR1E * AF49E * BF49E
      ACLR2L = CLR2L * AF49L * BF49L
      ACLR2S = CLR2S * AF49S * BF49S
      ACLR2E = CLR2E * AF49E * BF49E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACLR1T = ACLR1L + ACLR1S + ACLR1S
      ACLR2T = ACLR2L + ACLR2S + ACLR2E
C
C   CALCULATE TOTAL COST
      CLR1TT = ACLR1T
      CLR2TT = ACLR2T
C
C  PRINT ROUTINE FOR SUBROUTINE WCLEAR.....
C
      WRITE (8,49009)
49009 FORMAT (//)
      WRITE (8,49010)
49010 FORMAT ('0','SUBROUTINE WCLEAR, COSTS FOR AQUISITION AND
     +INSTALLATION OF EQUIPMENT FOR WATER CLARIFICATION,
ESTIMATES
     +BASED ON AND GIVEN FOR BOTH USER DEFINED TANK DIAMETER
AND
     +FLOW OF WASTE WATER PER MINUTE GIVEN AS RISE AND FLOW
RATES
     +FOR THE SYSTEM, USER DEFINED INPUT')
      WRITE (8,49020)
49020 FORMAT ('0',4X,'UNIT CONSIDERED IS TANK DIAMETER IN
METERS')
      WRITE (8,49030) DIA49
49030 FORMAT (8X,'TANK DIAMATER          ',F17.2)
      WRITE (8,49040)
49040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL FLOW QUANTITY
     +IN CUBIC METERS PER MINUTE')
      WRITE (8,49050) FLOW49
49050 FORMAT (8X,'FLOW RATE ESTIMATED    ',F17.2)
      WRITE (8,49060)
```

```
49060 FORMAT (8X,'UNIT CONSIDERED IS RISE RATE IN TANK IN METERS
     +PER MINUTE')
      WRITE (8,49070) RISE49
49070 FORMAT (8X,'TANK RISE RATE          ',F17.2)
      WRITE (8,49080)
49080 FORMAT (8X,'TANK DIAMETER ESTIMATED BY PROGRAM BASED
ON FLOW
     +AND RISE RATES')
      WRITE (8,49090) TANK49
49090 FORMAT (8X,'TANK DIAMETER (meters) ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,49100)
49100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,49110) AF49L
49110 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,49120) BF49L
49120 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,49130)
49130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,49140) AF49S
49140 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,49150) BF49S
49150 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,49160)
49160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,49170) AF49E
49170 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,49180) BF49E
49180 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,49190)
49190 FORMAT ('0','SUBROUTINE WCLEAR, CALCULATED COSTS
OUTPUT')
      WRITE (8,49200)
49200 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
```

```
     +USER DEFINED TANK DIAMETER')
      WRITE (8,49210) CLR1L
49210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,49220) CLR1S
49220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,49230) CLR1E
49230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,49240)
49240 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
     +PROGRAM DEFINED TANK DIAMETER USING RISE AND FLOW
RATES')
      WRITE (8,49250) CLR2L
49250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,49260) CLR2S
49260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,49270) CLR2E
49270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,49280)
49280 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON USER
     +DEFINED TANK DIAMETER')
      WRITE (8,49290) ACLR1L
49290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,49300) ACLR1S
49300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,49310) ACLR1E
49310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,49320)
49320 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON
     +PROGRAM DEFINED TANK DIAMETER USING RISE AND FLOW
RATES')
      WRITE (8,49330) ACLR2L
49330 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,49340) ACLR2S
49340 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,49350) ACLR2E
49350 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,49360)
49360 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON USER
     +DEFINED TANK DIAMETER')
      WRITE (8,49370) ACLR1T
49370 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,49380) CLR1TT
49380 FORMAT (8X,'PROJECT                ',F17.2)
      WRITE (8,49390)
```

```
49390 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON PROGRAM
     +DEFINED TANK DIAMETER USING RISE AND FLOW RATES')
      WRITE (8,49400) ACLR2T
49400 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,49410) CLR2TT
49410 FORMAT (8X,'PROJECT                 ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE NEUTRL
C
C
C   COSTS FOR ACQUISITION AND INSTALLATION OF EQUIPMENT FOR
C   WASTE WATER NEUTRALIZATION
C
C     NEUTRL
      REAL
     +            FLOW50,
     +            NTRLL,  NTRLS,  NTRLE,
     +            AF50L,  AF50S,  AF50E,
     +            BF50L,  BF50S,  BF50E,
     +            ANTRTL, ANTRLS, ANTRLE,
     +            ANTRLT, NTRLTT
C
C   READ FLOW RATE OF WASTE WATER EFFLUENT IN LITERS PER
SECOND
C
      READ (7,10,REC=4071) FLOW50
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      IF (FLOW50.LE.8.76) THEN
      NTRLL = 27091.780 * (FLOW50 ** 0.094)
      NTRLS = 16008.780 * (FLOW50 ** 0.094)
      NTRLE = 80043.930 * (FLOW50 ** 0.094)
      ELSE
      NTRLL =  5796.210 * (FLOW50 ** 0.562)
      NTRLS =  3425.030 * (FLOW50 ** 0.562)
      NTRLE = 17125.150 * (FLOW50 ** 0.562)
      ENDIF
C
```

```
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF50L.....AF50S.....AF50E
      READ (7,20,REC=4078) AF50L
      READ (7,20,REC=4090) AF50S
      READ (7,20,REC=4102) AF50E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF50L.....BF50S.....BF50E
      READ (7,30,REC=4083) BF50L
      READ (7,30,REC=4095) BF50S
      READ (7,30,REC=4107) BF50E
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ANTRLL = NTRLL * AF50L * BF50L
      ANTRLS = NTRLS * AF50S * BF50S
      ANTRLE = NTRLE * AF50E * BF50E
C
C   CALCULATE TOTAL ADJUSTED COST
      ANTRLT = ANTRLL + ANTRLS + ANTRLS
C
C   CALCULATE TOTAL COST
      NTRLTT = ANTRLT
C
C  PRINT ROUTINE FOR SUBROUTINE NEUTRL.....
C
      WRITE (8,50009)
50009 FORMAT (//)
      WRITE (8,50010)
50010 FORMAT ('0','SUBROUTINE NEUTRL, COSTS FOR AQUISITION AND
     +INSTALLATION OF EQUIPMENT FOR WASTE WATER
NEUTRALIZATION,
     +ESTIMATES BASED ON FLOW RATES IN LITERS PER SECOND,
     +USER DEFINED INPUT')
      WRITE (8,50020)
50020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL FLOW RATE IN
     +LITERS PER SECOND')
      WRITE (8,50030) FLOW50
50030 FORMAT (8X,'FLOW RATE                ',F17.2)
```

```
C
C-----------------------------------------------------------------
C
      WRITE (8,50040)
50040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,50050) AF50L
50050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,50060) BF50L
50060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,50070)
50070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,50080) AF50S
50080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,50090) BF50S
50090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,50100)
50100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,50110) AF50E
50110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,50120) BF50E
50120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,50130)
50130 FORMAT ('0','SUBROUTINE NEUTRL, CALCULATED COSTS OUTPUT')
      WRITE (8,50140)
50140 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
     +USER DEFINED FLOW RATES')
      WRITE (8,50150) NTRLL
50150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,50160) NTRLS
50160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,50170) NTRLE
50170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,50180)
50180 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON USER
     +DEFINED FLOW RATES')
      WRITE (8,50190) ANTRLL
```

```
50190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,50200) ANTRLS
50200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,50210) ANTRLE
50210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,50220)
50220 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON USER
     +DEFINED FLOW RATE')
      WRITE (8,50230) ANTRLT
50230 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,50240) NTRLTT
50240 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE ENGFEE
C
C
C   COSTS FOR ENGINEERING, CONSTRUCTION MANAGEMENT
C
C     ENGFEE
      REAL
     +            COST51,
     +            X2FRMM,  X2FRME,
     +            X1FRM,
     +            AF47M,  AF47E, AF47T,
     +            BF47M,  BF47E, BF47T,
     +            A2FRMM, A2FRME,
     +            A1FRM,
     +            X2FRMTT, X1FRMTT
C
C   READ TOTAL NET CONSTRUCTION COST FOR PROJECT
C
      READ (7,10,REC=4116) COST51
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON 2 FIRMS PERFORMING
CONSTRUCTION
C   MANAGEMENT AND ENGINEERING AND DESIGN
C
      X2FRMM = 0.688 * (COST51 ** 0.848)
```

```
      X2FRME = 0.489 * (COST51 ** 0.870)
C
C   CALCULATE BASE COSTS, BASED ON 1 FIRM PERFORMING
CONSTRUCTION
C   MANAGEMENT AND ENGINEERING AND DESIGN
C
      X1FRM = 0.729 * (COST51 ** 0.884)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR 2 FIRM MANAGEMENT, 2
FIRM
C   ENGINEERING AND 1 FIRM PERFORMING BOTH SERVICES.....
C   AF51M.....AF51E.....AF51T
      READ (7,20,REC=4123) AF51M
      READ (7,20,REC=4128) AF51E
      READ (7,20,REC=4133) AF51T
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "B" FOR 2 FIRM MANAGEMENT, 2
FIRM
C   ENGINEERING AND 1 FIRM PERFORMING BOTH SERVICES.....
C   BF51M.....BF51E.....BF51T
      READ (7,30,REC=4138) BF51M
      READ (7,30,REC=4143) BF51E
      READ (7,30,REC=4148) BF51T
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      A2FRMM = X2FRMM * AF51M * BF51M
      A2FRME = X2FRME * AF51E * BF51E
      A1FRM  = X1FRM  * AF51T * BF51T
C
C   CALCULATE TOTAL ADJUSTED COST
      A2FRMT = A2FRMM + A2FRME
      A1FRMT  =  A1FRM
C
C   CALCULATE TOTAL COST
      X2FRMTT = A2FRMT
      X1FRMTT  = A1FRMT
C
C  PRINT ROUTINE FOR SUBROUTINE ENGFEE.....
C
      WRITE (8,51009)
```

```
51009 FORMAT (//)
      WRITE (8,51010)
51010 FORMAT ('0','SUBROUTINE ENGFEE, COSTS FOR ENGINEERING,
     +CONSTRUCTION AND MANAGEMENT OF PROJECT,
     +USER DEFINED INPUT')
      WRITE (8,51020)
51020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL PROJECT COST')
      WRITE (8,51030) COST51
51030 FORMAT (8X,'TOTAL COST (dollars)   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,51040)
51040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO 2 FIRM
CONTRACT')
      WRITE (8,51050) AF51M
51050 FORMAT (8X,'2 FIRM MANAGEMENT "A"  ',F17.2)
      WRITE (8,51060) BF51M
51060 FORMAT (8X,'2 FIRM MANAGEMENT "B"  ',F17.2)
      WRITE (8,51070) AF51E
51070 FORMAT (8X,'2 FIRM ENGINEERING "A" ',F17.2)
      WRITE (8,51080) BF51E
51080 FORMAT (8X,'2 FIRM ENGINEERING "B" ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,51090)
51090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO 1 FIRM
CONTRACT')
      WRITE (8,51100) AF51T
51100 FORMAT (8X,'1 FIRM TOTAL SERVICE"A"',F17.2)
      WRITE (8,51110) BF51T
51110 FORMAT (8X,'1 FIRM TOTAL SERVICE"B"',F17.2)
C
C-----------------------------------------------------------------
C
C-----------------------------------------------------------------
      WRITE (8,51120)
51120 FORMAT ('0','SUBROUTINE ENGFEE, CALCULATED COSTS OUTPUT')
      WRITE (8,51130)
51130 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON 2 FIRMS
     +PREFORMING ENGINEERING AND MANAGEMENT SERVICES')
      WRITE (8,51140) X2FRMM
51140 FORMAT (8X,'2 FIRM MANAGEMENT      ',F17.2)
```

```
      WRITE (8,51150) X2FRME
51150 FORMAT (8X,'2 FIRMS ENGINEERING    ',F17.2)
      WRITE (8,51160)
51160 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON 2 FIRMS
     +PERFORMING ENGINEERING AND MANAGEMENT SERVICES')
      WRITE (8,51170) A2FRMM
51170 FORMAT (8X,'2 FIRMS MANAGEMENT     ',F17.2)
      WRITE (8,51180) A2FRME
51180 FORMAT (8X,'2 FIRMS ENGINEERING    ',F17.2)
      WRITE (8,51190)
51190 FORMAT ('0',4X,'TOTAL COST FOR SERVICES BASED ON 2 FIRMS')
      WRITE (8,51200) A2FRMT
51200 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,51210) X2FRMTT
51210 FORMAT (8X,'PROJECT                ',F17.2)
      WRITE (8,51220)
51220 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON 1 FIRM
     +PREFORMING ENGINEERING AND MANAGEMENT SERVICES')
      WRITE (8,51230) X1FRM
51230 FORMAT (8X,'1 FIRM TOTAL SERVICE   ',F17.2)
      WRITE (8,51240)
51240 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON 1 FIRM
     +PERFORMING ENGINEERING AND MANAGEMENT SERVICES')
      WRITE (8,51250) A1FRM
51250 FORMAT (8X,'1 FIRM TOTAL SERVICE   ',F17.2)
      WRITE (8,51260)
51260 FORMAT ('0',4X,'TOTAL COST FOR SERVICES BASED ON 1 FIRM')
      WRITE (8,51270) A1FRMT
51270 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,51280) X1FRMTT
51280 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE WCAP
C
C
C     WORKING CAPITAL REQUIRED TO MAINTAIN OPERATION
C
C     WCAP
      REAL
```

```
     +            CAP52,
     +            TOTL,
     +            A1F52, A2F52, A3F52,
     +            B1F52, B2F52, B3F52,
     +            ATOTL,
     +            ATOTLT,
     +            TOTLTT
C
C   READ TOTAL WORKING CAPITAL REQUIRED
C
      READ (7,10,REC=4157) CAP52
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON 2 FIRMS PERFORMING
CONSTRUCTION
      TOTL = CAP52
C
C   OTHER USER APLLIED FACTORS "A", APPLIED TO WORKING
CAPITAL.....
C   A1F52.....A2F52.....A3F52
      READ (7,20,REC=4164) A1F52
      READ (7,20,REC=4169) A2F52
      READ (7,20,REC=4174) A3F52
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B", APPLIED TO WORKING
CAPITAL.....
C   B1F51.....B2F51.....B3F51
      READ (7,30,REC=4179) B1F52
      READ (7,30,REC=4184) B2F52
      READ (7,30,REC=4189) B3F52
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ATOTL = TOTL * A1F52 * A2F52 * A3F52 * B1F52 *
     +        B2F52 * B3F52
C
C   CALCULATE TOTAL ADJUSTED COST
      ATOTLT = ATOTL
C
C   CALCULATE TOTAL COST
      TOTLTT = ATOTLT
C
C  PRINT ROUTINE FOR SUBROUTINE WCAP.....
```

```
C
      WRITE (8,52009)
52009 FORMAT (//)
      WRITE (8,52010)
52010 FORMAT ('0','SUBROUTINE WCAP, WORKING CAPITAL REQUIRED
TO
     +MAINTAIN OPERATION, USER DEFINED INPUT')
      WRITE (8,52020)
52020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL WORKING CAPITAL
USER
     +WISHES TO MAINTAIN')
      WRITE (8,52030) CAP52
52030 FORMAT (8X,'WORKING CAPITAL        ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,52040)
52040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO CAPITAL')
      WRITE (8,52050) A1F52
52050 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,52060) A2F52
52060 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,52070) A3F52
52070 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,52080)
52080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO CAPITAL')
      WRITE (8,52090) B1F52
52090 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,52100) B2F52
52100 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,52110) B3F52
52110 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,52120)
52120 FORMAT ('0','SUBROUTINE WCAP, CALCULATED COSTS OUTPUT')
      WRITE (8,52130)
```

```
52130 FORMAT ('0',4X,'BASE CAPITAL')
      WRITE (8,52140) TOTL
52140 FORMAT (8X,'CAPITAL BASE          ',F17.2)
      WRITE (8,52150)
52150 FORMAT ('0',4X,'ADJUSTED CAPITAL')
      WRITE (8,52160) ATOTL
52160 FORMAT (8X,'CAPITAL ADJUSTED      ',F17.2)
      WRITE (8,52170)
52170 FORMAT ('0',4X,'TOTAL CAPITAL')
      WRITE (8,52180) TOTLTT
52180 FORMAT (8X,'CAPITAL TOTAL         ',F17.2)
C
      RETURN
      END
C
C
C
```

Appendix D
UCAP.DAT, DATAFILE FOR UCAP1.FOR AND UCAP2.FOR

DATAFILE UCAP.DAT.....
DATA FILE FOR UCAP1.FOR AND UCAP2.FOR. A COST ESTIMATING PROGRAM TO ESTIMATE CAPITAL COSTS TO BE INCURRED IN DEVELOPING AN UNDERGROUND ROOM AND PILLAR MINING OPERATION. FOLLOW THE DIRECTIONS OUTLINED ON THE FOLLOWING SCREENS TO PROPERLY PREPARE THE DATA FILE FOR EXECUTION WITH THE MAIN PROGRAM UCAP1.FOR OR UCAP2.FOR.

CHOOSE THE COST ESTIMATING SUBROUTINES YOU WISH TO USE FROM THE LIST WHICH FOLLOWS. TO ACTIVATE A SUBROUTINE YOU SHOULD ENTER A NUMERAL "1" IN COLUMN 35 AFTER THE SUBROUTINE NAME ON THE SAME LINE. IF YOU DO NOT WISH TO USE A SUBROUTINE PLACE A NUMERAL "0" IN THIS LOCATION. IF YOU CHOSE TO ACTIVATE A COST ESTIMATING SUBROUTINE YOU MUST PROVIDE ANSWERS TO ALL OF THE DATA INPUT QUESTIONS WHICH RELATE TO THAT SUBROUTINE. FAIILURE TO PROVIDE THIS DATA, IN THE UNITS SPECIFIED, WILL RESULT IN MAIN PROGRAM EXECUTION ERROR....

YOUR COST ESTIMATING SUBROUTINE CHOICES ARE AS FOLLOWS:

C
O
L
U
N
M

3
5

1) CLEAR.....0
2) CORING.....0
3) SSHAFT.....0
4) SMRAIL.....0
5) SMTIRE.....0
6) MEDTIRE.....0
7) LGRAIL.....0
8) LGTIRE.....0
9) DRIVES.....0

RECORD = 31 UCAP1
SUBROUTINES
NUMBERS 1
THROUGH 30
(INCLUSIVE)

10) DROP.....0
11) RAISES.....0
12) DECLIN.....0
13) LGROOM.....0
14) HPANEL.....0
15) SPANEL.....0
16) PUMP1.....0
17) PUMP2.....0
18) HOISTD.....0
19) HOISTF.....0
20) JUMBOS.....0
21) JKLEGS.....0
22) MINERS.....0
23) TMACH.....0
24) CONV1.....0
25) CONV2.....0
26) LHD.....0
27) RAILS.....0
28) TRUCKS.....0
29) LAYRR.....0
30) SRCONV.....0
31) TALK.....0
32) AIR.....0
33) EPOWER.....0
34) FUEL.....0
35) OFFLAB.....0
36) PPOWER.....0
37) SHOPS.....0
38) STOCKP.....0
39) BUILDS.....0
40) VENT.....0
41) DRAIN.....0
42) WATER.....0
43) CROAD.....0
44) BLAST.....0
45) EXCAVE.....0
46) GRAVEL.....0
47) PAVE.....0
48) PLINES.....0
49) WCLEAR.....0
50) NEUTRL.....0
51) ENGFEE.....0
52) WCAP.....0

END UCAP1 SUBROUTINES
UCAP2 SUBROUTINES
NUMBERS 31
THROUGH 52
(INCLUSIVE)

END UCAP2 SUBROUTINES

NOW THAT THE COST ESTIMATING SUBROUTINE(S) TO BE USED HAVEBEEN DEFINED PROCEED THROUGH THIS DATA FILE AND PROVIDE ALL INFORMATION REQUIRED UNDER EACH COST ESTIMATING SUBROUTINE YOU SELECTED FOR USE.
DATA MUST BE IN THE UNITS SPECIFIED AND PLACED IN COLUMNS 16 THROUGH 32. THE "*" SYMBOL SURROUNDS THE COLUMNS RESERVED FOR THE PLACEMENT OF YOUR DATA. THE DECIMAL PLACE SHOULD NOT BE MOVED AND ONLY 2 DIGITS SHOULD BE PROVIDED AFTER THE DECIMAL POINT. SEE U.S. BUREAU OF MINES (1987) PUBLICATION LISTED IN THE REFERENCES FOR RANGES OF VALUES TO BE USED AS CORRECTION FACTORS FOR THE VARIABLES REQUESTED.

C	C
O	O
L	L
U	U
M	M
N	N
1	3
6	2

SUBROUTINE: CLEARING

...VARIABLES:

NAME: ACRE1
DESCRIPTION: HECTACRES TO BE CLEARED
UNITS: HECTARES
VALUE:* 0.00****** RECORD=112

...CORRECTION FOR PURCHASED EQUIPMENT

NAME: EFCT1
DESCRIPTION: PURCHASED EQUIPMENT REQUIRED
UNITS: NONE
VALUE:* 1.00***** RECORD=119

...CORRECTION FACTORS FOR LABOR:

NAME: BSF1L
DESCRIPTION: BRUSH CLEARING

UNITS: NONE
VALUE:* 1.00******* RECORD= 126

NAME: SPF1L
DESCRIPTION: SIDE SLOPE CLEARING (<20% OR
UNITS: NONE
VALUE:* 1.00******* RECORD=131

NAME: BNF1L
DESCRIPTION: BURNING BRUSH
UNITS: NONE
VALUE:* 1.00***** RECORD= 136

NAME: SBF1L
DESCRIPTION: WORK COMPLETED BY SUBCONRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=141

NAME: AF1L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=146

NAME: BF1L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=151

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BSF1S
DESCRIPTION: BRUSH CLEARING
UNITS: NONE
VALUE:* 1.00***** RECORD=158

NAME: SPF1S
DESCRIPTION: SIDE SLOPE CLEARING (<20% OR
UNITS: NONE
VALUE:* 1.00***** RECORD=163

NAME: BNF1S
DESCRIPTION: BURNING BRUSH
UNITS: NONE
VALUE:* 1.00***** RECORD=168

NAME: SBF1S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=173

NAME: AF1S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=178

NAME: BF1S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=183

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BSF1E
DESCRIPTION: BRUSH CLEARING
UNITS: NONE
VALUE:* 1.00***** RECORD=190

NAME: SPF1E
DESCRIPTION: SIDE SLOPE CLEARING (<20% OR
UNITS: NONE
VALUE:* 1.00***** RECORD=195

NAME: BNF1E
DESCRIPTION: BURNING BRUSH
UNITS: NONE
VALUE:* 1.00***** RECORD=200

NAME: SBF1E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=205

NAME: AF1E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=210

NAME: BF1E

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=215

SUBROUTINE:CORING

...VARIABLES:

NAME: METR2
DESCRIPTION: METERS OF CORE DRILLED FOR PREPRODUCTION
UNITS: METERS PER DAY
VALUE:* 0.00***** RECORD=225

...CORRECTION FACTORS FOR LABOR:

NAME: SBF2L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=232

NAME: AF2L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=237

NAME: BF2L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=242

...CORRECTION FACTORS FOR SUPPLIES:

NAME: SBF2S
DESCRIPTION: WORK COMPLETED BY SUBCONRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=249

NAME: AF2S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=254

NAME: BF2S

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=259

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: SBF2E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE:* 1.00***** RECORD=266

NAME: AF2E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00***** RECORD=271

NAME: BF2E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00***** RECORD=276

SUBROUTINE: SSHAFT

...VARIABLES:

NAME: AREA3
DESCRIPTION: FACE AREA OF SHAFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=287

NAME: LONG3
DESCRIPTION: TOTAL LENGTH OF SHAFT
UNITS: METERS
VALUE:* 0.00******* RECORD=292

...TIMBER LINER FACTOR:

NAME: WFCT3
DESCRIPTION: TIMBER LINING FACTOR
UNITS: ENTER A 1.00 IF SHAFT IS TIMBER LINED, OR 0.00 IF NOT
VALUE:* 1.00******* RECORD=299

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT3
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=306

...CORRECTION FACTORS FOR LABOR:

NAME: AF3L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=313

NAME: BF3L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=318

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF3S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=325

NAME: BF3S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=330

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF3E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=337

NAME: BF3E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=342

SUBROUTINE:SMRAIL
...VARIABLES:

NAME: AREA4
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=351

NAME: LONG4
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=356

...CORRECTION FOR ROCK HARDNESS

NAME: HFCT4
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=363

...CORRECTION FACTORS FOR LABOR:

NAME: BTF4L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=370

NAME: TMF4L
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=375

NAME: AF4L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=380

NAME: BF4L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=385

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF4S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=392

NAME: TMF4S
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=397

NAME: AF4S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=402

NAME: BF4S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=407

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF4E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=414

NAME: TMF4E
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=419

NAME: AF4E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=424

NAME: BF4E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=429

SUBROUTINE: SMTIRE

...VARIABLES:

NAME: AREA5
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=438

NAME: LONG5
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=443

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT5
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=450

...CORRECTION FACTORS FOR LABOR:

NAME: BTF5L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=457

NAME: AF5L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=462

NAME: BF5L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=467

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF5S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=474

NAME: AF5S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=479

NAME: BF5S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=484

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF5E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=491

NAME: AF5E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=496

NAME: BF5E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=501

SUBROUTINE: MEDTIRE

...VARIABLES:

NAME: AREA6
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=510

NAME: LONG6
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=515

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT6
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=522

...CORRECTION FACTORS FOR LABOR:

NAME: BTF6L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=529

NAME: STF6L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=534

NAME: CCF6L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=539

NAME: SSF6L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=544

NAME: AF6L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=549

NAME: BF6L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=554

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF6S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=562

NAME: STF6S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=567

NAME: CCF6S
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=572

NAME: SSF6S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=577

NAME: AF6S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=582

NAME: BF6S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=587

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF6E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=595

NAME: STF6E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=600

NAME: CCF6E
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=605

NAME: SSF6E

DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=610

NAME: AF6E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=615

NAME: BF6E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=620

SUBROUTINE: LGRAIL

...VARIABLES:

NAME: AREA7
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=629

NAME: LONG7
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=634

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT7
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=641

...CORRECTION FACTORS FOR LABOR:

NAME: BTF7L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=648

NAME: STF7L

DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=653

NAME: CCF7L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=658

NAME: SSF7L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=663

NAME: DTF7L
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=668

NAME: AF7L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=673

NAME: BF7L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=678

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF7S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=686

NAME: STF7S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=691

NAME: CCF7S
DESCRIPTION: CONCRETE LINER INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=696

NAME: SSF7S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=701

NAME: DTF7S
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=706

NAME: AF7S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=711

NAME: BF7S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=716

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF7E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=724

NAME: STF7E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=729

NAME: CCF7E
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=734

NAME: SSF7E
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE

VALUE:* 1.00******* RECORD=739

NAME: DTF7E
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=744

NAME: AF7E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=749

NAME: BF7E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=754

SUBROUTINE: LGTIRE

...VARIABLES:

NAME: AREA8
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=763

NAME: LONG8
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=768

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT8
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=775

...CORRECTION FACTORS FOR LABOR:

NAME: BTF8L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE

VALUE:* 1.00******* RECORD=782

NAME: STF8L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=787

NAME: AF8L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=792

NAME: BF8L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=797

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF8S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=805

NAME: STF8S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=810

NAME: AF8S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=815

NAME: BF8S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=820

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF8E

DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=828

NAME: STF8E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=833

NAME: AF8E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=838

NAME: BF8E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=843

SUBROUTINE: DRIVES

...VARIABLES:

NAME: AREA9
DESCRIPTION: FACE AREA OF RAISE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=852

NAME: LONG9
DESCRIPTION: TOTAL LENGTH OF RAISE
UNITS: METERS
VALUE:* 0.00******* RECORD=857

...CORRECTION FACTORS FOR LABOR:

NAME: TMF9L
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=864

NAME: RCF9L
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=869

NAME: RTF9L
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=874

NAME: SCF9L
DESCRIPTION: STEEL CHUTE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=879

NAME: AF9L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=884

NAME: BF9L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=889

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TMF9S
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=896

NAME: RCF9S
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=901

NAME: RTF9S
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=906

NAME: SCF9S
DESCRIPTION: STEEL CHUTE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=911

NAME: AF9S
DESCRIPTION: OTHER USER FACTOR A

UNITS: NONE
VALUE:* 1.00******* RECORD=916

NAME: BF9S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=921

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TMF9E
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=929

NAME: RCF9E
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=934

NAME: RTF9E
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=939

NAME: SCF9E
DESCRIPTION: STEEL CHUTE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=944

NAME: AF9E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=949

NAME: BF9E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=954

SUBROUTINE: DROP

...VARIABLES:

NAME: AREA10
DESCRIPTION: FACE AREA OF RAISE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=963

NAME: LONG10
DESCRIPTION: TOTAL LENGTH OF RAISE
UNITS: METERS
VALUE:* 0.00******* RECORD=968

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT10
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=975

...CORRECTION FACTORS FOR LABOR:

NAME: SRF10L
DESCRIPTION: SERVICE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=982

NAME: AF10L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=987

NAME: BF10L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=992

...CORRECTION FACTORS FOR SUPPLIES:

NAME: SRF10S
DESCRIPTION: SERVICE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=999

NAME: AF10S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1004

NAME: BF10S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1009

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: SRF10E
DESCRIPTION: SERVICE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1016

NAME: AF10E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1021

NAME: BF10E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1026

SUBROUTINE: RAISES

...VARIABLES:

NAME: AREA11
DESCRIPTION: FACE AREA OF RAISE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1035

NAME: LONG11
DESCRIPTION: TOTAL LENGTH OF RAISE
UNITS: METERS
VALUE:* 0.00******* RECORD=1040

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT11
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1047

...CORRECTION FACTOR FOR LENGTH OF RAISE

NAME: LFCT11
DESCRIPTION: PROPORTIONING OF COST BASED ON RAISE LENGTH
UNITS: ENTER A 1.00 IF USED, OR 0.00 IF NOT
VALUE:* 1.00******* RECORD=1054

...CORRECTION FACTORS FOR LABOR:

NAME: LNF11L
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1061

NAME: SRF11L
DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1066

NAME: AF11L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1071

NAME: BF11L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1076

...CORRECTION FACTORS FOR SUPPLIES:

NAME: LNF11S
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1083

NAME: SRF11S

DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1088

NAME: AF11S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1093

NAME: BF11S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1098

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: LNF11E
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1105

NAME: SRF11E
DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1110

NAME: AF11E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1115

NAME: BF11E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1120

SUBROUTINE: DECLIN

...VARIABLES:

NAME: AREA12
DESCRIPTION: FACE AREA OF INCLINE OR DECLINE
UNITS: SQUARE METERS

VALUE:* 0.00******* RECORD=1129

NAME: LONG12
DESCRIPTION: TOTAL LENGTH OF INCLINE OR DECLINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1134

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT12
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1141

...CORRECTION FACTORS FOR LABOR:

NAME: BTF12L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1148

NAME: STF12L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1153

NAME: CCF12L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1158

NAME: SSF12L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1163

NAME: AF12L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1168

NAME: BF12L
DESCRIPTION: OTHER USER FACTOR B

UNITS: NONE
VALUE:* 1.00******* RECORD=1173

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF12S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1180

NAME: STF12S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1185

NAME: CCF12S
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1190

NAME: SSF12S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1195

NAME: AF12S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1200

NAME: BF12S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1205

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF12E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1212

NAME: STF12E

DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1217

NAME: CCF12E
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1222

NAME: SSF12E
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1227

NAME: AF12E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1232

NAME: BF12E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1237

SUBROUTINE: LGROOM

...VARIABLES:

NAME: AREA13
DESCRIPTION: FACE AREA OF ROOM WALL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1246

NAME: LONG13
DESCRIPTION: TOTAL LENGTH OF ROOM
UNITS: METERS
VALUE:* 0.00******* RECORD=1251

...CORRECTION FACTORS FOR LABOR:

NAME: TKF13L
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1258

NAME: STF13L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1263

NAME: AF13L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1268

NAME: BF13L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1273

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TKF13S
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1280

NAME: STF13S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1285

NAME: AF13S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1290

NAME: BF13S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1295

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TKF13E
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1302

NAME: STF13E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1307

NAME: AF13E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1312

NAME: BF13E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1317

SUBROUTINE: HPANEL

...VARIABLES:

NAME: AREA14
DESCRIPTION: PLAN VIEW AREA OF PANEL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1326

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT14
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1333

...CORRECTION FACTORS FOR LABOR:

NAME: AF14L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1340

NAME: BF14L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1345

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF14S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1352

NAME: BF14S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1357

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF14E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1364

NAME: BF14E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1369

SUBROUTINE: SPANEL

...VARIABLES:

NAME: AREA15
DESCRIPTION: PLAN VIEW AREA OF PANEL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1378

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT15
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1385

...CORRECTION FACTORS FOR LABOR:

NAME: AF15L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1392

NAME: BF15L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1397

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF15S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1404

NAME: BF15S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1409

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF15E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1416

NAME: BF15E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1421

SUBROUTINE: PUMP1

...VARIABLES:

NAME: FLOW16
DESCRIPTION: TOTAL WATER PUMPING REQUIREMENTS
UNITS: CUBIC METERS PER DAY
VALUE:* 0.00******* RECORD=1430

...CORRECTION FACTORS FOR LABOR:

NAME: AF16L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1438

NAME: BF16L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1443

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF16S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1450

NAME: BF16S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1455

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF16E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1462

NAME: BF16E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1467

SUBROUTINE: PUMP2

...VARIABLES:

NAME: FLOW17
DESCRIPTION: TOTAL WATER PUMPING REQUIREMENTS
UNITS: CUBIC METERS PER DAY

VALUE:* 0.00******* RECORD=1476

NAME: DAYS17
DESCRIPTION: NUMBER OF DAYS ALLOWED FOR DEWATERING
UNITS: INTERGER NUMBER, 24 HOUR DAYS
VALUE:* 0.00******* RECORD=1481

...CORRECTION FACTOR FOR TOTAL VERTICAL HEIGHT OUT OF MINE

NAME: VFCT17
DESCRIPTION: VERTICAL HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1488

...CORRECTION FACTORS FOR LABOR:

NAME: AF17L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1495

NAME: BF17L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1500

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF17S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1507

NAME: BF17S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1512

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF17E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE

VALUE:* 1.00******* RECORD=1519

NAME: BF17E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1524

SUBROUTINE: HOISTD

...VARIABLES:

NAME: TONS18
DESCRIPTION: TOTAL HOIST CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1533

...CORRECTION FACTOR FOR TOTAL VERTICAL HEIGHT OUT OF MINE

NAME: VFCT18
DESCRIPTION: VERTICAL HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1540

...SERVICE HOIST FACTOR:

NAME: SFCT18
DESCRIPTION: HOIST TO BE USED FOR SERVICES ONLY
UNITS: ENTER A 1.00 IF SERVICE ONLY, OR 0.00 IF NOT
VALUE:* 1.00******* RECORD=1547

...CORRECTION FACTORS FOR LABOR:

NAME: AF18L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1554

NAME: BF18L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1559

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF18S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1566

NAME: BF18S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1571

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF18E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1578

NAME: BF18E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1583

SUBROUTINE: HOISTF

...VARIABLES:

NAME: TONS19
DESCRIPTION: TOTAL HOIST CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1592

...CORRECTION FACTOR FOR TOTAL VERTICAL HEIGHT OUT OF MINE

NAME: VFCT19
DESCRIPTION: VERTICAL HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1599

...SERVICE HOIST FACTOR:

NAME: SFCT19
DESCRIPTION: HOIST TO BE USED FOR SERVICES ONLY
UNITS: ENTER A 1.00 IF SERVICE ONLY, OR 0.00 IF NOT
VALUE:* 0.00******* RECORD=1606

...CORRECTION FACTORS FOR LABOR:

NAME: AF19L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1613

NAME: BF19L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1618

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF19S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1625

NAME: BF19S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1630

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF19E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1637

NAME: BF19E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1642

SUBROUTINE: JUMBOS

...VARIABLES:

NAME: TONS20
DESCRIPTION: TOTAL PRODUCTION CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1651

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT20
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTERGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1658

...CORRECTION FACTORS FOR LABOR:

NAME: AF20L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1665

NAME: BF20L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1670

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF20S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1677

NAME: BF20S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1682

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF20E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1689

NAME: BF20E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1694

SUBROUTINE: JKLEGS

...VARIABLES:

NAME: TONS21
DESCRIPTION: TOTAL PRODUCTION CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1703

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT21
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1710

...CORRECTION FACTORS FOR LABOR:

NAME: AF21L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1717

NAME: BF21L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1722

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF21S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1729

NAME: BF21S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1734

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF21E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1741

NAME: BF21E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1746

SUBROUTINE: MINERS

...VARIABLES:

NAME: TONS22
DESCRIPTION: TOTAL PRODUCTION CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1755

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT22
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1762

...CORRECTION FACTORS FOR LABOR:

NAME: AF22L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1769

NAME: BF22L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1774

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF22S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1781

NAME: BF22S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1786

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF22E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1793

NAME: BF22E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1798

SUBROUTINE: TMACH

...VARIABLES:

NAME: DIA23
DESCRIPTION: TOTAL FACE AREA OF TUNNEL BORING MACHINE IN USE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1807

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT23
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1,2 OR 3
VALUE:* 1.00******* RECORD=1814

...CORRECTION FACTORS FOR LABOR:

NAME: AF23L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1821

NAME: BF23L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1826

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF23S

DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1833

NAME: BF23S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1838

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF23E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1845

NAME: BF23E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1850

SUBROUTINE: CONV1

...VARIABLES:

NAME: TONS24
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1859

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT24
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1,2 OR 3
VALUE:* 1.00******* RECORD=1866

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT24
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1873

...CORRECTION FACTORS FOR LABOR:

NAME: AF24L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1880

NAME: BF24L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1885

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF24S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1892

NAME: BF24S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1897

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF24E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1904

NAME: BF24E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1909

SUBROUTINE: CONV2

...VARIABLES:

NAME: TONS25
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1918

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT25
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1925

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT25
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1932

...CORRECTION FACTORS FOR LABOR:

NAME: AF25L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1939

NAME: BF25L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1944

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF25S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1951

NAME: BF25S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1956

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF25E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1963

NAME: BF25E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1968

SUBROUTINE: LHD

...VARIABLES:

NAME: TONS26
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1977

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT26
DESCRIPTION: NUMBER OF SHIFTS 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1984

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT26
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1991

...CORRECTION FACTOR FOR GRADE OF INCLINE OR DECLINE

NAME: GFCT26
DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
UNITS: GRADE IN PERCENT OF INCLINE OR DECLINE (POSITIVE ONLY)
VALUE:* 0.00******* RECORD=1998

...CORRECTION FACTORS FOR LABOR:

NAME: AF26L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2005

NAME: BF26L

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2010

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF26S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2017

NAME: BF26S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2022

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF26E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2029

NAME: BF26E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2034

SUBROUTINE: RAILS

...VARIABLES:

NAME: TONS27
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2043

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT27
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=2050

...CORRECTION FACTOR FOR DISTANCE

NAME: DFCT27
DESCRIPTION: DISTANCE
UNITS: METERS
VALUE:* 0.00******* RECORD=2057

...CORRECTION FACTORS FOR LABOR:

NAME: TRF27L
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=2065

NAME: DSF27L
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=2070

NAME: A1F27L
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2075

NAME: B1F27L
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2080

NAME: A2F27L
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2085

NAME: B2F27L
DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2090

NAME: A3F27L
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL
LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2095

NAME: B3F27L
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL
LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2100

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TRF27S
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=2107

NAME: DSF27S
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=2113

NAME: A1F27S
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC
LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2118

NAME: B1F27S
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC
LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2123

NAME: A2F27S
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY
LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2128

NAME: B2F27S

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DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY
        LOCOMOTIVES
UNITS: NONE
VALUE:*         1.00*******             RECORD=2133

NAME: A3F27S
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL
        LOCOMOTIVES
UNITS: NONE
VALUE:*         1.00*******             RECORD=2138

NAME: B3F27S
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL
        LOCOMOTIVES
UNITS: NONE
VALUE:*         1.00*******             RECORD=2143

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TRF27E
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:*         1.00*******             RECORD=2150

NAME: DSF27E
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:*         1.00*******             RECORD=2155

NAME: A1F27E
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC
        LOCOMOTIVES
UNITS: NONE
VALUE:*         1.00*******             RECORD=2160

NAME: B1F27E
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC
        LOCOMOTIVES
UNITS: NONE
VALUE:*         1.00*******             RECORD=2165

NAME: A2F27E
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY
        LOCOMOTIVES
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UNITS: NONE
VALUE:* 1.00******* RECORD=2170

NAME: B2F27E
DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2175

NAME: A3F27E
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2180

NAME: B3F27E
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=2185

SUBROUTINE: TRUCKS

...VARIABLES:

NAME: TONS28
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2194

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT28
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=2201

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT28
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=2208

...CORRECTION FACTOR FOR GRADE OF INCLINE

NAME: IFCT28
DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
UNITS: GRADE IN PERCENT OF INCLINE (USE 0.00 FOR ANY DECLINE)
VALUE:* 0.00******* RECORD=2215

...CORRECTION FACTORS FOR LABOR:

NAME: AF28L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2222

NAME: BF28L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2227

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF28S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2234

NAME: BF28S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2239

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF28E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2246

NAME: BF28E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2251

SUBROUTINE: LAYRR

...VARIABLES:

NAME: LONG29
DESCRIPTION: TOTAL LENGTH OF TRACK TO BE LAYED
UNITS: KILOMETERS
VALUE:* 0.00******* RECORD=2260

...CORRECTION FACTOR FOR PURCHASED EQUIPMENT

NAME: EFCT29
DESCRIPTION: EQUIPMENT TO BE PURCHASED FOR LAYING RAIL
UNITS: NONE
VALUE:* 1.00******* RECORD=2267

...CORRECTION FACTORS FOR LABOR:

NAME: BLF29L
DESCRIPTION: TRACK BALLAST FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2274

NAME: SBF29L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2279

NAME: AF29L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2284

NAME: BF29L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2289

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BLF29S
DESCRIPTION: TRACK BALLAST FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2296

NAME: SBF29S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2301

NAME: AF29S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2306

NAME: BF29S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2311

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BLF29E
DESCRIPTION: TRACK BALLAST FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2318

NAME: SBF29E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=2323

NAME: AF29E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2328

NAME: BF29E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2333

SUBROUTINE: SRCONV

...VARIABLES:

NAME: TONS30
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY

VALUE:* 0.00******* RECORD=2342

...CORRECTION FACTOR FOR GRADE OF INCLINE

NAME: IFCT30
DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
UNITS: GRADE IN PERCENT OF INCLINE (USE 0.00 FOR ANY DECLINE)
VALUE:* 0.00******* RECORD=2349

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT30
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=2356

...CORRECTION FACTOR FOR STACKER-TRIPPER INSTALLATION

NAME: SFCT30
DESCRIPTION: STACKER-TRIPPER ACQUITITION AND INSTALLATION
UNITS: DOLLARS
VALUE:* 0.00******* RECORD=2363

...CORRECTION FACTORS FOR LABOR:

NAME: AF30L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2370

NAME: BF30L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2375

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF30S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2382

NAME: BF30S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2387

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF30E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2394

NAME: BF30E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2399

SUBROUTINE: TALK

...VARIABLES:

NAME: TONS31
DESCRIPTION: TOTAL MATERAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2408

...CORRECTION FACTORS FOR LABOR:

NAME: AF31L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2415

NAME: BF31L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2420

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF31S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2427

NAME: BF31S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2432

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF31E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2439

NAME: BF31E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2444

SUBROUTINE: AIR

...VARIABLES:

NAME: AIR32
DESCRIPTION: TOTAL COMPRESSOR CAPACITY NEEDED
UNITS: CUBIC METERS INSTALLED CAPACITY PER MINUTE
VALUE:* 0.00******* RECORD=2453

...CORRECTION FACTOR FOR ALTITUDE

NAME: AFCT32
DESCRIPTION: ALTITIDE ADJUSTMENT
UNITS: ELEVATION OF INSTALLATION IN METERS ABOVE SEA-LEVEL
VALUE:* 0.00******* RECORD=2460

...CORRECTION FACTORS FOR LABOR:

NAME: AF32L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2467

NAME: BF32L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE

VALUE:* 1.00******* RECORD=2472

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF32S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2479

NAME: BF32S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2484

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF32E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2491

NAME: BF32E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2496

SUBROUTINE: EPOWER

...VARIABLES:

NAME: KWT33
DESCRIPTION: TOTAL POWER CAPACITY REQUIRED
UNITS: KILOWATTS
VALUE:* 0.00******* RECORD=2505

NAME: TONS33
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2510

...CORRECTION FACTORS FOR LABOR:

NAME: ESF33L
DESCRIPTION: COSTS FOR SUBSTATION INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=2517

NAME: ADF33L
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2522

NAME: AF33L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2527

NAME: BF33L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2532

...CORRECTION FACTORS FOR SUPPLIES:

NAME: ESF33S
DESCRIPTION: COSTS FOR SUBSTATION INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=2539

NAME: ADF33S
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2544

NAME: AF33S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2549

NAME: BF33S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2554

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: ESF33E
DESCRIPTION: COSTS FOR SUBSTATION INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=2561

NAME: ADF33E
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2566

NAME: AF33E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2571

NAME: BF33E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2576

SUBROUTINE: FUEL

...VARIABLES:

NAME: TONS34
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2585

...CORRECTION FACTORS FOR LABOR:

NAME: NDF34L
DESCRIPTION: NON DIESEL MINE
UNITS: NONE
VALUE:* 1.00******* RECORD=2592

NAME: ADF34L
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2597

NAME: AF34L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2602

NAME: BF34L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2607

...CORRECTION FACTORS FOR SUPPLIES:

NAME: NDF34S
DESCRIPTION: NON DIESEL MINE
UNITS: NONE
VALUE:* 1.00******* RECORD=2614

NAME: ADF34S
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2619

NAME: AF34S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2624

NAME: BF34S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2629

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: NDF34E
DESCRIPTION: NON DIESEL MINE
UNITS: NONE
VALUE:* 1.00******* RECORD=2636

NAME: ADF34E
DESCRIPTION: ADIT ENTRY PRIMARY MEANS OF ACCESS
UNITS: NONE
VALUE:* 1.00******* RECORD=2641

NAME: AF34E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2646

NAME: BF34E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2651

SUBROUTINE: OFFLAB

...VARIABLES:

NAME: OFFA35
DESCRIPTION: TOTAL OFFICE AREA REQUIRED (APPLIED TO OFFICES)
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=2660

NAME: OFFT35
DESCRIPTION: TOTAL MATERIAL PRODUCTION (APPLIED TO OFFICES)
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2665

NAME: LABA35
DESCRIPTION: TOTAL LAB AREA REQUIRED (APPLIED TO LABS)
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=2670

NAME: LABT35
DESCRIPTION: TOTAL MATERIAL PRODUCTION (APPLIED TO LABS)
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2675

...CORRECTION FACTORS FOR LABOR:

NAME: WOF35L
DESCRIPTION: WEATHER FACTOR APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2682

NAME: WLF35L
DESCRIPTION: WEATHER FACTOR APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2687

NAME: AOF35L

DESCRIPTION: OTHER USER FACTOR A APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2692

NAME: BOF35L
DESCRIPTION: OTHER USER FACTOR B APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2697

NAME: ALF35L
DESCRIPTION: OTHER USER FACTOR A APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2702

NAME: BLF35L
DESCRIPTION: OTHER USER FACTOR B APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2707

...CORRECTION FACTORS FOR SUPPLIES:

NAME: WOF35S
DESCRIPTION: WEATHER FACTOR APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2714

NAME: WLF35S
DESCRIPTION: WEATHER FACTOR APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2719

NAME: AOF35S
DESCRIPTION: OTHER USER FACTOR A APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2724

NAME: BOF35S
DESCRIPTION: OTHER USER FACTOR B APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2729

NAME: ALF35S
DESCRIPTION: OTHER USER FACTOR A APPLIED TO LABS
UNITS: NONE

VALUE:* 1.00******* RECORD=2734

NAME: BLF35S
DESCRIPTION: OTHER USER FACTOR B APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2739

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: WOF35E
DESCRIPTION: WEATHER FACTOR APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2746

NAME: WLF35E
DESCRIPTION: WEATHER FACTOR APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2751

NAME: AOF35E
DESCRIPTION: OTHER USER FACTOR A APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2756

NAME: BOF35E
DESCRIPTION: OTHER USER FACTOR B APPLIED TO OFFICES
UNITS: NONE
VALUE:* 1.00******* RECORD=2761

NAME: ALF35E
DESCRIPTION: OTHER USER FACTOR A APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2766

NAME: BLF35E
DESCRIPTION: OTHER USER FACTOR B APPLIED TO LABS
UNITS: NONE
VALUE:* 1.00******* RECORD=2771

SUBROUTINE: PPOWER

...VARIABLES:

NAME: KWT36

DESCRIPTION: TOTAL REQUIRED POWER CAPACITY
UNITS: KILOWATTS
VALUE:* 0.00******* RECORD=2780

...CORRECTION FACTORS FOR LABOR:

NAME: ADF36L
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2787

NAME: BDF36L
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2792

NAME: ATF36L
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE
GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2797

NAME: BTF36L
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE
GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2802

...CORRECTION FACTORS FOR SUPPLIES:

NAME: ADF36S
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2809

NAME: BDF36S
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2814

NAME: ATF36S
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE
GENERATORS
UNITS: NONE

VALUE:* 1.00******* RECORD=2819

NAME: BTF36S
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2824

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: ADF36E
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2831

NAME: BDF36E
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2836

NAME: ATF36E
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2841

NAME: BTF36E
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2846

SUBROUTINE: SHOPS

...VARIABLES:

NAME: SURA37
DESCRIPTION: TOTAL SURFACE SHOP/WAREHOUSE AREA REQUIRED
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=2855

NAME: SURT37
DESCRIPTION: TOTAL MATERIAL PRODUCTION (APPLIED TO

SURFACE)
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2860

NAME: UNDA37
DESCRIPTION: TOTAL UNDERGROUND SHOP/WAREHOUSE AREA REQUIRED
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=2865

NAME: UNDT37
DESCRIPTION: TOTAL MATERIAL PRODUCTION(APPLIED TO UNDERGROUND)
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2870

...CORRECTION FACTOR FOR UNDERGROUND SATELITE SHOPS

NAME: LFCT37
DESCRIPTION: ONE SHOP PROVIDED ON EACH WORKING LEVEL
UNITS: INTERGER VALUE FOR NUMBER OF WORKING LEVELS
VALUE:* 1.00******* RECORD=2877

...CORRECTION FACTORS FOR LABOR:

NAME: WSF37L
DESCRIPTION: WEATHER FACTOR, SURFACE FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2884

NAME: RPF37L
DESCRIPTION: ROOM AND PILLAR FACTOR, UNDERGROUND FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2889

NAME: ASF37L
DESCRIPTION: OTHER USER FACTOR A APPLIED TO SURFACE
UNITS: NONE
VALUE:* 1.00******* RECORD=2894

NAME: BSF37L
DESCRIPTION: OTHER USER FACTOR B APPLIED TO SURFACE
UNITS: NONE

VALUE:* 1.00******* RECORD=2899

NAME: AUF37L
DESCRIPTION: OTHER USER FACTOR A APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2904

NAME: BUF37L
DESCRIPTION: OTHER USER FACTOR B APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2909

...CORRECTION FACTORS FOR SUPPLIES:

NAME: WSF37S
DESCRIPTION: WEATHER FACTOR, SURFACE FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2916

NAME: RPF37S
DESCRIPTION: ROOM AND PILLAR FACTOR, UNDERGROUND
FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2921

NAME: ASF37S
DESCRIPTION: OTHER USER FACTOR A APPLIED TO SURFACE
UNITS: NONE
VALUE:* 1.00******* RECORD=2926

NAME: BSF37S
DESCRIPTION: OTHER USER FACTOR B APPLIED TO SURFACE
UNITS: NONE
VALUE:* 1.00******* RECORD=2931

NAME: AUF37S
DESCRIPTION: OTHER USER FACTOR A APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2936

NAME: BUF37S

DESCRIPTION: OTHER USER FACTOR B APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2941

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: WSF37E
DESCRIPTION: WEATHER FACTOR, SURFACE FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2948

NAME: RPF37E
DESCRIPTION: ROOM AND PILLAR FACTOR, UNDERGROUND
FACILITIES
UNITS: NONE
VALUE:* 1.00******* RECORD=2953

NAME: ASF37E
DESCRIPTION: OTHER USER FACTOR A APPLIED TO SURFACE
UNITS: NONE
VALUE:* 1.00******* RECORD=2958

NAME: BSF37E
DESCRIPTION: OTHER USER FACTOR B APPLIED TO SURFACE
UNITS: NONE
VALUE:* 1.00******* RECORD=2963

NAME: AUF37E
DESCRIPTION: OTHER USER FACTOR A APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2968

NAME: BUF37E
DESCRIPTION: OTHER USER FACTOR B APPLIED TO
UNDERGROUND
UNITS: NONE
VALUE:* 1.00******* RECORD=2973

SUBROUTINE: STOCKP

...VARIABLES:

NAME: TONS38
DESCRIPTION: TOTAL LIVE STORAGE CAPACITY REQUIRED
UNITS: METRIC TONS
VALUE:* 0.00******* RECORD=2982

...CORRECTION FACTORS FOR LABOR:

NAME: AF38L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2989

NAME: BF38L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2994

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF38S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3001

NAME: BF38S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3006

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF38E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3013

NAME: BF38E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3018

SUBROUTINE: BUILDS

...VARIABLES:

NAME: AREA39
DESCRIPTION: TOTAL AREA FOR GENERAL SURFACE SUPPORT BUILDINGS
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=3027

NAME: TONS39
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=3032

NAME: RAT39
DESCRIPTION: METRIC TONS PER WORKER SHIFT RATIO
UNITS: NONE, SEE APPENDIX FOR U.S. BUREAU RECOMMENDATIONS
VALUE:* 1.00******* RECORD=3037

...CORRECTION FACTORS FOR LABOR:

NAME: WF39L
DESCRIPTION: WEATHER FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3044

NAME: AF39L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3049

NAME: BF39L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3054

...CORRECTION FACTORS FOR SUPPLIES:

NAME: WF39S
DESCRIPTION: WEATHER FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3061

NAME: AF39S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE

VALUE:* 1.00******* RECORD=3066

NAME: BF39S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3071

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: WF39E
DESCRIPTION: WEATHER FACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3078

NAME: AF39E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3083

NAME: BF39E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3088

SUBROUTINE: VENT

...VARIABLES:

NAME: AIR40
DESCRIPTION: TOTAL VENTILATION AIR CAPACITY REQUIRED
UNITS: CUBIC METERS PER MINUTE
VALUE:* 0.00******* RECORD=3097

...CORRECTION FACTORS FOR LABOR:

NAME: ACF40L
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=3104

NAME: AWF40L
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=3109

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NAME: AF40L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:*          1.00*******          RECORD=3114

NAME: BF40L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:*          1.00*******          RECORD=3119

...CORRECTION FACTORS FOR SUPPLIES:

NAME: ACF40S
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:*          1.00*******          RECORD=3126

NAME: AWF40S
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:*          1.00*******          RECORD=3131

NAME: AF40S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:*          1.00*******          RECORD=3136

NAME: BF40S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:*          1.00*******          RECORD=3141

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: ACF40E
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:*          1.00*******          RECORD=3148

NAME: AWF40E
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:*          1.00*******          RECORD=3153
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NAME: AF40E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3158

NAME: BF40E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3163

SUBROUTINE: DRAIN

...VARIABLES:

NAME: H2041
DESCRIPTION: TOTAL WATER PUMPING CAPACITY REQUIRED
UNITS: CUBIC METERS PER DAY
VALUE:* 0.00******* RECORD=3172

...CORRECTION FACTOR FOR PUMPING HEIGHT

NAME: VFCT41
DESCRIPTION: VERTICAL PUMPING HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=3179

...CORRECTION FACTORS FOR LABOR:

NAME: HSF41L
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=3186

NAME: HNF41L
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=3191

NAME: AF41L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3196

NAME: BF41L

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3201

...CORRECTION FACTORS FOR SUPPLIES:

NAME: HSF41S
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=3208

NAME: HNF41S
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=3213

NAME: AF41S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3218

NAME: BF41S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3223

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: HSF41E
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=3230

NAME: HNF41E
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=3235

NAME: AF41E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3240

NAME: BF41E

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3245

SUBROUTINE: WATER

...VARIABLES:

NAME: H2042
DESCRIPTION: TOTAL WATER DEMAND CAPACITY REQUIRED
UNITS: CUBIC METERS PER DAY
VALUE:* 0.00******* RECORD=3254

NAME: TONS42
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=3259

...CORRECTION FACTORS FOR LABOR:

NAME: PWF42L
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3266

NAME: A1F42L
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3271

NAME: B1F42L
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3276

NAME: A2F42L
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO
DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3281

NAME: B2F42L
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO
DEMAND

UNITS: NONE
VALUE:* 1.00******* RECORD=3286

NAME: A3F42L
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3291

NAME: B3F42L
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3296

...CORRECTION FACTORS FOR SUPPLIES:

NAME: PWF42S
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3303

NAME: A1F42S
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3308

NAME: B1F42S
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3313

NAME: A2F42S
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3318

NAME: B2F42S
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3323

NAME: A3F42S
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3328

NAME: B3F42S
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3333

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: PWF42E
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3340

NAME: A1F42E
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3345

NAME: B1F42E
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3350

NAME: A2F42E
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3355

NAME: B2F42E
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3360

NAME: A3F42E
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG DEMAND

UNITS: NONE
VALUE:* 1.00******* RECORD=3365

NAME: B3F42E
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=3370

SUBROUTINE: CROAD

...VARIABLES:

NAME: WIDE43
DESCRIPTION: TOTAL WIDTH OF ROADWAY
UNITS: METERS
VALUE:* 0.00******* RECORD=3379

NAME: LONG43
DESCRIPTION: TOTAL LENGTH OF ROADWAY
UNITS: KILOMETERS
VALUE:* 0.00******* RECORD=3384

...CORRECTION FACTOR FOR PURCHASED EQUIPMENT

NAME: EFCT43
DESCRIPTION: PURCHASE OF EQUIPMENT REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3391

...CORRECTION FACTORS FOR LABOR:

NAME: BRF43L
DESCRIPTION: BRUSH CLEARING
UNITS: NONE
VALUE:* 1.00******* RECORD=3398

NAME: SPF43L
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:* 1.00******* RECORD=3403

NAME: SBF43L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR

UNITS: NONE
VALUE:* 1.00******* RECORD=3408

NAME: AF43L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3413

NAME: BF43L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3418

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BRF43S
DESCRIPTION: BRUSH CLEARING
UNITS: NONE
VALUE:* 1.00******* RECORD=3425

NAME: SPF43S
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:* 1.00******* RECORD=3422

NAME: SBF43S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3427

NAME: AF43S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3432

NAME: BF43S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3437

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: BRF43E
DESCRIPTION: BRUSH CLEARING

UNITS: NONE
VALUE:* 1.00******* RECORD=3444

NAME: SPF43E
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:* 1.00******* RECORD=3449

NAME: SBF43E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3462

NAME: AF43E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3467

NAME: BF43E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3472

SUBROUTINE: BLAST

...VARIABLES:

NAME: WIDE44
DESCRIPTION: TOTAL WIDTH OF ROADWAY
UNITS: METERS
VALUE:* 0.00******* RECORD=3481

NAME: LONG44
DESCRIPTION: TOTAL LENGHT OF ROADWAY
UNITS: NONE
VALUE:* 1.00******* RECORD=3500

NAME: SPF44L
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:* 1.00******* RECORD=3505

NAME: SBF44L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR

```
UNITS: NONE
VALUE:*          1.00*******                RECORD=3510

NAME: AF44L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:*          1.00*******                RECORD=3515

NAME: BF44L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:*          1.00*******                RECORD=3520

...CORRECTION FACTORS FOR SUPPLIES:

NAME: RKF44S
DESCRIPTION: CORRECTION FOR PERCENT ROCK IN EXCAVATION
UNITS: NONE
VALUE:*          1.00*******                RECORD=3527

NAME: SPF44S
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:*          1.00*******                RECORD=3532

NAME: SBF44S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:*          1.00*******                RECORD=3537

NAME: AF44S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:*          1.00*******                RECORD=3542

NAME: BF44S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:*          1.00*******                RECORD=3547

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: RKF44E
DESCRIPTION: CORRECTION FOR PERCENT ROCK IN EXCAVATION
```

UNITS: NONE
VALUE:* 1.00******* RECORD=3554

NAME: SPF44E
DESCRIPTION: SIDE SLOPES EXCEEDING 20%
UNITS: NONE
VALUE:* 1.00******* RECORD=3559

NAME: SBF44E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3564

NAME: AF44E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3569

NAME: BF44E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3574

SUBROUTINE: EXCAVE

...VARIABLES:

NAME: WIDE45
DESCRIPTION: TOTAL WIDTH OF ROADWAY
UNITS: METERS
VALUE:* 0.00******* RECORD=3583

NAME: LONG45
DESCRIPTION: TOTAL LENGTH OF ROADWAY
UNITS: KILOMETERS
VALUE:* 0.00******* RECORD=3588

...CORRECTION FACTOR FOR EXCAVATION ON SLOPES EXCEEDING 20%

NAME: SFCT45
DESCRIPTION: SIDE SLOPE = 1 + PERCENT SLOPE/100
UNITS: ENTER REAL VALUE CALCULATED FROM DESCRIPTION
VALUE:* 1.00******* RECORD=3595

...CORRECTION FACTOR FOR PURCHASED EQUIPMENT

NAME: EFCT45
DESCRIPTION: PURCHASE OF EQUIPMENT REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3602

...CORRECTION FACTORS FOR LABOR:

NAME: MTF45L
DESCRIPTION: DEGREE OF DIFFICULTY IN EXCAVATING MATERIAL
UNITS: NONE
VALUE:* 1.00******* RECORD=3609

NAME: SBF45L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3614

NAME: AF45L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3619

NAME: BF45L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3624

...CORRECTION FACTORS FOR SUPPLIES:

NAME: MTF45S
DESCRIPTION: DEGREE OF DIFFICULTY IN EXCAVATING MATERIAL
UNITS: NONE
VALUE:* 1.00******* RECORD=3631

NAME: SBF45S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3636

NAME: AF45S

DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3641

NAME: BF45S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3646

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: MTF45E
DESCRIPTION: DEGREE OF DIFFICULTY IN EXCAVATING MATERIAL
UNITS: NONE
VALUE:* 1.00******* RECORD=3653

NAME: SBF45E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3658

NAME: AF45E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3663

NAME: BF45E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3668

SUBROUTINE: GRAVEL

...VARIABLES:

NAME: WIDE46
DESCRIPTION: TOTAL WIDTH OF ROADWAY
UNITS: METERS
VALUE:* 0.00******* RECORD=3677

NAME: LONG46
DESCRIPTION: TOTAL LENGTH OF ROADWAY
UNITS: KILOMETERS

VALUE:* 0.00******* RECORD=3682

...CORRECTION FACTOR FOR PURCHASED EQUIPMENT

NAME: EFCT46
DESCRIPTION: PURCHASE OF EQUIPMENT REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3689

...CORRECTION FACTORS FOR LABOR:

NAME: SBF46L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3696

NAME: AF46L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3701

NAME: BF46L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3706

...CORRECTION FACTORS FOR SUPPLIES:

NAME: SBF46S
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3713

NAME: AF46S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3718

NAME: BF46S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3723

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: SBF46E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3730

NAME: AF46E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=3735

NAME: BF46E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=3740

SUBROUTINE: PAVE

...VARIABLES:

NAME: WIDE47
DESCRIPTION: TOTAL WIDTH OF ROADWAY
UNITS: METERS
VALUE:* 0.00******* RECORD=3749

NAME: LONG47
DESCRIPTION: TOTAL LENGTH OF ROADWAY
UNITS: KILOMETERS
VALUE:* 0.00******* RECORD=3754

...CORRECTION FACTOR FOR PURCHASED EQUIPMENT

NAME: EFCT47
DESCRIPTION: PURCHASE OF EQUIPMENT REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=3761

...CORRECTION FACTORS FOR LABOR:

NAME: SBF47L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
UNITS: NONE
VALUE:* 1.00******* RECORD=3768

NAME: AF47L

```
      DESCRIPTION: OTHER USER FACTOR A
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3773

      NAME: BF47L
      DESCRIPTION: OTHER USER FACTOR B
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3778

...CORRECTION FACTORS FOR SUPPLIES:

      NAME: SBF47S
      DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3785

      NAME: AF47S
      DESCRIPTION: OTHER USER FACTOR A
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3790

      NAME: BF47S
      DESCRIPTION: OTHER USER FACTOR B
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3795

...CORRECTION FACTORS APPLIED TO EQUIPMENT

      NAME: SBF47E
      DESCRIPTION: WORK COMPLETED BY SUBCONTRACTOR
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3802

      NAME: AF47E
      DESCRIPTION: OTHER USER FACTOR A
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3807

      NAME: BF47E
      DESCRIPTION: OTHER USER FACTOR B
      UNITS: NONE
      VALUE:*          1.00*******                RECORD=3812

SUBROUTINE: PLINES
```

...VARIABLES:

NAME: PWR48
DESCRIPTION: TOTAL POWER LINE LOAD
UNITS: KV*A (THOUSAND VOLT AMPERES)
VALUE:* 0.00******* RECORD=3821

...CORRECTION FACTORS FOR LABOR:

NAME: A1F48L
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3828

NAME: B1F48L
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3833

NAME: A2F48L
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3838

NAME: B2F48L
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3843

NAME: A3F48L
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3848

NAME: B3F48L
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3853

NAME: A4F48L
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3858

NAME: B4F48L
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3863

NAME: A5F48L
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3868

NAME: B5F48L
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3873

NAME: A6F48L
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3878

NAME: B6F48L
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3883

...CORRECTION FACTORS FOR SUPPLIES:

NAME: A1F48S
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3890

NAME: B1F48S
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3895

NAME: A2F48S
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3900

NAME: B2F48S
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 10 KILOS.

UNITS: NONE
VALUE:* 1.00******* RECORD=3905

NAME: A3F48S
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3910

NAME: B3F48S
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3915

NAME: A4F48S
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3920

NAME: B4F48S
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3925

NAME: A5F48S
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3930

NAME: B5F48S
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3935

NAME: A6F48S
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3940

NAME: B6F48S
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3945

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: A1F48E
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3952

NAME: B1F48E
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3957

NAME: A2F48E
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3962

NAME: B2F48E
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 10 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3967

NAME: A3F48E
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3972

NAME: B3F48E
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3977

NAME: A4F48E
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3982

NAME: B4F48E
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 25 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3987

NAME: A5F48E
DESCRIPTION: OTHER USER FACTOR A, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3992

NAME: B5F48E
DESCRIPTION: OTHER USER FACTOR B, 2-20MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=3997

NAME: A6F48E
DESCRIPTION: OTHER USER FACTOR A, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=4002

NAME: B6F48E
DESCRIPTION: OTHER USER FACTOR B, 20-40MV*A LINES, 50 KILOS.
UNITS: NONE
VALUE:* 1.00******* RECORD=4007

SUBROUTINE: WCLEAR

...VARIABLES:

NAME: DIA49
DESCRIPTION: USER SPECIFIED CLARIFIER DIAMETER
UNITS: METERS
VALUE:* 0.00******* RECORD=4016

NAME: RISE49
DESCRIPTION: DESIGN RISE RATE (TO ESTIMATE NEEDED DIAMETER)
UNITS: METERS PER MINUTE
VALUE:* 0.00******* RECORD=4021

NAME: FLOW49
DESCRIPTION: DESIGN INFLOW RATE (TO ESTIMATE NEEDED DIAMETER)
UNITS: CUBIC METERS PER MINUTE
VALUE:* 0.00******* RECORD=4026

...CORRECTION FACTORS FOR LABOR:

NAME: AF49L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4033

NAME: BF49L

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4038

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF49S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4045

NAME: BF49S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4050

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: AF49E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4057

NAME: BF49E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4062

SUBROUTINE: NEUTRL

...VARIABLES:

NAME: FLOW50
DESCRIPTION: AVERAGE WASTE WATER FLOW RATE
UNITS: LITERS PER SECOND
VALUE:* 0.00******* RECORD=4071

...CORRECTION FACTORS FOR LABOR:

NAME: AF50L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4078

NAME: BF50L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4083

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF50S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4090

NAME: BF50S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4095

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: AF50E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=4102

NAME: BF50E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=4107

SUBROUTINE: ENGFEES

...VARIABLES:

NAME: COST51
DESCRIPTION: TOTAL NET CONSTRUCTION COST OF PROJECT
UNITS: DOLLARS
VALUE:* 0.00******* RECORD=4116

...CORRECTION FACTORS FOR LABOR:

NAME: AF51M
DESCRIPTION: OTHER USER FACTOR A, MANAGEMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=4123

NAME: BF51M
DESCRIPTION: OTHER USER FACTOR B, MANAGEMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=4128

NAME: AF51E
DESCRIPTION: OTHER USER FACTOR A, ENGINEERING
UNITS: NONE
VALUE:* 1.00******* RECORD=4133

NAME: BF51E
DESCRIPTION: OTHER USER FACTOR B, ENGINEERING
UNITS: NONE
VALUE:* 1.00******* RECORD=4138

NAME: AF51T
DESCRIPTION: OTHER USER FACTOR A, ONE FIRM TOTAL SERVICE
UNITS: NONE
VALUE:* 1.00******* RECORD=4143

NAME: BF51T
DESCRIPTION: OTHER USER FACTOR B, ONE FIRM TOTAL SERVICE
UNITS: NONE
VALUE:* 1.00******* RECORD=4148

SUBROUTINE: WCAP +

...VARIABLES:

NAME: CAP52
DESCRIPTION: TOTAL WORKING REQUIRED
UNITS: DOLLARS
VALUE:* 0.00******* RECORD=4157

...CORRECTION FACTORS FOR CAPITAL:

NAME: A1F52
DESCRIPTION: OTHER USER FACTOR A1
UNITS: NONE
VALUE:* 1.00******* RECORD=4164

NAME: A2F52
DESCRIPTION: OTHER USER FACTOR A2

UNITS: NONE
VALUE:* 1.00******* RECORD=4169

NAME: A3F52
DESCRIPTION: OTHER USER FACTOR A3
UNITS: NONE
VALUE:* 1.00******* RECORD=4174

NAME: B1F52
DESCRIPTION: OTHER USER FACTOR B1
UNITS: NONE
VALUE:* 1.00******* RECORD=4179

NAME: B2F52
DESCRIPTION: OTHER USER FACTOR B2
UNITS: NONE
VALUE:* 1.00******* RECORD=4184

NAME: B3F52
DESCRIPTION: OTHER USER FACTOR B3
UNITS: NONE
VALUE:* 1.00******* RECORD=4189

Appendix E
UOP1.FOR, FORTRAN CODE

```
      PROGRAM UOP1
C
C
C
C
      OPEN (UNIT=7,FILE='UOP.DAT',ACCESS='DIRECT',STATUS='OLD',
     +      FORM='FORMATTED',RECL=80)
      OPEN (UNIT=8,FILE='UOP1.OUT',STATUS='NEW')
C
C
C
C
C  UOP1 CONTROL STATEMENTS FOR USER DEFINED SUBROUTINE
C  CHOICES
C
      LINE = 0
      DO 1000,I=1,25,1
      LINE=30+I
      READ (7,2000,REC=LINE) J
 2000 FORMAT (34X,I1)
      IF(J.EQ.1) THEN
      GOTO (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),I
      ENDIF
      GO TO 1000
C
C   SUBROUTINE CALL STATEMENTS
C
     1 CALL CORING
       GO TO 1000
     2 CALL SSHAFT
       GO TO 1000
     3 CALL SMRAIL
       GO TO 1000
     4 CALL SMTIRE
       GO TO 1000
     5 CALL MEDTIRE
       GO TO 1000
     6 CALL LGRAIL
       GO TO 1000
     7 CALL LGTIRE
       GO TO 1000
     8 CALL DRIVES
       GO TO 1000
```

```
 9 CALL DROP
   GO TO 1000
10 CALL RAISES
   GO TO 1000
11 CALL DECLIN
   GO TO 1000
12 CALL LGROOM
   GO TO 1000
13 CALL HPANEL
   GO TO 1000
14 CALL SPANEL
   GO TO 1000
15 CALL HMINE
   GO TO 1000
16 CALL SMINE
   GO TO 1000
17 CALL PUMP1
   GO TO 1000
18 CALL HOISTD
   GO TO 1000
19 CALL HOISTF
   GO TO 1000
20 CALL JUMBOS
   GO TO 1000
21 CALL JKLEGS
   GO TO 1000
22 CALL CONV1
   GO TO 1000
23 CALL LHD
   GO TO 1000
24 CALL RRHAUL
   GO TO 1000
25 CALL TRUCKS
   GO TO 1000
1000 CONTINUE
     STOP
     END
C
C
     SUBROUTINE CORING
     REAL METR1,
    + COREL,  CORES,  COREE,
    + SBF1L,  SBF1S,  SBF1E,
    + AF1L,   AF1S,   AF1E,
```

```
     + BF1L,   BF1S,   BF1E,
     + ACOREL, ACORES, ACOREE,
     + ACORET, CORETT
C
C    COSTS FOR CORE DRILLING DURING PRODUCTION
C
C    READ DAILY METERS OF CORE TO BE DRILLED FROM DATA FILE
      READ (7,10,REC=111) METR1
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS FOR CORE DRILLING
      COREL = 21.38 * METR1
      CORES = 20.67 * METR1
      COREE =  2.70 * METR1
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    SUBCONTRACTOR FACTORS FOR LABOR, SUPPLIES AND
C    EQUIPMENT.....
C    SBF1L.....SBF1S.....SBF1E.....
      READ (7,40,REC=118) SBF1L
      READ (7,40,REC=135) SBF1S
      READ (7,40,REC=152) SBF1E
   40 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    AF1L.....AF1S.....AF1E
      READ (7,50,REC=123) AF1L
      READ (7,50,REC=140) AF1S
      READ (7,50,REC=157) AF1E
   50 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    BF1L.....BF1S.....BF1E
      READ (7,60,REC=128) BF1L
      READ (7,60,REC=145) BF1S
      READ (7,60,REC=162) BF1E
   60 FORMAT (15X,F17.2)
C
C    CALCULATE ADJUSTED COSTS
      ACOREL = COREL * SBF1L * AF1L * BF1L
      ACORES = CORES * SBF1S * AF1S * BF1S
```

```
      ACOREE = COREE * SBF1E * AF1E * BF1E
C
C   CALCULATE TOTAL ADJUSTED COST PER UNIT
      ACORET = (ACOREL + ACORES + ACOREE)/METR1
C
C   CALCULATE TOTAL COST
      CORETT = ACORET*METR1
C
C
C  PRINT ROUTINE FOR SUBROUTINE CORING.....
C
      WRITE (8,1009)
 1009 FORMAT (//)
      WRITE (8,01010)
 1010 FORMAT ('0','SUBROUTINE CORING, COSTS FOR CORE DRILLING
     +DURING PRODUCTION, USER DEFINED INPUT')
      WRITE (8,01020)
 1020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS')
      WRITE (8,01030) METR1
 1030 FORMAT (8X,'UNITS TO BE DRILLED    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,01040)
 1040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,01050) SBF1L
 1050 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,01060) AF1L
 1060 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,01070) BF1L
 1070 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,01080)
 1080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,01090) SBF1S
 1090 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,01100) AF1S
 1100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,01110) BF1S
 1110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,01120)
 1120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,01130) SBF1E
 1130 FORMAT (8X,'SUBCONTRACTOR          ',F17.2)
      WRITE (8,01140) AF1E
 1140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,01150) BF1E
 1150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,01160)
 1160 FORMAT ('0','SUBROUTINE CORING, CALCULATED COSTS OUTPUT')
      WRITE (8,01170)
 1170 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,01180) COREL
 1180 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,01190) CORES
 1190 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,01200) COREE
 1200 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,01210)
 1210 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,01220) ACOREL
 1220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,01230) ACORES
 1230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,01240) ACOREE
 1240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,01250)
 1250 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,01260) ACORET
 1260 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,01270) CORETT
 1270 FORMAT (8X,'PROJECT              ',F17.2)
      RETURN
      END
 C
 C
      SUBROUTINE SSHAFT
 C
 C
```

```
C    SSHAFT
     REAL          AREA2,
     +            LONG2,
     +            SINKL,  SINKS,  SINKE,
     +            HFCT2,
     +            HDF2L,  HDF2S,  HDF2E,
     +            WFCT2,  TFCT2,
     +            AF2L,   AF2S,   AF2E,
     +            BF2L,   BF2S,   BF2E,
     +            ASINKL, ASINKS, ASINKE,
     +            ASINKT, SINKTT
C
C    READ SHAFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=172) AREA2
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=177) LONG2
   20 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      SINKL = 615.598 * (AREA2 ** 0.542)
      SINKS = 182.051 * (AREA2 ** 0.558)
      SINKE = 681.476 * (AREA2 ** 0.407)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    ROCK HARDNESS FACTOR
C    READ ROCK HARDNESS.....HFCT2
      READ (7,30,REC=191) HFCT2
   30 FORMAT (15X,F17.2)
C    ROCK HARDNESS FACTORS.....HDF2L.....HDF2S.....HDF2E
      HDF2L = 0.388 * (HFCT3 ** 0.093)
      HDF2S = 0.579 * (HFCT3 ** 0.054)
      HDF2E = 0.715 * (HFCT3 ** 0.033)
C
C    TIMBER FACTOR.....TFCT2
C    READ SWITCH TURNING FACTOR ON OR OFF.....WFCT2
      READ (7,40,REC=184) WFCT2
   40 FORMAT (15X,F17.2)
C    CALCULATE TIMBER FACTOR.....TFCT2
      IF (WFCT2.EQ.1) THEN
      TFCT2 = 0.482 * (AREA3 ** 0.077)
      ELSE
      TFCT2 = 1.0
      ENDIF
```

```
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF2L.....AF2S.....AF2E
      READ (7,50,REC=198) AF2L
      READ (7,50,REC=210) AF2S
      READ (7,50,REC=222) AF2E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF2L.....BF2S.....BF2E
      READ (7,60,REC=203) BF2L
      READ (7,60,REC=215) BF2S
      READ (7,60,REC=227) BF2E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASINKL = SINKL * HDF2L * TFCT2 * AF2L * BF2L
      ASINKS = SINKS * HDF2S * TFCT2 * AF2S * BF2S
      ASINKE = SINKE * HDF2E * TFCT2 * AF2E * BF2E
C
C   CALCULATE TOTAL ADJUSTED COST
      ASINKT = ASINKL + ASINKS + ASINKE
C
C   CALCULATE TOTAL COST
      SINKTT = ASINKT * LONG2
C
C
C  PRINT ROUTINE FOR SUBROUTINE SSHAFT.....
C
      WRITE (8,2009)
 02009 FORMAT (//)
      WRITE (8,02010)
 02010 FORMAT ('0','SUBROUTINE SSHAFT, COSTS FOR SINKING VERTICAL
     +SHAFTS, USER DEFINED INPUT')
      WRITE (8,02020)
 02020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF SHAFT')
      WRITE (8,02030) LONG2
 02030 FORMAT (8X,'UNITS TO BE SUNK       ',F17.2)
      WRITE (8,02040)
 02040 FORMAT (4X,'SHAFT FACE AREA IN SQUARE METERS')
      WRITE (8,02050) AREA2
 02050 FORMAT (8X,'FACE AREA              ',F17.2)
```

```
      WRITE (8,02060)
02060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,02070) HFCT2
02070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
      WRITE (8,02080)
02080 FORMAT (4X,'TIMBER FACTOR, YES=1, NO=0')
      WRITE (8,02090) WFCT2
02090 FORMAT (8X,'TIMBER FACTOR          ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02100)
02100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,02110) HDF2L
02110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,02120) TFCT2
02120 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,02130) AF2L
02130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02140) BF2L
02140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02150)
02150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,02160) HDF2S
02160 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,02170) TFCT2
02170 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,02180) AF2S
02180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02190) BF2S
02190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,02200)
02200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,02210) HDF2E
02210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,02220) TFCT2
02220 FORMAT (8X,'TIMBER LINING          ',F17.2)
      WRITE (8,02230) AF2E
```

```
02230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,02240) BF2E
02240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,02250)
02250 FORMAT ('0','SUBROUTINE SSHAFT, CALCULATED COSTS OUTPUT')
      WRITE (8,02260)
02260 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,02270) SINKL
02270 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,02280) SINKS
02280 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,02290) SINKE
02290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,02300)
02300 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,02310) ASINKL
02310 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,02320) ASINKS
02320 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,02330) ASINKE
02330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,02340)
02340 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,02350) ASINKT
02350 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,02360) SINKTT
02360 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SMRAIL
C
C     COST FOR DEVELOPING SMALL SIZE DRIFTS USED FOR HAULAGE
C     BY RAIL
C
C     SMRAIL
      REAL          AREA3,
```

```
     +            LONG3,
     +            SMRRL, SMRRS, SMRRE,
     +            HFCT3,
     +            HDF3L, HDF3S, HDF3E,
     +            BTF3L, BTF3S, BTF3E,
     +            TMF3L, TMF3S, TMF3F,
     +            AF3L, AF3S, AF3E,
     +            BF3L, BF3S, BF3E,
     +            ASMRRL, ASMRRS, ASMRRE,
     +            ASMRRT, SMRRTT
C
C
C  READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=236) AREA3
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=241) LONG3
   20 FORMAT (15X,F17.2)
C
C  CALCULATE BASE COSTS
      SMRRL = 79.926 * (AREA3 ** 0.764)
      SMRRS = 73.283 * (AREA3 ** 0.602)
      SMRRE =  4.869 * (AREA3 ** 0.647)
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  ROCK HARDNESS FACTOR
C  READ ROCK HARDNESS.....HFCT3
      READ (7,30,REC=248) HFCT3
   30 FORMAT (15X,F17.2)
C  ROCK HARDNESS FACTORS.....HDF3L.....HDF3S.....HDF3E
      HDF3L = 0.388 * (HFCT3 ** 0.093)
      HDF3S = 0.579 * (HFCT3 ** 0.054)
      HDF3E = 0.715 * (HFCT3 ** 0.033)
C
C  ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C  BTF3L.....BTF3S.....BTF3E
      READ (7,40,REC=255) BTF3L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=277) BTF3S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=299) BTF3E
   60 FORMAT (15X,F17.2)
C
C  TIMBERING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
```

```
C   TMF3L.....TMF3S.....TMF3E
      READ (7,70,REC=260) TMF3L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=282) TMF3S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=304) TMF3E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF3L.....AF3S.....AF3E
      READ (7,100,REC=265) AF3L
      READ (7,100,REC=287) AF3S
      READ (7,100,REC=309) AF3E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIES FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF3L.....BF3S.....BF3E
      READ (7,110,REC=270) BF3L
      READ (7,110,REC=292) BF3S
      READ (7,110,REC=314) BF3E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASMRRL = SMRRL * HDF3L * BTF3L * TMF3L * AF3L *
     +         BF3L
      ASMRRS = SMRRS * HDF3S * BTF3S * TMF3S * AF3S *
     +         BF3S
      ASMRRE = SMRRE * HDF3E * BTF3E * TMF3E * AF3E *
     +         BF3E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ASMRRT = ASMRRL + ASMRRS + ASMRRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      SMRRTT = ASMRRT * LONG3
C
C
C   PRINT ROUTINE FOR SUBROUTINE SMRAIL.....
C
      WRITE (8,3009)
 03009 FORMAT (//)
      WRITE (8,03010)
```

```
03010 FORMAT ('0','SUBROUTINE SMRAIL, COSTS FOR DEVELOPING
     +SMALL SIZED DRIFTS USED FOR HAULAGE BY RAIL, USER DEFINED
     +INPUT')
      WRITE (8,03020)
03020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,03030) LONG3
03030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,03040)
03040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,03050) AREA3
03050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,03060)
03060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,03070) HFCT3
03070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,03080)
03080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,03090) HDF3L
03090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03100) BTF3L
03100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,03110) TMF3L
03110 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,03120) AF3L
03120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03130) BF3L
03130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,03140)
03140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,03150) HDF3S
03150 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03160) BTF3S
03160 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,03170) TMF3S
03170 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,03180) AF3S
03180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03190) BF3S
```

```
03190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,03200)
03200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,03210) HDF3E
03210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,03220) BTF3E
03220 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,03230) TMF3E
03230 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,03240) AF3E
03240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,03250) BF3E
03250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,03260)
03260 FORMAT ('0','SUBROUTINE SMRAIL, CALCULATED COSTS OUTPUT')
      WRITE (8,03270)
03270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,03280) SMRRL
03280 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,03290) SMRRS
03290 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,03300) SMRRE
03300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,03310)
03310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,03320) ASMRRL
03320 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,03330) ASMRRS
03330 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,03340) ASMRRE
03340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,03350)
03350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,03360) ASMRRT
03360 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,03370) SMRRTT
03370 FORMAT (8X,'PROJECT                ',F17.2)
```

```
C
      RETURN
      END
C
C
C
      SUBROUTINE SMTIRE
C
C   COSTS FOR DEVELOPING SMALL SIZE DRIFTS USED FOR HAULAGE
C   BY RUBBER TIRED VEHICLES
C
C     SMTIRE
      REAL
     +            AREA4,  LONG4,
     +            STIRL,  STIRS,  STIRE,
     +            HFCT4,
     +            HDF4L,  HDF4S,  HDF4E,
     +            BTF4L,  BTF4S,  BTF4E,
     +            AF4L,   AF4S,   AF4E,
     +            BF5L,   BF5S,   BF5E,
     +            ASTIRL, ASTIRS, ASTIRE,
     +            ASTIRT, STIRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
       READ (7,10,REC=323) AREA4
   10 FORMAT (15X,F17.2)
       READ (7,20,REC=328) LONG4
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
       STIRL = 72.721 * (AREA4 ** 0.685)
       STIRS = 43.313 * (AREA4 ** 0.687)
       STIRE =  1.360 * (AREA4 ** 1.188)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ROCK HARDNESS FACTOR
C   READ ROCK HARDNESS.....HFCT4
       READ (7,30,REC=335) HFCT4
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF4L.....HDF4S.....HCF4E
       HDF4L = 0.388 * (HFCT4 ** 0.093)
       HDF4S = 0.579 * (HFCT4 ** 0.054)
       HDF4E = 0.715 * (HFCT4 ** 0.033)
```

```
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF4L.....BTF4S.....BTF4E
      READ (7,40,REC=342) BTF4L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=359) BTF4S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=376) BTF4E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF4L.....AF4S.....AF4E
      READ (7,70,REC=347) AF4L
      READ (7,70,REC=364) AF4S
      READ (7,70,REC=381) AF4E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTOR "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF4L.....BF4S.....BF4E
      READ (7,80,REC=352) BF4L
      READ (7,80,REC=369) BF4S
      READ (7,80,REC=386) BF4E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASTIRL = STIRL * HDF4L * BTF4L * AF4L * BF4L
      ASTIRS = STIRS * HDF4S * BTF4S * AF4S * BF4S
      ASTIRE = STIRE * HDF4E * BTF4E * AF4E * BF4E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ASTIRT = ASTIRL + ASTIRS + ASTIRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      STIRTT = ASTIRT * LONG4
C
C
C  PRINT ROUTINE FOR SUBROUTINE SMTIRE.....
C
      WRITE (8,04009)
04009 FORMAT (//)
      WRITE (8,04010)
04010 FORMAT ('0','SUBROUTINE SMTIRE, COSTS FOR DEVELOPING
```

```
     +SMALL SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,04020)
04020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,04030) LONG4
04030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,04040)
04040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,04050) AREA4
04050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,04060)
04060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,04070) HFCT4
04070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04080)
04080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,04090) HDF4L
04090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04100) BTF4L
04100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,04110) AF4L
04110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,04120) BF4L
04120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04130)
04130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,04140) HDF4S
04140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04150) BTF4S
04150 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,04160) AF4S
04160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,04170) BF4S
04170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,04180)
```

```
04180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,04190) HDF4E
04190 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,04200) BTF4E
04200 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,04210) AF4E
04210 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,04220) BF4E
04220 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,04230)
04230 FORMAT ('0','SUBROUTINE SMTIRE, CALCULATED COSTS OUTPUT')
      WRITE (8,04240)
04240 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,04250) STIRL
04250 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,04260) STIRS
04260 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,04270) STIRE
04270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,04280)
04280 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,04290) ASTIRL
04290 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,04300) ASTIRS
04300 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,04310) ASTIRE
04310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,04320)
04320 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,04330) ASTIRT
04330 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,04340) STIRTT
04340 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE MEDTIRE
```

```
C
C
C  COSTS FOR DEVELOPING MEDIUM SIZE DRIFTS USED FOR
C  HAULAGE BY RUBBER TIRED VEHICLES
C
C   MEDTIRE
     REAL
    +            AREA5,  LONG5,
    +            MTIRL,  MTIRS,   MTIRE,
    +            HFCT5,
    +            HDF5L,  HDF5S,  HDF5E,
    +            BTF5L,  BTF5S,  BTF5E,
    +            STF5L,  STF5S,  STF5E,
    +            CCF5L,  CCF5S,  CCF5E,
    +            SSF5L,  SSF5S,  SSF5E,
    +            AF5L,   AF5S,   AF5E,
    +            BF5L,   BF5S,   BF5E,
    +            AMTIRL, AMTIRS, AMTIRE,
    +            AMTIRT, MTIRTT
C
C  READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
C
      READ (7,10,REC=395) AREA5
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=400) LONG5
   20 FORMAT (15X,F17.2)
C
C  CALCULATE BASE COSTS
      MTIRL = 86.960 * (AREA5 ** 0.349)
      MTIRS = 27.390 * (AREA5 ** 0.855)
      MTIRE =  4.497 * (AREA5 ** 0.648)
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  READ ROCK HARDNESS.....HFCT5
      READ (7,30,REC=407) HFCT5
   30 FORMAT (15X,F17.2)
C  ROCK HARDNESS FACTORS....:HDF5L.....HDF5S.....HDF5E
      HDF5L = 0.388 * (HFCT5 ** 0.093)
      HDF5S = 0.579 * (HFCT5 ** 0.054)
      HDF5E = 0.715 * (HFCT5 ** 0.033)
C
C  ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C  BTF5L.....BTF5S.....BTF5E
```

```
      READ (7,40,REC=414) BTF5L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=447) BTF5S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=480) BTF5E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF5L.....STF5S.....STF5E
      READ (7,70,REC=419) STF5L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=452) STF5S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=485) STF5E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   CCF5L.....CCF5S.....CCF5E
      READ (7,100,REC=424) CCF5L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=457) CCF5S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=490) CCF5E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF5L.....SSF5S.....SSF5E
      READ (7,130,REC=429) SSF5L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=462) SSF5S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=495) SSF5E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF5L.....AF5S.....AF5E
      READ (7,160,REC=434) AF5L
      READ (7,160,REC=467) AF5S
      READ (7,160,REC=500) AF5E
  160 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
```

```
C   EQUIPMENT..
C   BF5L.....BF5S.....BF5E
      READ (7,170,REC=439) BF5L
      READ (7,170,REC=472) BF5S
      READ (7,170,REC=505) BF5E
  170 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AMTIRL = MTIRL * HDF5L * BTF5L * STF5L * CCF5L *
     +         SSF5L * AF5L * BF5L
      AMTIRS = MTIRS * HDF5S * BTF5S * STF5S * CCF5S *
     +         SSF5S * AF5S * BF5S
      AMTIRE = MTIRE * HDF5E * BTF5E * STF5E * CCF5E *
     +         SSF5E * AF5E * BF5E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      AMTIRT = AMTIRL + AMTIRS + AMTIRE
C
C   CALCULATE COST FOR ENTIRE LENGTH OF DRIFT
      MTIRTT = AMTIRT * LONG5
C
C
C  PRINT ROUTINE FOR SUBROUTINE MEDTIRE.....
C
      WRITE (8,05009)
05009 FORMAT (//)
      WRITE (8,05010)
05010 FORMAT ('0','SUBROUTINE MEDTIRE, COSTS FOR DEVELOPING
     +MEDIUM SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE
VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,05020)
05020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,05030) LONG5
05030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,05040)
05040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,05050) AREA5
05050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,05060)
05060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,05070) HFCT5
05070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,05080)
05080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,05090) HDF5L
05090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,05100) BTF5L
05100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,05110) STF5L
05110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,05120) CCF5L
05120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,05130) SSF5L
05130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,05140) AF5L
05140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,05150) BF5L
05150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,05160)
05160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,05170) HDF5S
05170 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,05180) BTF5S
05180 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,05190) STF5L
05190 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,05200) CCF5L
05200 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,05210) SSF5L
05210 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,05220) AF5S
05220 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,05230) BF5S
05230 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,05240)
05240 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,05250) HDF5E
05250 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
```

```
      WRITE (8,05260) BTF5E
05260 FORMAT (8X,'ROCK BOLTS            ',F17.2)
      WRITE (8,05270) STF5L
05270 FORMAT (8X,'SHOTCRETE             ',F17.2)
      WRITE (8,05280) CCF5L
05280 FORMAT (8X,'CONCRETE LINER        ',F17.2)
      WRITE (8,05290) SSF5L
05290 FORMAT (8X,'STEEL SETS            ',F17.2)
      WRITE (8,05300) AF5E
05300 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,05310) BF5E
05310 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,05320)
05320 FORMAT ('0','SUBROUTINE MEDTIRE, CALCULATED COSTS
     +OUTPUT')
      WRITE (8,05330)
05330 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,05340) MTIRL
05340 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,05350) MTIRS
05350 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,05360) MTIRE
05360 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,05370)
05370 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,05380) AMTIRL
05380 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,05390) AMTIRS
05390 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,05400) AMTIRE
05400 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,05410)
05410 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,05420) AMTIRT
05420 FORMAT (8X,'PER UNIT              ',F17.2)
      WRITE (8,05430) MTIRTT
05430 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
```

```
C
C
C
      SUBROUTINE LGRAIL
C
C   COSTS FOR DEVELOPING LARGE SIZE DRIFTS FOR HAULAGE BY
C   RAIL
C    LGRAIL
      REAL
     +            AREA6,  LONG6,
     +            LGRRL,  LGRRS,  LGRRE,
     +            HFCT6,
     +            HDF6L,  HDF6S,  HDF6E
     +            BTF6L,  BTF6S,  BTF6E,
     +            STF6L,  STF6S,  STF6E,
     +            CCF6L,  CCF6S,  CCF6E,
     +            SSF6L,  SSF6S,  SSF6E,
     +            DTF6L,  DTF6S,  DTF6E,
     +            AF6L,   AF6S,   AF6E,
     +            BF6L,   BF6S,   BF6E,
     +            ALGRRL, ALGRRS, ALGRRE,
     +            ALGRRT, LGRRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=514) AREA6
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=519) LONG6
   20 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      LGRRL = 27.037 * (AREA6 ** 0.857)
      LGRRS = 63.689 * (AREA6 ** 0.693)
      LGRRE =  1.437 * (AREA6 ** 1.056)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT6
      READ (7,30,REC=526) HFCT6
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF6L.....HDF6S.....HDF6E
      HDF6L = 0.388 * (HFCT6 ** 0.093)
      HDF6S = 0.579 * (HFCT6 ** 0.054)
      HDF6E = 0.715 * (HFCT6 ** 0.033)
C
```

```
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF6L.....BTF6S.....BTF6E
      READ (7,40,REC=533) BTF6L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=571) BTF6S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=609) BTF6E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF6L.....STF6S.....STF6E
      READ (7,70,REC=538) STF6L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=576) STF6S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=614) STF6E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   CCF6L.....CCF6S.....CCF6E
      READ (7,100,REC=543) CCF6L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=581) CCF6S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=619) CCF6E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF6L.....SSF6S.....SSF6E
      READ (7,130,REC=548) SSF6L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=586) SSF6S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=624) SSF6E
  150 FORMAT (15X,F17.2)
C
C   DUAL TRACK FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DTF6L.....DTF6S.....DTF6E
      READ (7,160,REC=553) DTF6L
  160 FORMAT (15X,F17.2)
      READ (7,170,REC=591) DTF6S
  170 FORMAT (15X,F17.2)
      READ (7,180,REC=629) DTF6E
```

```
  180 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF6L.....AF6S.....AF6E
      READ (7,190,REC=558) AF6L
      READ (7,190,REC=596) AF6S
      READ (7,190,REC=634) AF6E
  190 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF6L.....BF6S.....BF6E
      READ (7,200,REC=563) BF6L
      READ (7,200,REC=601) BF6S
      READ (7,200,REC=639) BF6E
  200 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ALGRRL = LGRRL * HDF6L * BTF6L * STF6L * CCF6L *
     +         SSF6L * DTF6L * AF6L * BF6L
      ALGRRS = LGRRS * HDF6S * BTF6S * STF6S * CCF6S *
     +         SSF6S * DTF6L * AF6S * BF6S
      ALGRRE = LGRRE * HDF6E * BTF6E * STF6E * CCF6E *
     +         SSF6E * DTF6E * AF6E * BF6E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF DRIFT
      ALGRRT = ALGRRL + ALGRRS + ALGRRE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DRIFT
      LGRRTT = ALGRRT * LONG6
C
C
C  PRINT ROUTINE FOR SUBROUTINE LGRAIL.....
C
      WRITE (8,06009)
06009 FORMAT (//)
      WRITE (8,06010)
06010 FORMAT ('0','SUBROUTINE LGRAIL, COSTS FOR DEVELOPING LARGE
     +SIZED DRIFTS USED FOR HAULAGE BY RAIL, USER DEFINED INPUT')
      WRITE (8,06020)
06020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,06030) LONG6
06030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
```

```
      WRITE (8,06040)
06040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,06050) AREA6
06050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,06060)
06060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,06070) HFCT6
06070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06080)
06080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,06090) HDF6L
06090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06100) BTF6L
06100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06110) STF6L
06110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06120) CCF6L
06120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,06130) SSF6L
06130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,06140) DTF6L
06140 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,06150) AF6L
06150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,06160) BF6L
06160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06170)
06170 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,06180) HDF6S
06180 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06190) BTF6S
06190 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06200) STF6L
06200 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06210) CCF6L
06210 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,06220) SSF6L
06220 FORMAT (8X,'STEEL SETS             ',F17.2)
```

```
      WRITE (8,06230) DTF6L
06230 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,06240) AF6S
06240 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,06250) BF6S
06250 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,06260)
06260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,06270) HDF6E
06270 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,06280) BTF6E
06280 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,06290) STF6L
06290 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,06300) CCF6L
06300 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,06310) SSF6L
06310 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,06320) DTF6L
06320 FORMAT (8X,'DUAL TRACKS            ',F17.2)
      WRITE (8,06330) AF6E
06330 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,06340) BF6E
06340 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,06350)
06350 FORMAT ('0','SUBROUTINE LGRAIL, CALCULATED COSTS OUTPUT')
      WRITE (8,06360)
06360 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,06370) LGRRL
06370 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,06380) LGRRS
06380 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,06390) LGRRE
06390 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,06400)
06400 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,06410) ALGRRL
```

```
06410 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,06420) ALGRRS
06420 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,06430) ALGRRE
06430 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,06440)
06440 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,06450) ALGRRT
06450 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,06460) LGRRTT
06460 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LGTIRE
C
C
C   COSTS FOR DEVELOPING LARGE SIZE DRIFTS FOR HAULAGE BY
C   RUBBER TIRED VEHICLES
C
C     LGTIRE
      REAL
     +            AREA7,  LONG7,
     +            LTIRL,  LTIRS,  LTIRE,
     +            HFCT7,
     +            HDF7L,  HDF7S,  HDF7E,
     +            BTF7L,  BTF7S,  BTF7E,
     +            STF7L,  STF7S,  STF7E,
     +            AF7L,   AF7S,   AF7E,
     +            BF7L,   BF7S,   BF7E,
     +            ALTIRL, ALTIRS, ALTIRE,
     +            ALTIRT, LTIRTT
C
C   READ DRIFT FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=648) AREA7
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=653) LONG7
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      LTIRL = 43.360 * (AREA7 ** 0.542)
```

```
      LTIRS = 57.018 * (AREA7 ** 0.617)
      LTIRE =  4.144 * (AREA7 ** 0.661)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT7
      READ (7,30,REC=660) HFCT7
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF7L.....HDF7S.....HDF7E
      HDF7L = 0.388 * (HFCT7 ** 0.093)
      HDF7S = 0.579 * (HFCT7 ** 0.054)
      HDF7E = 0.715 * (HFCT7 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF7L.....BTF7S.....BTF7E
      READ (7,40,REC=667) BTF7L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=690) BTF7S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=713) BTF7E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF7L.....STF7S.....STF7E
      READ (7,70,REC=672) STF7L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=695) STF7S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=718) STF7E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF7L.....AF7S.....AF7E
      READ (7,100,REC=677) AF7L
      READ (7,100,REC=700) AF7S
      READ (7,100,REC=723) AF7E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF7L.....BF7S.....BF7E
      READ (7,110,REC=682) BF7L
      READ (7,110,REC=705) BF7S
```

```
      READ (7,110,REC=728) BF7E
  110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ALTIRL = LTIRL * HDF7L * BTF7L * STF7L * AF7L *
     +         BF7L
      ALTIRS = LTIRS * HDF7S * BTF7S * STF7S * AF7S *
     +         BF7S
      ALTIRE = LTIRE * HDF7E * BTF7E * STF7E * AF7E *
     +         BF7E
C
C   CALCULATE TOTAL ADJUSTED COST
      ALTIRT = ALTIRL + ALTIRS +ALTIRE
C
C   CALCULATE COST FOR ENTIRE LENGTH OF DRIFT
      LTIRTT = ALTIRT * LONG8
C
C  PRINT ROUTINE FOR SUBROUTINE LGTIRE.....
C
      WRITE (8,07009)
07009 FORMAT (//)
      WRITE (8,07010)
07010 FORMAT ('0','SUBROUTINE LGTIRE, COSTS FOR DEVELOPING LARGE
     +SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES,
     +USER DEFINED INPUT')
      WRITE (8,07020)
07020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DRIFT')
      WRITE (8,07030) LONG7
07030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,07040)
07040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,07050) AREA7
07050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,07060)
07060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,07070) HFCT7
07070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07080)
07080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,07090) HDF7L
07090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
```

```
      WRITE (8,07100) BTF7L
07100 FORMAT (8X,'ROCK BOLTS              ',F17.2)
      WRITE (8,07110) STF7L
07110 FORMAT (8X,'SHOTCRETE               ',F17.2)
      WRITE (8,07120) AF7L
07120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,07130) BF7L
07130 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07140)
07140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,07150) HDF7S
07150 FORMAT (8X,'ROCK HARDNESS           ',F17.2)
      WRITE (8,07160) BTF7S
07160 FORMAT (8X,'ROCK BOLTS              ',F17.2)
      WRITE (8,07170) STF7S
07170 FORMAT (8X,'SHOTCRETE               ',F17.2)
      WRITE (8,07180) AF7S
07180 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,07190) BF7S
07190 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,07200)
07200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,07210) HDF7E
07210 FORMAT (8X,'ROCK HARDNESS           ',F17.2)
      WRITE (8,07220) BTF7E
07220 FORMAT (8X,'ROCK BOLTS              ',F17.2)
      WRITE (8,07230) STF7E
07230 FORMAT (8X,'SHOTCRETE               ',F17.2)
      WRITE (8,07240) AF7E
07240 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,07250) BF7E
07250 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,07260)
07260 FORMAT ('0','SUBROUTINE LGTIRE, CALCULATED COSTS OUTPUT')
```

```
      WRITE (8,07270)
07270 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,07280) LTIRL
07280 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,07290) LTIRS
07290 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,07300) LTIRE
07300 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,07310)
07310 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,07320) ALTIRL
07320 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,07330) ALTIRS
07330 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,07340) ALTIRE
07340 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,07350)
07350 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,07360) ALTIRT
07360 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,07370) LTIRTT
07370 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE DRIVES
C
C
C   COSTS FOR DEVELOPING CONVENTIONALLY DRIVEN RAISES
C
C    DRIVES
      REAL
     +          AREA8,  LONG8,
     +          DRIVL,  DRIVS,  DRIVE,
     +          TMF8L,  TMF8S,  TMF8E,
     +          RCF8L,  RCF8S,  RCF8E,
     +          RTF8L,  RTF8S,  RTF8E,
     +          SCF8L,  SCF8S,  SCF8E,
     +          AF8L,   AF8S,   AF8E,
     +          BF8L,   BF8S,   BF8E,
     +          ADRIVL, ADRIVS, ADRIVE,
```

```
     +              ADRIVT, DRIVTT
C
C   READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=737) AREA8
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=742) LONG8
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DRIVL = 134.819 * (AREA8 ** 0.438)
      DRIVS = 109.009 * (AREA8 ** 0.526)
      DRIVE =   2.267 * (AREA8 ** 0.757)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TIMBER FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   TMF8L.....TMF8S.....TMF8E
      READ (7,30,REC=749) TMF8L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=781) TMF8S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=814) TMF8E
   50 FORMAT (15X,F17.2)
C
C   RAISE CLIMBER FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   RCF8L.....RCF8S.....RCF8E
      READ (7,60,REC=754) RCF8L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=786) RCF8S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=819) RCF8E
   80 FORMAT (15X,F17.2)
C
C   RUBBER TIRED MUCK DISPOSAL FACTORS FOR LABOR, SUPPLIES
C   AND EQUIPMENT.....RTF8L.....RTF8S.....RTF8E
      READ (7,90,REC=759) RTF8L
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=791) RTF8S
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=824) RTF8E
  110 FORMAT (15X,F17.2)
C
C   STEEL CHUTE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
```

```
C   SCF8L.....SCF8S.....SCF8E
      READ (7,120,REC=764) SCF8L
  120 FORMAT (15X,F17.2)
      READ (7,130,REC=796) SCF8S
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=829) SCF8E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF8L.....AF8S.....AF8E
      READ (7,150,REC=769) AF8L
      READ (7,150,REC=801) AF8S
      READ (7,150,REC=834) AF8E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF8L.....BF8S.....BF8E
      READ (7,160,REC=774) BF8L
      READ (7,160,REC=806) BF8S
      READ (7,160,REC=839) BF8E
  160 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRIVL = DRIVL * TMF8L * RCF8L * RTF8L * SCF8L *
     +         AF8L * BF8L
      ADRIVS = DRIVS * TMF8S * RCF8S * RTF8S * SCF8S *
     +         AF8S * BF8S
      ADRIVE = DRIVE * TMF8E * RCF8E * RTF8E * SCF8E *
     +         AF8E * BF8E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ADRIVT = ADRIVL + ADRIVS + ADRIVE
C
C   CALCULATE COST FOR DRIVING ENTIRE LENGTH OF RAISE
      DRIVTT = ADRIVT * LONG8
C
C  PRINT ROUTINE FOR SUBROUTINE DRIVES.....
C
      WRITE (8,08009)
08009 FORMAT (//)
      WRITE (8,08010)
08010 FORMAT ('0','SUBROUTINE DRIVES, COSTS FOR DEVELOPING
```

```
     +CONVENTIONALLY DRIVEN RAISES, USER DEFINED INPUT')
      WRITE (8,08020)
08020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,08030) LONG8
08030 FORMAT (8X,'UNITS TO BE DRIFTED    ',F17.2)
      WRITE (8,08040)
08040 FORMAT (4X,'DRIFT FACE AREA IN SQUARE METERS')
      WRITE (8,08050) AREA8
08050 FORMAT (8X,'FACE AREA              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,08060)
08060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,08070) TMF8L
08070 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,08080) RCF8L
08080 FORMAT (8X,'RAISE CLIMBER          ',F17.2)
      WRITE (8,08090) RTF8L
08090 FORMAT (8X,'RUBBER TIRE MUCKING    ',F17.2)
      WRITE (8,08100) SCF8L
08100 FORMAT (8X,'STEEL CHUTE            ',F17.2)
      WRITE (8,08110) AF8L
08110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,08120) BF8L
08120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,08130)
08130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,08140) TMF8S
08140 FORMAT (8X,'TIMBER LAGGING         ',F17.2)
      WRITE (8,08150) RCF8S
08150 FORMAT (8X,'RAISE CLIMBER          ',F17.2)
      WRITE (8,08160) RTF8S
08160 FORMAT (8X,'RUBBER TIRE MUCKING    ',F17.2)
      WRITE (8,08170) SCF8S
08170 FORMAT (8X,'STEEL CHUTE            ',F17.2)
      WRITE (8,08180) AF8S
08180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,08190) BF8S
08190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-------------------------------------------------------------
C
      WRITE (8,08200)
08200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,08210) TMF8E
08210 FORMAT (8X,'TIMBER LAGGING          ',F17.2)
      WRITE (8,08220) RCF8E
08220 FORMAT (8X,'RAISE CLIMBER           ',F17.2)
      WRITE (8,08230) RTF8E
08230 FORMAT (8X,'RUBBER TIRE MUCKING     ',F17.2)
      WRITE (8,08240) SCF8E
08240 FORMAT (8X,'STEEL CHUTE             ',F17.2)
      WRITE (8,08250) AF8E
08250 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,08260) BF8E
08260 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-------------------------------------------------------------
C-------------------------------------------------------------
C
      WRITE (8,08270)
08270 FORMAT ('0','SUBROUTINE DRIVES, CALCULATED COSTS OUTPUT')
      WRITE (8,08280)
08280 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,08290) DRIVL
08290 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,08300) DRIVS
08300 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,08310) DRIVE
08310 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,08320)
08320 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,08330) ADRIVL
08330 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,08340) ADRIVS
08340 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,08350) ADRIVE
08350 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,08360)
08360 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,08370) ADRIVT
08370 FORMAT (8X,'PER UNIT                ',F17.2)
      WRITE (8,08380) DRIVTT
08380 FORMAT (8X,'PROJECT                 ',F17.2)
```

```
C
      RETURN
      END
C
C
C
      SUBROUTINE DROP
C
C   COSTS FOR DEVELOPING RAISES BY LONGHOLE OR DROPRAISING
C   METHODS
C
C     DROP
      REAL
     +            AREA9, LONG9,
     +            DROPL,  DROPS,  DROPE,
     +            LFCT9,
     +            HFCT9,
     +            HDF9L, HDF9S, HDF9E,
     +            SRF9L, SRF9S, SRF9E,
     +            AF9L,  AF9S,  AF9E,
     +            BF9L,  BF9S,  BF9E,
     +            ADROPL, ADROPS, ADROPE,
     +            ADROPT, DROPTT
C
C   READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=848) AREA9
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=853) LONG9
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DROPL =  58.314 * (AREA9 ** 0.374)
      DROPS = 136.383 * (AREA9 ** 0.205)
      DROPE =   8.895 * (AREA9 ** 0.711)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT9
      READ (7,30,REC=860) HFCT9
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF9L.....HDF9S.....HDF9E
      HDF9L = 0.388 * (HFCT9 ** 0.093)
      HDF9S = 0.579 * (HFCT9 ** 0.054)
      HDF9E = 0.033 * (HFCT9 ** 0.033)
```

```
C
C  SERVICE INSTALLTION FACTORS FOR LABOR, SUPPLIES AND
C  EQUIPMENT.....
C  SRF9L.....SRF9S.....SRF9E
      READ (7,40,REC=867) SRF9L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=884) SRF9S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=901) SRF9E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF9L.....AF9S.....AF9E
      READ (7,70,REC=872) AF9L
      READ (7,70,REC=889) AF9S
      READ (7,70,REC=906) AF9E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF9L.....BF9S.....BF9E
      READ (7,80,REC=877) BF9L
      READ (7,80,REC=894) BF9S
      READ (7,80,REC=911) BF9E
   80 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADROPL = DROPL * HDF9L * SRF9L * AF9L * BF9L
      ADROPS = DROPS * HDF9S * SRF9S * AF9S * BF9S
      ADROPE = DROPE * HDF9E * SRF9E * AF9E * BF9E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ADROPT = ADROPL + ADROPS + ADROPE
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF DROP RAISE
      DROPTT = ADROPT * LONG9
C
C  PRINT ROUTINE FOR SUBROUTINE DROP.....
C
      WRITE (8,09009)
 09009 FORMAT (//)
      WRITE (8,09010)
 09010 FORMAT ('0','SUBROUTINE DROP, COSTS FOR DEVELOPING RAISES
```

```
     +BY LONGHOLE OR DROP-RAISING METHODS, USER DEFINED INPUT')
      WRITE (8,09020)
09020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,09030) LONG9
09030 FORMAT (8X,'UNITS TO BE RAISED     ',F17.2)
      WRITE (8,09040)
09040 FORMAT (4X,'RAISE FACE AREA IN SQUARE METERS')
      WRITE (8,09050) AREA9
09050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,09060)
09060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,09070) HFCT9
09070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09080)
09080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,09090) HDF9L
09090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,09100) SRF9L
09100 FORMAT (8X,'SERVICE INSTALLATION   ',F17.2)
      WRITE (8,09110) AF9L
09110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09120) BF9L
09120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09130)
09130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,09140) HDF9S
09140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,09150) SRF9S
09150 FORMAT (8X,'SERVICE INSTALLTION    ',F17.2)
      WRITE (8,09160) AF9S
09160 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09170) BF9S
09170 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,09180)
09180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
```

```
      WRITE (8,09190) HDF9E
09190 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,09200) SRF9E
09200 FORMAT (8X,'SERVICE INSTALLTION    ',F17.2)
      WRITE (8,09210) AF9E
09210 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,09220) BF9E
09220 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,09230)
09230 FORMAT ('0','SUBROUTINE DROP, CALCULATED COSTS OUTPUT')
      WRITE (8,09240)
09240 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,09250) DROPL
09250 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,09260) DROPS
09260 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,09270) DROPE
09270 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,09280)
09280 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,09290) ADROPL
09290 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,09300) ADROPS
09300 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,09310) ADROPE
09310 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,09320)
09320 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,09330) ADROPT
09330 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,09340) DROPTT
09340 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
      SUBROUTINE RAISES
C
C
C   COSTS FOR DEVELOPING RAISES WITH UPWARD REAMED RAISE
```

```
C   BORING METHODS
C
C    RAISES
     REAL
     +          AREA10, LONG10,
     +          RAISL,  RAISS,  RAISE,
     +          HFCT10, LFCT10,
     +          HDF10L, HDF10S, HDF10E,
     +          LF10L,  LF10S,  LF10E,
     +          LNF10L, LNF10S, LNF10E,
     +          SRF10L, SRF10S, SRF10E,
     +          AF10L,  AF10S,  AF10E,
     +          BF10L,  BF10S,  BF10E,
     +          ARAISL, ARAISS, ARAISE,
     +          ARAIST, RAISTT
C
C   READ RAISE FACE AREA AND TOTAL LENGTH FROM DATA FILE
      READ (7,10,REC=920) AREA10
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=925) LONG10
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      RAISL =  81.941 * (AREA10 ** 1.376)
      RAISS = 180.595 * (AREA10 ** 1.097)
      RAISE =  46.568 * (AREA10 ** 1.759)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT10
      READ (7,30,REC=932) HFCT10
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF10L.....HDF10S.....HDF10E
      HDF10L = 0.0000018 * (HFCT10 ** 1.231)
      HDF10S = 0.0000018 * (HFCT10 ** 1.231)
      HDF10E = 0.0000018 * (HFCT10 ** 1.231)
C
C   RAISE BORING LENGTH FACTORS
C   READ SWITCH TURNING FACTOR ON OR OFF.....LFCT10
      READ (7,40,REC=939) LFCT10
   40 FORMAT (15X,F17.2)
      IF (LFCT10.EQ.1) THEN
C   LENGTH FACTORS.....LF10L.....LF10S.....LF10E
      LF10L = 1.468 * (LONG10 ** (-0.080))
```

```
      LF10S = 1.468 * (LONG10 ** (-0.080))
      LF10E = 1.468 * (LONG10 ** (-0.080))
      ELSE
      LF10L = 1.0
      LF10S = 1.0
      LF10E = 1.0
      ENDIF
C
C   LINING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   LNF10L.....LNF10S.....LNF10E
      READ (7,50,REC=946) LNF10L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=968) LNF10S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=990) LNF10E
   70 FORMAT (15X,F17.2)
C
C   SERVICE INSTALLTION FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT....
C   SRF10L.....SRF10S.....SRF10E
      READ (7,80,REC=951) SRF10L
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=973) SRF10S
   90 FORMAT (15X,F17.2)
      READ (7,100,REC=995) SRF10E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF10L.....AF10S.....AF10E
      READ (7,110,REC=956) AF10L
      READ (7,110,REC=978) AF10S
      READ (7,110,REC=1000) AF10E
  110 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF10L.....BF10S....:BF10E
      READ (7,120,REC=961) BF10L
      READ (7,120,REC=983) BF10S
      READ (7,120,REC=1005) BF10E
  120 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
```

```
      ARAISL = RAISL * HDF10L * LF10L * LNF10L * SRF10L *
     +          AF10L * BF10L
      ARAISS = RAISS * HDF10S * LF10S * LNF10S * SRF10S *
     +          AF10S * BF10S
      ARAISE = RAISE * HDF10E * LF10E * LNF10E * SRF10E *
     +          AF10E * BF10E
C
C   CALCULATE ADJUSTED COST PER METER OF RAISE
      ARAIST = ARAISL + ARAISS + ARAISE
C
C   CALCULATE COST OF TOTAL LENGHT OF RAISE
      RAISTT = ARAIST * LONG10
C
C
C  PRINT ROUTINE FOR SUBROUTINE RAISES.....
C
      WRITE (8,10009)
10009 FORMAT (//)
      WRITE (8,10010)
10010 FORMAT ('0','SUBROUTINE RAISES, COSTS FOR DEVELOPING RAISES
     +WITH UPWARD REAMED RAISE BORING, USER DEFINED INPUT')
      WRITE (8,10020)
10020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF RAISE')
      WRITE (8,10030) LONG10
10030 FORMAT (8X,'UNITS TO BE RAISED     ',F17.2)
      WRITE (8,10040)
10040 FORMAT (4X,'RAISE FACE AREA IN SQUARE METERS')
      WRITE (8,10050) AREA10
10050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,10060)
10060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,10070) HFCT10
10070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
      WRITE (8,10080)
10080 FORMAT (4X,'LENGTH FACTOR, YES=1, NO=0')
      WRITE (8,10090) LFCT10
10090 FORMAT (8X,'LENGTH FACTOR          ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10100)
10100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,10110) HDF10L
10110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
```

```
      WRITE (8,10120) LNF10L
10120 FORMAT (8X,'LENGTH                ',F17.2)
      WRITE (8,10130) SRF10L
10130 FORMAT (8X,'SERVICE INSTALLATION  ',F17.2)
      WRITE (8,10140) AF10L
10140 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,10150) BF10L
10150 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10160)
10160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,10170) HDF10S
10170 FORMAT (8X,'ROCK HARDNESS         ',F17.2)
      WRITE (8,10180) LNF10S
10180 FORMAT (8X,'LENGTH                ',F17.2)
      WRITE (8,10190) SRF10S
10190 FORMAT (8X,'SERVICE INSTALLATION  ',F17.2)
      WRITE (8,10200) AF10S
10200 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,10210) BF10S
10210 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,10220)
10220 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,10230) HDF10E
10230 FORMAT (8X,'ROCK HARDNESS         ',F17.2)
      WRITE (8,10240) LNF10E
10240 FORMAT (8X,'LENGTH                ',F17.2)
      WRITE (8,10250) SRF10E
10250 FORMAT (8X,'SERVICE INSTALLATION  ',F17.2)
      WRITE (8,10260) AF10E
10260 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,10270) BF10E
10270 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,10280)
10280 FORMAT ('0','SUBROUTINE RAISES, CALCULATED COSTS OUTPUT')
```

```
      WRITE (8,10290)
10290 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,10300) RAISL
10300 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,10310) RAISS
10310 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,10320) RAISE
10320 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,10330)
10330 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,10340) ARAISL
10340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,10350) ARAISS
10350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,10360) ARAISE
10360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,10370)
10370 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,10380) ARAIST
10380 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,10390) RAISTT
10390 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE DECLIN
C
C     DECLIN
      REAL
     +            AREA11, LONG11,
     +            RAMPL,  RAMPS,  RAMPE,
     +            HFCT11,
     +            HDF11L, HDF11S, HDF11E,
     +            BTF11L, BTF11S, BTF11E,
     +            STF11L, STF11S, STF11E,
     +            CCF11L, CCF11S, CCF11E,
     +            SSF11L, SSF11S, SSF11E,
     +            AF11L,  AF11S,  AF11E,
     +            BF11L,  BF11S,  BF11E,
     +            ARAMPL, ARAMPS, ARAMPE,
     +            ARAMPT, RAMPTT
```

```
C
C   COSTS FOR DEVELOPING INCLINE OR DECLINE PASSAGES
C
C   READ INCLINE-DECLINE FACE AREA AND TOTAL LENGHT FROM
C   DATA FILE
      READ (7,10,REC=1014) AREA11
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1019) LONG11
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      RAMPL = 42.779 * (AREA11 ** 0.789)
      RAMPS = 48.709 * (AREA11 ** 0.567)
      RAMPE =  1.498 * (AREA11 ** 1.303)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT11
      READ (7,30,REC=1026) HFCT11
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF11L.....HDF11S.....HDF11E
      HDF11L = 0.388 * (HFCT11 ** 0.093)
      HDF11S = 0.579 * (HFCT11 ** 0.054)
      HDF11E = 0.715 * (HFCT11 ** 0.033)
C
C   ROCK BOLT FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   BTF11L.....BTF11S.....BTF11E
      READ (7,40,REC=1033) BTF11L
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=1065) BTF11S
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=1097) BTF11E
   60 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF11L.....STF11S.....STF11E
      READ (7,70,REC=1038) STF11L
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=1070) STF11S
   80 FORMAT (15X,F17.2)
      READ (7,90,REC=1102) STF11E
   90 FORMAT (15X,F17.2)
C
C   CONCRETE LINER FACTORS FOR LABOR, SUPPLIES AND
```

```
C   EQUIPMENT.....
C   CCF11L.....CCF11S.....CCF11E
      READ (7,100,REC=1043) CCF11L
  100 FORMAT (15X,F17.2)
      READ (7,110,REC=1075) CCF11S
  110 FORMAT (15X,F17.2)
      READ (7,120,REC=1107) CCF11E
  120 FORMAT (15X,F17.2)
C
C   STEEL SET FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   SSF11L.....SSF11S.....SSF11E
      READ (7,130,REC=1048) SSF11L
  130 FORMAT (15X,F17.2)
      READ (7,140,REC=1080) SSF11S
  140 FORMAT (15X,F17.2)
      READ (7,150,REC=1112) SSF11E
  150 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF11L.....AF11S.....AF11E
      READ (7,160,REC=1053) AF11L
      READ (7,160,REC=1085) AF11S
      READ (7,160,REC=1117) AF11E
  160 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF11L.....BF11S.....BF11E
      READ (7,170,REC=1058) BF11L
      READ (7,170,REC=1090) BF11S
      READ (7,170,REC=1122) BF11E
  170 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ARAMPL = RAMPL * HDF11L * BTF11L * STF11L * CCF11L *
     +         SSF11L * AF11L * BF11L
      ARAMPS = RAMPS * HDF11S * BTF11S * STF11S * CCF11S *
     +         SSF11S * AF11S * BF11S
      ARAMPE = RAMPE * HDF11E * BTF11E * STF11E * CCF11E *
     +         SSF11E * AF11E * BF11E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF
C   INCLINE-DECLINE
```

```
      ARAMPT = ARAMPL + ARAMPS + ARAMPE
C
C   CALCULATE TOTAL COSTS FOR ENTIRE INCLINE-DECLINE LENGTH
      RAMPTT = ARAMPT * LONG11
C
C  PRINT ROUTINE FOR SUBROUTINE DECLIN.....
C
      WRITE (8,11009)
11009 FORMAT (//)
      WRITE (8,11010)
11010 FORMAT ('0','SUBROUTINE DECLIN, COSTS FOR DEVELOPING
     +INCLINE OR DECLINE RAMPS, USER DEFINED INPUT')
      WRITE (8,11020)
11020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF DECLINE')
      WRITE (8,11030) LONG11
11030 FORMAT (8X,'UNITS TO BE DEVELOPED  ',F17.2)
      WRITE (8,11040)
11040 FORMAT (4X,'DECLINE FACE AREA IN SQUARE METERS')
      WRITE (8,11050) AREA11
11050 FORMAT (8X,'FACE AREA              ',F17.2)
      WRITE (8,11060)
11060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,11070) HFCT11
11070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,11080)
11080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,11090) HDF11L
11090 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11100) BTF11L
11100 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,11110) STF11L
11110 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,11120) CCF11L
11120 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,11130) SSF11L
11130 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,11140) AF11L
11140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11150) BF11L
11150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,11160)
11160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,11170) HDF11S
11170 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11180) BTF11S
11180 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,11190) STF11S
11190 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,11200) CCF11S
11200 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,11210) SSF11S
11210 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,11220) AF11S
11220 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11230) BF11S
11230 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,11240)
11240 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,11250) HDF11E
11250 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,11260) BTF11E
11260 FORMAT (8X,'ROCK BOLTS             ',F17.2)
      WRITE (8,11270) STF11E
11270 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,11280) CCF11E
11280 FORMAT (8X,'CONCRETE LINER         ',F17.2)
      WRITE (8,11290) SSF11E
11290 FORMAT (8X,'STEEL SETS             ',F17.2)
      WRITE (8,11300) AF11E
11300 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,11310) BF11E
11310 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,11320)
11320 FORMAT ('0','SUBROUTINE DECLIN, CALCULATED COSTS OUTPUT')
      WRITE (8,11330)
```

```
11330 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,11340) RAMPL
11340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,11350) RAMPS
11350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,11360) RAMPE
11360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,11370)
11370 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,11380) ARAMPL
11380 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,11390) ARAMPS
11390 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,11400) ARAMPE
11400 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,11410)
11410 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,11420) ARAMPT
11420 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,11430) RAMPTT
11430 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE LGROOM
C
C     LGROOM
      REAL
     +            AREA12, LONG12,
     +            ROOML,  ROOMS,  ROOME,
     +            TKF12L, TKF12S, TKF12E,
     +            STF12L, STF12S, STF12E,
     +            AF12L,  AF12S,  AF12E,
     +            BF12L,  BF12S,  BF12E,
     +            AROOML, AROOMS, AROOME,
     +            AROOMT, ROOMTT
C
C     COSTS FOR DEVELOPING LARGE UNDERGROUND EXCAVATIONS
C
C     READ ROOM WALL FACE AREA AND TOTAL LENGTH OF
C     EXCAVATION FROM DATA FILE
```

```
C
      READ (7,10,REC=1131) AREA12
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=1136) LONG12
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      ROOML = 10.817 * (AREA12 ** 0.947)
      ROOMS = 23.050 * (AREA12 ** 0.793)
      ROOME =  1.739 * (AREA12 ** 0.917)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TRACK HAULAGE FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   TKF12L.....TKF12S.....TKF12E
      READ (7,30,REC=1143) TKF12L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=1165) TKF12S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=1187) TKF12E
   50 FORMAT (15X,F17.2)
C
C   SHOTCRETE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   STF12L.....STF12S.....STF12E
      READ (7,60,REC=1148) STF12L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=1170) STF12S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=1192) STF12E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF12L.....AF12S.....AF12E
      READ (7,90,REC=1153) AF12L
      READ (7,90,REC=1175) AF12S
      READ (7,90,REC=1197) AF12E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF12L.....BF12S.....BF12E
      READ (7,100,REC=1158) BF12L
```

```
      READ (7,100,REC=1180) BF12S
      READ (7,100,REC=1202) BF12E
  100 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AROOML = ROOML * TKF12L * STF12L * AF12L * BF12L
      AROOMS = ROOMS * TKF12S * STF12S * AF12S * BF12S
      AROOME = ROOME * TKF12E * STF12E * AF12E * BF12E
C
C   CALCULATE TOTAL ADJUSTED COST PER METER OF EXCAVATION
      AROOMT = AROOML + AROOMS + AROOME
C
C   CALCULATE TOTAL COST FOR ENTIRE LENGTH OF EXCAVATION
      ROOMTT = AROOMT * LONG12
C
C  PRINT ROUTINE FOR SUBROUTINE LGROOM.....
C
      WRITE (8,12009)
12009 FORMAT (//)
      WRITE (8,12010)
12010 FORMAT ('0','SUBROUTINE LGROOM, COSTS FOR DEVELOPING LARGE
     +UNDERGROUND EXCAVATIONS, USER DEFINED INPUT')
      WRITE (8,12020)
12020 FORMAT ('0',4X,'UNITS CONSIDERED ARE METERS OF ROOM')
      WRITE (8,12030) LONG12
12030 FORMAT (8X,'UNITS TO BE EXCAVATED  ',F17.2)
      WRITE (8,12040)
12040 FORMAT (4X,'ROOM WALL FACE AREA IN SQUARE METERS')
      WRITE (8,12050) AREA12
12050 FORMAT (8X,'FACE AREA             ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,12060)
12060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,12070) TKF12L
12070 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,12080) STF12L
12080 FORMAT (8X,'SHOTCRETE             ',F17.2)
      WRITE (8,12090) AF12L
12090 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12100) BF12L
12100 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,12110)
12110 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,12120) TKF12S
12120 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,12130) STF12S
12130 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,12140) AF12S
12140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12150) BF12S
12150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,12160)
12160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,12170) TKF12E
12170 FORMAT (8X,'TRACK HAULAGE MUCKING  ',F17.2)
      WRITE (8,12180) STF12E
12180 FORMAT (8X,'SHOTCRETE              ',F17.2)
      WRITE (8,12190) AF12E
12190 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,12200) BF12E
12200 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,12210)
12210 FORMAT ('0','SUBROUTINE LGROOM, CALCULATED COSTS OUTPUT')
      WRITE (8,12220)
12220 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,12230) ROOML
12230 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,12240) ROOMS
12240 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,12250) ROOME
12250 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,12260)
12260 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,12270) AROOML
12270 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,12280) AROOMS
```

```
12280 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,12290) AROOME
12290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,12300)
12300 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,12310) AROOMT
12310 FORMAT (8X,'PER UNIT              ',F17.2)
      WRITE (8,12320) ROOMTT
12320 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HPANEL
C
C     HPANEL
      REAL
     +            AREA13,
     +            HPANL,  HPANS,  HPANE,
     +            HFCT13,
     +            HDF13L, HDF13S, HDF13E,
     +            AF13L,  AF13S,  AF13E,
     +            BF13L,  BF13S,  BF13E,
     +            AHPANL, AHPANS, AHPANE,
     +            AHPANT, HPANTT
C
C     COSTS FOR PREPARING A PANEL FOR PRODUCTION IN HARD
C     MATERIAL
C
C     READ PLAN VIEW AREA OF PANEL FROM DATA FILE
      READ (7,10,REC=1211) AREA13
   10 FORMAT (15X,F17.2)
C
C     CALCULATE BASE COSTS
      HPANL = 4.019 * (AREA13 ** 0.890)
      HPANS = 2.686 * (AREA13 ** 0.997)
      HPANE = 0.046 * (AREA13 ** 1.128)
C
C     CONSIDER ADJUSTMENT FACTORS
C
C     READ ROCK HARDNESS.....HFCT13
      READ (7,20,REC=1218) HFCT13
```

```
   20 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   HDF13L.....HDF13S.....HDF13E
      HDF13L = 0.388 * (HFCT13 ** 0.093)
      HDF13S = 0.579 * (HFCT13 ** 0.054)
      HDF13E = 0.715 * (HFCT13 ** 0.033)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF13L.....AF13S.....AF13E
      READ (7,30,REC=1225) AF13L
      READ (7,30,REC=1237) AF13S
      READ (7,30,REC=1249) AF13E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF13L.....BF13S.....BF13E
      READ (7,40,REC=1230) BF13L
      READ (7,40,REC=1242) BF13S
      READ (7,40,REC=1254) BF13E
   40 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AHPANL = HPANL * HDF13L * AF13L * BF13L
      AHPANS = HPANS * HDF13S * AF13S * BF13S
      AHPANE = HPANE * HDF13E * AF13E * BF13E
C
C   CALCULATE TOTAL ADJUSTED COST FOR PANEL PLAN AREA
      AHPANT = (AHPANL + AHPANS + AHPANE)/AREA13
C
C   CALCULATE TOTAL COST FOR ENTIRE PANEL
      HPANTT = AHPANT*AREA13
C
C  PRINT ROUTINE FOR SUBROUTINE HPANEL.....
C
      WRITE (8,13009)
13009 FORMAT (//)
      WRITE (8,13010)
13010 FORMAT ('0','SUBROUTINE HPANEL, COSTS FOR DEVELOPING PANELS
     +FOR PRODUCTION IN HARD ROCK, USER DEFINED INPUT')
      WRITE (8,13020)
13020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL SQUARE METERS
```

```
     +OF PANEL IN PLAN VIEW')
      WRITE (8,13030) AREA13
13030 FORMAT (4X,'PLAN VIEW AREA, SQ. METERS',F17.2)
      WRITE (8,13040) HFCT13
13040 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,13050)
13050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,13060) HDF13L
13060 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,13070) AF13L
13070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13080) BF13L
13080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,13090)
13090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,13100) HDF13S
13100 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,13110) AF13S
13110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13120) BF13S
13120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,13130)
13130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,13140) HDF13E
13140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,13150) AF13E
13150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,13160) BF13E
13160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,13170)
13170 FORMAT ('0','SUBROUTINE HPANEL, CALCULATED COSTS OUTPUT')
```

```
      WRITE (8,13180)
13180 FORMAT ('0',4X,'BASE COST FOR PANEL UNIT')
      WRITE (8,13190) HPANL
13190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,13200) HPANS
13200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,13210) HPANE
13210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,13220)
13220 FORMAT ('0',4X,'ADJUSTED COST PER PANEL UNIT')
      WRITE (8,13230) AHPANL
13230 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,13240) AHPANS
13240 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,13250) AHPANE
13250 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,13260)
13260 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,13270) AHPANT
13270 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,13280) HPANTT
13280 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE SPANEL
C
C
C     SPANEL
      REAL
     +            AREA14,
     +            SPANL,  SPANS,  SPANE,
     +            HFCT14,
     +            HDF14L, HDF14S, HDF14E,
     +            AF14L,  AF14S,  AF14E,
     +            BF14L,  BF14S,  BF14E,
     +            ASPANL, ASPANS, ASPANE,
     +            ASPANT, SPANTT
C
C     COSTS FOR PREPARING A PANEL FOR PRODUCTION IN SOFT
C     MATERIAL
```

```
C
C   READ PLAN VIEW AREA OF PANEL FROM DATA FILE
      READ (7,10,REC=1263) AREA14
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      SPANL = 43.903 * (AREA14 ** 0.557)
      SPANS = 20.909 * (AREA14 ** 0.632)
      SPANE =  0.117 * (AREA14 ** 0.908)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ ROCK HARDNESS.....HFCT14
      READ (7,20,REC=1270) HFCT14
   20 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   HDF14L.....HDF14S.....HDF14E
      HDF14L = 0.388 * (HFCT14 ** 0.093)
      HDF14S = 0.579 * (HFCT14 ** 0.054)
      HDF14E = 0.715 * (HFCT14 ** 0.033)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF14L.....AF14S.....AF14E
      READ (7,30,REC=1277) AF14L
      READ (7,30,REC=1289) AF14S
      READ (7,30,REC=1301) AF14E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF14L.....BF14S.....BF14E
      READ (7,40,REC=1282) BF14L
      READ (7,40,REC=1294) BF14S
      READ (7,40,REC=1306) BF14E
   40 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASPANL = SPANL * HDF14L * AF14L * BF14L
      ASPANS = SPANS * HDF14S * AF14S * BF14S
      ASPANE = SPANE * HDF14E * AF14E * BF14E
C
C   CALCULATE TOTAL ADJUSTED COST FOR PANEL PLAN AREA
```

```
      ASPANT = (ASPANL + ASPANS + ASPANE)/AREA14
C
C   CALCULATE TOTAL COST FOR ENTIRE PANEL
      SPANTT = ASPANT*AREA14
C
C  PRINT ROUTINE FOR SUBROUTINE SPANEL.....
C
      WRITE (8,14009)
14009 FORMAT (//)
      WRITE (8,14010)
14010 FORMAT ('0','SUBROUTINE SPANEL, COSTS FOR DEVELOPING PANELS
     +FOR PRODUCTION IN SOFT ROCK, USER DEFINED INPUT')
      WRITE (8,14020)
14020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL SQUARE METERS
     +OF PANEL IN PLAN VIEW')
      WRITE (8,14030) AREA14
14030 FORMAT (4X,'PLAN VIEW AREA, SQ. METERS,    ',F17.2)
      WRITE (8,14040) HFCT14
14040 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,14050)
14050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,14060) HDF14L
14060 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14070) AF14L
14070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14080) BF14L
14080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,14090)
14090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,14100) HDF14S
14100 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14110) AF14S
14110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14120) BF14S
14120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
```

```
      WRITE (8,14130)
14130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,14140) HDF14E
14140 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,14150) AF14E
14150 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,14160) BF14E
14160 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,14170)
14170 FORMAT ('0','SUBROUTINE SPANEL, CALCULATED COSTS OUTPUT')
      WRITE (8,14180)
14180 FORMAT ('0',4X,'BASE COST FOR PANEL UNIT')
      WRITE (8,14190) SPANL
14190 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,14200) SPANS
14200 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,14210) SPANE
14210 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,14220)
14220 FORMAT ('0',4X,'ADJUSTED COST PER PANEL UNIT')
      WRITE (8,14230) ASPANL
14230 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,14240) ASPANS
14240 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,14250) ASPANE
14250 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,14260)
14260 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,14270) ASPANT
14270 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,14280) SPANTT
14280 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE HMINE
C
C     HMINE
```

```
      REAL          TONS15,
     +             HMINEL,  HMINES,  HMINEE,
     +             HFCT15,
     +             HDF15L,  HDF15S,  HDF15E,
     +             BFCTL15,  BFCTE15,  BFCTS15
     +             AF15L,   AF15S,   AF15E,
     +             BF15L,   BF15S,   BF15E,
     +             AHMINEL, AHMINES, AHMINEE,
     +             AHMINET, HMINETT
C
C    READ TONAGE TO BE MINED PER DAY FROM DATA FILE
       READ (7,10,REC=1315) TONS15
    10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
       HMINEL = 4.074 * (TONS15 ** 0.875)
       HMINES = 2.572 * (TONS15 ** 0.863)
       HMINEE = 0.079 * (TONS15 ** 0.967)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    ROCK HARDNESS FACTOR
C    READ ROCK HARDNESS.....HFCT15
       READ (7,30,REC=1322) HFCT15
    30 FORMAT (15X,F17.2)
C    ROCK HARDNESS FACTORS.....HDF15L.....HDF15S.....HDF15E
       HDF15L = 0.388 * (HFCT15 ** 0.093)
       HDF15S = 0.579 * (HFCT15 ** 0.054)
       HDF15E = 0.715 * (HFCT15 ** 0.033)
C
C    BENCH FACTOR
C    ROCK BENCH FACTORS.....BFCT15L....BFCT15S....BFCT15E
       READ (7,40,REC=1329) BFCT15L
       READ (7,40,REC=1346) BFCT15S
       READ (7,40,REC=1363) BFCT15E
    40 FORMAT (15X,F17.2)
C
C    U.S. BUREAU OF MINES RECOMMENDED BENCH FACTORS FOLLOW.....
C       BFCT15L = 0.872 * (TONS15 ** 0.020)
C       BFCT15S = 0.910
C       BFCT15E = 1.498 * (TONS15 ** (-0.013))
C
C
C    OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
```

```
C   EQUIPMENT..
C   AF15L.....AF15S.....AF15E
      READ (7,50,REC=1334) AF15L
      READ (7,50,REC=1351) AF15S
      READ (7,50,REC=1368) AF15E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF15L.....BF15S.....BF15E
      READ (7,60,REC=1339) BF15L
      READ (7,60,REC=1356) BF15S
      READ (7,60,REC=1373) BF15E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AHMINEL = HMINEL * HDF15L * BFCT15L * AF15L * BF15L
      AHMINES = HMINES * HDF15S * BFCT15S * AF15S * BF15S
      AHMINEE = HMINEE * HDF15E * BFCT15E * AF15E * BF15E
C
C   CALCULATE TOTAL ADJUSTED COST
      AHMINET = AHMINEL + AHMINES + AHMINEE
C
C   CALCULATE TOTAL COST
      HMINETT = AHMINET
C
C
C  PRINT ROUTINE FOR SUBROUTINE HMINE.....
C
      WRITE (8,15009)
15009 FORMAT (//)
      WRITE (8,15010)
15010 FORMAT ('0','SUBROUTINE HMINE, COSTS FOR PRODUCTION IN
     +ROOM AND PILLAR MINING, HARD ROCK USER DEFINED INPUT')
      WRITE (8,15020)
15020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS PRODUCTION PER
     +DAY')
      WRITE (8,15030) TONS15
15030 FORMAT (8X,'UNITS TO BE MINED      ',F17.2)
      WRITE (8,15060)
15060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,15070) HFCT15
15070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,15100)
15100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,15110) HDF15L
15110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15130) AF15L
15130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,15140) BF15L
15140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,15150)
15150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,15160) HDF15S
15160 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15180) AF15S
15180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,15190) BF15S
15190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,15200)
15200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,15210) HDF15E
15210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,15230) AF3E
15230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,15240) BF15E
15240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,15250)
15250 FORMAT ('0','SUBROUTINE HMINE, CALCULATED COSTS OUTPUT')
      WRITE (8,15260)
15260 FORMAT ('0',4X,'BASE COST')
      WRITE (8,15270) HMINEL
15270 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,15280) HMINES
15280 FORMAT (8X,'SUPPLIES               ',F17.2)
```

```
      WRITE (8,15290) HMINEE
15290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,15300)
15300 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,15310) AHMINEL
15310 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,15320) AHMINES
15320 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,15330) AHMINEE
15330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,15340)
15340 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,15350) AHMINET
15350 FORMAT (8X,'PER UNIT               ',F17.2)
      WRITE (8,15360) HMINETT
15360 FORMAT (8X,'PROJECT                ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE SMINE
C
C     SMINE
      REAL          TONS16,
     +            SMINEL,   SMINES,   SMINEE,
     +            HFCT16,
     +            HDF16L,   HDF16S,   HDF16E,
     +            BFCTL16,  BFCTE16,  BFCTS16
     +            AF16L,    AF16S,    AF16E,
     +            BF16L,    BF16S,    BF16E,
     +            ASMINEL,  ASMINES,  ASMINEE,
     +            ASMINET,  SMINETT
C
C     READ TONAGE TO BE MINED PER DAY FROM DATA FILE
      READ (7,10,REC=1382) TONS16
   10 FORMAT (15X,F17.2)
C
C     CALCULATE BASE COSTS
      SMINEL = 3.186 * (TONS16 ** 0.894)
      SMINES = 0.936 * (TONS16 ** 0.991)
      SMINEE = 2.159 * (TONS16 ** 0.723)
C
C     CONSIDER ADJUSTMENT FACTORS
```

```
C
C   ROCK HARDNESS FACTOR
C   READ ROCK HARDNESS.....HFCT16
      READ (7,30,REC=1389) HFCT16
   30 FORMAT (15X,F17.2)
C   ROCK HARDNESS FACTORS.....HDF16L.....HDF16S.....HDF16E
      HDF16L = 0.388 * (HFCT16 ** 0.093)
      HDF16S = 0.579 * (HFCT16 ** 0.054)
      HDF16E = 0.715 * (HFCT16 ** 0.033)
C
C
C   OTHER USER APPLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF16L.....AF16S.....AF16E
      READ (7,50,REC=1396) AF16L
      READ (7,50,REC=1408) AF16S
      READ (7,50,REC=1420) AF16E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF16L.....BF16S.....BF16E
      READ (7,60,REC=1401) BF16L
      READ (7,60,REC=1413) BF16S
      READ (7,60,REC=1425) BF16E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ASMINEL = SMINEL * HDF16L * BFCT16L * AF16L * BF16L
      ASMINES = SMINES * HDF16S * BFCT16S * AF16S * BF16S
      ASMINEE = SMINEE * HDF16E * BFCT16E * AF16E * BF16E
C
C   CALCULATE TOTAL ADJUSTED COST
      ASMINET = ASMINEL + ASMINES + ASMINEE
C
C   CALCULATE TOTAL COST
      SMINETT = ASMINET
C
C
C  PRINT ROUTINE FOR SUBROUTINE SMINE.....
C
      WRITE (8,16009)
16009 FORMAT (//)
      WRITE (8,16010)
```

```
16010 FORMAT ('0','SUBROUTINE SMINE, COSTS FOR PRODUCTION IN
     +ROOM AND PILLAR MINING, SOFT ROCK USER DEFINED INPUT')
      WRITE (8,16020)
16020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS PRODUCTION PER
     +DAY')
      WRITE (8,16030) TONS16
16030 FORMAT (8X,'UNITS TO BE MINED      ',F17.2)
      WRITE (8,16060)
16060 FORMAT (4X,'ROCK HARDNESS IN POUNDS PER SQUARE INCH')
      WRITE (8,16070) HFCT16
16070 FORMAT (8X,'ROCK HARDNESS (psi)    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16100)
16100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,16110) HDF16L
16110 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,16130) AF16L
16130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,16140) BF16L
16140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16150)
16150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,16160) HDF16S
16160 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,16180) AF16S
16180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,16190) BF16S
16190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,16200)
16200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,16210) HDF16E
16210 FORMAT (8X,'ROCK HARDNESS          ',F17.2)
      WRITE (8,16230) AF16E
16230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,16240) BF16E
16240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
```

```
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,16250)
16250 FORMAT ('0','SUBROUTINE SMINE, CALCULATED COSTS OUTPUT')
      WRITE (8,16260)
16260 FORMAT ('0',4X,'BASE COST')
      WRITE (8,16270) SMINEL
16270 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,16280) SMINES
16280 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,16290) SMINEE
16290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,16300)
16300 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,16310) ASMINEL
16310 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,16320) ASMINES
16320 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,16330) ASMINEE
16330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,16340)
16340 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,16350) ASMINET
16350 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,16360) SMINETT
16360 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE PUMP1
C
C   COSTS FOR OPERATION OF VERTICAL TURBINE PUMPS
C
C    PUMP1
      REAL
     +            FLOW17,
     +            PMP1L,  PMP1S,  PMP1E,
     +            AF17L,  AF17S,  AF17E,
     +            BF17L,  BF17S,  BF17E,
```

```
     +            APMP1L, APMP1S, APMP1E,
     +            APMP1T, PMP1TT
C
C    READ CUBIC METERS OF WATER TO BE PUMPED PER DAY FROM
C    DATA FILE
      READ (7,10,REC=1434) FLOW17
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      PMP1L =  0.304 * (FLOW17 ** 0.757)
      PMP1S =  0.131 * (FLOW17 ** 0.992)
      PMP1E =  0.167 * (FLOW17 ** 0.766)
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    AF17L.....AF17S.....AF17E
      READ (7,20,REC=1442) AF17L
      READ (7,20,REC=1454) AF17S
      READ (7,20,REC=1466) AF17E
   20 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    BF17L.....BF17S.....BF17E
      READ (7,30,REC=1447) BF17L
      READ (7,30,REC=1459) BF17S
      READ (7,30,REC=1471) BF17E
   30 FORMAT (15X,F17.2)
C
C    CALCULATE ADJUSTED COSTS
      APMP1L = PMP1L * AF17L * BF17L
      APMP1S = PMP1S * AF17S * BF17S
      APMP1E = PMP1E * AF17E * BF17E
C
C    CALCULATE TOTAL ADJUSTED COST
      APMP1T = APMP1L + APMP1S + APMP1E
C
C    CALCULATE TOTAL COST
      PMP1TT = APMP1T
C
C   PRINT ROUTINE FOR SUBROUTINE PUMP1.....
C
      WRITE (8,17009)
 17009 FORMAT (//)
```

```
      WRITE (8,17010)
17010 FORMAT ('0','SUBROUTINE PUMP1, COSTS FOR OPERATION OF
     +VERTICAL TURBINE PUMPS, USER DEFINED INPUT')
      WRITE (8,17020)
17020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TOTAL CUBIC METERS
     +OF WATER PUMPED PER DAY')
      WRITE (8,17030) FLOW17
17030 FORMAT (8X,'UNITS TO BE PUMPED     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,17040)
17040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,17050) AF17L
17050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,17060) BF17L
17060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,17070)
17070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,17080) AF17S
17080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,17090) BF17S
17090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,17100)
17100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,17110) AF17E
17110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,17120) BF17E
17120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,17130)
17130 FORMAT ('0','SUBROUTINE PUMP1, CALCULATED COSTS OUTPUT')
      WRITE (8,17140)
17140 FORMAT ('0',4X,'BASE COST PER UNIT')
      WRITE (8,17150) PMP1L
```

```
17150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,17160) PMP1S
17160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,17170) PMP1E
17170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,17180)
17180 FORMAT ('0',4X,'ADJUSTED COST PER UNIT')
      WRITE (8,17190) APMP1L
17190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,17200) APMP1S
17200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,17210) APMP1E
17210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,17220)
17220 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,17230) APMP1T
17230 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,17240) PMP1TT
17240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HOISTD
C
C     HOISTD
      REAL
     +            TONS18,
     +            DRUML,  DRUMS,  DRUME,
     +            VFCT18,
     +            DPF18L, DPF18S, DPF18E,
     +            SFCT18,
     +            AF18L,  AF18S,  AF18E,
     +            BF18L,  BF18S,  BF18E,
     +            ADRUML, ADRUMS, ADRUME,
     +            ADRUMT, DRUMTT
C
C     COSTS FOR ACQUISTION AND INSTALLATION OF DOUBLE DRUM
C     HOIST
C
C     READ TOTAL METRIC TONS CAPACITY PER DAY TO BE HOISTED
C
```

```
      READ (7,10,REC=1480) TONS18
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      DRUML = 2426.354 * (TONS18 ** 1.026)
      DRUMS = 5216.661 * (TONS18 ** 1.026)
      DRUME = 4488.754 * (TONS18 ** 1.026)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    TOTAL DEPTH TO BE HOISTED.....VFCT18
      READ (7,20,REC=1487) VFCT18
   20 FORMAT (15X,F17.2)
C    HOISTING DEPTH FACTOR FOR LABOR, SUPPLIES AND
C    EQUIPMENT.....
C    DPF18L.....DPF18S.....DPF18E
      DPF18L = 0.094 * (VFCT18 ** (0.345))
      DPF18S = 0.094 * (VFCT18 ** (0.345))
      DPF18E = 0.094 * (VFCT18 ** (0.345))
C
C    SERVICE HOIST FACTOR.....SFCT18
      READ (7,30,REC=1494) SFCT18
   30 FORMAT (15X,F17.2)
      IF (SFCT18.EQ.1) THEN
      DRUML = 2426.354 * ((TONS18 * 0.33) ** 1.026)
      DRUMS = 5216.661 * ((TONS18 * 0.33) ** 1.026)
      DRUME = 4488.754 * ((TONS18 * 0.33) ** 1.026)
      ELSE
      ENDIF
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    AF18L.....AF18S.....AF18E
      READ (7,40,REC=1501) AF18L
      READ (7,40,REC=1513) AF18S
      READ (7,40,REC=1525) AF18E
   40 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    BF18L.....BF18S.....BF18E
      READ (7,50,REC=1506) BF18L
      READ (7,50,REC=1518) BF18S
      READ (7,50,REC=1530) BF18E
```

```
  50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRUML = DRUML * DPF18L * AF18L * BF18L
      ADRUMS = DRUMS * DPF18S * AF18S * BF18S
      ADRUME = DRUME * DPF18E * AF18E * BF18E
C
C   CALCULATE TOTAL ADJUSTED COST
      ADRUMT = ADRUML + ADRUMS + ADRUME
C
C   CALCULATE TOTAL COST
      DRUMTT = ADRUMT
C
C  PRINT ROUTINE FOR SUBROUTINE HOISTD.....
C
      WRITE (8,18009)
18009 FORMAT (//)
      WRITE (8,18010)
18010 FORMAT ('0','SUBROUTINE HOISTD, COSTS FOR ACQUISITION AND
     +INSTALLATION OF DOUBLE DRUM HOIST, USER DEFINED INPUT')
      WRITE (8,18020)
18020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +HOISTED PER DAY')
      WRITE (8,18030) TONS18
18030 FORMAT (8X,'TONS TO BE HOISTED     ',F17.2)
      WRITE (8,18040)
18040 FORMAT (4X,'TOTAL DEPTH TO BE HOISTED IN METERS')
      WRITE (8,18050) VFCT18
18050 FORMAT (8X,'TOTAL DEPTH (meters)   ',F17.2)
      WRITE (8,18060)
18060 FORMAT (4X,'SERVICE HOIST FACTOR, YES=1, NO=0')
      WRITE (8,18070) SFCT18
18070 FORMAT (8X,'SERVICE FACTOR         ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,18080)
18080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,18090) DPF18L
18090 FORMAT (8X,'DEPTH                  ',F17.2)
      WRITE (8,18100) AF18L
18100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,18110) BF18L
18110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
```

```
C
C-----------------------------------------------------------------
C
      WRITE (8,18120)
18120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,18130) DPF18S
18130 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,18140) AF18S
18140 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,18150) BF18S
18150 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,18160)
18160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,18170) DPF18E
18170 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,18180) AF18E
18180 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,18190) BF18E
18190 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,18200)
18200 FORMAT ('0','SUBROUTINE HOISTD, CALCULATED COSTS OUTPUT')
      WRITE (8,18210)
18210 FORMAT ('0',4X,'BASE COST PER HOIST')
      WRITE (8,18220) DRUML
18220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,18230) DRUMS
18230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,18240) DRUME
18240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,18250)
18250 FORMAT ('0',4X,'ADJUSTED COST PER HOIST')
      WRITE (8,18260) ADRUML
18260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,18270) ADRUMS
18270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,18280) ADRUME
18280 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,18290)
18290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,18300) ADRUMT
18300 FORMAT (8X,'PER UNIT          ',F17.2)
      WRITE (8,18310) DRUMTT
18310 FORMAT (8X,'PROJECT           ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE HOISTF
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF FRICTION HOIST
C
C     HOISTF
      REAL
     +          TONS19,
     +          FRICL,  FRICS,  FRICE,
     +          VFCT19,
     +          DPF19L, DPF19S, DPF19E,
     +          SFCT19,
     +          AF19L,  AF19S,  AF19E,
     +          BF19L,  BF19S,  BF19E,
     +          AFRICL, AFRICS, AFRICE,
     +          AFRICT, FRICTT
C
C   READ TOTAL METRIC TONS CAPACITY PER DAY TO BE HOISTED
C
      READ (7,10,REC=1539) TONS19
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      FRICL = 1670.281 * (TONS19 ** 0.918)
      FRICS = 2783.801 * (TONS19 ** 0.918)
      FRICE = 4825.256 * (TONS19 ** 0.918)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   TOTAL DEPTH TO BE HOISTED.....VFCT19
      READ (7,20,REC=1546) VFCT19
   20 FORMAT (15X,F17.2)
```

```
C   HOISTING DEPTH FACTOR FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   DPF19L.....DPF19S.....DPF19E
      DPF19L = 0.112 * (VFCT19 ** (0.322))
      DPF19S = 0.112 * (VFCT19 ** (0.322))
      DPF19E = 0.112 * (VFCT19 ** (0.322))
C
C   SERVICE HOIST FACTOR.....SFCT19
      READ (7,30,REC=1553) SFCT19
   30 FORMAT (15X,F17.2)
      IF (SFCT19.EQ.1) THEN
      FRICL = 1670.281 * ((TONS19 * 0.33) ** 0.918)
      FRICS = 2783.801 * ((TONS19 * 0.33) ** 0.918)
      FRICE = 4825.256 * ((TONS19 * 0.33) ** 0.918)
      ELSE
      ENDIF
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF19L.....AF19S.....AF19E
      READ (7,40,REC=1560) AF19L
      READ (7,40,REC=1572) AF19S
      READ (7,40,REC=1584) AF19E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF19L.....BF19S.....BF19E
      READ (7,50,REC=1565) BF19L
      READ (7,50,REC=1577) BF19S
      READ (7,50,REC=1589) BF19E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AFRICL = FRICL * DPF19L * AF19L * BF19L
      AFRICS = FRICS * DPF19S * AF19S * BF19S
      AFRICE = FRICE * DPF19E * AF19E * BF19E
C
C   CALCULATE TOTAL ADJUSTED COST
      AFRICT = AFRICL + AFRICS + AFRICE
C
C   CALCULATE TOTAL COST
      FRICTT = AFRICT
C
```

```
C  PRINT ROUTINE FOR SUBROUTINE HOISTF.....
C
      WRITE (8,19009)
19009 FORMAT (//)
      WRITE (8,19010)
19010 FORMAT ('0','SUBROUTINE HOISTF, COSTS FOR OPERATION AND
     +MAINTAINING A FRICTION HOIST, USER DEFINED INPUT')
      WRITE (8,19020)
19020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +HOISTED PER DAY')
      WRITE (8,19030) TONS19
19030 FORMAT (8X,'TONS TO BE HOISTED      ',F17.2)
      WRITE (8,19040)
19040 FORMAT (4X,'TOTAL DEPTH TO BE HOISTED IN METERS')
      WRITE (8,19050) VFCT19
19050 FORMAT (8X,'TOTAL DEPTH (meters)   ',F17.2)
      WRITE (8,19060)
19060 FORMAT (4X,'SERVICE HOIST FACTOR, YES=1, NO=0')
      WRITE (8,19070) SFCT19
19070 FORMAT (8X,'SERVICE FACTOR         ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,19080)
19080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,19090) DPF19L
19090 FORMAT (8X,'DEPTH                  ',F17.2)
      WRITE (8,19100) AF19L
19100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,19110) BF19L
19110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,19120)
19120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,19130) DPF19S
19130 FORMAT (8X,'DEPTH                  ',F17.2)
      WRITE (8,19140) AF19S
19140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,19150) BF19S
19150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,19160)
19160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,19170) DPF19E
19170 FORMAT (8X,'DEPTH                ',F17.2)
      WRITE (8,19180) AF19E
19180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,19190) BF19E
19190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,19200)
19200 FORMAT ('0','SUBROUTINE HOISTF, CALCULATED COSTS OUTPUT')
      WRITE (8,19210)
19210 FORMAT ('0',4X,'BASE COST PER HOIST')
      WRITE (8,19220) FRICL
19220 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,19230) FRICS
19230 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,19240) FRICE
19240 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,19250)
19250 FORMAT ('0',4X,'ADJUSTED COST PER HOIST')
      WRITE (8,19260) AFRICL
19260 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,19270) AFRICS
19270 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,19280) AFRICE
19280 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,19290)
19290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,19300) AFRICT
19300 FORMAT (8X,'PER UNIT             ',F17.2)
      WRITE (8,19310) FRICTT
19310 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
      SUBROUTINE JUMBOS
C
C
```

```
C   COSTS FOR OPERATION OF WATER SYSTEM USED WITH JUMBOS
C   USED FOR PRIMARY PRODUCTION EQUIPMENT
C
C    JUMBOS
     REAL
     +            TONS20,
     +            JUMBL,  JUMBS,  JUMBE,
     +            SHFT20,
     +            AF20L,  AF20S,  AF20E,
     +            BF20L,  BF20S,  BF20E,
     +            AJUMBL, AJUMBS, AJUMBE,
     +            AJUMBT, JUMBTT
C
C    READ TOTAL METRIC TONS CAPACITY PER DAY TO BE PRODUCED
C
      READ (7,10,REC=1598) TONS20
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      JUMBL =    2.058 * (TONS20 ** 0.444)
      JUMBS =    0.680 * (TONS20 ** 0.627)
      JUMBE =    0.150 * (TONS20 ** 0.658)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C    SHIFT FACTOR
      READ (7,20,REC=1605) SHFT20
   20 FORMAT (15X,F17.2)
C    SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT20.EQ.1) THEN
      JUMBL = JUMBL / 2.0
      JUMBS = JUMBS / 2.0
      JUMBE = JUMBE / 2.0
      ELSE
      ENDIF
      IF (SHFT20.EQ.3) THEN
      JUMBL = JUMBL * 1.5
      JUMBS = JUMBS * 1.5
      JUMBE = JUMBE * 1.5
      ELSE
      ENDIF
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
```

```
C   AF20L.....AF20S.....AF20E
      READ (7,40,REC=1612) AF20L
      READ (7,40,REC=1624) AF20S
      READ (7,40,REC=1636) AF20E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF20L.....BF20S.....BF20E
      READ (7,50,REC=1617) BF20L
      READ (7,50,REC=1629) BF20S
      READ (7,50,REC=1641) BF20E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AJUMBL = JUMBL * AF20L * BF20L
      AJUMBS = JUMBS * AF20S * BF20S
      AJUMBE = JUMBE * AF20E * BF20E
C
C   CALCULATE TOTAL ADJUSTED COST
      AJUMBT = AJUMBL + AJUMBS + AJUMBE
C
C   CALCULATE TOTAL COST
      JUMBTT = AJUMBT
C
C  PRINT ROUTINE FOR SUBROUTINE JUMBOS.....
C
      WRITE (8,20009)
20009 FORMAT (//)
      WRITE (8,20010)
20010 FORMAT ('0','SUBROUTINE JUMBOS, COSTS FOR OPERATING
     +DRILL AND BLAST EQUIPMENT OF JUMBOS AS
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,20020)
20020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +PRODUCED PER DAY')
      WRITE (8,20030) TONS20
20030 FORMAT (8X,'TONS TO BE PRODUCED    ',F17.2)
      WRITE (8,20040)
20040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,20050) SHFT20
20050 FORMAT (8X,'SHIFTS                ',F17.2)
C
C-----------------------------------------------------------------
```

```
C
      WRITE (8,20060)
20060 FORMAT ('0',4X
      WRITE (8,20070)
20070 FORMAT (8X,'O
      WRITE (8,20080)
20080 FORMAT (8X,'O
C
C-----------  ----------
C
      WRITE (8,20090)
20090 FORMAT ('0',4X
      WRITE (8,20100)
20100 FORMAT (8X,'
      WRITE (8,20110)
20110 FORMAT (8X,'
C
C-----------  ----------
C
      WRITE (8,20120)
20120 FORMAT ('0',4X
      WRITE (8,20130)
20130 FORMAT (8X,'
      WRITE (8,20140)
20140 FORMAT (8X,'
C
C-----------  ----------
C-----------  ----------
C
      WRITE (8,20150)
20150 FORMAT ('0','
      WRITE (8,20160)
20160 FORMAT ('0',4X
      WRITE (8,20170)
20170 FORMAT (8X,'
      WRITE (8,20180)
20180 FORMAT (8X,
      WRITE (8,20190)
20190 FORMAT (8X,'
      WRITE (8,20200)
20200 FORMAT ('0',4
      WRITE (8,20210)
20210 FORMAT (8X,
      WRITE (8,20220)
```

```
C
      WRITE (8,20060)
20060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,20070) AF20L
20070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20080) BF20L
20080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,20090)
20090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,20100) AF20S
20100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20110) BF20S
20110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,20120)
20120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,20130) AF20E
20130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,20140) BF20E
20140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,20150)
20150 FORMAT ('0','SUBROUTINE JUMBOS, CALCULATED COSTS OUTPUT')
      WRITE (8,20160)
20160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,20170) JUMBL
20170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,20180) JUMBS
20180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,20190) JUMBE
20190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,20200)
20200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,20210) AJUMBL
20210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,20220) AJUMBS
```

```
20220 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,20230) AJUMBE
20230 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,20240)
20240 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,20250) AJUMBT
20250 FORMAT (8X,'PER UNIT PRODUCTION   ',F17.2)
      WRITE (8,20260) JUMBTT
20260 FORMAT (8X,'PROJECT PRODUCTION    ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE JKLEGS
C
C
C  COSTS FOR OPERARION OF DRILL AND BLAST EQUIPMENT FOR
C  JACKLEGS AS PRIMARY PRODUCTION EQUIPMENT
C
C   JKLEGS
      REAL
     +            TONS21,
     +            JLEGL,  JLEGS,  JLEGE,
     +            SHFT21,
     +            AF21L,  AF21S,  AF21E,
     +            BF21L,  BF21S,  BF21E,
     +            AJLEGL, AJLEGS, AJLEGE,
     +            AJLEGT, JLEGTT
C
C  READ TOTAL METRIC TONS CAPACITY PER DAY TO BE PRODUCED
C
      READ (7,10,REC=1650) TONS21
   10 FORMAT (15X,F17.2)
C
C  CALCULATE BASE COSTS
      JLEGL =   2.058 * (TONS21 ** 0.444)
      JLEGS =   0.680 * (TONS21 ** 0.627)
      JLEGE =   0.150 * (TONS21 ** 0.658)
C
C  CONSIDER ADJUSTMENT FACTORS
C
C  SHIFT FACTOR
```

```
      READ (7,20,REC=1657) SHFT21
   20 FORMAT (15X,F17.2)
C    SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT21.EQ.1) THEN
      JLEGL = JLEGL / 2.0
      JLEGS = JLEGS / 2.0
      JLEGE = JLEJE / 2.0
      ELSE
      ENDIF
      IF (SHFT21.EQ.3) THEN
      JLEGL = JLEGL * 1.5
      JLEGS = JLEGS * 1.5
      JLEGE = JLEGE * 1.5
      ELSE
      ENDIF
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    AF21L.....AF21S.....AF21E
       READ (7,40,REC=1664) AF21L
       READ (7,40,REC=1676) AF21S
       READ (7,40,REC=1688) AF21E
    40 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    BF21L.....BF21S.....BF21E
       READ (7,50,REC=1669) BF21L
       READ (7,50,REC=1681) BF21S
       READ (7,50,REC=1693) BF21E
    50 FORMAT (15X,F17.2)
C
C    CALCULATE ADJUSTED COSTS
       AJLEGL = JLEGL * AF21L * BF21L
       AJLEGS = JLEGS * AF21S * BF21S
       AJLEGE = JLEGE * AF21E * BF21E
C
C    CALCULATE TOTAL ADJUSTED COST
       AJLEGT = AJLEGL + AJLEGS + AJLEGE
C
C    CALCULATE TOTAL COST
       JLEGTT = AJLEGT
C
C    PRINT ROUTINE FOR SUBROUTINE JKLEGS.....
```

```
C
      WRITE (8,21009)
21009 FORMAT (//)
      WRITE (8,21010)
21010 FORMAT ('0','SUBROUTINE JKLEGS, COSTS FOR OPERATION OF
     +DRILL AND BLAST EQUIPMENT FOR JACKLEGS AS
     +PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT')
      WRITE (8,21020)
21020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL METRIC TONS
     +PRODUCED PER DAY')
      WRITE (8,21030) TONS21
21030 FORMAT (8X,'TONS TO BE PRODUCED    ',F17.2)
      WRITE (8,21040)
21040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,21050) SHFT21
21050 FORMAT (8X,'SHIFTS                ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21060)
21060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,21070) AF21L
21070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21080) BF21L
21080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21090)
21090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,21100) AF21S
21100 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21110) BF21S
21110 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,21120)
21120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,21130) AF21E
21130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,21140) BF21E
21140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
```

```
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,21150)
21150 FORMAT ('0','SUBROUTINE JKLEGS, CALCULATED COSTS OUTPUT')
      WRITE (8,21160)
21160 FORMAT ('0',4X,'BASE COST TO MEET PRODUCTION')
      WRITE (8,21170) JLEGL
21170 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,21180) JLEGS
21180 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,21190) JLEGE
21190 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,21200)
21200 FORMAT ('0',4X,'ADJUSTED COST TO MEET PRODUCTION')
      WRITE (8,21210) AJLEGL
21210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,21220) AJLEGS
21220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,21230) AJLEGE
21230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,21240)
21240 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,21250) AJLEGT
21250 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,21260) JLEGTT
21260 FORMAT (8X,'PROJECT PRODUCTION     ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE CONV1
C
C
C   COSTS FOR OPERATION OF MAIN CONVEYOR
C   EQUIPMENT FOR USE IN MATERIAL TRANSPORTATION
C
C    CONV1
      REAL
     +            TONS22,
     +            CON1L,  CON1S,  CON1E,
     +            SHFT22,
     +            DFCT22,
```

```
     +          DSF22L, DSF22S, DSF22E,
     +          AF22L,  AF22S,  AF22E,
     +          BF22L,  BF22S,  BF22E,
     +          ACON1L, ACON1S, ACON1E,
     +          ACON1T, CON1TT
C
C    READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1703) TONS22
   10 FORMAT (15X,F17.2)
C
C    CALCULATE BASE COSTS
      CON1L =  10.036 * (TONS22 ** 0.415)
      CON1S =   0.018 * (TONS22 ** 0.771)
      CON1E =   1.010 * (TONS22 ** 0.535)
C
C    CONSIDER ADJUSTMENT FACTORS
C
C
C    DISTANCE FACTOR....DFCT22
      READ (7,30,REC=1717) DFCT22
   30 FORMAT (15X,F17.2)
C    DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C    DSF22L.....DSF22S.....DSF22E
      DSF22L = 0.095 * (DFCT22 ** 0.413)
      DSF22S = 0.003 * (DFCT22 ** 0.996)
      DSF22E = 0.003 * (DFCT22 ** 0.996)
C
C    OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    AF22L.....AF22S.....AF22E
      READ (7,40,REC=1724) AF22L
      READ (7,40,REC=1736) AF22S
      READ (7,40,REC=1748) AF22E
   40 FORMAT (15X,F17.2)
C
C    OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C    EQUIPMENT..
C    BF22L.....BF22S.....BF22E
      READ (7,50,REC=1729) BF22L
      READ (7,50,REC=1741) BF22S
      READ (7,50,REC=1753) BF22E
   50 FORMAT (15X,F17.2)
C
```

```
C   CALCULATE ADJUSTED COSTS
      ACON1L = CON1L * DSF22L * AF22L * BF22L
      ACON1S = CON1S * DSF22S * AF22S * BF22S
      ACON1E = CON1E * DSF22E * AF22E * BF22E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACON1T = ACON1L + ACON1S + ACON1E
C
C   CALCULATE TOTAL COST
      CON1TT = ACON1T
C
C  PRINT ROUTINE FOR SUBROUTINE CONV1.....
C
      WRITE (8,22009)
22009 FORMAT (//)
      WRITE (8,22010)
22010 FORMAT ('0','SUBROUTINE CONV1, COSTS FOR OPERATION
     +OF MAIN CONVEYOR EQUIPMENT FOR USE IN MATERIAL
     +TRANSPORT, USER DEFINED INPUT')
      WRITE (8,22020)
22020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE
     +TRANSPORTED PER DAY')
      WRITE (8,22030) TONS22
22030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,22040)
22040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,22050) SHFT22
22050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,22060)
22060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,22070) DFCT22
22070 FORMAT (8X,'DISTANCE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,22080)
22080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,22090) DSF22L
22090 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,22100) AF22L
22100 FORMAT (8X,'OTHER USER FACTOR A   ',F17.2)
      WRITE (8,22110) BF22L
22110 FORMAT (8X,'OTHER USER FACTOR B   ',F17.2)
C
```

```
C-----------------------------------------------------------------
C
      WRITE (8,22120)
22120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,22130) DSF22S
22130 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,22140) AF22S
22140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,22150) BF22S
22150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,22160)
22160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,22170) DSF22E
22170 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,22180) AF22E
22180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,22190) BF22E
22190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,22200)
22200 FORMAT ('0','SUBROUTINE CONV1, CALCULATED COSTS OUTPUT')
      WRITE (8,22210)
22210 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,22220) CON1L
22220 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,22230) CON1S
22230 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,22240) CON1E
22240 FORMAT (8X,'EQUIPMENT               ',F17.2)
      WRITE (8,22250)
22250 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,22260) ACON1L
22260 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,22270) ACON1S
22270 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,22280) ACON1E
22280 FORMAT (8X,'EQUIPMENT               ',F17.2)
```

```
      WRITE (8,22290)
22290 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,22300) ACON1T
22300 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,22310) CON1TT
22310 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE LHD
C
C   COSTS FOR OPERATION OF LOAD-HAUL-DUMP EQUIPMENT FOR
C   USE IN MATERIAL TRANSPORTATION
C
C    LHD
      REAL
     +            TONS23,
     +            LHDL,  LHDS,  LHDE,
     +            SHFT23,
     +            DFCT23,
     +            DSF23L, DSF23S, DSF23E,
     +            GFCT23,
     +            GDF23L, GDF23S, GDF23E,
     +            AF23L,  AF23S,  AF23E,
     +            BF23L,  BF23S,  BF23E,
     +            ALHDL,  ALHDS,  ALHDE,
     +            ALHDT,  LHDTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1762) TONS23
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      LHDL =   1.584 * (TONS23 ** 0.812)
      LHDS =   1.165 * (TONS23 ** 0.859)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C
C   DISTANCE FACTOR....DFCT23
      READ (7,30,REC=1776) DFCT23
```

```
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   DSF23L.....DSF23S.....DSF23E
      DSF23L = 0.098 * (DFCT23 ** 0.382)
      DSF23S = 0.098 * (DFCT23 ** 0.382)
      DSF23E = 0.098 * (DFCT23 ** 0.382)
C   GRADE FACTOR....GFCT23
      READ (7,40,REC=1783) GFCT23
   40 FORMAT (15X,F17.2)
C   GRADE FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT
C   GDF23L.....GDF23S.....GDF23E
      GDF23L = 0.929 * (1.037 ** GFCT23)
      GDF23S = 0.929 * (1.037 ** GFCT23)
      GDF23E = 0.929 * (1.037 ** GFCT23)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   AF23L.....AF23S.....AF23E
      READ (7,50,REC=1790) AF23L
      READ (7,50,REC=1802) AF23S
      READ (7,50,REC=1814) AF23E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   BF23L.....BF23S.....BF23E
      READ (7,60,REC=1795) BF23L
      READ (7,60,REC=1807) BF23S
      READ (7,60,REC=1819) BF23E
   60 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ALHDL = LHDL * DSF23L * GDF23L * AF23L * BF23L
      ALHDS = LHDS * DSF23S * GDF23S * AF23S * BF23S
      ALHDE = LHDE * DSF23E * GDF23E * AF23E * BF23E
C
C   CALCULATE TOTAL ADJUSTED COST
      ALHDT = ALHDL + ALHDS + ALHDE
C
C   CALCULATE TOTAL COST
      LHDTT = ALHDT
C
C  PRINT ROUTINE FOR SUBROUTINE LHD.....
C
```

```
      WRITE (8,23009)
23009 FORMAT (//)
      WRITE (8,23010)
23010 FORMAT ('0','SUBROUTINE LHD, COSTS FOR OPERATION OF
     +LOAD-HAUL-DUMP EQUIPMENT FOR USE IN MATERIAL TRANSPORT,
     +USER DEFINED INPUT')
      WRITE (8,23020)
23020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE TRANSPORTED
     +PER DAY')
      WRITE (8,23030) TONS23
23030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,23060)
23060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,23070) DFCT23
23070 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,23080)
23080 FORMAT (4X,'GRADE FACTOR')
      WRITE (8,23090) GFCT23
23090 FORMAT (8X,'GRADE                 ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23100)
23100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,23110) DSF23L
23110 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,23120) GDF23L
23120 FORMAT (8X,'GRADE                 ',F17.2)
      WRITE (8,23130) AF23L
23130 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,23140) BF23L
23140 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23150)
23150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,23160) DSF23S
23160 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,23170) GDF23S
23170 FORMAT (8X,'GRADE                 ',F17.2)
      WRITE (8,23180) AF23S
23180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,23190) BF23S
```

```
23190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,23200)
23200 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,23210) DSF23E
23210 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,23220) GDF23E
23220 FORMAT (8X,'GRADE                 ',F17.2)
      WRITE (8,23230) AF23E
23230 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,23240) BF23E
23240 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,23250)
23250 FORMAT ('0','SUBROUTINE LHD, CALCULATED COSTS OUTPUT')
      WRITE (8,23260)
23260 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,23270) LHDL
23270 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,23280) LHDS
23280 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,23290) LHDE
23290 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,23300)
23300 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,23310) ALHDL
23310 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,23320) ALHDS
23320 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,23330) ALHDE
23330 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,23340)
23340 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,23350) ALHDT
23350 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,23360) LHDTT
23360 FORMAT (8X,'PROJECT               ',F17.2)
C
```

```
      RETURN
      END
C
C
C
      SUBROUTINE RRHAUL
C
C
C   COSTS FOR OPERATION OF RAIL HAULAGE EQUIPMENT FOR USE IN
C   MATERIAL TRANSPORTATION
C
C    RRHAUL
      REAL
     +            TONS24,
     +            ELRRL,  ELRRS,  ELRRE,
     +            SHFT24,
     +            TF24L,  TF24S,  TF24E,
     +            DF24L,  DF24S,  DF24E,
     +            DFCT24,
     +            DSF24L, DSF24S, DSF24E,
     +            AEF24L, AEF24S, AEF24E,
     +            BEF24L, BEF24S, BEF24E,
     +            ATF24L, ATF24S, ATF24E,
     +            BTF24L, BTF24S, BTF24E,
     +            ADF24L, ADF24S, ADF24E,
     +            BDF24L, BDF24S, BDF24E,
     +            AELRRL, AELRRS, AELRRE,
     +            ATRRRL, ATRRRS, ATRRRE,
     +            ADSRRL, ADSRRS, ADSRRE,
     +            AELRRT, ELRRTT,
     +            ATRRRT, TRRRTT,
     +            ADSRRT, DSRRTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1828) TONS24
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      ELRRL =  128.402 * (TONS24 ** 0.386)
      ELRRS =    0.043 * (TONS24 ** 0.971)
      ELRRE =    7.797 * (TONS24 ** 0.579)
C
C   CONSIDER ADJUSTMENT FACTORS
C
```

```
C   SHIFT FACTOR.....SHFT24
      READ (7,20,REC=1835) SHFT24
   20 FORMAT (15X,F17.2)
C   SHIFT FACTOR FOR LABOR, SUPPLIES AND EQUIPMENT.....
      IF (SHFT24.EQ.1) THEN
      ELRRL = ELRRL / 2.0
      ELRRS = ELRRS / 2.0
      ELRRE = ELRRS / 2.0
      ELSE
      ENDIF
      IF (SHFT24.EQ.3) THEN
      ELRRL = ELRRL * 1.5
      ELRRS = ELRRS * 1.5
      ELRRE = ELRRE * 1.5
      ELSE
      ENDIF
C
C   TROLLEY LOCOMOTIVE FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   TF24L.....TF24S.....TF24E
      READ (7,30,REC=1850) TF24L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=1892) TF24S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=1935) TF24E
   50 FORMAT (15X,F17.2)
C   DIESEL LOCOMOTIVE FACTORS FOR LABOR, SUPPLIES AND
C   EQUIPMENT.....
C   DF24L.....DF24S.....DF24E
      READ (7,60,REC=1855) DF24L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=1898) DF24S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=1940) DF24E
   80 FORMAT (15X,F17.2)
C
C   DISTANCE FACTOR....DFCT24
      READ (7,90,REC=1842) DFCT24
   90 FORMAT (15X,F17.2)
C   DISTANCE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   DSF24L.....DSF24S.....DSF24E
      DSF24L = 0.259 * (DFCT24 ** 0.169)
      DSF24S = 0.171 * (DFCT24 ** 0.221)
      DSF24E = 0.042 * (DFCT24 ** 0.396)
```

```
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR ELECTRIC RAIL HAULAGE.....A1F24L.....A1F24S.....A1F24E
      READ (7,100,REC=1865) A1F24L
      READ (7,100,REC=1903) A1F24S
      READ (7,100,REC=1945) A1F24E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR ELECTRIC RAIL HAULAGE.....B1F24L.....B1F24S.....B1F24E
      READ (7,110,REC=1865) B1F24L
      READ (7,110,REC=1908) B1F24S
      READ (7,110,REC=1950) B1F24E
  110 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR TROLLEY RAIL HAULAGE.....A2F24L.....A2F24S.....A2F24E
      READ (7,120,REC=1870) A2F24L
      READ (7,120,REC=1913) A2F24S
      READ (7,120,REC=1955) A2F24E
  120 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR TROLLEY RAIL HAULAGE.....B2F24L.....B2F24S.....B2F24E
      READ (7,130,REC=1875) B2F24L
      READ (7,130,REC=1918) B2F24S
      READ (7,130,REC=1960) B2F24E
  130 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR DIESEL RAIL HAULAGE.....A1F24L.....A1F24S.....A1F24E
      READ (7,140,REC=1880) A3F24L
      READ (7,140,REC=1923) A3F24S
      READ (7,140,REC=1965) A3F24E
  140 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
C   EQUIPMENT..
C   FOR DIESEL RAIL HAULAGE.....B1F24L.....B1F24S.....B1F24E
      READ (7,150,REC=1885) B3F24L
      READ (7,150,REC=1928) B3F24S
```

```
      READ (7,150,REC=1970) B3F24E
  150 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AELRRL = ELRRL * DSF24L * A1F24L * B1F24L
      AELRRS = ELRRS * DSF24S * A1F24S * B1F24S
      AELRRE = ELRRE * DSF24E * A1F24E * B1F24E
      ATRRRL = ELRRL * TF24L * DSF24L * A2F24L * B2F24L
      ATRRRS = ELRRS * TF24S * DSF24S * A2F24S * B2F24S
      ATRRRE = ELRRE * TF24E * DSF24E * A2F24E * B2F24E
      ADSRRL = ELRRL * DF24E * DSF24L * A3F24L * B3F24L
      ADSRRS = ELRRS * DF24S * DSF24S * A3F24S * B3F24S
      ADSRRE = ELRRE * DF24E * DSF24E * A3F24E * B3F24E
C
C   CALCULATE TOTAL ADJUSTED COST
      AELRRT = AELRRL + AELRRS + AELRRE
      ATRRRT = ATRRRL + ATRRRS + ATRRRE
      ADSRRT = ADSRRL + ADSRRS + ADSRRE
C
C   CALCULATE TOTAL COST
      ELRRTT = AELRRT
      TRRRTT = ATRRRT
      DSRRTT = ADSRRT
C
C  PRINT ROUTINE FOR SUBROUTINE RRHAUL.....
C
      WRITE (8,24009)
 24009 FORMAT (//)
      WRITE (8,24010)
 24010 FORMAT ('0','SUBROUTINE RRHAUL, COSTS FOR OPERATION OF
     +RAIL HAULAGE EQUIPMENT FOR USE IN MATERIAL TRANSPORT.
     +COSTS BASED LOCOMOTIVES AND ADJUSTED TO PROVIDE')
      WRITE (8,24011)
 24011 FORMAT ('0','COST FOR DIESEL AND TROLLEY SYSTEMS.
     +ELECTRIC SYSTEMS ARE DESIGNATED AS TYPE 1 SYSTEMS,
     +TROLLEY SYSTEMS ARE TYPE 2, AND DIESEL SYSTEMS ARE TYPE 3.')
      WRITE (8,24012)
 24012 FORMAT ('0','CORRECTION FACTORS A1, B1, A2, B2, A3, B3,
     +CORRESPOND WITH THE MATCHING TYPE SYSTEM.')
      WRITE (8,24020)
 24020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE TRANSPORTED
     +PER DAY')
      WRITE (8,24030) TONS24
 24030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
```

```
      WRITE (8,24040)
24040 FORMAT (4X,'NUMBER OF SHIFTS OPERATED PER DAY')
      WRITE (8,24050) SHFT24
24050 FORMAT (8X,'SHIFTS                ',F17.2)
      WRITE (8,24060)
24060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,24070) DFCT24
24070 FORMAT (8X,'DISTANCE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,24080)
24080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,24090) TF24L
24090 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,24100) DF24L
24100 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,24110) DSF24L
24110 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,24120) A1F24L
24120 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,24130) B1F24L
24130 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,24140) A2F24L
24140 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,24150) B2F24L
24150 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,24160) A3F24L
24160 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,24170) B3F24L
24170 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,24180)
24180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,24190) TF24S
24190 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,24200) DF24S
24200 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,24210) DSF24S
24210 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,24220) A1F24S
24220 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
```

```
      WRITE (8,24230) B1F24S
24230 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,24240) A2F24S
24240 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,24250) B2F24S
24250 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,24260) A3F24S
24260 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,24270) B3F24S
24270 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,24280)
24280 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,24290) TF24E
24290 FORMAT (8X,'TROLLEY LOCOMOTIVES(2) ',F17.2)
      WRITE (8,24300) DF24E
24300 FORMAT (8X,'DIESEL LOCOMOTIVES(3)  ',F17.2)
      WRITE (8,24310) DSF24E
24310 FORMAT (8X,'DISTANCE               ',F17.2)
      WRITE (8,24320) A1F24E
24320 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,24330) B1F24E
24330 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,24340) A2F24E
24340 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,24350) B2F24E
24350 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,24360) A3F24E
24360 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,24370) B3F24E
24370 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,24380)
24380 FORMAT ('0','SUBROUTINE RRHAUL, CALCULATED COSTS OUTPUT')
      WRITE (8,24390)
24390 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,24400)
24400 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,24410) ELRRL
```

```
24410 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,24420) ELRRS
24420 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,24430) ELRRE
24430 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,24440)
24440 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,24450) TRRRL
24450 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,24460) TRRRS
24460 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,24470) TRRRE
24470 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,24480)
24480 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,24490) DSRRL
24490 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,24500) DSRRS
24500 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,24510) DSRRE
24510 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,24520)
24520 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,24530)
24530 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,24540) AELRRL
24540 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,24550) AELRRS
24550 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,24560) AELRRE
24560 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,24570)
24570 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,24580) ATRRRL
24580 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,24590) ATRRRS
24590 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,24600) ATRRRE
24600 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,24610)
24610 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,24620) ADSRRL
24620 FORMAT (8X,'LABOR                ',F17.2)
```

```
      WRITE (8,24630) ADSRRS
24630 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,24640) ADSRRE
24640 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,24650)
24650 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,24660)
24660 FORMAT ('0',8X,'ELECTRIC LOCOMOTIVES')
      WRITE (8,24670) AELRRT
24670 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,24680) ELRRTT
24680 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,24690)
24690 FORMAT ('0',8X,'TROLLEY LOCOMOTIVES')
      WRITE (8,24700) ATRRRT
24700 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,24710) TRRRTT
24710 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,24720)
24720 FORMAT ('0',8X,'DIESEL LOCOMOTIVES')
      WRITE (8,24730) ADSRRT
24730 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,24740) DSRRTT
24740 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE TRUCKS
C
C
C     COSTS FOR OPERATION OF TRUCK EQUIPMENT FOR USE IN
C     MATERIAL TRANSPORTATION
C
C     TRUCKS
      REAL
     +            TONS25,
     +            TRUKL,  TRUKS,
     +            DFCT25,
     +            DSF25L, DSF25S,
     +            IFCT25,
     +            INF25L, INF25S,
```

```
     +            AF25L,  AF25S,
     +            BF25L,  BF25S,
     +            ATRUKL, ATRUKS,
     +            ATRUKT, TRUKTT
C
C   READ TOTAL METRIC TONS PER DAY TO BE TRANSPORTED
C
      READ (7,10,REC=1979) TONS25
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      TRUKL = (0.386 * (TONS25 ** 0.974)) + (0.361 * (TONS25 ** 0.980))
      TRUKS = (0.747 * (TONS25 ** 0.915)) + (0.506 * (TONS25 ** 0.953))
C
C   CONSIDER ADJUSTMENT FACTORS
C
C
C   DISTANCE FACTOR....DFCT25
      READ (7,30,REC=1993) DFCT25
   30 FORMAT (15X,F17.2)
C   DISTANCE FACTOR FOR LABOR, SUPPLIES
C   DSF25L.....DSF25S.....
      DSF25L = 0.040 * (DFCT25 ** 0.492)
      DSF25S = 0.040 * (DFCT25 ** 0.492)
C
C   INCLINE FACTOR....IFCT25
      READ (7,40,REC=2000) IFCT25
   40 FORMAT (15X,F17.2)
C   INCLINE FACTOR FOR LABOR, SUPPLIES
C   INF25L.....INF25S.....
      INF25L = 1.0 + (0.016 * IFCT25)
      INF25S = 1.0 + (0.016 * IFCT25)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES
C   AF25L.....AF25S.....
      READ (7,50,REC=2007) AF25L
      READ (7,50,REC=2019) AF25S
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES
C   BF25L.....BF25S.....
      READ (7,60,REC=2012) BF25L
      READ (7,60,REC=2024) BF25S
   60 FORMAT (15X,F17.2)
C
```

```
C  CALCULATE ADJUSTED COSTS
     ATRUKL = TRUKL * DSF25L * INF25L * AF25L * BF25L
     ATRUKS = TRUKS * DSF25S * INF25S * AF25S * BF25S
C
C  CALCULATE TOTAL ADJUSTED COST
     ATRUKT = ATRUKL + ATRUKS
C
C  CALCULATE TOTAL COST
     TRUKTT = ATRUKT
C
C PRINT ROUTINE FOR SUBROUTINE TRUCKS.....
C
      WRITE (8,25009)
25009 FORMAT (//)
      WRITE (8,25010)
25010 FORMAT ('0','SUBROUTINE TRUCKS, COSTS FOR OPERATION OF
     +TRUCK EQUIPMENT FOR USE IN MATERIAL TRANSPORT,
     +USER DEFINED INPUT')
      WRITE (8,25020)
25020 FORMAT ('0',4X,'UNITS CONSIDERED ARE TONS TO BE TRANSPORTED
     +PER DAY')
      WRITE (8,25030) TONS25
25030 FORMAT (8X,'TONS TRANSPORTED PER DAY',F17.2)
      WRITE (8,25060)
25060 FORMAT (4X,'DISTANCE FACTOR')
      WRITE (8,25070) DFCT25
25070 FORMAT (8X,'DISTANCE                ',F17.2)
      WRITE (8,25080)
25080 FORMAT (4X,'INCLINE FACTOR')
      WRITE (8,25090) IFCT25
25090 FORMAT (8X,'INCLINE (degrees)       ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,25100)
25100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,25110) DSF25L
25110 FORMAT (8X,'DISTANCE                ',F17.2)
      WRITE (8,25120) INF25L
25120 FORMAT (8X,'INCLINE                 ',F17.2)
      WRITE (8,25130) AF25L
25130 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,25140) BF25L
25140 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
```

```
C
C-----------------------------------------------------------------
C
      WRITE (8,25150)
25150 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,25160) DSF25S
25160 FORMAT (8X,'DISTANCE              ',F17.2)
      WRITE (8,25170) INF25S
25170 FORMAT (8X,'INCLINE               ',F17.2)
      WRITE (8,25180) AF25S
25180 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,25190) BF25S
25190 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,25250)
25250 FORMAT ('0','SUBROUTINE TRUCKS, CALCULATED COSTS OUTPUT')
      WRITE (8,25260)
25260 FORMAT ('0',4X,'BASE COST TO MEET TRANSPORT REQUIREMENTS')
      WRITE (8,25270) TRUKL
25270 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,25280) TRUKS
25280 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,25300)
25300 FORMAT ('0',4X,'ADJUSTED COST TO MEET TRANSPORT
REQUIREMENTS')
      WRITE (8,25310) ATRUKL
25310 FORMAT (8X,'LABOR                 ',F17.2)
      WRITE (8,25320) ATRUKS
25320 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,25340)
25340 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,25350) ATRUKT
25350 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,25360) TRUKTT
25360 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
```

C
C
C

Appendix F
UOP2.FOR, FORTRAN CODE

```
      PROGRAM UOP2
C
C
C
C
      OPEN (UNIT=7,FILE='UOP.DAT',ACCESS='DIRECT',STATUS='OLD',
     +     FORM='FORMATTED',RECL=80)
      OPEN (UNIT=8,FILE='UOP2.OUT',STATUS='NEW')
C
C
C
C
C  UNDERX CONTROL STATEMENTS FOR USER DEFINED SUBROUTINE
CHOICES
C
      LINE = 0
      DO 1000,I=1,10,1
      LINE=55+I
      READ (7,2000,REC=LINE) J
 2000 FORMAT (34X,I1)
      IF(J.EQ.1) THEN
      GOTO (1,2,3,4,5,6,7,8,9,10),I
      ENDIF
      GO TO 1000
C
C   SUBROUTINE CALL STATEMENTS
C
    1 CALL AIR
      GO TO 1000
    2 CALL OPER
      GO TO 1000
    3 CALL PPOWER
      GO TO 1000
    4 CALL STOCKP
      GO TO 1000
    5 CALL VENT
      GO TO 1000
    6 CALL DRAIN
      GO TO 1000
    7 CALL WATER
      GO TO 1000
    8 CALL WCLEAR
      GO TO 1000
    9 CALL NEUTRL
      GO TO 1000
   10 CALL GEN
```

```
      GO TO 1000
 1000 CONTINUE
      STOP
      END
C
C
C
C
C
      SUBROUTINE AIR
C
C
C   COSTS FOR OPERATION OF A COMPRESSED AIR
C   SUPPLY SYSTEM
C
C    AIR
      REAL
     +            AIR26,
     +            AIRL,   AIRS,   AIRE,
     +            AFCT26,
     +            ALF26L, ALF26S, ALF26E,
     +            AF26L,  AF26S,  AF26E,
     +            BF26L,  BF26S,  BF26E,
     +            AAIRL,  AAIRS,  AAIRE,
     +            AAIRT,  AIRTT
C
C   READ TOTAL COMPRESSOR CAPACITY NEEDED IN CUBIC METERS
INSTALLED
C   CAPACITY PER MINUTE
C
      READ (7,10,REC=2046) AIR26
   10 FORMAT (15X,F17.2)
C   CALCULATE BASE COSTS
      AIRL =  0.006 * (AIR26 ** 1.213)
      AIRS =  0.743 * (AIR26 ** 1.214)
      AIRE =  0.013 * (AIR26 ** 1.213)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   ALTITUDE FACTOR....AFCT26
      READ (7,20,REC=2053) AFCT26
   20 FORMAT (15X,F17.2)
C   ALTITUDE FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT
C   ALF26L....ALF26S.....ALF26E
```

```
      ALF26L = (0.823 + (0.0001 * AFCT26))
      ALF26S = (0.823 + (0.0001 * AFCT26))
      ALF26E = (0.823 + (0.0001 * AFCT26))
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF26L.....AF26S.....AF26E
      READ (7,30,REC=2060) AF26L
      READ (7,30,REC=2072) AF26S
      READ (7,30,REC=2084) AF26E
   30 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF26L....BF26S.....BF26E
      READ (7,40,REC=2065) BF26L
      READ (7,40,REC=2077) BF26S
      READ (7,40,REC=2089) BF26E
   40 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AAIRL = AIRL * ALF26L * AF26L * BF26L
      AAIRS = AIRS * ALF26S * AF26S * BF26S
      AAIRE = AIRE * ALF26E * AF26E * BF26E
C
C   CALCULATE TOTAL ADJUSTED COST
      AAIRT = AAIRL + AAIRS + AAIRE
C
C   CALCULATE TOTAL COST
      AIRTT = AAIRT
C
C  PRINT ROUTINE FOR SUBROUTINE AIR.....
C
      WRITE (8,26009)
26009 FORMAT (//)
      WRITE (8,26010)
26010 FORMAT ('0','SUBROUTINE AIR, COSTS FOR OPERATION
     +OF A COMPRESSED AIR SUPPLY SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,26020)
26020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED CAPACITY IN
     +CUBIC METERS PER MINUTE')
      WRITE (8,26030) AIR32
26030 FORMAT (8X,'CUBIC METERS PER MINUTE',F17.2)
```

```
      WRITE (8,26040) AFCT32
26040 FORMAT (4X,'ALTITUDE FACTOR (meters)',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26050)
26050 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,26060) ALF32L
26060 FORMAT (8X,'ALTITUDE                ',F17.2)
      WRITE (8,26070) AF32L
26070 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,26080) BF32L
26080 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26090)
26090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,26100) ALF32S
26100 FORMAT (8X,'ALTITUDE                ',F17.2)
      WRITE (8,26110) AF32S
26110 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,26120) BF32S
26120 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,26130)
26130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,26140) ALF32E
26140 FORMAT (8X,'ALTITUDE                ',F17.2)
      WRITE (8,26150) AF32E
26150 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,26160) BF32E
26160 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,26170)
26170 FORMAT ('0','SUBROUTINE AIR, CALCULATED COSTS OUTPUT')
      WRITE (8,26180)
26180 FORMAT ('0',4X,'BASE COST TO MEET AIR REQUIREMENTS')
      WRITE (8,26190) AIRL
```

```
26190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,26200) AIRS
26200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,26210) AIRE
26210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,26220)
26220 FORMAT ('0',4X,'ADJUSTED COST TO MEET AIR REQUIREMENTS')
      WRITE (8,26230) AAIRL
26230 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,26240) AAIRS
26240 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,26250) AAIRE
26250 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,26260)
26260 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,26270) AAIRT
26270 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,26280) AIRTT
26280 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
C
      SUBROUTINE OPER
C
C
C   COSTS FOR ACQUISTION AND INSTALLATION OF A FUELING STORAGE
AND
C   DISTRIBUTION SYSTEM
C
C    OPER
      REAL
     +            TONS27,
     +            OPERL,  OPERS,  OPERE,
     +            NDF27L, NDF27S, NDF27E,
     +            AEF27L, AEF27S, AEF27E,
     +            AF27L,  AF27S,  AF27E,
     +            BF27L,  BF27S,  BF27E,
     +            AOPERL, AOPERS, AOPERE,
     +            AOPERT, OPERTT
C
```

```
C   READ TOTAL METRIC TONS PER DAY MINED
C
      READ (7,10,REC=2099) TONS27
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      OPERL = 2176.103 + (TONS27 * 0.664)
      OPERS = 7979.043 + (TONS27 * 2.434)
      OPERE =  207.248 + (TONS27 * 0.063)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF27L.....AF27S.....AF27E
      READ (7,80,REC=2106) AF27L
      READ (7,80,REC=2118) AF27S
      READ (7,80,REC=2130) AF27E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF27L.....BF27S.....BF27E
      READ (7,90,REC=2111) BF27L
      READ (7,90,REC=2123) BF27S
      READ (7,90,REC=2135) BF27E
   90 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AOPERL = OPERL * AF27L * BF27L
      AOPERS = OPERS * AF27S * BF27S
      AOPERE = OPERE * AF27E * BF27E
C
C   CALCULATE TOTAL ADJUSTED COST
      AOPERT = AOPERL + AOPERS + AOPERE
C
C   CALCULATE TOTAL COST
      OPERTT = AOPERT
C
C  PRINT ROUTINE FOR SUBROUTINE OPER.....
C
      WRITE (8,27009)
27009 FORMAT (//)
```

```
      WRITE (8,27010)
27010 FORMAT ('0','SUBROUTINE OPER, COSTS FOR GENERAL
     +OPERATIONS OF MINE PRODUCTION,
     +USER DEFINED INPUT')
      WRITE (8,27020)
27020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONS PRODUCED
     +PER DAY')
      WRITE (8,27030) TONS34
27030 FORMAT (8X,'TONS PER DAY          ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27040)
27040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,27070) AF34L
27070 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,27080) BF34L
27080 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27090)
27090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,27120) AF34S
27120 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,27130) BF34S
27130 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,27140)
27140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,27170) AF34E
27170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,27180) BF34E
27180 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,27190)
27190 FORMAT ('0','SUBROUTINE OPER, CALCULATED COSTS OUTPUT')
      WRITE (8,27200)
27200 FORMAT ('0',4X,'BASE COST TO MEET REQUIREMENTS')
```

```
      WRITE (8,27210) OPERL
27210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,27220) OPERS
27220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,27230) OPERE
27230 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,27240)
27240 FORMAT ('0',4X,'ADJUSTED COST TO MEET REQUIREMENTS')
      WRITE (8,27250) AOPERL
27250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,27260) AOPERS
27260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,27270) AOPERE
27270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,27280)
27280 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,27290) AOPERT
27290 FORMAT (8X,'PER SYSTEM             ',F17.2)
      WRITE (8,27300) OPERTT
27300 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
C
      SUBROUTINE PPOWER
C
C
C  COSTS FOR OPERATION OF A PRIMARY POWER
C  SOURCE
C
C    PPOWER
      REAL
     +            KWT28,
     +            DIESL,  DIESS,  DIESE,
     +            TURBL,  TURBS,  TURBE,
     +            ADF28L,  ADF28S,  ADF28E,
     +            BDF28L,  BDF28S,  BDF28E,
     +            ATF28L,  ATF28S,  ATF28E,
     +            BTF28L,  BTF28S,  BTF28E,
     +            ADIESL, ADIESS, ADIESE,
     +            ATURBL, ATURBS, ATURBE,
```

```
     +              ADIEST, DIESTT,
     +              ATURBT, TURBTT
C
C   READ TOTAL POWER CAPACITY NEEDED IN KILOWATTS
C
      READ (7,10,REC=2144) KWT28
   10 FORMAT (15X,F17.2)

C   CALCULATE BASE COSTS, FOR DIESEL GENERATORS
      DIESL = 0.409 * (KWT28 ** (-0.466))
      DIESS = 1.0   * (KWT28 ** 1.0)
      DIESE = 0.158 * (KWT28 ** (-0.070))
C
C   CALCULATE BASE COSTS, FOR GAS TURBINE GENERATORS
      TURBL =  0.409 * (KWT28 ** (-0.466))
      TURBS =  1.0   * (KWT28 ** 1.0)
      TURBE =  0.158 * (KWT28 ** (-0.070))
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR DIESEL GENERATORS FOR
LABOR,
C   SUPPLIES AND EQUIPMENT.....ADF28L.....ADF28S.....ADF28E
      READ (7,20,REC=2151) ADF28L
      READ (7,20,REC=2173) ADF28S
      READ (7,20,REC=2195) ADF28E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR DIESEL GENERATORS FOR
LABOR,
C   SUPPLIES AND EQUIPMENT.....BDF28L.....BDF28S.....BDF28E
      READ (7,30,REC=2156) BDF28L
      READ (7,30,REC=2178) BDF28S
      READ (7,30,REC=2200) BDF28E
   30 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" FOR GAS TURBINE GENERATORS
FOR
C   LABOR, SUPPLIES AND EQUIPMENT...ATF28L.....ATF28S.....ATF28E
      READ (7,40,REC=2161) ATF28L
      READ (7,40,REC=2183) ATF28S
      READ (7,40,REC=2205) ATF28E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR GAS TURBINE GENERATORS
```

```
FOR
C   LABOR, SUPPLIES AND EQUIPMENT...BTF28L.....BTF28S.....BTF28E
      READ (7,50,REC=2166) BTF28L
      READ (7,50,REC=2188) BTF28S
      READ (7,50,REC=2210) BTF28E
   50 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADIESL = DIESL * ADF28L * BDF28L
      ADIESS = DIESS * ADF28S * BDF28S
      ADIESE = DIESE * ADF28E * BDF28E
      ATURBL = TURBL * ATF28L * BTF28L
      ATURBS = TURBS * ATF28S * BTF28S
      ATURBE = TURBE * ATF28E * BTF28E
C
C   CALCULATE TOTAL ADJUSTED COST
      ADIEST = ADIESL + ADIESS + ADIESE
      ATURBT = ATURBL + ATURBS + ATURBE
C
C   CALCULATE TOTAL COST
      DIESTT = ADIEST
      TURBTT = ATURBT
C
C  PRINT ROUTINE FOR SUBROUTINE PPOWER.....
C
      WRITE (8,28009)
28009 FORMAT (//)
      WRITE (8,28010)
28010 FORMAT ('0','SUBROUTINE PPOWER, COSTS FOR OPEATION OF
     +A PRIMARY PORTABLE POWER SOURCE, COSTS ARE
     +PROVIDED FOR BOTH DEISEL AND TURBINE GENERATORS,
     +USER DEFINED INPUT')
      WRITE (8,28020)
28020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL KILOWATTS NEEDED')
      WRITE (8,28030) KWT36
28030 FORMAT (8X,'KILOWATTS              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28040)
28040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
     +(DIESEL GENERATORS')
      WRITE (8,28050) ADF36L
28050 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
```

```
      WRITE (8,28060) BDF36L
28060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28070)
28070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(DIESEL GENERATORS)')
      WRITE (8,28080) ADF36S
28080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28090) BDF36S
28090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28100)
28100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(DIESEL GENERATORS) ')
      WRITE (8,28110) ADF36E
28110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28120) BDF36E
28120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C
      WRITE (8,28130)
28130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR
     +(TURBINE GENERATORS')
      WRITE (8,28140) ATF36L
28140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28150) BTF36L
28150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,28160)
28160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES
     +(TURBINE GENERATORS)')
      WRITE (8,28170) ATF36S
28170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28180) BTF36S
28180 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
```

```
      WRITE (8,28190)
28190 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT
     +(TURBINE GENERATORS) ')
      WRITE (8,28200) ATF36E
28200 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,28210) BTF36E
28210 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,28220)
28220 FORMAT ('0','SUBROUTINE PPOWER, CALCULATED COSTS OUTPUT')
      WRITE (8,28230)
28230 FORMAT ('0',4X,'BASE COST TO MEET POWER REQUIREMENTS')
      WRITE (8,28240)
28240 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,28250) DIESL
28250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,28260) DIESS
28260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,28270) DIESE
28270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28280)
28280 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,28290) TURBL
28290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,28300) TURBS
28300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,28310) TURBE
28310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28320)
28320 FORMAT ('0',4X,'ADJUSTED COST TO MEET POWER REQUIREMENTS')
      WRITE (8,28330)
28330 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,28340) ADIESL
28340 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,28350) ADIESS
28350 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,28360) ADIESE
28360 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28370)
28370 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,28380) ATURBL
```

```
28380 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,28390) ATURBS
28390 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,28400) ATURBE
28400 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,28410)
28410 FORMAT ('0',4X,'TOTAL COST')
      WRITE (8,28420)
28420 FORMAT ('0',8X,'DIESEL GENERATORS')
      WRITE (8,28430) ADIEST
28430 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,28440) DIESTT
28440 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,28450)
28450 FORMAT ('0',8X,'TURBINE GENERATORS')
      WRITE (8,28460) ATURBT
28460 FORMAT (8X,'PER UNIT PRODUCTION    ',F17.2)
      WRITE (8,28470) TURBTT
28470 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE STOCKP
C
C
C   COSTS FOR OPERATION OF A STOCKPILE STORAGE
C   FACILITY
C
C    STOCKP
      REAL
     +            TONS29,
     +            PILEL,  PILES,  PILEE,
     +            AF29L,  AF29S,  AF29E,
     +            BF29L,  BF29S,  BF29E,
     +            APILEL, APILES, APILEE,
     +            APILET, PILETT
C
C   READ TOTAL LIVE STORAGE CAPACITY IN METRIC TONS
C
      READ (7,10,REC=2220) TONS29
   10 FORMAT (15X,F17.2)
```

```
C   CALCULATE BASE COSTS
      PILEL = 7.229 * (TONS29 ** 0.503)
      PILES = 0.019 * (TONS29 ** 0.928)
      PILEE = 4.643 * (TONS29 ** 0.524)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF29L.....AF29S.....AF29E
      READ (7,20,REC=2227) AF29L
      READ (7,20,REC=2239) AF29S
      READ (7,20,REC=2251) AF29E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF29L.....BF29S.....BF29E
      READ (7,30,REC=2232) BF29L
      READ (7,30,REC=2244) BF29S
      READ (7,30,REC=2256) BF29E
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      APILEL = PILEL * AF29L * BF29L
      APILES = PILES * AF29S * BF29S
      APILEE = PILEE * AF29E * BF29E
C
C   CALCULATE TOTAL ADJUSTED COST
      APILET = APILEL + APILES + APILEE
C
C   CALCULATE TOTAL COST
      PILETT = APILET
C
C  PRINT ROUTINE FOR SUBROUTINE STOCKP.....
C
      WRITE (8,29009)
29009 FORMAT (//)
      WRITE (8,29010)
29010 FORMAT ('0','SUBROUTINE STOCKP, COSTS FOR OPERATION OF
     +A STOCKPILE STORAGE FACILITY,
     +USER DEFINED INPUT')
      WRITE (8,29020)
29020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL LIVE STORAGE
```

```
     +CAPACITY IN METRIC TONS')
      WRITE (8,29030) TONS38
29030 FORMAT (8X,'TONS LIVE STORAGE      ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29040)
29040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,29050) AF38L
29050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29060) BF38L
29060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29070)
29070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,29080) AF38S
29080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29090) BF38S
29090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,29100)
29100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,29110) AF38E
29110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,29120) BF38E
29120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,29130)
29130 FORMAT ('0','SUBROUTINE STOCKP, CALCULATED COSTS OUTPUT')
      WRITE (8,29140)
29140 FORMAT ('0',4X,'BASE COST')
      WRITE (8,29150) PILEL
29150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,29160) PILES
29160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,29170) PILEE
29170 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,29180)
29180 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,29190) APILEL
29190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,29200) APILES
29200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,29210) APILEE
29210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,29220)
29220 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,29230) APILET
29230 FORMAT (8X,'PER FACILITY           ',F17.2)
      WRITE (8,29240) PILETT
29240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE VENT
C
C
C   COSTS FOR OPERATION OF A MINE VENTILATION
C   SYSTEM
C
C    VENT
      REAL
     +            AIR30,
     +            VENTL,  VENTS,  VENTE,
     +            ACF30L, ACF30S, ACF30E,
     +            AWF30L, AWF30S, AWF30E,
     +            AF30L,  AF30S,  AF30E,
     +            BF30L,  BF30S,  BF30E,
     +            AVENTL, AVENTS, AVENTE,
     +            AVENTT, VENTTT
C
C   READ TOTAL AIR QUANITIY DEMAND IN CUBIC METERS PER MINUTE
C
      READ (7,10,REC=2266) AIR30
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      VENTL =  0.0003 * (AIR30 ** 0.870)
      VENTS =  0.0003 * (AIR30 ** 0.878)
```

```
      VENTE =  0.002  * (AIR30 ** 0.870)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   AIR COOLING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   ACF30L.....ACF30S.....ACF30E
      READ (7,20,REC=2273) ACF30L
   20 FORMAT (15X,F17.2)
      READ (7,30,REC=2295) ACF30S
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2317) ACF30E
   40 FORMAT (15X,F17.2)
C
C   AIR WARMING FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   AWF30L.....AWF30S.....AWF30E
      READ (7,50,REC=2278) AWF30L
   50 FORMAT (15X,F17.2)
      READ (7,60,REC=2300) AWF30S
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2322) AWF30E
   70 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF30L.....AF30S.....AF30E
      READ (7,80,REC=2283) AF30L
      READ (7,80,REC=2305) AF30S
      READ (7,80,REC=2327) AF30E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF30L.....BF30S.....BF30E
      READ (7,90,REC=2288) BF30L
      READ (7,90,REC=2310) BF30S
      READ (7,90,REC=2332) BF30E
   90 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AVENTL = VENTL * ACF30L * AWF30L * AF30L * BF30L
      AVENTS = VENTS * ACF30S * AWF30S * AF30S * BF30S
      AVENTE = VENTE * ACF30E * AWF30E * AF30E * BF30E
C
C   CALCULATE TOTAL ADJUSTED COST
```

```
      AVENTT = AVENTL + AVENTS + AVENTE
C
C   CALCULATE TOTAL COST
      VENTTT = AVENTT
C
C  PRINT ROUTINE FOR SUBROUTINE VENT.....
C
      WRITE (8,30009)
30009 FORMAT (//)
      WRITE (8,30010)
30010 FORMAT ('0','SUBROUTINE VENT, COSTS FOR OPERATION
     +OF A MINE VENTALATION SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,30020)
30020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL AIR DEMAND QUANTITY
     +IN CUBIC METER PER MINUTE')
      WRITE (8,30030) AIR40
30030 FORMAT (8X,'AIR DEMAND              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,30040)
30040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,30050) ACF40L
30050 FORMAT (8X,'AIR COOLING             ',F17.2)
      WRITE (8,30060) AWF40L
30060 FORMAT (8X,'AIR WARMING              ',F17.2)
      WRITE (8,30070) AF40L
30070 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,30080) BF40L
30080 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,30090)
30090 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,30100) ACF40S
30100 FORMAT (8X,'AIR COOLING             ',F17.2)
      WRITE (8,30110) AWF40S
30110 FORMAT (8X,'AIR WARMING              ',F17.2)
      WRITE (8,30120) AF40S
30120 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,30130) BF40S
30130 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
```

```
C
C-----------------------------------------------------------
C
      WRITE (8,30140)
30140 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,30150) ACF40E
30150 FORMAT (8X,'AIR COOLING          ',F17.2)
      WRITE (8,30160) AWF40E
30160 FORMAT (8X,'AIR WARMING          ',F17.2)
      WRITE (8,30170) AF40E
30170 FORMAT (8X,'OTHER USER FACTOR A  ',F17.2)
      WRITE (8,30180) BF40E
30180 FORMAT (8X,'OTHER USER FACTOR B  ',F17.2)
C
C-----------------------------------------------------------
C-----------------------------------------------------------
C
      WRITE (8,30190)
30190 FORMAT ('0','SUBROUTINE VENT, CALCULATED COSTS OUTPUT')
      WRITE (8,30200)
30200 FORMAT ('0',4X,'BASE COST')
      WRITE (8,30210) VENTL
30210 FORMAT (8X,'LABOR              ',F17.2)
      WRITE (8,30220) VENTS
30220 FORMAT (8X,'SUPPLIES           ',F17.2)
      WRITE (8,30230) VENTE
30230 FORMAT (8X,'EQUIPMENT          ',F17.2)
      WRITE (8,30240)
30240 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,30250) AVENTL
30250 FORMAT (8X,'LABOR              ',F17.2)
      WRITE (8,30260) AVENTS
30260 FORMAT (8X,'SUPPLIES           ',F17.2)
      WRITE (8,30270) AVENTE
30270 FORMAT (8X,'EQUIPMENT          ',F17.2)
      WRITE (8,30280)
30280 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,30290) AVENTT
30290 FORMAT (8X,'PER FACILITY       ',F17.2)
      WRITE (8,30300) VENTTT
30300 FORMAT (8X,'PROJECT            ',F17.2)
C
      RETURN
      END
```

```
C
C
C
      SUBROUTINE DRAIN
C
C
C   COSTS FOR OPERATION OF A MINE DRAINAGE
C   SYSTEM
C
C     DRAIN
      REAL
     +            H2O31,
     +            DRANL,  DRANS,  DRANE,
     +            VFCT31,
     +            PF31L,  PF31S,  PF31E,
     +            HSF31L, HSF31S, HSF31E,
     +            HNF31L, HNF31S, HNF31E,
     +            AF31L,  AF31S,  AF31E,
     +            BF31L,  BF31S,  BF31E,
     +            ADRANL, ADRANS, ADRANE,
     +            ADRANT, DRANTT
C
C   READ TOTAL WATER PUMPING QUANITIY IN CUBIC METERS PER DAY
C
      READ (7,10,REC=2341) H2O31
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      DRANL =  0.304 * (H2O31 ** 0.757)
      DRANS =  0.131 * (H2O31 ** 0.992)
      DRANE =  0.167 * (H2O31 ** 0.766)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   READ PUMPING HEIGHT FROM DATA FILE.....VFCT31
      READ (7,20,REC=2348) VFCT31
   20 FORMAT (15X,F17.2)
C
C   PUMPING HEAD FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   PF31L.....PF31S.....PF31E
C
      PF31L = 0.731  * (EXP ** (0.0005 * VFCT31))
      PF31S = 0.0019 * (VFCT31 ** 0.977)
      PF31E = 0.572  * (EXP ** (0.001 * VFCT31))
```

```
C
C   HORIZONTAL DRAINAGE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT IF
C   SETTLING TAKES PLACE.....HSF31L.....HSF31S.....HSF31E
      READ (7,30,REC=2355) HSF31L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2377) HSF31S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=2399) HSF31E
   50 FORMAT (15X,F17.2)
C
C   HORIZONTAL DRAINAGE FACTORS FOR LABOR, SUPPLIES AND
EQUIPMENT IF
C   NO SETTLING TAKES PLACE.....HNF31L.....HNF31S.....HNF31E
      READ (7,60,REC=2360) HNF31L
   60 FORMAT (15X,F17.2)
      READ (7,70,REC=2382) HNF31S
   70 FORMAT (15X,F17.2)
      READ (7,80,REC=2404) HNF31E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF31L.....AF31S.....AF31E
      READ (7,90,REC=2365) AF31L
      READ (7,90,REC=2387) AF31S
      READ (7,90,REC=2409) AF31E
   90 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF31L.....BF31S.....BF31E
      READ (7,100,REC=2370) BF31L
      READ (7,100,REC=2392) BF31S
      READ (7,100,REC=2414) BF31E
  100 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ADRANL = DRANL * PF31L * HSF31L * HNF31L * AF31L *
     +         BF31L
      ADRANS = DRANS * PF31S * HSF31S * HNF31S * AF31S *
     +         BF31S
      ADRANE = DRANE * PF31E * HSF31E * HNF31E * AF31E *
     +         BF31E
```

```
C
C  CALCULATE TOTAL ADJUSTED COST
     ADRANT = ADRANL + ADRANS + ADRANE
C
C  CALCULATE TOTAL COST
     DRANTT = ADRANT
C
C  PRINT ROUTINE FOR SUBROUTINE DRAIN.....
C
      WRITE (8,31009)
31009 FORMAT (//)
      WRITE (8,31010)
31010 FORMAT ('0','SUBROUTINE DRAIN, COSTS FOR OPERATION OF
     +A MINE DRAINAGE SYSTEM,
     +USER DEFINED INPUT')
      WRITE (8,31020)
31020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL WATER PUMPING
     +QUANTITY IN CUBIC METERS PER DAY')
      WRITE (8,31030) H2O41
31030 FORMAT (8X,'PUMPING QUANITY (mpd)  ',F17.2)
      WRITE (8,31040)
31040 FORMAT ('0',4X,'TOTAL VERTICAL PUMPING HEIGHT FACTOR IN
METERS')
      WRITE (8,31050) VFCT41
31050 FORMAT (8X,'PUMPING HEIGHT (meters)',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,31060)
31060 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,31070) PF41L
31070 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,31080) HSF41L
31080 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,31090) HNF41L
31090 FORMAT (8X,'HORIZONTAL NO SETTLING ',F17.2)
      WRITE (8,31100) AF41L
31100 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,31110) BF41L
31110 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,31120)
```

```
31120 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,31130) PF41S
31130 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,31140) HSF41S
31140 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,31150) HNF41S
31150 FORMAT (8X,'HORIZONTAL NO SETTLING  ',F17.2)
      WRITE (8,31160) AF41S
31160 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,31170) BF41S
31170 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-------------------------------------------------------------
C
      WRITE (8,31180)
31180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,31190) PF41E
31190 FORMAT (8X,'PUMPING HEIGHT          ',F17.2)
      WRITE (8,31200) HSF41E
31200 FORMAT (8X,'HORIZONTAL SETTLING     ',F17.2)
      WRITE (8,31210) HNF41E
31210 FORMAT (8X,'HORIZONTAL NO SETTLING  ',F17.2)
      WRITE (8,31220) AF41E
31220 FORMAT (8X,'OTHER USER FACTOR A     ',F17.2)
      WRITE (8,31230) BF41E
31230 FORMAT (8X,'OTHER USER FACTOR B     ',F17.2)
C
C-------------------------------------------------------------
C-------------------------------------------------------------
C
      WRITE (8,31240)
31240 FORMAT ('0','SUBROUTINE DRAIN, CALCULATED COSTS OUTPUT')
      WRITE (8,31250)
31250 FORMAT ('0',4X,'BASE COST')
      WRITE (8,31260) DRANL
31260 FORMAT (8X,'LABOR                   ',F17.2)
      WRITE (8,31270) DRANS
31270 FORMAT (8X,'SUPPLIES                ',F17.2)
      WRITE (8,31280) DRANE
31280 FORMAT (8X,'EQUIPMENT                ',F17.2)
      WRITE (8,31290)
31290 FORMAT ('0',4X,'ADJUSTED COST')
      WRITE (8,31300) ADRANL
31300 FORMAT (8X,'LABOR                   ',F17.2)
```

```
      WRITE (8,31310) ADRANS
31310 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,31320) ADRANE
31320 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,31330)
31330 FORMAT ('0',4X,'TOTAL COSTS')
      WRITE (8,31340) ADRANT
31340 FORMAT (8X,'PER FACILITY          ',F17.2)
      WRITE (8,31350) DRANTT
31350 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
C
      SUBROUTINE WATER
C
C
C   COSTS FOR OPERATION OF A WATER SUPPLY
C   SYSTEM
C
C    WATER
      REAL
     +            H2O32,  TONS32,
     +            WAT1L,  WAT1S,  WAT1E,
     +            JBWAT,
     +            WAT2L,  WAT2S,  WAT2E,
     +            ALWAT,
     +            WAT3L,  WAT3S,  WAT3E,
     +            PWF32L, PWF32S, PWF32E,
     +            A1F32L, A1F32S, A1F32E,
     +            B1F32L, B1F32S, B1F32E,
     +            A2F32L, A2F32S, A2F32E,
     +            B2F32L, B2F32S, B2F32E,
     +            A3F32L, A3F32S, A3F32E,
     +            B3F32L, B3F32S, B3F32E,
     +            AWAT1L, AWAT1S, AWAT1E,
     +            AWAT2L, AWAT2S, AWAT2E,
     +            AWAT3L, AWAT3S, AWAT3E,
     +            AWAT1T, WAT1TT,
     +            AWAT2T, WAT2TT,
     +            AWAT3T, WAT3TT
C
```

```
C   READ TOTAL WATER DEMAND QUANITIY IN CUBIC METERS PER DAY
C
      READ (7,10,REC=2423) H2O32
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=2428) TONS32
   20 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON USER ESTIMATE
      WAT1L =  2.058 * (H2O42 ** 0.444)
      WAT1S =  0.680 * (H2O42 ** 0.627)
      WAT1E =  0.150 * (H2O42 ** 0.658)
C
C   CALCULATE BASE COSTS, BASED ON TONNAGE PRODUCED PER DAY
AND
C   DRILLING METHODS
C
C   WATER NEEDED FOR JUMBO OPERATION, CUBIC METERS PER 16 HOURS
      JBWAT =     0.049 * (TONS32 ** 0.889)
      WAT2L =  546.786 * (JBWAT ** 0.693)
      WAT2S =  207.681 * (JBWAT ** 0.693)
      WAT2E =  721.418 * (JBWAT ** 0.693)
C
C   WATER NEEDED FOR AIR-LEG DRILL OPERATION, CUBIC METERS
C   PER 16 HOURS
      ALWAT =    0.025 * (TONS32  ** 0.749)
      WAT3L =  546.786 * (ALWAT ** 0.693)
      WAT3S =  207.681 * (ALWAT ** 0.693)
      WAT3E =  721.418 * (ALWAT ** 0.693)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   PURCHASED WATER FACTORS FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   PWF32L.....PWF32S.....PWF32E
      READ (7,30,REC=2435) PWF32L
   30 FORMAT (15X,F17.2)
      READ (7,40,REC=2472) PWF32S
   40 FORMAT (15X,F17.2)
      READ (7,50,REC=2509) PWF32E
   50 FORMAT (15X,F17.2)
C
C   OTHER USER APLLIED FACTORS "A" APPLIED TO USER SPECIFIED WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A1F32L.....A1F32S.....A1F32E
      READ (7,60,REC=2440) A1F32L
```

```
      READ (7,60,REC=2477) A1F32S
      READ (7,60,REC=2514) A1F32E
   60 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO USER SPECIFIED WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B1F32L.....B1F32S.....B1F32E
      READ (7,70,REC=2445) B1F32L
      READ (7,70,REC=2482) B1F32S
      READ (7,70,REC=2519) B1F32E
   70 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" APPLIED TO ESTIMATED JUMBO
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A2F32L.....A2F32S.....A2F32E
      READ (7,80,REC=2450) A2F32L
      READ (7,80,REC=2487) A2F32S
      READ (7,80,REC=2524) A2F32E
   80 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO ESTIMATED JUMBO
WATER
C   DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B2F32L.....B2F32S.....B2F32E
      READ (7,90,REC=2455) B2F32L
      READ (7,90,REC=2492) B2F32S
      READ (7,90,REC=2529) B2F32E
   90 FORMAT (15X,F17.2)
C   OTHER USER APLLIED FACTORS "A" APPLIED TO ESTIMATED AIR-LEG
DRILL
C   WATER DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   A3F32L.....A3F32S.....A3F32E
      READ (7,100,REC=2460) A3F32L
      READ (7,100,REC=2497) A3F32S
      READ (7,100,REC=2534) A3F32E
  100 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" APPLIED TO ESTIMATED AIR-LEG
DRILL
C   WATER DEMAND FOR LABOR, SUPPLIES AND EQUIPMENT.....
C   B3F32L.....B3F32S.....B3F32E
      READ (7,110,REC=2465) B3F32L
      READ (7,110,REC=2502) B3F32S
      READ (7,110,REC=2539) B3F32E
```

```
 110 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      AWAT1L = WAT1L * PWF32L * A1F32L * B1F32L
      AWAT1S = WAT1S * PWF32S * A1F32S * B1F32S
      AWAT1E = WAT1E * PWF32E * A1F32E * B1F32E
      AWAT2L = WAT2L * PWF32L * A2F32L * B2F32L
      AWAT2S = WAT2S * PWF32S * A2F32S * B2F32S
      AWAT2E = WAT2E * PWF32E * A2F32E * B2F32E
      AWAT3L = WAT3L * PWF32L * A3F32L * B3F32L
      AWAT3S = WAT3S * PWF32S * A3F32S * B3F32S
      AWAT3E = WAT3E * PWF32E * A3F32E * B3F32E
C
C   CALCULATE TOTAL ADJUSTED COST
      AWAT1T = AWAT1L + AWAT1S + AWAT1E
      AWAT2T = AWAT2L + AWAT2S + AWAT2E
      AWAT3T = AWAT3L + AWAT3S + AWAT3E
C
C   CALCULATE TOTAL COST
      WAT1TT = AWAT1T
      WAT2TT = AWAT2T
      WAT3TT = AWAT3T
C
C  PRINT ROUTINE FOR SUBROUTINE WATER.....
C
      WRITE (8,32009)
32009 FORMAT (//)
      WRITE (8,32010)
32010 FORMAT ('0','SUBROUTINE WATER, COSTS FOR OPERATION
     +OF A WATER SUPPLY SYSTEM.')
      WRITE (8,32011)
32011 FORMAT ('0','ESTIMATES BASED ON AND GIVEN FOR BOTH USER
DEFINED
     +NEEDS IN CUBIC METERS PER DAY AND TONS TO BE MINED PER DAY
     +BY A SPECIFED PRODUCTION METHOD, USER DEFINED INPUT.')
      WRITE (8,32012)
32012 FORMAT ('0','ESTIMATES BASED ON USER DEFINED NEED ARE
     +CONSIDERED SYSTEM 1, THOSE BASED ON PRODUCTION WITH JUMBOS
ARE
     +SYSTEM 2 AND THOSE FOR AIR-LEG DRILLS ARE SYSTEM 3.')
      WRITE (8,32013)
32013 FORMAT ('0','CORRECTION FACTORS FOR A1, B1, A2, B2, A3, B3,
     +CORRESPOND TO SYSTEM 1, 2 OR 3 USE.')
      WRITE (8,32020)
```

```
32020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL NEEDED WATER
CAPACITY
     +IN CUBIC METERS PER DAY')
      WRITE (8,32030) H2O42
32030 FORMAT (8X,'WATER NEED ESTIMATED   ',F17.2)
      WRITE (8,32040)
32040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL TONNAGE MINED PER
     +DAY')
      WRITE (8,32050) TONS42
32050 FORMAT (8X,'TONS PER DAY          ',F17.2)
      WRITE (8,32060)
32060 FORMAT (8X,'TOTAL WATER REQUIRED BASED ON TONNAGE MINED
     +USING JUMBOS, 16 HOUR OPERATION')
      WRITE (8,32070) JBWAT
32070 FORMAT (8X,'JUMBO WATER NEED       ',F17.2)
      WRITE (8,32080)
32080 FORMAT (8X,'TOTAL WATER REQUIRED BASED ON TONNAGE MINED
     +USING AIR-LEG DRILLS, 16 HOUR OPERATION')
      WRITE (8,32090) ALWAT
32090 FORMAT (8X,'AIR-LEG WATER NEED     ',F17.2)
C
C-------------------------------------------------------------
C
      WRITE (8,32100)
32100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,32110) PWF42L
32110 FORMAT (8X,'PURCHASED WATER        ',F17.2)
      WRITE (8,32120) A1F42L
32120 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,32130) B1F42L
32130 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,32140) A2F42L
32140 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8.32150) B2F42L
32150 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,32160) A3F42L
32160 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,32170) B3F42L
32170 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-------------------------------------------------------------
C
      WRITE (8,32180)
32180 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
```

```
      WRITE (8,32190) PWF42S
32190 FORMAT (8X,'PURCHASED WATER        ',F17.2)
      WRITE (8,32200) A1F42S
32200 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,32210) B1F42S
32210 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,32220) A2F42S
32220 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,32230) B2F42S
32230 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,32240) A3F42S
32240 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,32250) B3F42S
32250 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,32260)
32260 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,32270) PWF42E
32270 FORMAT (8X,'WEATHER                ',F17.2)
      WRITE (8,32280) A1F42E
32280 FORMAT (8X,'OTHER USER FACTOR A1   ',F17.2)
      WRITE (8,32290) B1F42E
32290 FORMAT (8X,'OTHER USER FACTOR B1   ',F17.2)
      WRITE (8,32300) A2F42E
32300 FORMAT (8X,'OTHER USER FACTOR A2   ',F17.2)
      WRITE (8,32310) B2F42E
32310 FORMAT (8X,'OTHER USER FACTOR B2   ',F17.2)
      WRITE (8,32320) A3F42E
32320 FORMAT (8X,'OTHER USER FACTOR A3   ',F17.2)
      WRITE (8,32330) B3F42E
32330 FORMAT (8X,'OTHER USER FACTOR B3   ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,32340)
32340 FORMAT ('0','SUBROUTINE WATER, CALCULATED COSTS OUTPUT')
      WRITE (8,32350)
32350 FORMAT ('0',4X,'BASE COST FOR WATER SYSTEM BASED ON TOTAL
     +CUBIC METERS REQUIRED')
      WRITE (8,32360) WAT1L
32360 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32370) WAT1S
32370 FORMAT (8X,'SUPPLIES               ',F17.2)
```

```
      WRITE (8,32380) WAT1E
32380 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,32390)
32390 FORMAT ('0',4X,'BASE COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,32400) WAT2L
32400 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32410) WAT2S
32410 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,32420) WAT2E
32420 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,32430)
32430 FORMAT ('0',4X,'BASE COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,32440) WAT3L
32440 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32450) WAT3S
32450 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,32460) WAT3E
32460 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,32470)
32470 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON
     +TOTAL CUBIC METERS REQUIRED')
      WRITE (8,32480) AWAT1L
32480 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32490) AWAT1S
32490 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,32500) AWAT1E
32500 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,32510)
32510 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,32520) AWAT2L
32520 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32530) AWAT2S
32530 FORMAT (8X,'SUPPLIES               ',F17.2)
      WRITE (8,32540) AWAT2E
32540 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,32550)
32550 FORMAT ('0',4X,'ADJUSTED COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,32560) AWAT3L
32560 FORMAT (8X,'LABOR                  ',F17.2)
      WRITE (8,32570) AWAT3S
```

```
32570 FORMAT (8X,'SUPPLIES              ',F17.2)
      WRITE (8,32580) AWAT3E
32580 FORMAT (8X,'EQUIPMENT             ',F17.2)
      WRITE (8,32590)
32590 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TOTAL
     +CUBIC METER REQUIRED')
      WRITE (8,32600) AWAT1T
32600 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,32610) WAT1TT
32610 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,32620)
32620 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TONNAGE
     +MINED USING JUMBOS')
      WRITE (8,32630) AWAT2T
32630 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,32640) WAT2TT
32640 FORMAT (8X,'PROJECT               ',F17.2)
      WRITE (8,32650)
32650 FORMAT ('0',4X,'TOTAL COST FOR WATER BASED ON TONNAGE
     +MINED USING AIR-LEG DRILLS')
      WRITE (8,32660) AWAT3T
32660 FORMAT (8X,'PER SYSTEM            ',F17.2)
      WRITE (8,32670) WAT3TT
32670 FORMAT (8X,'PROJECT               ',F17.2)
C
      RETURN
      END
C
C
      SUBROUTINE WCLEAR
C
C
C   COSTS FOR OPERATION OF EQUIPMENT FOR
C   WATER CLARIFICATION
C
C    WCLEAR
      REAL
     +            DIA33,  RISE33, FLOW33,
     +            CLR1L,  CLR1S,  CLR1E,
     +            TANK33,
     +            CLR2L,  CLR2S,  CLR2E,
     +            AF33L,  AF33S,  AF33E,
     +            BF33L,  BF33S,  BF33E,
     +            ACLR1L, ACLR1S, ACLR1E,
```

```
     +            ACLR2L, ACLR2S, ACLR2E,
     +            ACLR1T, CLR1TT,
     +            ACLR2T, CLR2TT
C
C   READ CLARIFICATION TANK DIAMETER IN METERS, DESIGN RISE RATE
C   IN METERS PER MINUTE AND DESIGN FLOW RATE IN CUBIC METERS PER
C   MINUTE
C
      READ (7,10,REC=2549) DIA33
   10 FORMAT (15X,F17.2)
      READ (7,20,REC=2554) RISE33
   20 FORMAT (15X,F17.2)
      READ (7,30,REC=2559) FLOW33
   30 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, BASED ON USER DEFINED TANK DIAMETER
      CLR1L =  38.931 * (DIA33 ** 0.119)
      CLR1S =   1.083 * (DIA33 ** 0.633)
      CLR1E =   0.505 * (DIA33 ** 1.064)
C
C   CALCULATE BASE COSTS, BASED ON TANK SIZING ESTIMATION USING
C   DESIGN RISE AND FLOW RATES
      TANK33 =     1.128 * ((FLOW33 / RISE33) ** 0.500)
      CLR2L  =  2969.910 *  (TANK33 ** 0.991)
      CLR2S  =   781.550 *  (TANK33 ** 0.991)
      CLR2E  = 11879.601 *  (TANK33 ** 0.991)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF33L.....AF33S.....AF33E
      READ (7,40,REC=2566) AF33L
      READ (7,40,REC=2578) AF33S
      READ (7,40,REC=2590) AF33E
   40 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF33L.....BF33S.....BF33E
      READ (7,50,REC=2571) BF33L
      READ (7,50,REC=2583) BF33S
      READ (7,50,REC=2595) BF33E
   50 FORMAT (15X,F17.2)
```

```
C
C   CALCULATE ADJUSTED COSTS
      ACLR1L = CLR1L * AF33L * BF33L
      ACLR1S = CLR1S * AF33S * BF33S
      ACLR1E = CLR1E * AF33E * BF33E
      ACLR2L = CLR2L * AF33L * BF33L
      ACLR2S = CLR2S * AF33S * BF33S
      ACLR2E = CLR2E * AF33E * BF33E
C
C   CALCULATE TOTAL ADJUSTED COST
      ACLR1T = ACLR1L + ACLR1S + ACLR1S
      ACLR2T = ACLR2L + ACLR2S + ACLR2E
C
C   CALCULATE TOTAL COST
      CLR1TT = ACLR1T
      CLR2TT = ACLR2T
C
C  PRINT ROUTINE FOR SUBROUTINE WCLEAR.....
C
      WRITE (8,33009)
33009 FORMAT (//)
      WRITE (8,33010)
33010 FORMAT ('0','SUBROUTINE WCLEAR, COSTS FOR OPERATION
     +OF EQUIPMENT FOR WATER CLARIFICATION, ESTIMATES
     +BASED ON AND GIVEN FOR BOTH USER DEFINED TANK DIAMETER AND
     +FLOW OF WASTE WATER PER MINUTE GIVEN AS RISE AND FLOW
RATES
     +FOR THE SYSTEM, USER DEFINED INPUT')
      WRITE (8,33020)
33020 FORMAT ('0',4X,'UNIT CONSIDERED IS TANK DIAMETER IN METERS')
      WRITE (8,33030) DIA49
33030 FORMAT (8X,'TANK DIAMATER          ',F17.2)
      WRITE (8,33040)
33040 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL FLOW QUANTITY
     +IN CUBIC METERS PER MINUTE')
      WRITE (8,33050) FLOW49
33050 FORMAT (8X,'FLOW RATE ESTIMATED    ',F17.2)
      WRITE (8,33060)
33060 FORMAT (8X,'UNIT CONSIDERED IS RISE RATE IN TANK IN METERS
     +PER MINUTE')
      WRITE (8,33070) RISE49
33070 FORMAT (8X,'TANK RISE RATE         ',F17.2)
      WRITE (8,33080)
33080 FORMAT (8X,'TANK DIAMETER ESTIMATED BY PROGRAM BASED ON
```

```
FLOW
     +AND RISE RATES')
      WRITE (8,33090) TANK49
33090 FORMAT (8X,'TANK DIAMETER (meters) ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33100)
33100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,33110) AF49L
33110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,33120) BF49L
33120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33130)
33130 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,33140) AF49S
33140 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,33150) BF49S
33150 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,33160)
33160 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,33170) AF49E
33170 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,33180) BF49E
33180 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,33190)
33190 FORMAT ('0','SUBROUTINE WCLEAR, CALCULATED COSTS OUTPUT')
      WRITE (8,33200)
33200 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
     +USER DEFINED TANK DIAMETER')
      WRITE (8,33210) CLR1L
33210 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,33220) CLR1S
33220 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,33230) CLR1E
33230 FORMAT (8X,'EQUIPMENT              ',F17.2)
```

```
      WRITE (8,33240)
33240 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
     +PROGRAM DEFINED TANK DIAMETER USING RISE AND FLOW RATES')
      WRITE (8,33250) CLR2L
33250 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,33260) CLR2S
33260 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,33270) CLR2E
33270 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,33280)
33280 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON USER
     +DEFINED TANK DIAMETER')
      WRITE (8,33290) ACLR1L
33290 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,33300) ACLR1S
33300 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,33310) ACLR1E
33310 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,33320)
33320 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON
     +PROGRAM DEFINED TANK DIAMETER USING RISE AND FLOW RATES')
      WRITE (8,33330) ACLR2L
33330 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,33340) ACLR2S
33340 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,33350) ACLR2E
33350 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,33360)
33360 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON USER
     +DEFINED TANK DIAMETER')
      WRITE (8,33370) ACLR1T
33370 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,33380) CLR1TT
33380 FORMAT (8X,'PROJECT              ',F17.2)
      WRITE (8,33390)
33390 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON PROGRAM
     +DEFINED TANK DIAMETER USING RISE AND FLOW RATES')
      WRITE (8,33400) ACLR2T
33400 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,33410) CLR2TT
33410 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
```

```
C
C
C
      SUBROUTINE NEUTRL
C
C
C   COSTS FOR OPERATION OF EQUIPMENT FOR
C   WASTE WATER NEUTRALIZATION
C
C    NEUTRL
      REAL
     +            FLOW34,
     +            NTRLL,  NTRLS,  NTRLE,
     +            AF34L,  AF34S,  AF34E,
     +            BF34L,  BF34S,  BF34E,
     +            ANTRTL, ANTRLS, ANTRLE,
     +            ANTRLT, NTRLTT
C
C   READ FLOW RATE OF WASTE WATER EFFLUENT IN LITERS PER SECOND
C
      READ (7,10,REC=2604) FLOW34
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS
      NTRLL =  84.85  * (FLOW34 ** 0.000)
      NTRLS =  21.282 * (FLOW34 ** 0.997)
      NTRLE =   1.801 * (FLOW34 ** 0.563)
C
C   CONSIDER ADJUSTMENT FACTORS
C
C   OTHER USER APLLIED FACTORS "A" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   AF34L.....AF34S.....AF34E
      READ (7,20,REC=2611) AF34L
      READ (7,20,REC=2623) AF34S
      READ (7,20,REC=2635) AF34E
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B" FOR LABOR, SUPPLIES AND
EQUIPMENT..
C   BF34L.....BF34S.....BF34E
      READ (7,30,REC=2616) BF34L
      READ (7,30,REC=2628) BF34S
      READ (7,30,REC=2640) BF34E
```

```
  30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ANTRLL = NTRLL * AF34L * BF34L
      ANTRLS = NTRLS * AF34S * BF34S
      ANTRLE = NTRLE * AF34E * BF34E
C
C   CALCULATE TOTAL ADJUSTED COST
      ANTRLT = ANTRLL + ANTRLS + ANTRLS
C
C   CALCULATE TOTAL COST
      NTRLTT = ANTRLT
C
C  PRINT ROUTINE FOR SUBROUTINE NEUTRL.....
C
      WRITE (8,34009)
34009 FORMAT (//)
      WRITE (8,34010)
34010 FORMAT ('0','SUBROUTINE NEUTRL, COSTS FOR OPERATION
     +OF EQUIPMENT FOR WASTE WATER NEUTRALIZATION,
     +ESTIMATES BASED ON FLOW RATES IN LITERS PER SECOND,
     +USER DEFINED INPUT')
      WRITE (8,34020)
34020 FORMAT ('0',4X,'UNIT CONSIDERED IS TOTAL FLOW RATE IN
     +LITERS PER SECOND')
      WRITE (8,34030) FLOW50
34030 FORMAT (8X,'FLOW RATE              ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,34040)
34040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO LABOR')
      WRITE (8,34050) AF50L
34050 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,34060) BF50L
34060 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,34070)
34070 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO SUPPLIES')
      WRITE (8,34080) AF50S
34080 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,34090) BF50S
```

```
34090 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,34100)
34100 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO EQUIPMENT')
      WRITE (8,34110) AF50E
34110 FORMAT (8X,'OTHER USER FACTOR A    ',F17.2)
      WRITE (8,34120) BF50E
34120 FORMAT (8X,'OTHER USER FACTOR B    ',F17.2)
C-----------------------------------------------------------------
C-----------------------------------------------------------------
      WRITE (8,34130)
34130 FORMAT ('0','SUBROUTINE NEUTRL, CALCULATED COSTS OUTPUT')
      WRITE (8,34140)
34140 FORMAT ('0',4X,'BASE COST FOR SYSTEM BASED ON
     +USER DEFINED FLOW RATES')
      WRITE (8,34150) NTRLL
34150 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,34160) NTRLS
34160 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,34170) NTRLE
34170 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,34180)
34180 FORMAT ('0',4X,'ADJUSTED COST FOR SYSTEM BASED ON USER
     +DEFINED FLOW RATES')
      WRITE (8,34190) ANTRLL
34190 FORMAT (8X,'LABOR                ',F17.2)
      WRITE (8,34200) ANTRLS
34200 FORMAT (8X,'SUPPLIES             ',F17.2)
      WRITE (8,34210) ANTRLE
34210 FORMAT (8X,'EQUIPMENT              ',F17.2)
      WRITE (8,34220)
34220 FORMAT ('0',4X,'TOTAL COST FOR SYSTEM BASED ON USER
     +DEFINED FLOW RATE')
      WRITE (8,34230) ANTRLT
34230 FORMAT (8X,'PER SYSTEM              ',F17.2)
      WRITE (8,34240) NTRLTT
34240 FORMAT (8X,'PROJECT              ',F17.2)
C
      RETURN
      END
C
C
```

```
      SUBROUTINE GEN
C
C
C   WORKING CAPITAL REQUIRED TO MAINTAIN OPERATION
C
C     GEN
      REAL
     +            CAP35,
     +            TOTL,
     +            A1F35, A2F35, A3F35,
     +            B1F35, B2F35, B3F35,
     +            ATOTL,
     +            ATOTLT,
     +            TOTLTT
C
C   READ TOTAL OPERATING CAPITAL REQUIRED
C
      READ (7,10,REC=2650) CAP35
   10 FORMAT (15X,F17.2)
C
C   CALCULATE BASE COSTS, ADMINMISTRATIVE COSTS
      TOTL = CAP35
C
C   OTHER USER APLLIED FACTORS "A", APPLIED TO OPERATRIONS     .....
C   A1F35.....A2F35.....A3F35
      READ (7,20,REC=2657) A1F35
      READ (7,20,REC=2662) A2F35
      READ (7,20,REC=2667) A3F35
   20 FORMAT (15X,F17.2)
C
C   OTHER USER APPLIED FACTORS "B", APPLIED TO OPERATIONS      .....
C   B1F35.....B2F35.....B3F35
      READ (7,30,REC=2672) B1F35
      READ (7,30,REC=2677) B2F35
      READ (7,30,REC=2682) B3F35
   30 FORMAT (15X,F17.2)
C
C   CALCULATE ADJUSTED COSTS
      ATOTL = TOTL * A1F35 * A2F35 * A3F35 * B1F35 *
     +        B2F35 * B3F35
C
C   CALCULATE TOTAL ADJUSTED COST
      ATOTLT = ATOTL
C
```

```
C   CALCULATE TOTAL COST
      TOTLTT = ATOTLT
C
C  PRINT ROUTINE FOR SUBROUTINE GEN .....
C
      WRITE (8,35009)
35009 FORMAT (//)
      WRITE (8,35010)
35010 FORMAT ('0','SUBROUTINE GEN, CAPITAL REQUIRED TO
     +MAINTAIN OPERATION, USER DEFINED INPUT')
      WRITE (8,35020)
35020 FORMAT ('0',4X,'UNIT CONSIDERED IS CAPITAL USER
     +WISHES TO MAINTAIN')
      WRITE (8,35030) CAP52
35030 FORMAT (8X,'CAPITAL DOLLARS        ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35040)
35040 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO CAPITAL')
      WRITE (8,35050) A1F52
35050 FORMAT (8X,'OTHER USER FACTOR A1    ',F17.2)
      WRITE (8,35060) A2F52
35060 FORMAT (8X,'OTHER USER FACTOR A2    ',F17.2)
      WRITE (8,35070) A3F52
35070 FORMAT (8X,'OTHER USER FACTOR A3    ',F17.2)
C
C-----------------------------------------------------------------
C
      WRITE (8,35080)
35080 FORMAT ('0',4X,'CORRECTION FACTORS APPLIED TO CAPITAL')
      WRITE (8,35090) B1F52
35090 FORMAT (8X,'OTHER USER FACTOR B1    ',F17.2)
      WRITE (8,35100) B2F52
35100 FORMAT (8X,'OTHER USER FACTOR B2    ',F17.2)
      WRITE (8,35110) B3F52
35110 FORMAT (8X,'OTHER USER FACTOR B3    ',F17.2)
C
C-----------------------------------------------------------------
C
C-----------------------------------------------------------------
C-----------------------------------------------------------------
C
      WRITE (8,35120)
```

```
35120 FORMAT ('0','SUBROUTINE GEN, CALCULATED COSTS OUTPUT')
      WRITE (8,35130)
35130 FORMAT ('0',4X,'BASE CAPITAL')
      WRITE (8,35140) TOTL
35140 FORMAT (8X,'CAPITAL BASE          ',F17.2)
      WRITE (8,35150)
35150 FORMAT ('0',4X,'ADJUSTED CAPITAL')
      WRITE (8,35160) ATOTL
35160 FORMAT (8X,'CAPITAL ADJUSTED      ',F17.2)
      WRITE (8,35170)
35170 FORMAT ('0',4X,'TOTAL CAPITAL')
      WRITE (8,35180) TOTLTT
35180 FORMAT (8X,'CAPITAL TOTAL         ',F17.2)
C
      RETURN
      END
C
C
C
```

Appendix G
UOP.DAT, DATAFILE FOR UOP1.FOR AND UOP2.FOR

DATAFILE UOP.DAT.....
DATA FILE FOR UOP1 AND UOP2. A COST ESTIMATING PROGRAM TO ESTIMATE CAPITAL COSTS TO BE INCURRED IN DEVELOPING AN UNDERGROUND ROOM AND PILLAR MINING OPERATION. FOLLOW THE DIRECTIONS OUTLINED ON THE FOLLOWING SCREENS TO PROPERLY PREPARE THE DATA FILE FOR EXECUTION WITH THE MAIN PROGRAM.

CHOOSE THE COST ESTIMATING SUBROUTINES YOU WISH TO USE FROM THE LIST WHICH FOLLOWS. TO ACTIVATE A SUBROUTINE YOU SHOULD ENTER A NUMERAL "1" IN COLUMN 35 AFTER THE SUBROUTINE NAME ON THE SAME LINE. IF YOU DO NOT WISH TO USE A SUBROUTINE PLACE A NUMERAL "0" IN THIS LOCATION. IF YOU CHOSE TO ACTIVATE A COST ESTIMATING SUBROUTINE YOU MUST PROVIDE ANSWERS TO ALL OF THE DATA INPUT QUESTIONS WHICH RELATE TO THAT SUBROUTINE. FAIILURE TO PROVIDE THIS DATA, IN THE UNITS SPECIFIED, WILL RESULT IN MAIN PROGRAM EXECUTION ERROR....

YOUR COST ESTIMATING SUBROUTINE CHOICES ARE AS FOLLOWS:

C
O
L
U
N
M

3
5

UOP1.FOR
RECORD=31 SUBROUTINES
NUMBERS 1
THROUGH 25
(INCLUSIVE)

1) CORING.....0
2) SSHAFT.....0
3) SMRAIL.....0
4) SMTIRE.....0
5) MEDTIRE.....0
6) LGRAIL.....0
7) LGTIRE.....0
8) DRIVES.....0
9) DROP.....0
10) RAISES.....0
11) DECLIN.....0
12) LGROOM.....0

13) HPANEL.....0
14) SPANEL.....0
15) HMINE.....0
16) SMINE.....0
17) PUMP1.....0
18) HOISTD.....0
19) HOISTF.....0
20) JUMBOS.....0
21) JKLEGS.....0
22) CONV1.....0
23) LHD.....0
24) RRHAUL.....0
25) TRUCKS.....0 END UOP1 SUBROUTINES
26) AIR.....0 BEGIN UOP1.FOR
27) OPER.....0 SUBROUTINES 26 THROUGH
28) PPOWER.....0 35 INCLUSIVE
29) STOCKP.....0
30) VENT.....0
31) DRAIN.....0
32) WATER.....0
33) WCLEAR.....0
34) NEUTRL.....0
35) GEN.....0 END UOP2.FOR SUBROUTINES

NOW THAT THE COST ESTIMATING SUBROUTINE(S) TO BE USED HAVE BEEN DEFINED PROCEED THROUGH THIS DATA FILE AND PROVIDE ALL INFORMATION REQUIRED UNDER EACH COST ESTIMATING SUBROUTINE YOU SELECTED FOR USE. DATA MUST BE IN THE UNITS SPECIFIED AND PLACED IN COLUMNS 16 THROUGH 32. THE "*" SYMBOL SURROUNDS THE COLUMNS RESERVED FOR THE PLACEMENT OF YOUR DATA. THE DECIMAL PLACE SHOULD NOT BE MOVED AND ONLY 2 DIGITS SHOULD BE PROVIDED AFTER THE DECIMAL POINT. SEE U.S. BUREAU OF MINES (1987) PUBLICATION LISTED IN THE REFERENCES FOR RANGES OF VALUES TO BE USED AS CORRECTION FACTORS FOR THE VARIABLES REQUESTED.

C O L U M N	C O L U M N
1	3
6	2

SUBROUTINE:CORING

...VARIABLES:

NAME: METR1
DESCRIPTION: METERS OF CORE DRILLED FOR PREPRODUCTION
UNITS: METERS PER DAY
VALUE: 0.00 RECORD=111

...CORRECTION FACTORS FOR LABOR:

NAME: SBF1L
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE: 1.00 RECORD=118

NAME: AF1L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE: 1.00 RECORD=123

NAME: BF1L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE: 1.00 RECORD=128

...CORRECTION FACTORS FOR SUPPLIES:

NAME: SBF1S
DESCRIPTION: WORK COMPLETED BY SUBCONRACT
UNITS: NONE
VALUE: 1.00 RECORD=135

NAME: AF1S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE: 1.00 RECORD=140

NAME: BF1S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE: 1.00 RECORD=145

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: SBF1E
DESCRIPTION: WORK COMPLETED BY SUBCONTRACT
UNITS: NONE
VALUE: 1.00 RECORD=152

NAME: AF1E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE: 1.00 RECORD=157

NAME: BF1E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE: 1.00 RECORD=162

SUBROUTINE: SSHAFT

...VARIABLES:

NAME: AREA2
DESCRIPTION: FACE AREA OF SHAFT
UNITS: SQUARE METERS
VALUE:* 100.00******* RECORD=172

NAME: LONG2
DESCRIPTION: TOTAL LENGTH OF SHAFT

UNITS: METERS
VALUE:* 110.00******* RECORD=177

...TIMBER LINER FACTOR:

NAME: WFCT2
DESCRIPTION: TIMBER LINING FACTOR
UNITS: ENTER A 1.00 IF SHAFT IS TIMBER LINED, OR 0.00 IF NOT
VALUE:* 0.00******* RECORD=184

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT2
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 30000.00******* RECORD=191

...CORRECTION FACTORS FOR LABOR:

NAME: AF2L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=198

NAME: BF2L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=203

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF2S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=210

NAME: BF2S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=215

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF2E

DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=222

NAME: BF2E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=227

SUBROUTINE: SMRAIL
...VARIABLES:

NAME: AREA3
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=236

NAME: LONG3
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=241

...CORRECTION FOR ROCK HARDNESS

NAME: HFCT3
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=248

...CORRECTION FACTORS FOR LABOR:

NAME: BTF3L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=255

NAME: TMF3L
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=260

NAME: AF3L
DESCRIPTION: OTHER USER FACTOR A

UNITS: NONE
VALUE:* 1.00******* RECORD=265

NAME: BF3L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=270

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF3S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=277

NAME: TMF3S
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=282

NAME: AF3S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=287

NAME: BF3S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=292

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF3E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=299

NAME: TMF3E
DESCRIPTION: TIMBERING TO SUPPORT DRIFT
UNITS: NONE
VALUE:* 1.00******* RECORD=304

NAME: AF3E
DESCRIPTION: OTHER USER FACTOR A

UNITS: NONE
VALUE:* 1.00******* RECORD=309

NAME: BF3E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=314

SUBROUTINE: SMTIRE

...VARIABLES:

NAME: AREA4
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=323

NAME: LONG4
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=328

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT4
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=335

...CORRECTION FACTORS FOR LABOR:

NAME: BTF4L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=342

NAME: AF4L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=347

NAME: BF4L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE

VALUE:* 1.00******* RECORD=352

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF4S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=359

NAME: AF4S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=364

NAME: BF4S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=369

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF4E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=376

NAME: AF4E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=381

NAME: BF4E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=386

SUBROUTINE: MEDTIRE

...VARIABLES:

NAME: AREA5
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 80.00******* RECORD=395

NAME: LONG5
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 200.00******* RECORD=400

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT5
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 30000.00******* RECORD=407

...CORRECTION FACTORS FOR LABOR:

NAME: BTF5L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.70******* RECORD=414

NAME: STF5L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=419

NAME: CCF5L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=424

NAME: SSF5L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=429

NAME: AF5L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=434

NAME: BF5L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=439

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF5S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 3.00******* RECORD=447

NAME: STF5S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=452

NAME: CCF5S
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=457

NAME: SSF5S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=462

NAME: AF5S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=467

NAME: BF5S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=472

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF5E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.50******* RECORD=480

NAME: STF5E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE

VALUE:* 1.00******* RECORD=485

NAME: CCF5E
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=490

NAME: SSF5E
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=495

NAME: AF5E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=500

NAME: BF5E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=505

SUBROUTINE: LGRAIL

...VARIABLES:

NAME: AREA6
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=514

NAME: LONG6
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=519

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT6
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=526

...CORRECTION FACTORS FOR LABOR:

NAME: BTF6L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=533

NAME: STF6L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=538

NAME: CCF6L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=543

NAME: SSF6L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=548

NAME: DTF6L
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=553

NAME: AF6L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=558

NAME: BF6L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=563

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF6S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=571

NAME: STF6S

DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=576

NAME: CCF6S
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=581

NAME: SSF6S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=586

NAME: DTF6S
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=591

NAME: AF6S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=596

NAME: BF6S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=601

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF6E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=609

NAME: STF6E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=614

NAME: CCF6E
DESCRIPTION: CONCRETE LINER INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=619

NAME: SSF6E
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=624

NAME: DTF6E
DESCRIPTION: DUAL TRACK INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=629

NAME: AF6E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=634

NAME: BF6E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=639

SUBROUTINE: LGTIRE

...VARIABLES:

NAME: AREA7
DESCRIPTION: FACE AREA OF DRIFT
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=648

NAME: LONG7
DESCRIPTION: TOTAL LENGTH OF DRIFT
UNITS: METERS
VALUE:* 0.00******* RECORD=653

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT7
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=660

...CORRECTION FACTORS FOR LABOR:

NAME: BTF7L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=667

NAME: STF7L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=672

NAME: AF7L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=677

NAME: BF7L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=682

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF7S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=690

NAME: STF7S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=695

NAME: AF7S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=700

NAME: BF7S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=705

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF7E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=713

NAME: STF7E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=718

NAME: AF7E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=723

NAME: BF7E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=728

SUBROUTINE: DRIVES

...VARIABLES:

NAME: AREA8
DESCRIPTION: FACE AREA OF DRIVE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=737

NAME: LONG8
DESCRIPTION: TOTAL LENGTH OF DRIVE
UNITS: METERS
VALUE:* 0.00******* RECORD=742

...CORRECTION FACTORS FOR LABOR:

NAME: TMF8L
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=749

NAME: RCF8L
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=754

NAME: RTF8L
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=759

NAME: SCF8L
DESCRIPTION: STEEL CHUTE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=764

NAME: AF8L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=769

NAME: BF8L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=774

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TMF8S
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=781

NAME: RCF8S
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=786

NAME: RTF8S
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=791

NAME: SCF8S
DESCRIPTION: STEEL CHUTE INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=796

NAME: AF8S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=801

NAME: BF8S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=806

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TMF8E
DESCRIPTION: TIMBER SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=814

NAME: RCF8E
DESCRIPTION: RAISE CLIMBER USED IN DEVELOPMENT
UNITS: NONE
VALUE:* 1.00******* RECORD=819

NAME: RTF8E
DESCRIPTION: RUBBER TIRED MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=824

NAME: SCF8E
DESCRIPTION: STEEL CHUTE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=829

NAME: AF8E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=834

NAME: BF8E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE

VALUE:* 1.00******* RECORD=839

SUBROUTINE: DROP

...VARIABLES:

NAME; AREA9
DESCRIPTION: FACE AREA OF RAISE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=848

NAME: LONG9
DESCRIPTION: TOTAL LENGTH OF RAISE
UNITS: METERS
VALUE:* 0.00******* RECORD=853

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT9
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=860

...CORRECTION FACTORS FOR LABOR:

NAME: SRF9L
DESCRIPTION: SERVICE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=867

NAME: AF9L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=872

NAME: BF9L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=877

...CORRECTION FACTORS FOR SUPPLIES:

NAME: SRF9S
DESCRIPTION: SERVICE INSTALLATION

UNITS: NONE
VALUE:* 1.00******* RECORD=884

NAME: AF9S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=889

NAME: BF9S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=894

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: SRF9E
DESCRIPTION: SERVICE INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=901

NAME: AF9E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=906

NAME: BF9E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=911

SUBROUTINE: RAISES

...VARIABLES:

NAME: AREA10
DESCRIPTION: FACE AREA OF RAISE
UNITS: SQUARE METERS
VALUE:* 80.00******* RECORD=920

NAME: LONG10
DESCRIPTION: TOTAL LENGTH OF RAISE
UNITS: METERS
VALUE:* 200.00******* RECORD=925

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT10
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 30000.00******* RECORD=932

...CORRECTION FACTOR FOR LENGTH OF RAISE

NAME: LFCT10
DESCRIPTION: PROPORTIONING OF COST BASED ON RAISE LENGTH
UNITS: ENTER A 1.00 IF USED, OR 0.00 IF NOT
VALUE:* 0.00******* RECORD=939

...CORRECTION FACTORS FOR LABOR:

NAME: LNF10L
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=946

NAME: SRF10L
DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=951

NAME: AF10L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=956

NAME: BF10L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=961

...CORRECTION FACTORS FOR SUPPLIES:

NAME: LNF10S
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=968

NAME: SRF10S

DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=973

NAME: AF10S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=978

NAME: BF10S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=983

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: LNF10E
DESCRIPTION: RAISE LINING INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=990

NAME: SRF10E
DESCRIPTION: SERVICE INSTALATION
UNITS: NONE
VALUE:* 1.00******* RECORD=995

NAME: AF10E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1000

NAME: BF10E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1005

SUBROUTINE: DECLIN

...VARIABLES:

NAME: AREA11
DESCRIPTION: FACE AREA OF INCLINE OR DECLINE
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1014

NAME: LONG11
DESCRIPTION: TOTAL LENGTH OF INCLINE OR DECLINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1019

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT11
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1026

...CORRECTION FACTORS FOR LABOR:

NAME: BTF11L
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1033

NAME: STF11L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1038

NAME: CCF11L
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1043

NAME: SSF11L
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1048

NAME: AF11L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1053

NAME: BF11L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1058

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BTF11S
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1065

NAME: STF11S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1070

NAME: CCF11S
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1075

NAME: SSF11S
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1080

NAME: AF11S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1085

NAME: BF11S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1090

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BTF11E
DESCRIPTION: ROCK BOLT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1097

NAME: STF11E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1102

NAME: CCF11E
DESCRIPTION: CONCRETE LINER INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1107

NAME: SSF11E
DESCRIPTION: STEEL SET SUPPORT INSTALLATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1112

NAME: AF11E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1117

NAME: BF11E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1122

SUBROUTINE: LGROOM

...VARIABLES:

NAME: AREA12
DESCRIPTION: FACE AREA OF ROOM WALL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1131

NAME: LONG12
DESCRIPTION: TOTAL LENGTH OF ROOM
UNITS: METERS
VALUE:* 0.00******* RECORD=1136

...CORRECTION FACTORS FOR LABOR:

NAME: TKF12L
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1143

NAME: STF12L
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE

VALUE:* 1.00******* RECORD=1148

NAME: AF12L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1153

NAME: BF12L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1158

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TKF12S
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1165

NAME: STF12S
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE
VALUE:* 1.00******* RECORD=1170

NAME: AF12S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1175

NAME: BF12S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1180

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TKF12E
DESCRIPTION: TRACK HAULAGE MUCK DISPOSAL
UNITS: NONE
VALUE:* 1.00******* RECORD=1187

NAME: STF12E
DESCRIPTION: SHOTCRETE APPLICATION
UNITS: NONE

VALUE:* 1.00******* RECORD=1192

NAME: AF12E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1197

NAME: BF12E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1202

SUBROUTINE: HPANEL

...VARIABLES:

NAME: AREA13
DESCRIPTION: PLAN VIEW AREA OF PANEL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1211

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT13
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1218

...CORRECTION FACTORS FOR LABOR:

NAME: AF13L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1225

NAME: BF13L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1230

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF13S
DESCRIPTION: OTHER USER FACTOR A

UNITS: NONE
VALUE:* 1.00******* RECORD=1237

NAME: BF13S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1242

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF13E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1249

NAME: BF13E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1254

SUBROUTINE: SPANEL

...VARIABLES:

NAME: AREA14
DESCRIPTION: PLAN VIEW AREA OF PANEL
UNITS: SQUARE METERS
VALUE:* 0.00******* RECORD=1263

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT14
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1270

...CORRECTION FACTORS FOR LABOR:

NAME: AF14L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1277

NAME: BF14L

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1282

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF14S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1289

NAME: BF14S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1294

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF14E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1301

NAME: BF14E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1306

SUBROUTINE: HMINE

...VARIABLES:

NAME: TONS15
DESCRIPTION: TONS TO BE TRANSPORTED
UNITS: TONS PER DAY
VALUE:* 100.00******* RECORD=1315

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT15
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1322

...CORRECTION FACTORS FOR LABOR:

NAME: BFCT15L
DESCRIPTION: ROCK BENCH CORRECTION
UNITS: NONE
VALUE:* 1.00******* RECORD=1329

NAME: AF15L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1334

NAME: BF15L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1339

...CORRECTION FACTORS FOR SUPPLIES:

NAME: BFCT15S
DESCRIPTION: ROCK BENCH CORRECTION
UNITS: NONE
VALUE:* 1.00******* RECORD=1346

NAME: AF15S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1351

NAME: BF15S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1356

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: BFCT15E
DESCRIPTION: ROCK BENCH CORRECTION
UNITS: NONE
VALUE:* 1.00******* RECORD=1363

NAME: AF15E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE

VALUE:* 1.00******* RECORD=1368

NAME: BF15E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1373

SUBROUTINE: SMINE

...VARIABLES:

NAME: TONS16
DESCRIPTION: TONS TO BE TRANSPORTED
UNITS: TONS PER DAY
VALUE:* 100.00******* RECORD=1382

...CORRECTION FACTOR FOR ROCK HARDNESS

NAME: HFCT16
DESCRIPTION: ROCK HARDNESS
UNITS: POUNDS PER SQUARE INCH (PSI)
VALUE:* 0.00******* RECORD=1389

...CORRECTION FACTORS FOR LABOR:

NAME: AF16L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1396

NAME: BF16L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1401

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF16S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1408

NAME: BF16S
DESCRIPTION: OTHER USER FACTOR B

UNITS: NONE
VALUE:* 1.00******* RECORD=1413

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF16E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1420

NAME: BF16E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1425

SUBROUTINE: PUMP1

...VARIABLES:

NAME: FLOW17
DESCRIPTION: TOTAL WATER PUMPING REQUIREMENTS
UNITS: CUBIC METERS PER DAY
VALUE:* 0.00******* RECORD=1434

...CORRECTION FACTORS FOR LABOR:

NAME: AF17L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1442

NAME: BF17L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1447

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF17S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1454

NAME: BF17S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1459

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF17E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1466

NAME: BF17E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1471

SUBROUTINE: HOISTD

...VARIABLES:

NAME: TONS18
DESCRIPTION: TOTAL HOIST CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1480

...CORRECTION FACTOR FOR TOTAL VERTICAL HEIGHT OUT OF MINE

NAME: VFCT18
DESCRIPTION: VERTICAL HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=1487

...SERVICE HOIST FACTOR:

NAME: SFCT18
DESCRIPTION: HOIST TO BE USED FOR SERVICES ONLY
UNITS: ENTER A 1.00 IF SERVICE ONLY, OR 0.00 IF NOT
VALUE:* 1.00******* RECORD=1494

...CORRECTION FACTORS FOR LABOR:

NAME: AF18L
DESCRIPTION: OTHER USER FACTOR A

UNITS: NONE
VALUE:* 1.00******* RECORD=1501

NAME: BF18L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1506

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF18S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1513

NAME: BF18S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1518

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF18E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1525

NAME: BF18E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1530

SUBROUTINE: HOISTF

...VARIABLES:

NAME: TONS19
DESCRIPTION: TOTAL HOIST CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 100.00******* RECORD=1539

...CORRECTION FACTOR FOR TOTAL VERTICAL HEIGHT OUT OF MINE

NAME: VFCT19

DESCRIPTION: VERTICAL HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 110.00******* RECORD=1546

...SERVICE HOIST FACTOR:

NAME: SFCT19
DESCRIPTION: HOIST TO BE USED FOR SERVICES ONLY
UNITS: ENTER A 1.00 IF SERVICE ONLY, OR 0.00 IF NOT
VALUE:* 0.00******* RECORD=1553

...CORRECTION FACTORS FOR LABOR:

NAME: AF19L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1560

NAME: BF19L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1565

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF19S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1572

NAME: BF19S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1577

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF19E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1584

NAME: BF19E
DESCRIPTION: OTHER USER FACTOR B

UNITS: NONE
VALUE:* 1.00******* RECORD=1589

SUBROUTINE: JUMBOS

...VARIABLES:

NAME: TONS20
DESCRIPTION: TOTAL PRODUCTION CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 125.00******* RECORD=1598

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT20
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTERGER NUMBER 1, 2 OR 3
VALUE:* 3.00******* RECORD=1605

...CORRECTION FACTORS FOR LABOR:

NAME: AF20L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1612

NAME: BF20L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1617

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF20S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1624

NAME: BF20S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1629

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF20E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1636

NAME: BF20E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1641

SUBROUTINE: JKLEGS

...VARIABLES:

NAME: TONS21
DESCRIPTION: TOTAL PRODUCTION CAPACITY REQUIRED
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1650

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT21
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1657

...CORRECTION FACTORS FOR LABOR:

NAME: AF21L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1664

NAME: BF21L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1669

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF21S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1676

NAME: BF21S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1681

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF21E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1688

NAME: BF21E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1693

SUBROUTINE: CONV1

...VARIABLES:

NAME: TONS22
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1703

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT22
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1,2 OR 3
VALUE:* 1.00******* RECORD=1710

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT22
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1717

...CORRECTION FACTORS FOR LABOR:

NAME: AF22L

DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1724

NAME: BF22L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1729

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF22S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1736

NAME: BF22S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1741

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF22E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1748

NAME: BF22E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1753

SUBROUTINE: LHD

...VARIABLES:

NAME: TONS23
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******** RECORD=1762

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT23
DESCRIPTION: NUMBER OF SHIFTS 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1769

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT23
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1776

...CORRECTION FACTOR FOR GRADE OF INCLINE OR DECLINE

NAME: GFCT23
DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
UNITS: GRADE IN PERCENT OF INCLINE OR DECLINE (POSITIVE ONLY)
VALUE:* 0.00******* RECORD=1783

...CORRECTION FACTORS FOR LABOR:

NAME: AF23L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1790

NAME: BF23L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1795

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF23S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1802

NAME: BF23S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1807

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF23E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=1814

NAME: BF23E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=1819

SUBROUTINE: RRHAUL

...VARIABLES:

NAME: TONS24
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1828

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT24
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1835

...CORRECTION FACTOR FOR DISTANCE

NAME: DFCT24
DESCRIPTION: DISTANCE
UNITS: METERS
VALUE:* 0.00******* RECORD=1842

...CORRECTION FACTORS FOR LABOR:

NAME: TRF24L
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=1850

NAME: DSF24L
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE

VALUE:* 1.00******* RECORD=1855

NAME: A1F24L
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1860

NAME: B1F24L
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1865

NAME: A2F24L
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1870

NAME: B2F24L
DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1875

NAME: A3F24L
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1880

NAME: B3F24L
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1885

...CORRECTION FACTORS FOR SUPPLIES:

NAME: TRF24S
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=1892

NAME: DSF24S
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=1898

NAME: A1F24S
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1903

NAME: B1F24S
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1908

NAME: A2F24S
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1913

NAME: B2F24S
DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1918

NAME: A3F24S
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1923

NAME: B3F24S
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1928

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: TRF24E
DESCRIPTION: TROLLEY LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=1935

NAME: DSF24E
DESCRIPTION: DIESEL LOCOMOTIVES TO BE USED
UNITS: NONE
VALUE:* 1.00******* RECORD=1940

NAME: A1F24E
DESCRIPTION: OTHER USER FACTOR A FOR ELECTRIC LOCOMOTIVES

UNITS: NONE
VALUE:* 1.00******* RECORD=1945

NAME: B1F24E
DESCRIPTION: OTHER USER FACTOR B FOR ELECTRIC LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1950

NAME: A2F24E
DESCRIPTION: OTHER USER FACTOR A FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1955

NAME: B2F24E
DESCRIPTION: OTHER USER FACTOR B FOR TROLLEY LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1960

NAME: A3F24E
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1965

NAME: B3F24E
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL LOCOMOTIVES
UNITS: NONE
VALUE:* 1.00******* RECORD=1970

SUBROUTINE: TRUCKS

...VARIABLES:

NAME: TONS25
DESCRIPTION: TOTAL REQUIRED TRANSPORT CAPACITY
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=1979

...CORRECTION FACTOR FOR NUMBER OF SHIFTS WORKED PER DAY

NAME: SHFT25
DESCRIPTION: NUMBER OF 8 HR. SHIFTS PER 24 HR. DAY
UNITS: INTEGER NUMBER 1, 2 OR 3
VALUE:* 1.00******* RECORD=1986

...CORRECTION FACTOR FOR TOTAL DISTANCE TRANSPORTED

NAME: DFCT25
DESCRIPTION: TOTAL DISTANCE TRANSPORTED
UNITS: METERS
VALUE:* 0.00******* RECORD=1993

...CORRECTION FACTOR FOR GRADE OF INCLINE

NAME: IFCT25
DESCRIPTION: GRADE OF TRANSPORT CORRIDOR
UNITS: GRADE IN PERCENT OF INCLINE (USE 0.00 FOR ANY DECLINE)
VALUE:* 0.00******* RECORD=2000

...CORRECTION FACTORS FOR LABOR:

NAME: AF25L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2007

NAME: BF25L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2012

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF25S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2019

NAME: BF25S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2024

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF25E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2031

NAME: BF25E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2036

SUBROUTINE: AIR

...VARIABLES:

NAME: AIR26
DESCRIPTION: TOTAL COMPRESSOR CAPACITY NEEDED
UNITS: CUBIC METERS INSTALLED CAPACITY PER MINUTE
VALUE:* 0.00******* RECORD=2046

...CORRECTION FACTOR FOR ALTITUDE

NAME: AFCT26
DESCRIPTION: ALTITIDE ADJUSTMENT
UNITS: ELEVATION OF INSTALLATION IN METERS ABOVE SEA-LEVEL
VALUE:* 0.00******* RECORD=2053

...CORRECTION FACTORS FOR LABOR:

NAME: AF26L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2060

NAME: BF26L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2065

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF26S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2072

NAME: BF26S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE

VALUE:* 1.00******* RECORD=2077

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF26E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2084

NAME: BF26E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2089

SUBROUTINE: OPER

...VARIABLES:

NAME: TONS27
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2099

...CORRECTION FACTORS FOR LABOR:

NAME: AF27L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2106

NAME: BF27L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2111

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF27S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2118

NAME: BF27S

DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2123

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF27E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2130

NAME: BF27E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2135

SUBROUTINE: PPOWER

...VARIABLES:

NAME: KWT28
DESCRIPTION: TOTAL REQUIRED POWER CAPACITY
UNITS: KILOWATTS
VALUE:* 0.00******* RECORD=2144

...CORRECTION FACTORS FOR LABOR:

NAME: ADF28L
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2151

NAME: BDF28L
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2156

NAME: ATF28L
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2161

NAME: BTF28L
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE GENERATORS

UNITS: NONE
VALUE:* 1.00******* RECORD=2166

...CORRECTION FACTORS FOR SUPPLIES:

NAME: ADF28S
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2173

NAME: BDF28S
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2178

NAME: ATF28S
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2183

NAME: BTF28S
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2188

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: ADF28E
DESCRIPTION: OTHER USER FACTOR A FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2195

NAME: BDF28E
DESCRIPTION: OTHER USER FACTOR B FOR DIESEL GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2200

NAME: ATF28E
DESCRIPTION: OTHER USER FACTOR A FOR TURBINE GENERATORS
UNITS: NONE
VALUE:* 1.00******* RECORD=2205

NAME: BTF28E
DESCRIPTION: OTHER USER FACTOR B FOR TURBINE GENERATORS

UNITS: NONE
VALUE:* 1.00******* RECORD=2210

SUBROUTINE: STOCKP

...VARIABLES:

NAME: TONS29
DESCRIPTION: TOTAL LIVE STORAGE CAPACITY REQUIRED
UNITS: METRIC TONS
VALUE:* 0.00******* RECORD=2220

...CORRECTION FACTORS FOR LABOR:

NAME: AF29L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2227

NAME: BF29L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2232

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF29S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2239

NAME: BF29S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2244

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: AF29E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2251

NAME: BF29E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2256

SUBROUTINE: VENT

...VARIABLES:

NAME: AIR30
DESCRIPTION: TOTAL VENTILATION AIR CAPACITY REQUIRED
UNITS: CUBIC METERS PER MINUTE
VALUE:* 0.00******* RECORD=2266

...CORRECTION FACTORS FOR LABOR:

NAME: ACF30L
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2273

NAME: AWF30L
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2278

NAME: AF30L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2283

NAME: BF30L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2288

...CORRECTION FACTORS FOR SUPPLIES:

NAME: ACF30S
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2295

NAME: AWF30S
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2300

NAME: AF30S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2305

NAME: BF30S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2310

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: ACF30E
DESCRIPTION: AIR COOLING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2317

NAME: AWF30E
DESCRIPTION: AIR WARMING CAPACITY
UNITS: NONE
VALUE:* 1.00******* RECORD=2322

NAME: AF30E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2327

NAME: BF30E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2332

SUBROUTINE: DRAIN

...VARIABLES:

NAME: H2031
DESCRIPTION: TOTAL WATER PUMPING CAPACITY REQUIRED
UNITS: CUBIC METERS PER DAY

VALUE:* 0.00******* RECORD=2341

...CORRECTION FACTOR FOR PUMPING HEIGHT

NAME: VFCT31
DESCRIPTION: VERTICAL PUMPING HEIGHT OUT OF MINE
UNITS: METERS
VALUE:* 0.00******* RECORD=2348

...CORRECTION FACTORS FOR LABOR:

NAME: HSF31L
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=2355

NAME: HNF31L
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=2360

NAME: AF31L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2365

NAME: BF31L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2370

...CORRECTION FACTORS FOR SUPPLIES:

NAME: HSF31S
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=2377

NAME: HNF31S
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=2382

NAME: AF31S

DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2387

NAME: BF31S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2392

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: HSF31E
DESCRIPTION: HORIZONTAL DRAINAGE, AFTER SETTLING
UNITS: NONE
VALUE:* 1.00******* RECORD=2399

NAME: HNF31E
DESCRIPTION: HORIZONTAL DRAINAGE, NO SETTLING ALLOWED
UNITS: NONE
VALUE:* 1.00******* RECORD=2404

NAME: AF31E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2409

NAME: BF31E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2414

SUBROUTINE: WATER

...VARIABLES:

NAME: H2032
DESCRIPTION: TOTAL WATER DEMAND CAPACITY REQUIRED
UNITS: CUBIC METERS PER DAY
VALUE:* 0.00******* RECORD=2423

NAME: TONS32
DESCRIPTION: TOTAL MATERIAL PRODUCTION
UNITS: METRIC TONS PER DAY
VALUE:* 0.00******* RECORD=2428

...CORRECTION FACTORS FOR LABOR:

NAME: PWF32L
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=2435

NAME: A1F32L
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2440

NAME: B1F32L
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2445

NAME: A2F32L
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2450

NAME: B2F32L
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2455

NAME: A3F32L
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2460

NAME: B3F32L
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2465

...CORRECTION FACTORS FOR SUPPLIES:

NAME: PWF32S
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE

VALUE:* 1.00******* RECORD=2472

NAME: A1F32S
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2477

NAME: B1F32S
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2482

NAME: A2F32S
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2487

NAME: B2F32S
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2492

NAME: A3F32S
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG
DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2497

NAME: B3F32S
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG
DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2502

...CORRECTION FACTORS FOR EQUIPMENT:

NAME: PWF32E
DESCRIPTION: PURCHASED WATER REQUIRED
UNITS: NONE
VALUE:* 1.00******* RECORD=2509

NAME: A1F32E
DESCRIPTION: OTHER USER FACTOR A, USER SPECIFIED DEMAND
UNITS: NONE

VALUE:* 1.00******* RECORD=2514

NAME: B1F32E
DESCRIPTION: OTHER USER FACTOR B, USER SPECIFIED DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2519

NAME: A2F32E
DESCRIPTION: OTHER USER FACTOR A, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2524

NAME: B2F32E
DESCRIPTION: OTHER USER FACTOR B, CALCULATED JUMBO DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2529

NAME: A3F32E
DESCRIPTION: OTHER USER FACTOR A, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2534

NAME: B3F32E
DESCRIPTION: OTHER USER FACTOR B, CALCULATED AIR-LEG DEMAND
UNITS: NONE
VALUE:* 1.00******* RECORD=2539

SUBROUTINE: WCLEAR

...VARIABLES:

NAME: DIA33
DESCRIPTION: USER SPECIFIED CLARIFIER DIAMETER
UNITS: METERS
VALUE:* 0.00******* RECORD=2549

NAME: RISE33
DESCRIPTION: DESIGN RISE RATE (TO ESTIMATE NEEDED DIAMETER)
UNITS: METERS PER MINUTE
VALUE:* 0.00******* RECORD=2554

NAME: FLOW33
DESCRIPTION: DESIGN INFLOW RATE (TO ESTIMATE NEEDED DIAMETER)
UNITS: CUBIC METERS PER MINUTE
VALUE:* 0.00******* RECORD=2559

...CORRECTION FACTORS FOR LABOR:

NAME: AF33L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2566

NAME: BF33L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2571

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF33S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2578

NAME: BF33S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2583

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: AF33E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2590

NAME: BF33E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2595

SUBROUTINE: NEUTRL

...VARIABLES:

NAME: FLOW34
DESCRIPTION: AVERAGE WASTE WATER FLOW RATE
UNITS: LITERS PER SECOND
VALUE:* 0.00******* RECORD=2604

...CORRECTION FACTORS FOR LABOR:

NAME: AF34L
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2611

NAME: BF34L
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2616

...CORRECTION FACTORS FOR SUPPLIES:

NAME: AF34S
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2623

NAME: BF34S
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2628

...CORRECTION FACTORS APPLIED TO EQUIPMENT

NAME: AF34E
DESCRIPTION: OTHER USER FACTOR A
UNITS: NONE
VALUE:* 1.00******* RECORD=2635

NAME: BF34E
DESCRIPTION: OTHER USER FACTOR B
UNITS: NONE
VALUE:* 1.00******* RECORD=2640

SUBROUTINE: GEN

...VARIABLES:

NAME: CAP35
DESCRIPTION: TOTAL OPERATION CAPITAL
UNITS: DOLLARS
VALUE:* 0.00******* RECORD=2650

...CORRECTION FACTORS FOR CAPITAL:

NAME: A1F35
DESCRIPTION: OTHER USER FACTOR A1
UNITS: NONE
VALUE:* 1.00******* RECORD=2657

NAME: A2F35
DESCRIPTION: OTHER USER FACTOR A2
UNITS: NONE
VALUE:* 1.00******* RECORD=2662

NAME: A3F35
DESCRIPTION: OTHER USER FACTOR A3
UNITS: NONE
VALUE:* 1.00******* RECORD=2667

NAME: B1F35
DESCRIPTION: OTHER USER FACTOR B1
UNITS: NONE
VALUE:* 1.00******* RECORD=2672

NAME: B2F35
DESCRIPTION: OTHER USER FACTOR B2
UNITS: NONE
VALUE:* 1.00******* RECORD=2677

NAME: B3F35
DESCRIPTION: OTHER USER FACTOR B3
UNITS: NONE
VALUE:* 1.00******* RECORD=2682

Appendix H
OUTPUT FROM UCAP1.FOR COST-ESTIMATION EXAMPLE

0SUBROUTINE CLEAR, COSTS FOR LAND CLEARING DURING PREPRODUCTION DEVELOPMENT, USER DEFINED INPUT

0	UNITS CONSIDERED ARE HECTACRES	
	UNITS TO BE CLEARED	10.00
0	PURCHASED EQUIPMENT FACTOR	
	PURCHASED EQUIPMENT	1.00
0	CORRECTION FACTORS APPLIED TO LABOR	
	BRUSH	1.20
	SIDE SLOPE	2.10
	BURNING	1.00
	SUBCONTRACTOR	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO SUPPLIES	
	BRUSH	1.10
	SIDE SLOPE	1.90
	BURNING	1.00
	SUBCONTRACTOR	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO EQUIPMENT	
	BRUSH	1.00
	SIDE SLOPE	2.70
	BURNING	1.00
	SUBCONTRACTOR	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00

0SUBROUTINE CLEARING, CALCULATED COSTS OUTPUT

0	BASE COST PER UNIT	
	LABOR	10299.77
	SUPPLIES	2234.89
	EQUIPMENT	4397.01
0	ADJUSTED COST PER UNIT	
	LABOR	25955.42
	SUPPLIES	4670.92
	EQUIPMENT	11871.93
0	TOTAL COSTS	
	PER UNIT	2684.26
	PROJECT	26842.62

0SUBROUTINE SSHAFT, COSTS FOR SINKING VERTICAL SHAFTS, USER DEFINED INPUT

0 UNITS CONSIDERED ARE METERS OF SHAFT
UNITS TO BE SUNK 110.00
SHAFT FACE AREA IN SQUARE METERS
FACE AREA 100.00
ROCK HARDNESS IN POUNDS PER SQUARE INCH
ROCK HARDNESS (psi) 30000.00
TIMBER FACTOR, YES=1, NO=0
TIMBER FACTOR 0.00

0 CORRECTION FACTORS APPLIED TO LABOR
ROCK HARDNESS 1.01
TIMBER LINING 1.00
OTHER USER FACTOR A 1.00
OTHER USER FACTOR B 1.00

0 CORRECTION FACTORS APPLIED TO SUPPLIES
ROCK HARDNESS 1.01
TIMBER LINING 1.00
OTHER USER FACTOR A 1.00
OTHER USER FACTOR B 1.00

0 CORRECTION FACTORS APPLIED TO EQUIPMENT
ROCK HARDNESS 0.00
TIMBER LINING 1.00
OTHER USER FACTOR A 1.00
OTHER USER FACTOR B 1.00

0SUBROUTINE SSHAFT, CALCULATED COSTS OUTPUT

0 BASE COST PER UNIT
LABOR 7469.60
SUPPLIES 2377.90
EQUIPMENT 4440.69

0 ADJUSTED COST PER UNIT
LABOR 7559.64
SUPPLIES 2402.35
EQUIPMENT 4461.71

0 TOTAL COSTS
PER UNIT 14423.70
PROJECT 1586607.50

0SUBROUTINE MEDTIRE, COSTS FOR DEVELOPING MEDIUM SIZED DRIFTS USED FOR HAULAGE BY RUBBER TIRE VEHICLES, USER DEFINED INPUT

0 UNITS CONSIDERED ARE METERS OF DRIFT

UNITS TO BE DRIFTED	200.00

DRIFT FACE AREA IN SQUARE METERS

FACE AREA	80.00

ROCK HARDNESS IN POUNDS PER SQUARE INCH

ROCK HARDNESS (psi)	30000.00

0 CORRECTION FACTORS APPLIED TO LABOR

ROCK HARDNESS	1.01
ROCK BOLTS	1.70
SHOTCRETE	1.00
CONCRETE LINER	1.00
STEEL SETS	1.00
OTHER USER FACTOR A	1.00
OTHER USER FACTOR B	1.00

0 CORRECTION FACTORS APPLIED TO SUPPLIES

ROCK HARDNESS	1.01
ROCK BOLTS	3.00
SHOTCRETE	1.00
CONCRETE LINER	1.00
STEEL SETS	1.00
OTHER USER FACTOR A	1.00
OTHER USER FACTOR B	1.00

0 CORRECTION FACTORS APPLIED TO EQUIPMENT

ROCK HARDNESS	1.00
ROCK BOLTS	1.50
SHOTCRETE	1.00
CONCRETE LINER	1.00
STEEL SETS	1.00
OTHER USER FACTOR A	1.00
OTHER USER FACTOR B	1.00

0SUBROUTINE MEDTIRE, CALCULATED COSTS OUTPUT

0	BASE COST PER UNIT	
	LABOR	401.33
	SUPPLIES	1160.74
	EQUIPMENT	76.94
0	ADJUSTED COST PER UNIT	
	LABOR	690.48
	SUPPLIES	3518.02
	EQUIPMENT	115.95
0	TOTAL COSTS	
	PER UNIT	4324.45
	PROJECT	864889.81

0SUBROUTINE RAISES, COSTS FOR DEVELOPING RAISES WITH UPWARD REAMED RAISE BORING, USER DEFINED INPUT

0	UNITS CONSIDERED ARE METERS OF RAISE	
	UNITS TO BE RAISED	200.00
	RAISE FACE AREA IN SQUARE METERS	
	FACE AREA	80.00
	ROCK HARDNESS IN POUNDS PER SQUARE INCH	
	ROCK HARDNESS (psi)	30000.00
	LENGTH FACTOR, YES=1, NO=0	
	LENGTH FACTOR	0.00
0	CORRECTION FACTORS APPLIED TO LABOR	
	ROCK HARDNESS	0.58
	LENGTH	1.00
	SERVICE INSTALLATION	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO SUPPLIES	
	ROCK HARDNESS	0.58
	LENGTH	1.00
	SERVICE INSTALLATION	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO EQUIPMENT	
	ROCK HARDNESS	0.58
	LENGTH	1.00
	SERVICE INSTALLATION	1.00
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00

0SUBROUTINE RAISES, CALCULATED COSTS OUTPUT

0	BASE COST PER UNIT	
	LABOR	34052.83
	SUPPLIES	22100.16
	EQUIPMENT	103662.76
0	ADJUSTED COST PER UNIT	
	LABOR	19895.81
	SUPPLIES	12912.31
	EQUIPMENT	60566.34
0	TOTAL COSTS	
	PER UNIT	93374.46
	PROJECT	18674892.00

0SUBROUTINE HOISTF, COSTS FOR ACQUISITION AND INSTALLATION OF FRICTION HOIST, USER DEFINED INPUT

0	UNIT CONSIDERED IS TOTAL METRIC TONS HOISTED PER DAY	
	TONS TO BE HOISTED	100.00
	TOTAL DEPTH TO BE HOISTED IN METERS	
	TOTAL DEPTH (meters)	110.00
	SERVICE HOIST FACTOR, YES=1, NO=0	
	SERVICE FACTOR	0.00
0	CORRECTION FACTORS APPLIED TO LABOR	
	DEPTH	0.51
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO SUPPLIES	
	DEPTH	0.51
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO EQUIPMENT	
	DEPTH	0.51
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00

0SUBROUTINE HOISTF, CALCULATED COSTS OUTPUT

0	BASE COST PER HOIST	
	LABOR	114495.79
	SUPPLIES	190826.28
	EQUIPMENT	330765.59
0	ADJUSTED COST PER HOIST	
	LABOR	58255.37
	SUPPLIES	97092.27
	EQUIPMENT	168293.28
0	TOTAL COST	
	PER UNIT	323640.94
	PROJECT	323640.94

0SUBROUTINE JUMBOS, COSTS FOR ACQUISITION OF DRILL AND BLAST EQUIPMENT FOR USE WITH JUMBOS AS PRIMARY PRODUCTION EQUIPMENT, USER DEFINED INPUT

0	UNIT CONSIDERED IS TOTAL METRIC TONS PRODUCED PER DAY	
	TONS TO BE PRODUCED	125.00
	NUMBER OF SHIFTS OPERATED PER DAY	
	SHIFTS	3.00
0	CORRECTION FACTORS APPLIED TO LABOR	
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO SUPPLIES	
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00
0	CORRECTION FACTORS APPLIED TO EQUIPMENT	
	OTHER USER FACTOR A	1.00
	OTHER USER FACTOR B	1.00

0SUBROUTINE JUMBOS, CALCULATED COSTS OUTPUT

0	BASE COST TO MEET PRODUCTION	
	LABOR	0.00
	SUPPLIES	0.00
	EQUIPMENT	83707.28
0	ADJUSTED COST TO MEET PRODUCTION	
	LABOR	0.00
	SUPPLIES	0.00
	EQUIPMENT	83707.28
0	TOTAL COST	
	PER UNIT PRODUCTION	83707.28
	PROJECT PRODUCTION	83707.28