University of Nevada
Reno
A Microcomputer-based, Management Information System for a Small, Surface Heap Leach Mine

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Mining Engineering

by

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This thesis provides application software dedicated to small, surface heap leach operations. The software is a major component of a microcomputer-based management information system designed to give the small mine manager many of the same capabilities once restricted to larger operations.

The three programs developed in the thesis are a mine daily production recording and reporting system, a heap leach daily production recording and reporting system, and a mobile maintenance information system. The thesis also provides a conceptual framework of an operation control system which could be used as a model for a site-specific system.
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Chapter 1

INTRODUCTION

While large mining operations have used computers since the late 1950's, it was not until the 1980's that computers became routinely available to smaller mining operations. The "microcomputer revolution" had a significant impact on mining in general, and introduced technical and managerial applications to the small mine operator which were once only available through consultants or centralized corporate headquarters. This has given the small mine operator the necessary tools to manage more efficiently in a high risk industry where quite often success is measured in terms of operating profit rather than return on investment.

1.1 Purpose of Thesis

The primary purpose of this thesis is to provide application software dedicated to small, surface, heap leach operations. This software is a major component of a microcomputer-based, operation control system. Specifically, three computer programs were developed for this thesis; a mine daily production recording and reporting system, a heap leach daily production recording
and reporting system, and a mobile equipment maintenance information system.

In support of the three computer programs, this thesis provides the conceptual framework of an operation control system for a small, surface, heap leach operation. Such a system (which is basically a management information system directed towards control of an operation) provides the small mine operator with information necessary for efficient operations management. While the system developed in this thesis might not be implemented as is, at any particular mine, certain elements of the system (i.e. the software modules, information flow design) could be readily utilized.

In addition, this system could provide a guide or outline for development of site specific systems. By utilizing this thesis a more cost-effective approach to system development would be obtained. This, in turn, might convince the small mine manager to proceed with the development of a system which the manager would otherwise do without because of the relatively large initial investment required.

1.2 Management Information Systems/Historical Perspective

A management information system (MIS) can be defined as an organized collection of people, procedures, and devices which gathers, interprets, and presents information in
support of managerial decision making. The concept of an information system in support of management functions predates the age of the computer and stems primarily from simple accounting procedures of the 19th century. Such procedures provided managers with decision influencing information, though these procedures were used primarily for obtaining credit. As commercial activity expanded in the 20th century and business organizations grew more complex, it became necessary for management to specialize in certain functional areas (i.e. finance, marketing, etc.). Managers of different functional areas required data from differing sources and of different types in order to perform their managerial duties. As a result, information systems tended to come into being which were composed of unrelated, task-oriented subsystems. These information systems were systems in only the broadest sense of the word. They tended to be characterized by unorganized duplication of data collection and storage. This type of simple, multiflow system leads to the first mention of a formal Management Information System.1

The further evolution of management information systems is linked directly with technical developments in data-processing equipment, especially the introduction of the computer to business applications in 1954.2 These developments allowed the volume and frequency of information flows to increase dramatically over what had been possible
with manual systems. The simple, multi-flow system gradually improved in efficiency as various task-oriented systems were grouped within functional areas. While this functionally oriented approach was a big improvement over original systems, it still retained the inherent weakness of duplication of data storage and handling.

In an effort to eradicate this problem of redundancy, the single-flow management information system model was developed in the early 1960's. This type of model relies on a single, integrated data base, where all relevant information is stored and managed. The obvious advantage of this approach is the elimination of the redundancy problem in data collection, storage, and handling. In addition, the model introduces the concept of real-time, on-line processing which provides decision makers with information on request rather than at the end of some arbitrary period. For the most part this totally integrated information system model remains theoretical. Efforts to implement the model have frequently failed due to high cost, elusive benefits, and organizational behavioral problems (acceptance by and integration of the human element in the MIS). There are also theoretical problems with the model, the primary one being an assumption of homogeneity of management information which allows the use of a single set of principles in handling problems on a firmwide basis. Such an assumption is usually invalid.
The mixed flow model is a compromise between the multi-flow and single flow MIS models. In this model, if functional information sub-systems have similar inputs, they are integrated. Unrelated sub-systems retain separate data bases. In practice, the mixed-flow model is widely used.

Other important factors (besides the advent of the computer) which have influenced the MIS concept include developments in the fields of managerial accounting and operations research.

Managerial accounting is basically concerned with cost behavior, and provides accounting information of particular relevance to internal control. It evolved as a separate field of accounting over the first half of this century, and stems from both financial accounting practice and microeconomics. Managerial accounting encompasses a number of facets or ideas including responsibility accounting, cost structure analysis, capital budgeting, breakeven analysis, and transfer pricing.

Operations research is the application of the scientific method to determine the best solution to decision problems under the constraint of limited resources. Operations research also developed as a field of applied mathematics during the 20th century, both to provide tools for business decision making and also in support of military and other government applications. Some of the techniques associated with operations research include linear
programming, dynamic programming, queuing theory, game theory, and simulation. The development of the computer stimulated the practical application of operations research techniques to a great degree.

1.3 Management: Function and Information Requirements

Objective setting, planning, and control are the basic functions of management. Objective setting is the establishment of goals. Planning is the selection of means to achieve those goals. Control is the process of measuring and guiding actual performance to ensure the accomplishment of pre-set goals. In performance of its basic functions, management is required to make decisions. Managerial decisions can be grouped into two broad categories: long range or capacity decisions, (also known as strategic), and short range or operating (tactical) decisions. Long range decisions involve changes in a firm's productive capacity which influence cash flows over a relatively long period (i.e. years). In the mining industry a couple of examples of long range decisions are: whether or not to bring a property from the exploration stage into the development stage, and if so at what rate to set production capacity (i.e. 1500 tpd or 15,000 tpd).

Short range decisions involve a relatively short time frame (less than a year) and do not affect a firm's overall
productive capacity. Rather, they involve making use of existing potential to best achieve the firm's pre-set goals. In the mining context, two examples of short range decisions are: the setting of production levels (up to the mine's capacity), and the selection of which bench to mine in a given period.

In order to make sound decisions, a manager must have access to information which supports the determination of relative costs and benefits of the alternatives being considered. The provision of this information is the basic purpose of any management information system.

In the context of an operating mine, the basic information requirements of management are more closely associated with short term decision making and the control function rather than with long term planning. Therefore, an operating mine's management information system would be geared mainly toward providing this sort of information.

1.4 Microcomputers and Data Processing

As previously mentioned, the electronic computer made its debut in the business world in 1954. Over the next decade, centralized mainframe computing had an effect on practically all large organizations. Major mining corporations were no exception to this. Early applications were generally limited to various routine accounting
functions such as payroll and inventory. Over the decade of the 60's, a number of technical applications were developed and implemented using mainframe computers. These included computer-based drilling records, ore reserve calculations, and long range mine planning.

In the 1970's, computer usage in the mining industry expanded dramatically. More powerful central processors, higher capacity data storage devices, and a plethora of new types of communication terminals made possible the solution of more complex mining problems and also made computing power available to a broader spectrum of users. The use of minicomputers spread, particularly in process control applications. In large mining organizations, network type structures of interconnected systems were formed. These facilitated the flow of information between various departments, which provided opportunities for better operation control.6

While large mining operations have used computers for decades, it was not until the 1980's that computers became available to smaller mining operations. The development of large scale integration (LSI) of electronic circuits made possible the introduction of the microcomputer, which in turn greatly expanded the availability of computers worldwide.

LSI circuits or "chips" form the central processing unit(s) and active memory storage of microcomputers.
Permanent memory requirements are handled by floppy and hard disc drives. Printers, plotters, and CRTs are all common output devices used with microcomputers, while standard input is usually provided via keyboard. Early microcomputers had a fairly limited capacity (as low as 4000 bytes RAM), but more recent models have both higher computational speeds and greatly expanded memory capacity. Unlike larger computer systems, microcomputers require no special environmental operating conditions which might make them unsuitable for operations at remote sites. In addition, capital costs of micro-systems are low enough that even very small operations can afford the expense.

Microcomputers have provided small scale operations with many of the same technical capabilities once restricted to major mining companies. Mining software for microcomputers has generally evolved from large computer applications and programs of the 1970's. Table 1.1 lists some of the applications now available.

Table 1.1 Microcomputer Applications in Mining

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The development and availability of application software such as that listed has been the catalyst
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propelling the acceptance of microcomputers at small mine sites.7

1.5 Gold Mining: Role of Small Scale Operations

Small scale mining operations have always been a part of the mining industry, although their relative economic importance has possibly declined during this century. In certain sectors of the mining industry (such as gemstones, with the exception of diamonds) small scale mining still plays a predominant role. In other sectors, e.g. base metals, there may be no such thing as small scale economic operations. Gold mining is one part of the minerals industry which has retained a segment of small operations. Not only do the lone prospector and week-end gold-bug continue to engage in prospecting activities, but small gold mines remain a viable and important part of the gold mining industry.

The definition of "small scale" depends on such factors as mineral commodity being produced, the geographical location of the operation, etc. In the context of this thesis, the exact definition of small may not be as important as restricting the type of operation to which this thesis applies. Nevertheless, a flexible definition of small will be given here. A small scale mining operation can be defined as any surface mining operation producing
less than 1,500 tons per day of ore and employing fewer than 50 people. These figures are somewhat arbitrary, but are based on a sampling of mines in Nevada which are considered to be small operations. (A gold heap leach operation of 1,500 tons per day capacity would produce on the order of 10,000 tr. oz. of gold per year, depending on ore grade and metallurgical recovery.

Gold production in the Western world reached its highest level in history in 1987 with production of approximately 41,200,000 troy ounces. Furthermore, the next few years should see that record broken each and every year (including 1988). While small scale operations play a minor role in this total, increasing gold production implies that small scale mining activity is also increasing.

Although the prime motivation for the current gold boom is the price of gold, developments in extractive technologies also stimulated growth by allowing the profitable mining of fairly low-grade deposits. Heap leaching in particular (primarily due to low capital requirements and low operating costs) has been utilized at numerous low grade deposits. For instance, gold production in Nevada for 1988 was estimated to be 3,770,000 tr.oz., or 8.3% of the world total. Heap leaching was expected to account for 44% (1,660,000 tr. oz.) of Nevada's production in 1988.
In small scale gold mining, heap leaching assumes an even greater importance. Low tonnage and/or low grade deposits which might not provide the necessary rate of return to justify acquisition of a conventional milling complex, often will support a heap leaching operation.

Since gold occurs and is mined in widely differing environments using different mining and processing techniques, it is not feasible to construct a single MIS applicable to all small operations. In fact, one of the basic tenets of management information system design is that systems should be developed on an individual or custom basis to fit each particular operation. A management information system general enough to apply to many different operations would probably not be specific enough to be of much use at any one particular operation. Since this thesis is concerned with the development of a non-site specific system for a small mine, it was necessary to restrict the applicability of the system to a particular type of mining operation. This was done in order to avoid development of a system too general to be applied.

A mine model was constructed with distinct and individual characteristics, yet based on a common gold mining/processing method. The model itself is detailed in Chapter 3. A brief description is given here, along with the reasoning behind selection of this mining scenario. The
model is of a small (less than 1,500 tons per day ore), open pit, precious metals mine utilizing conventional mining methods and heap leach processing with carbon column metals recovery. This type model was selected chiefly because open pit mining coupled with heap leaching is a low cost and common practice well suited to many smaller, low grade ore bodies. As mentioned previously, heap leaching accounts for about 44% of total gold production in Nevada. While much of this comes from large operations (often in conjunction with conventional milling), there is enough small scale activity to warrant development of a management information system geared toward this type of operation. In addition, while most small operations now have microcomputers, these operations generally can't afford, or do not wish to fund the custom software development necessary to implement a management information system.
This chapter presents information concerning management practices obtained from a number of mining operations in and around the state of Nevada. An original survey of mines was conducted in 1984 (Appendix I). That study has since been augmented by visits to an additional six heap-leach operations over the past year, along with a review of published literature. Also presented in this chapter is a general discussion of management's role in an operating mine.

2.1 Mine Operations: A Management Perspective

The mineral supply process can be broken down into four stages or periods: exploration, feasibility, construction (development), and operation. While managerial decision-making is required during each of these stages, this thesis is concerned with the operating period of the mineral supply process. A general description of this period, including typical problems faced by management, is given below.
2.1.1 The Operating Period: Mining Strategy

The operating period is usually the longest of the four stages in a mining project, and is the only revenue-generating time frame in the mineral supply process. During the operating period, the proportion of short term decisions increases in comparison with long term decisions. However, long term decisions associated with equipment replacement, introduction of new technology, etc., still have to be made.

Every mining operation has associated with it what may be called a mining strategy. This defines the parameters for extraction of minerals. Some strategies are well-defined, while others may be more informal. The basic goal of most mining strategies is to obtain as high a net return on investment as possible. This goal is rarely achieved due to a number of reasons, the agglomeration of which might be termed the high risk factor of the mining industry. Yet, the mining strategy provides the basis for decision-making and must therefore be considered central to any discussion concerning the operating period of a mining venture.

A mining strategy is composed of long term, or controlling elements, and short term, or modifying elements. The two main controlling elements are the actual physical characteristics of the mineral deposit, and the perception of that deposit as expressed in the feasibility study. The mineral deposit itself is a constant which cannot be fully
defined until it is mined out (and sometimes not even then). The feasibility study defines the mining plan, the mining equipment, the processing plan and facilities, the maximum production rate, and many other factors which permit, but also limit the range of response to problems which might occur during the operating period.

There are three main factors which are often at variance with the predicted, and which may dictate the enactment of modifying elements (short term decisions) to the mining strategy. The first factor is the price of the product. In the case of precious metals, price fluctuations are often volatile. Therefore, price is difficult to predict during the feasibility study, and operating decisions often have to be made which are at odds with long term goals. Tactics used to cope with price fluctuation will be discussed shortly. The second factor is the cost of production. Production cost variance can be caused by any number of reasons. Some of these, along with solutions for controlling costs, will be discussed. Finally, ore parameters which are different from those predicted, often result in major problems. The ore quality, quantity, and metallurgical characteristics directly influence the unit costs, quantity, and quality of production.
2.1.2 Price Fluctuation: Modifying Elements

The small mine manager generally has no control over the market price of the mine's product. However, the operator can pursue various mining policies in response to price fluctuation. For example, if the price of gold is increasing, a mine operator might try increasing the mine's production rate. Unfortunately, this has definite limitations due to the fact that most operations aren't designed with a great deal of excess capacity (controlling element). If the increasing price trend is viewed as long-term, then the mine operator has the option of expanding facilities through additional capitalization.

Another option available in the case of higher than expected prices, is to change the ore cut-off grade. Lowering the cut-off grade increases the mineable reserves, extends the mine life, and can result in an increase in the return on investment. Raising the cut-off grade increases the amount of metal produced per ton processed, thereby generating greater revenues over the short term.9

A decreasing price trend would also trigger the use of certain tactics. First, production could be scaled down by cutting back the number of shifts, or by idling equipment. A cut-back in production might be considered if it were felt that the price trend was short-term and would reverse in good time. Cutting back production would help minimize
short term operating losses while still maintaining the readiness of the operation should higher prices warrant a return to full production. In contrast, a decision might be made to increase production in order to maintain cash flow. This alternative would be considered if the price was high enough that revenues from production still exceeded variable costs of production.

Another short term solution would be to stockpile finished goods until product prices return to an acceptable level. In general, working capital considerations severely limit this option for the small scale precious metals operation.

A third tactic that could be employed is the practice of high-grading. This is a selective mining technique in which only the higher grades of ore are mined and processed. This tactic can generate positive cash flows even during periods of low price. However, high-grading can have adverse effects on future mining efforts. Blocks of ore bypassed during high-grading may be inaccessible at future times. In addition, high-grading may lower the average grade of the remainder of the deposit to a point where it isn't profitable to mine it even at higher than expected prices.

Finally, during periods of low prices, major efforts are undertaken to reduce unit operating costs. Since low prices and high operating costs have the same net effect,
some of the causes of higher than expected operating costs will be discussed concurrently with tactics used to reduce those costs.

2.1.3 Operating Cost: Variance and Control

Variances between actual and estimated ore parameters often lead to higher than expected unit costs. If, for instance, the gold grade of a block of ore turns out to be lower than estimated, the amount of gold produced from that block will also be lower than estimated. While the cost per ton of mining and processing that ore will be essentially the same no matter what the grade, the cost per ounce of gold produced increases as the grade goes down.

Metallurgical recovery is another factor with a great deal of influence on unit costs. For example, in a heap leach operation, estimated gold recovery over a 60 day leach cycle might be 65% of contained gold. If unit costs amount to $250 per tr. oz. at 65% recovery, these costs jump to $271 per tr. oz. with a 5% drop in recovery (to 60%). This kind of variance is not uncommon in heap leach operations.

Maintenance costs make up a significant portion of total operating costs. Due to high production requirements and little excess capacity, regularly scheduled maintenance is often overlooked or postponed (perhaps more of an excuse than a valid reason, but a very common practice
nevertheless). Equipment is kept operating in order to meet production quotas, even though this often leads to catastrophic failures which are both expensive and time-consuming to repair. A good preventive maintenance program can substantially lower the cost of maintenance while actually increasing equipment productivity. It also spreads the cost of maintenance more evenly over time so that it is easier to predict and budget for these costs. In addition, a good maintenance program, coupled with adequate reporting helps a great deal in decisions regarding equipment replacement.

The cost of labor is another important component of a mine's operating cost. A lack of trained personnel and high employee turn-over rates are typical of the mining industry. These conditions lead to low productivity and high unit operating costs. While all miners (in the U.S.) are required to have some safety training, many mines do not have any other formal training programs. In general, employees who are well-trained are more productive, safer, and treat equipment better. While establishment of a formal training program might be considered a long-term decision, it can result in lower unit operating costs.

Before being able to significantly reduce operating costs, the mine manager must be able to define and allocate costs by functional area. While all mining operations have some sort of information system, formal or otherwise, many
small operations do not obtain the information necessary for effective cost management. An adequate system needs a minimum of two components: production reporting, and cost accounting. These two components provide the manager with information on actual and budgeted production, sales, and fixed and variable costs associated with production. Besides providing an operation summary, a breakdown of costs by functional area (i.e. drilling, blasting, etc.) is also required. This allows the manager to pinpoint cost variances and thus deal more efficiently with problems. In short, an adequate information system not only provides the manager with the information necessary to determine whether or not an operating profit is being made, but also identifies areas where cost reduction efforts would be most effective.

2.2 Mine Organizational Structures

Both the business structure and the internal organization of a mining operation affect the management practice at the operation. Depending on the business structure, the small mine manager may have either a great deal or very little flexibility in dealing with situations. In addition, business structure and internal organization often dictate parameters of information flow and reporting requirements.
2.2.1 Business Structures

One of the most common business structures associated with heap leach operations in the western U.S. is the joint venture. A joint venture is a form of partnership organized to carry out a specific business enterprise for profit, and is usually of short duration. As such, it is well-suited to small, short-lived heap leach projects. Joint ventures are usually formed for one of two reasons: 1) a smaller entity has an attractive prospect and requires additional financing and/or mining expertise for development of said prospect, or 2) the joint venture is used as a means of spreading financial requirements between two or more partners so that more acceptable risk levels are attained. In the typical joint venture, management and operation of the project is entrusted to one member while the other venture partner(s) share the costs and mineral production in accordance with their interest.

A number of heap leach projects are also organized as investment centers of publicly held corporations. These investment centers often take the form of wholly-owned subsidiaries or divisions of large companies, but a more recent trend has been for larger corporations to spin off publicly owned companies which then develop and operate precious metals properties independently of the parent organization.
Another factor which affects the business structure of a majority of small mining operations is the royalty. A royalty is a passive or non-operating economic interest in a mineral property. Royalty arrangements are used as a means of sharing proceeds from a mining venture for land holders who lack the means or the desire to develop the property on their own. Royalty owners are not responsible for providing any financing for the venture. Royalties not only burden a mining operation with financial obligations, but also increase reporting requirements. For example, one operation in northeastern Nevada had to prepare separate monthly reports for six different royalty owners. Separate production records also had to be kept for each mining claim.

2.2.2 Internal Organization

The internal organization of small heap leach projects is fairly consistent as far as definition of main functional areas is concerned. There is, however, considerable variability in chains of command and sub-divisions within main functional areas. Figure 2.1 shows an organization chart from an active operation utilizing both heap leaching and conventional milling. This mine produces about 2,500 tons of ore per day. The organization is fairly typical of heap leach operations, with the exception of the direct
FIGURE 2.1: MINE ORGANIZATION CHART
chain of command between the general manager and the safety and accounting departments. In general, the basic organization of small heap leach projects is as outlined below:

I. Mining, Processing, and Administration

These three main functional areas are consistently found directly beneath the General Manager in the chain of command. Each functional area is headed by a superintendent, although in small operations the general manager often assumes all three roles in addition to his own.

II. Maintenance, Safety

Approximately half of the operations included in the survey have separate maintenance and safety departments which report directly to the general manager. In other operations, maintenance and safety departments are included within one or more of the main functional areas.

III. Engineering, Geology, Metallurgy, Accounting

These categories are usually found as sub-sets of the main functional areas. However, some operations have separate departments in direct line of command to the general manager.

The smallest operations still maintain a similar pattern of organization, however, it is typical for personnel at these operations to be responsible for more
than one function. For example, the mining engineer at a small operation might also be the safety director and mine superintendent, in addition to fulfilling engineering duties.

2.3 Management Controls

As previously mentioned (Section 2.1), the small mine manager basically depends on timely access to relevant information in order to effectively control the mine operation. The following discussion is primarily concerned with how in actual practice, the small mine manager obtains this information. General information sources, and accounting and budgeting systems of existing heap leach projects will be reviewed along with other pertinent details.

2.3.1 Information Sources

Each functional area in a mine's organization generates some primary data which forms the basis of the information flow. This basic information concerns two related topics: production, and the resources required to achieve production (labor, materials, energy, etc.). As previously indicated, Mining, Processing, and Administration are generally seen as the three main functional areas of a mining operation.
These can be broken down into numerous sub-functional areas, as shown in Figure 2.2. The following is a description of sources of information from sub-functional categories for a typical surface heap leach operation.

Drilling provides the samples from which other departments assign qualitative values to ore in place. Drill hole cuttings are collected and sampled at specific intervals during the drilling of blastholes. These samples are documented, tagged, and transported to the assay lab. The assay lab assigns qualitative values to the samples through the use of various analytical techniques (fire assay, etc.). The Engineering/Geology department uses this information for grade control purposes. Other information associated with the drilling function is also collected, and includes footage drilled, labor required, equipment used, fuel consumed, and supplies used. This information is used for production costing.

Information collected about the blasting function includes the amount and type of explosives consumed per hole, number of holes blasted, labor used, and other supplies and equipment required. This information is used to determine blasting costs and productivity.

Productivity and production costing also provide the catalyst for obtaining information regarding the loading function. This includes equipment hours, labor, fuel consumed, and the number of trucks loaded.
FIGURE 2.2: FUNCTION CHART - HEAP LEACH OPERATION
The haulage function provides the first check on the quantity of ore and waste mined, usually via truck count times a load factor. Information about the haulage function, including labor, fuel, and equipment usage is also collected.

The maintenance department collects information on equipment availability, servicing (preventive maintenance), repair labor, general equipment information, and parts and supplies consumed.

Information obtained regarding the crushing function includes crusher operating time, quantity crushed (usually via belt weightometer), size range of crushed material, labor required, maintenance required, other equipment usage, power consumed, and parts and supplies used. In addition, samples are collected for determination of leach pad grade and moisture content.

Pad construction and loading generate information on materials used, labor needed, equipment used, quantity of material in the heap, and time required for construction. During the actual leaching cycle, data is collected on reagents consumed, labor, time in leach, pH and cyanide concentration of applied solution, pumping requirements, and solution flow rates. Also samples of pregnant solution are taken for assay.
The processing method is usually one of two types: carbon-column adsorption and desorption along with electrowinning of metallic values, or zinc-precipitate (Merrill-Krowe) process followed by melting. Quantities of chemical reagents and supplies consumed, flow-rates, power consumed, time in circuit, labor, repair parts, and maintenance labor required are recorded when using either method. Also, samples of barren solution and finished products are collected for assay, and weight measurements on the finished products are taken.

The assay lab generates values for samples collected along the entire product flow path (from drilling through refining).

The engineering/geology department conducts surveys to determine drill hole locations for ore control, and pit as-built. The department also provides direct staff support for basic control of the mining function. Analysis provided by engineering/geology supports management decisions regarding equipment usage and replacement, production capacity, and other factors important to efficient operations management. Engineering/geology is closely associated with the mining functions, and is often found as a part of the Mining department (as shown in Figure 2.2).

The purchasing department documents what's been (or needs to be) bought, for how much, and for what reason. This
provides essential cost information for the entire operation.

The warehouse/inventory department documents quantity on hand along with departmental requests and inventory orders. This information is used both for inventory control and for determination of usage of consumables by functional area.

The payroll department records employee payroll expense based on time records and other information supplied by the various departments. The information is used not only for payroll purposes, but also for determination of production labor costing.

Sales provides information on quantities sold, and prices and dates of sale along with associated expenses.

While the above list is certainly not exhaustive in regard to primary sources of information, it does include the more significant internal sources.

2.3.2 Accounting, Budgeting, and Computers

Accounting practice at small heap leach operations tends to be geared more toward financial, rather than managerial needs. For instance, none of the operations visited in the survey (Appendix I.) used Standard Costing techniques for determining production costs. Rather Absorption Costing using historical cost data was the norm.
Absorption Costing is a system of costing whereby the variable costs of production, along with fixed overhead, are assigned to the product. It is generally used for valuing inventories for external reporting purposes. While unit costing (allocation of cost on a per ton or per ounce basis) is normal practice in mining, Absorption Costing produces a tendency to allocate support and administrative costs somewhat arbitrarily. This confuses the use of the system for cost control.11

To a certain extent, Responsibility Accounting is used at most operations. Responsibility Accounting is a system of recording costs and revenues where each functional manager is assigned only those cost factors that the manager can affect.12 Responsibility centers most often consist of two of the main functional areas: mining and processing. A few of the larger operations have more involved responsibility systems with a more detailed breakdown of responsibility centers.

Most operations visited in the survey had a trained accountant on the staff. However the smaller operations (those employing fewer than thirty people) used clerical personnel for daily bookkeeping and relied on outside accounting sources for formal reporting and taxes.

Budgeting practice varies considerably from operation to operation, with variances stemming from both management style and type of business structure. A majority of
operations use what can be loosely defined as a bottom-up process, whereby department heads submit departmental budgets to the manager. The manager in turn, submits the total budget to the board or other organizational authority for final approval. A few operations use this approach for capital items only.

A top-down budgeting process is used at about one-third of the operations visited. Basically, the general manager assumes responsibility for all budgeting. However, at one mine in particular, the capital and operating budgets are prepared at company headquarters and presented to the general manager. In this case, the general manager's role is reduced to the control function only.

The typical budgeting horizon for operating mines is one year. Monthly budgets are then derived from the annual budget. Based on survey results, performance budgeting (comparison of actual production and costs with budgeted figures) is standard practice at about 90% of heap leach operations. A majority of the mines using performance budgets have these reports prepared off-site by home office staff. As a result, there is often a serious time delay which limits the usefulness of the report. In many cases, this time delay is as long as a month. Ideally, this type of report should be available within a week of the end of the period to which it applies. In addition, many of these reports lack the information necessary for meaningful
analysis. For example, Figure 2.3 shows a single page from a mine's monthly performance report. This report doesn't include any production figures (tonnage, mined tr.oz., dore, etc.) or consumption figures, (labor, reagents, supplies, etc.) so it is impossible to analyze the variance between budgeted and actual expenses. In order to do this, production and resource consumption information needs to be presented. Then the manager can pinpoint whether variances are due to differences in quantities produced, resources utilized, or varying rates and prices. The manager at this operation would have to review separate production records in order to make use of this particular report as a control tool (possibly a productive, but not very efficient use of the manager's time).

As one of the primary sources of information for the performance budget, production reporting is a universal practice at heap leach operations. All operations surveyed keep track of daily production statistics, and all operations issue formal monthly production reports (compiled from daily records). About 50% of operations also prepare weekly reports. Figure 2.4 shows a daily production report which also presents weekly, monthly, and year-to-date statistics. Virtually all heap leach operations surveyed now have microcomputers on site, although not all operations use these for management applications. In contrast, microcomputers were in use at only 55% of operations in 1984
FIGURE 2.3: DETAIL FROM MONTHLY PERFORMANCE REPORT

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FIGURE 2.4: DAILY PRODUCTION REPORT

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(based on the survey). Production reporting, accounting functions (i.e. general ledger, accounts receivable, etc.), maintenance reporting, and parts inventories are some of the more common management applications now installed on microcomputers.

In summary, the managers of small heap leach operations are faced with two primary problems associated with information flow: timeliness and relevancy. The introduction of on-site computing at virtually all operations has given the small mine manager the tools necessary to improve the expediency of information flow. By dispensing with off-site data processing and by computerizing where appropriate, reports can be produced in a more timely manner. This, in turn, can lead to more effective control of the operation. The relevance of information has little to do with computers. As discussed, there is an abundance of information generated at every mining operation. The problem is that this information is not always organized and presented in a manner supportive of effective management. Many existing heap leach operations lack a coherent and well-defined information system. If this problem were rectified, the management of these operations could be far easier, more efficient, and better able to cope with unforeseen difficulties.

A heap leach information system made to address these small mine concerns in the next chapter.
Chapter three is devoted to a description of a model of an operating mine and the operation control system developed for this particular model. A mine model has been constructed which is characteristic of small scale heap leach operations in the western United States. The model is that of a small, open pit precious metals (gold and silver) mine utilizing conventional mining methods and heap leach processing with carbon column metals recovery.

The management information system developed for this model consists of the design and definition of data collection, information flow, and report formats. Included as part of the information system are three computer modules: a mine production report system, a mobile maintenance information system, and a heap leach production report system. These three computer modules will be discussed in detail in Chapter 4.

3.1 Mine Model

As previously stated, this model is of an operating heap leach project using conventional mining techniques and carbon column metals recovery. This particular type of
operation was chosen because it is very common and is well suited to small scale operations. The model is not restrictive as far as specification of exact capacity and/or makes and models of mining and processing equipment. For instance, the model applies equally well over a range of processing capacities from 100 tons per day to 1,500 tons per day.

3.1.1 Mine Organization

Figure 3.1 presents the mine organization chart of the model. As can be seen, the three main functional areas of mining, processing, and administration are directly beneath the project manager in the chain of command. Each of these three areas is further sub-divided into specific sub-functional departments. In the majority of mines to which this model applies, project personnel are responsible for more than a single function. For example, the project manager might also assume the duties of all three superintendent positions (mine superintendent, process superintendent, and administrative superintendent). The following discussion provides details about each of the areas defined in the mine model.
3.1.2 Mining Function

The mining function is broken down into three main sub-functions: production, mobile equipment maintenance, and engineering/geology.

In the largest mines to which this model applies, the production department would be headed by the mine foreman. In the smaller mines, the mine foreman job might be handled by the mine superintendent. Production is composed of the five functional areas of drilling, blasting, loading, hauling, and general services. For the drilling function, the mine model does not specify any particular type or size of drilling equipment other than that it is diesel-powered. Drill crews consist of one driller per crew.

Blasting is accomplished using "ANFO" as the primary blasting agent. Blasthole pattern design is not specified. The blasting crew consists of a blasting foreman aided by one to three helpers, depending on the size of the operation.

The Loading function is carried out by diesel powered front-end loaders and/or diesel-hydraulic shovels. This is in keeping with the almost universal practice of small heap-leach operations. The model provides for haulage requirements to be fulfilled by rear-dump, off-highway trucks. Although the model does not specify the make or
size of trucks, the Mine Daily Production Report computer module (Chapter 4) restricts the size category of trucks to a limit of two sizes. Typical truck sizes at small heap leach operations run from 20 to 50 ton capacity.

The general services function basically consists of road and dump maintenance, and limited earth moving (ripping, dozing, and grading functions). The use of diesel powered equipment is the only specific requirement imposed by the model. Typical mobile equipment included in this category consists of dozers, graders, and water trucks.

The model specifies the existence of a mobile equipment maintenance department. This department is responsible for all preventive and emergency maintenance of mobile equipment used for mining and heap leach pad loading, etc. It is also responsible for general fueling duties. The department is headed by a mobile maintenance foreman who reports directly to the mine superintendent. The numbers of mechanics, assistants and service bays are not specified by the model, but depend on the size of the fleet at a particular operation.

The engineering/geology department comprises the third main sub-functional area of the Mining function. The model does not specify any particular personnel requirements for this department, however its responsibilities are typical of those commonly associated with mine engineering and geology. These include surveying, mine planning, grade control, mine
3.1.3 Processing Function

The second main functional area, processing, is also broken into three sub-functional departments: production, plant maintenance, and metallurgy. The parallels with the mining function are obvious, with one of the sub-functional areas being directly responsible for physical production and the other two providing direct support.

The production department is divided into four main sub-categories: crushing/agglomeration, heap construction, leaching, and A-D-R (adsorption-desorption-refining).

The model does not specify the size or type of crushers and associated equipment (screens, conveyors, feeders, agglomerator, etc.) nor does it put restrictions on crushing capacity or specifications of crushed rock. The model does specify the addition of cement and lime during agglomeration.

Heap Construction includes pad construction and the loading and unloading of heaps. Pad construction is basically considered a capital item. The type of liners, piping, sprinklers, and other engineering details are not specified by the model. The loading of pads is accomplished
using mobile equipment and the model also provides for the option of unloading (re-using) pads.

The leaching function includes the pumping and distribution of barren solution to the heaps and the collection of pregnant solution from the heaps. The model doesn't specify particular pumps, piping, or operating parameters (such as flow rate). It assumes the existence of pregnant and barren ponds for solution storage.

The A-D-R department basically includes all in-plant functions such as carbon adsorption, carbon transfer, carbon stripping, electrowinning, and fire refining. Again, the model is not specific regarding equipment, but only about general operating procedures.

Plant maintenance is responsible for all preventive and emergency maintenance of non-mobile plant equipment including crushing facilities, pumps, tanks, piping, etc. The maintenance department is in direct line of command with the process superintendent. The model doesn't specify staffing requirements for the maintenance department, since this depends on the relative size of the operation.

Metallurgy provides technical support for the plant production department. It is also responsible for operation of the assay lab. At most operations to which this model applies, this department would be headed by a metallurgical engineer. The model doesn't specify exact personnel requirements.
3.1.4 Administration

The third main functional area is administration. Depending on the size of operation, this department might be headed by either an administrative superintendent or by the project manager. The administration division is divided into five main sub-functional departments: accounting, stores, purchasing, security, and safety. The function of each of these departments is conventional, and the model is not definitive concerning staffing requirements. The mine model excludes a dedicated computer department, but it is assumed that at least one microcomputer is on site which is available on an operation-wide basis.

3.2 Information System: Flow and Format

As stated in Chapter 2, a useable management information system for an operating mine needs a minimum of two procedural components: production reporting, and cost accounting. These two components depend on information generated by every functional area within the project organization. In the remainder of this chapter, a description will be given of the design of information flow and format for the previously described mine model. The system is basically a computer-assisted manual information system which follows a mixed flow model concept.
Information is collected from the various functional areas, stored in appropriate data bases or files, and processed to provide required reports.

The following series of figures depict the model information flow (sources, routes, and destinations) by functional area. Subsequent to the presentation of information flow is another series of figures which represent system report formats.

3.2.1 Information Flow

Figure 3.2 shows the basic information flow within and from the mine production department. Information is collected via a series of simple forms filled out by equipment operators each shift. The information collected includes production figures, equipment usage, labor usage, and supplies consumed. The forms are reviewed by the shift foreman (or mine foreman) and then routed to the Mine Daily Production Report module. The information contained on the forms is input into the computer by a data entry clerk. The foreman also fills out a Daily Status Report which includes general information about pit progress and equipment status. This report is distributed to the mine superintendent and to engineering/geology. The foreman is also responsible for forwarding emergency repair requests to the maintenance
FIGURE 3.2: INFORMATION FLOW - MINE PRODUCTION DEPT.

- **DRILLING REPORTS**
  - Production
  - Equipment Use
  - Labor
  - Supplies

- **BLASTING REPORT**
  - Production
  - Equipment
  - Labor
  - Supplies

- **LOADING REPORTS**
  - Production
  - Equipment Use
  - Labor

- **HAULAGE REPORTS**
  - Production
  - Equipment Use
  - Labor

- **GEN. SERVICES REPORTS**
  - Activity
  - Equipment Use
  - Labor

- **TIME CARDS**

- **MINE FOREMAN**

- **DAILY STATUS REPORT**
  - MINE SUPERINTENDENT
  - ENG./GEOL.
  - MOBILE MAINTENANCE FOREMAN

- **EMERGENCY REPAIR REQUESTS**

- **MINE DAILY PRODUCTION REPORT MODULE**

- **ACCOUNTING**
foreman. Time cards are kept for each employee, and these are sent to the accounting department on a weekly basis.

Figure 3.3 represents the information flow within the mobile equipment maintenance department. The primary information collected in this department is routed through the maintenance foreman to the computerized Mobile Maintenance module. This information is collected via job tickets, oiler/fueler reports, and equipment inspection preventive maintenance (P.M.) reports. In addition, the maintenance foreman completes a daily status report detailing the number of jobs completed, in queue, and in progress. This report is delivered to the mine superintendent. Maintenance employees are also required to punch time cards, and these are sent to the accounting department each week.

Information flow within the engineering/geology department is depicted in Figure 3.4. Figure 3.4 also shows information flow from the mine superintendent. Much of the information utilized by engineering/geology is generated or collected by other departments and isn't shown in this figure. However, survey data (general mapping information) is generated within engineering/geology. Also, samples from blastholes and exploration drilling are collected, bagged, marked, and recorded. These samples are transported to the assay lab for analysis. Blasthole assay reports are returned to engineering/geology (as depicted in Figure 3.6)
for use in assigning grades to ore mined and in defining and delineating ore and waste. A monthly Mine Production Planning and Scheduling report is prepared and routed to the mine superintendent and the mine production departments. Special reports concerning exploration projects, ore reserves, long term mine planning, etc. are also prepared by engineering/geology. Expense reports and time cards are sent to the accounting department.

The mine superintendent is responsible for preparation and distribution of the Mine Weekly Production Report. This report is based on outputs from both the Mine Daily Production Report module and the Mobile Maintenance module, along with other information from various departmental reports. The weekly report is distributed to the project manager, accounting, and within the mining division.

Figure 3.5 shows the information flow from and within the process production and maintenance departments. Information is collected through the use of simple forms filled out by operators each shift. In the case of the production department, this information includes production figures, equipment usage, supplies and reagents consumed, and labor usage. The information is reviewed by the process foreman and then sent to the Heap Leach Production module as input. A Daily Status Report is also completed by the foreman for distribution to the plant superintendent and metallurgist. This report includes general information.
about the day's production activities. The process foreman is also responsible for informing the respective maintenance departments (mobile equipment maintenance and plant maintenance) of any emergency repair requests. Process maintenance information is collected via job tickets and preventive maintenance inspection reports. This data is utilized by the plant maintenance foreman in preparing weekly plant maintenance reports. These reports are forwarded to the production foreman and plant superintendent.

Figure 3.6 depicts the information flow from the metallurgy department and the plant superintendent. The assay lab (part of metallurgy) provides essential information for qualitative analysis of both mine and process operations. The metallurgy department organizes this information and distributes necessary reports to various departments (i.e. blasthole assay report to engineering/geology). Assay information from the heap leach operations is routed to the Heap Leach Production module after compilation and review by the metallurgist. The metallurgist is also responsible for the Daily Status Report of the metallurgy department and a Daily Analytical Report of the heap leach operation. Both of these reports are given to the process superintendent. Expense reports and time cards are sent to the Accounting department.
ASSAY REPORTS:
- Blasthole
- Exploration
- Crusher
- A-D-R Circuit
- Other

SHIFT REPORTS:
- Progress
- Equipment
- Labor
- Supplies

METALLURGIST

HEAP LEACH PRODUCTION MODULE

BLASTHOLE ASSAY REPORTS

EXPLORATION ASSAY REPORTS

DAILY STATUS REPORT

DAILY ANALYTICAL REPORT

ENGINEERING/GEOLGY

PLANT SUPERINTENDENT

WEEKLY REPORT
- Production
- Maintenance
- Metallurgy

PROJECT MANAGER

ACCOUNTING

EXPENSE REPORTS

TIME CARDS
The process superintendent prepares the Weekly Process Production Report which is based on output from the Heap Leach Production module, along with information from other departmental reports. The Process Production Report is distributed to the project manager, accounting, and within the process division.

Information flow from the administration division is represented by Figure 3.7. While none of this information is directly associated with physical production, it is very important from a cost analysis point of view. In particular, the accounting department is burdened with the task of assembling the Summary Performance Report on a monthly basis. This is the most important report from a managerial perspective. Information from each functional area of the operation is utilized in preparation of the report, which basically compares actual performance (in terms of production, variable and fixed costs) with planned or budgeted performance. A more thorough description of the Summary Performance Report will be given later.
FIGURE 3.7: INFORMATION FLOW - ADMINISTRATION

SAFETY REPORTS

SECURITY REPORTS

INVENTORY REPORT
Spare parts
Supplies
Reagents

EXPENSE REPORTS

TIME CARDS

PURCHASING REPORT
Cash Disbursements
Purchase Orders

WAREHOUSE ISSUE
NOTICES

PURCHASING AGENT

ACCOUNTING

PAYROLL

SUMMARY
PERFORMANCE
REPORT

PROJECT MANAGER

PERFORMANCE
REPORT
Distributed by
Responsibility
Center

MINE
SUPERINTENDENT

PLANT
SUPERINTENDENT

ADMINISTRATIVE
SUPERINTENDENT
3.2.2 Information Format

A number of different reports have been mentioned in the preceding description of information flow. The format of these reports has been defined, along with the format of various forms used for information collection. The following set of figures depicts some of these information collection forms and report formats. Included is the Summary Performance Report outline and representative subsidiary sections of that report. Appendix II contains a complete catalogue of the forms and reports associated with this system. The various reports produced by the three computer modules will be described in Chapter 4.

Data collection forms were designed with the objective of obtaining the necessary information under the constraints of limited operator ability and time. As a result, each of these forms is specific for a particular function, i.e. drilling, blasting, etc. Because each form is specialized, the operator does not have to make any decisions concerning which parts to complete—the entire form is filled out. Figure 3.8 shows the format of two of these forms, a Driller's Shift Report and a Mobile Maintenance Job Ticket. The driller's report basically documents the number of holes and total footage drilled, time drilling, and supplies used (other than fuel and lubricants). The job ticket lists the equipment I.D., job description (including P.M.#), apparent
### DRILLER REPORT

**DAY**____________**SHIFT**____________**CREW**____________

**DRILL I.D.**____________

**PRODUCTION**

**FOOTAGE**________**NO. HOLES**________**HRS. DRILLING**________

**BENCH #**____________**GRID #**____________

**CONSUMABLES**

**STEEL**____________**BITS**____________**OTHER**____________

**DRILL STATUS AT END OF SHIFT**____________

**COMMENTS:**

---

### MOBILE MAINTENANCE JOB TICKET

**JOB #**____________**EQUIPMENT I.D.**____________

**SCHEDULED**

**UNSCHEDULED**

**JOB DESCRIPTION:** PM #

**REASON FOR FAILURE:**

**PARTS REQUIRED:**

**STATUS:**

**IN QUEUE:** DATE______ TIME______

**IN SERVICE:** DATE______ TIME______

**COMPLETED:** DATE______ TIME______

**TOTAL MAN HOURS REQUIRED:**________

**# OF MECHANICS REQUIRED:**________

**LEAD MECHANIC:**________
reason for component failure (if applicable), parts required, and a log of the job status. While the Driller's Report is turned in at the end of each shift, the Job Ticket remains with the job until it is completed. However, information from incomplete job tickets is utilized in the maintenance foreman's Daily Status Report. This is shown as Figure 3.9. This report summarizes the jobs in service and in queue, and also comments on the actual maintenance progress in comparison with planned progress (as established by the Mobile Maintenance module Planning and Scheduling Report).

The Summary Performance Report is a multi-page periodic study of actual performance in comparison with planned performance. It utilizes elements of production reporting, cost accounting, and flexible budgeting in order to provide this comparison. Figure 3.10 shows the basic outline or table of contents of this report. As can be seen, the report begins with an operation-wide analysis of performance. Costs and production figures are then broken down by functional area in order to make use of the concept of responsibility centers. For example, the mine foreman is responsible for the performance of the drilling, blasting, loading, hauling, and general services departments. The inclusion of a breakdown of costs and production by department in the Summary Performance Report gives the mine foreman the ability to more accurately assess
# Maintenance Foreman's Status Report

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## Jobs in Service

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## Jobs in Queue

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<th>PARTS NEEDED</th>
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### SUMMARY PERFORMANCE REPORT

**PERIOD**

#### TABLE OF CONTENTS:

1. Production Statistics
2. Profit/Loss
3. Capital Budget Status
4. Mobile Equipment Utilization
5. Analysis of Payroll
6. Mine Performance Report
   - Summary
   - Drilling
   - Blasting
   - Loading
   - Hauling
   - General Services
   - Eng./Geol
   - Mobile Maintenance
7. Process Performance Report
   - Summary
   - Crushing/Agglomeration
   - Pad Loading/Unloading
   - Leach/ADR
   - Plant Maintenance
   - Metallurgy/Assay Lab
8. Administration Performance Report
   - Summary
   - Accounting/Stores
   - Purchasing
   - Security/Safety
the performance of his responsibility center. It also gives
the mine superintendent the means to assess the performance
of the mine foreman. The Summary Performance Report is
presented in its entirety in Appendix II. However, three
representative sections of the report will be shown here in
order to demonstrate the applicability of this report as a
managerial aid. Figure 3.11 shows the Production Statistics
section of the report. The Actual category is summarized
from the mine and process daily production reports, while
the Planned category is taken from the operation's annual
production plan. This page gives the project manager an
overall view of the operation's physical performance without
consideration of fiscal performance.

Figure 3.12 depicts the format of the Mine Summary
Performance Report. The mine is treated as a cost center on
this page, and no allocation of administrative overhead or
other indirect costs is made. This provides the mine
superintendent with an overview of his responsibility
center. Actual, planned and variance figures for ore and
waste production, variable costs by department, and fixed
costs (also by department) are included in the mining
summary. In addition, the variable cost per ton mined is
determined along with the variable cost per recoverable
ounce equivalent. (The silver is included with the gold at
the ratio of their recoverable values.) Fixed costs are
kept out of this calculation so that the mine superintendent
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**Figure 3.12: Summary Performance Report - Mine Summary Performance**
can determine the true contribution margin per ton mined. Also, the use of a flexible budget means that planned variable costs are adjusted to reflect actual production levels. This eliminates the influence of production variance on cost variance, which in turn makes the cost analysis more meaningful.

Figure 3.13 represents the Mine Performance Report-Blasting Detail. Actual, planned, and variance figures are also included in this section. Production is measured in terms of number of holes blasted, and the tonnage of ore and waste broken. In addition, explosive consumption and powder ratio are presented. Variable costs include labor (in both hours and dollars), supplies, explosives, equipment maintenance, and fuel. Equipment maintenance cost is applied at an hourly equipment usage rate. The actual equipment maintenance costs are also included as a comparison to applied costs. Total variable cost (using applied maintenance, not actual) and variable cost per ton broken are also shown. Fixed costs aren't allocated in any of the production department performance detail sections. It is assumed that personnel in these functional areas are hourly, and it only diminishes the clarity of analysis if supervisory expense etc. is arbitrarily allocated at this level of responsibility.
### SUMMARY PERFORMANCE REPORT

#### MINE PERFORMANCE

**BLASTING**

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</tr>
<tr>
<td>EQUIP. MAINT.</td>
<td></td>
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</tr>
<tr>
<td>ACTUAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPLIED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT. VAR. COSTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$/TON BROKEN</td>
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</table>

**ACTUAL** | **BUDGET** | **VAR.**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>----</td>
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<td>---</td>
</tr>
<tr>
<td>----</td>
<td>----</td>
<td>---</td>
</tr>
</tbody>
</table>
As previously mentioned, the other forms and reports associated with this system are included in Appendix II. Together, these make up an important contribution to effective operations control. The three computer programs which are also a part of this system will be described in the next chapter.
Three computer programs have been developed as part of the management information system for a small heap leach operation. These are: the Mine Daily Production Report module, the Mobile Maintenance module, and the Heap Leach Production module. The original programming language used was a version of MicroSoft Basic called "ZBASIC." The programs have since been converted to "GWBASIC". They were developed for use on an IBM-PC or compatible with at least 128 K-byte RAM and two floppy-disk drives. The main emphasis of this chapter is to describe each of these programs in turn, including their inter-relationship and importance to the information system as a whole. Documentation and a listing of the code for each program are included in Appendices III, IV, and V.

4.1 Mine Daily Production Report

The Mine Daily Production Report module is a menu-driven, interactive program with an approximate length of 25,000 bytes (in compressed binary format). It basically consists of three routines: 1. Initialization of data files, 2. data input and preparation of the daily report,
and 3. an adjustment routine for modifying previously entered data. Besides creating and updating four data files internally, the program also makes use of three data files created by the Mobile Maintenance module. Figure 4.1 shows the inputs and outputs associated with the program.

4.1.1 Initialization Routine

The initialization routine is used to create four random access files for storage of daily production statistics. The first file consists of 367 records, (one year’s worth of data storage) each of which is 75 bytes long. It is used for storage of loading and haulage function statistics. The second file contains a like number of records, though each is 100 bytes in length. It is used for storage of drilling, blasting, and general services data. The final two files are used for storing information about drilling, blasting, and loading locations by shift. Bench and grid numbers are stored in these files. From a data management perspective, all of the daily mine production statistics should probably be stored in one file. However, the limitations imposed by the original ZBASIC language precluded that option. In ZBASIC, the maximum allowable record length is 256 bytes, and the daily mine production statistics require well over that amount.
Figure 4.1: Mine Production Report Module - Schematic Diagram

- **Data Input**
- **Data Modification Routine**
- **Initialization Routine**
- **Mine Daily Production Report Module**
  - **MnPrd1.dat**
  - **MnPrd2.dat**
  - **MnDrL.dat**
  - **MnLod.dat**

- **Update Equipment Usage Files**
  - **MoEqTyp.dat**
  - **Eqhrs.dat**

- **Daily Report**
The initialization routine also requires the input of load factors (tons per truckload) for both ore and waste, for two different truck sizes. This is because the program calculates daily mined tonnage by truck count. Load factors and daily tonnages can be changed using the adjustment routine.

4.1.2 Data Input and Report Preparation

The Data Input and Report Preparation routine comprises the bulk of the Mine Daily Production Report program. Data input is achieved interactively through the use of questions posed by the computer. These questions are centered around mobile equipment usage by shift. The program goes down the list of mobile equipment contained in the data file MOEQUIP.DAT, organizes the list by function (i.e. drilling equipment, loaders, haul trucks, etc.), and then requests input about usage and production for each piece of equipment used in that particular function. The only data input not centered around equipment usage is for the blasting function. The program presents separate input screens for drilling, blasting, loading, hauling, and general services. Figure 4.2 shows two input screens, one for blasting data input, and one for loading data input. If equipment is not used on a particular shift, data input is by-passed for that shift. For example, if loader "L015"
Blasting Information

Shift Number 1

Any work done this shift? (Y/N)

Number of holes loaded?

Number of holes shot?

Volume of broken ore? (cu. yds.)?

Volume of broken waste? (cu. yds.)?

Bench #

Grid #

LBS ANFO consumed?

Det chord-feet?

Number of delays?

Number of primers?

Is information correct? (Y/N)

Loading Information

Loader number Lo15

Shift number 2

Was loader used this shift? (Y/N)

Hours worked?

Loads of ore?

Loads of waste?

Bench #

Grid #

Is information correct? (Y/N)
(see Figure 4.2) isn't used during shift # 1, the questions regarding production and usage would not appear on the screen. Also, a query is made concerning the accuracy of data input for each data series. This allows the user to re-enter questionable data.

After data input is complete, the program runs a number of calculations which basically sum up shift production numbers to determine the daily production. These daily figures are then stored on disk in the previously mentioned data files. Mobile equipment usage and production are also stored in the appropriate files.

Printing of the daily report is the final step in the Data Input and Report Preparation routine. Since the length of the report depends to a certain extent on the size of the equipment fleet, the program contains a sub routine which determines the required length and then adjusts the report format accordingly. Figure 4.3 presents a sample Mine Daily Production Report. The report begins with day and week to date summary statistics. These include ore and waste mined along with estimated grades. Grades are estimated based on blasthole assays, and are assigned to daily haulage production depending on where in the pit ore is being mined. Following the summary, information from each functional area is presented by piece of equipment and shift. In this case, the entire report requires three pages. For a larger equipment fleet, the report might have to be extended. This
### MINE DAILY PRODUCTION REPORT

**DATE:** 01-05-1989

#### SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>DAY</th>
<th>WEEK TO DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORE MINED</td>
<td>1155 T</td>
<td>4095 T</td>
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<tr>
<td>WASTE MINED</td>
<td>3500 T</td>
<td>14900 T</td>
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<td>TOTAL MINED</td>
<td>4655 T</td>
<td>18395 T</td>
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<table>
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</tr>
</thead>
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<tr>
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<td>0.048 OZ/T GOLD</td>
<td>0.050 OZ/T GOLD</td>
</tr>
<tr>
<td>WASTE</td>
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#### DRILLING

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<thead>
<tr>
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<th>HRS LOGGED</th>
<th>FOOTAGE</th>
<th>BITS</th>
<th>LOCATION</th>
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<td>0</td>
<td>0</td>
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<td>2</td>
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<td>16</td>
<td>0</td>
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<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DR02</td>
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<td>0</td>
<td>0</td>
</tr>
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<td></td>
<td>2</td>
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<td>0</td>
</tr>
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</tr>
<tr>
<td>DR03</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>45</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**TOTALS:** 21 HRS 54 HOLES 1250 FT 68 BITS 3 BENCH 20 GRID

#### BLASTING

<table>
<thead>
<tr>
<th>HOLES</th>
<th>HOLES</th>
<th>VOL.</th>
<th>EST. TONNAGE</th>
<th>ANFO CHRD</th>
<th>LAYS MERS</th>
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</thead>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
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<td>2</td>
<td>30</td>
<td>30</td>
<td>580</td>
<td>2500</td>
<td>1292</td>
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**TOTALS:** 30 HOLES 30 VOL. 3000 VOL. 5400 CHRD 2700 MERS

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<tr>
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<th>GRID</th>
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<td>5640</td>
<td>05-15</td>
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<tr>
<td>3</td>
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</table>
**Figure 4.3: The Daily Production Report - Sample Output**

### Loading

<table>
<thead>
<tr>
<th>EQUIP</th>
<th>SHIFT</th>
<th>HRS</th>
<th>LOADS</th>
<th>LOADS</th>
<th>EST. TONNAGE</th>
<th>LOCATION</th>
</tr>
</thead>
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<tr>
<td></td>
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<td></td>
<td>ORE</td>
<td>WASTE</td>
<td>ORE</td>
<td>GRID</td>
</tr>
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<td>LO01</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>LO02</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td></td>
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<td>6</td>
<td>22</td>
<td>17</td>
<td>1155</td>
<td>850</td>
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### Haulage

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<th>LOADS</th>
<th>EST. TONNAGE</th>
<th>TOTAL</th>
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<tbody>
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<td></td>
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<td>ORE</td>
<td>WASTE</td>
<td>ORE</td>
<td>WASTE</td>
</tr>
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<td>8</td>
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</tr>
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</tr>
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<td></td>
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</tr>
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</tr>
<tr>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td></td>
<td>30</td>
<td>22</td>
<td>70</td>
<td>1155</td>
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</tbody>
</table>

TOTAL TONNAGE: 4655
FIGURE 4.3: THE DAILY PRODUCTION REPORT - SAMPLE OUTPUT

<table>
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<th>EQUIP SHIFT</th>
<th>HRS</th>
<th>ACTIVITY</th>
<th>STATUS</th>
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<tbody>
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<td>0.0</td>
<td>UP</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.5 ROAD MAINTENANCE</td>
<td>UP</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.0</td>
<td>UP</td>
</tr>
<tr>
<td>GS02</td>
<td>1</td>
<td>0.0</td>
<td>UP</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>7.2 RIP AND DOZE ORE</td>
<td>DOWN</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.0</td>
<td>DOWN</td>
</tr>
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<td>1</td>
<td>0.0</td>
<td>UP</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4.0 DUST CONTROL</td>
<td>UP</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.0</td>
<td>UP</td>
</tr>
</tbody>
</table>

TOTAL HRS 16.7
is accomplished automatically with the previously mentioned sub routine.

The information displayed in the Mine Daily Production Report is used to monitor daily performance of the mining functions. It also comprises a major element of the Monthly Performance Report.

4.1.3 Data Adjustment

The final routine of the Mine Daily Production Report module is the Data Adjustment routine. It is used to modify historical (i.e. already saved to disk) production figures to reflect new information. For example, if an end of month survey or belt weightometer reading shows that the tonnage moved is less than that indicated by truck count, then the daily tonnages can be changed using the routine. Load factors are adjusted automatically whenever the tonnage is changed. In addition, load factors can be changed without modification of historical production figures. This might be necessary if different rock types with different specific gravity are being mined, or if a truck fleet replacement takes place.

4.2 Mobile Maintenance Module

The Mobile Maintenance Module is a menu-driven, interactive program similar in some respects to the Mine
Daily Production Report program previously discussed. It is, however, approximately twice the length (47,000 bytes) and produces six different reports. It consists of seven primary routines, many of which have menu-driven subsidiary routines. The seven primary routines are: 1. System Initialization. 2. Data Input. 3. Planning and Scheduling report. 4. Fuel and Oil report. 5. Equipment Maintenance History. 6. Equipment Records. 7. Tire Control. The program makes use of a total of nine different data files. Figure 4.4 shows an overview of inputs and outputs of the Mobile Maintenance program.

4.2.1 System Initialization

The system initialization routine is used to create the nine random access data files incorporated in the Mobile Maintenance Module. The initialization routine is menu-driven, which lets the user input initial data in a sequential and organized manner. The first file to be created is the Equipment Records file (MOEQUIP.DAT). This file consists of one record for every unit of mobile equipment. Each record contains the equipment I.D., description (make, model, year), acquisition cost and date, estimated life, insurer, the cost and coverage of insurance, equipment hours to date, historical availability and
utilization, and production to date (i.e. tons hauled, etc.). Initialization of this file requires the input of the above information for the entire mobile equipment fleet. The program imposes a fleet limitation of 21 units of mobile equipment because of restrictions inherent in the GWBASIC language.

The second item on the initialization menu is the setup of equipment hours, fuel, and oil files. This routine establishes three files for recording operating hours, fuel consumed, and oil consumed per day for each piece of equipment in MOEQUIP.DAT. The files contain one year of operating data, and initialization basically sets all values to zero. This has to be done annually.

The planning and scheduling files initialization is the third listing on the menu. This routine creates one file of preventive maintenance tasks, and a second file which contains equipment I.D.s and those tasks which are applicable. The information required for each P.M. task includes the task number, description, number of mechanics required, estimated total man hours, major parts list, and the interval (in equipment hours) between servicing. The program allows a maximum of 99 preventive maintenance tasks. The second file created by this routine basically relates the P.M. tasks to specific pieces of equipment. For example, replacement of ripper teeth would be assigned to dozers and not to drills.
The fourth menu item in the initialization routine is the creation of the maintenance history file. This file is essentially a maintenance job ticket history. Information from completed job tickets is entered via the Data Input routine, and stored in this file.

Finally, the initialization routine sets up two files in support of tire control. The first file is a tire database which stores information on each tire, such as the tire brand, manufacturer, size, cost, warranty hours, and year of manufacture. The second file contains a tire maintenance history based on job ticket format.

4.2.2 Data Input

The Mobile Maintenance module's data input routine is composed of four sections: fuel and oil usage, maintenance history, additions to equipment records, and tire control update. Each of these sections is accessed via the Data Input menu. Data input is achieved interactively in a similar manner to that used in the Mine Daily Production Report module.

The fuel and oil usage update is used to record the daily consumption of fuel and oil by piece of equipment. The date of use is input, then the program lists each piece of mobile equipment and inquires about fuel and oil
consumption. The Daily Fuler's Report provides the source of information.

The maintenance history update routine allows the input of information from completed maintenance job tickets. It also updates the availability and utilization statistics of all mobile equipment referred to in the job tickets.

Additions to the mobile equipment fleet require corresponding additions of records to the equipment records file. This is accomplished using the Additions to Equipment Records data input routine. This routine is very similar to the procedure used in the initialization of equipment records previously discussed in section 4.2.1. The information required for each new record includes the equipment I.D., description, acquisition date and cost, estimated life, insurer, cost and coverage of insurance, equipment hours, historical availability and utilization, and production to date.

The final item on the Data Input menu is the Tire Control Update routine. This routine allows the user to record and update tire maintenance history via the input of data from the tire job tickets. This data includes the date of repair, tire I.D., equipment I.D., tire position, and the cost of repair. The routine also provides the means for adding new tires to the tire data base. The information required is identical to that described in the tire control initialization routine (section 4.2.1)
The Planning and Scheduling routine is composed of three main elements: 1. a routine which allows the addition to or modification of the P.M. (preventive maintenance) task list, 2. preparation and printing of the Planning and Scheduling report, and 3. printing of the P.M. task list.

The first routine allows the user to change general restrictions influencing preventive maintenance (i.e. the number of service bays, the number of mechanics, etc.), provides the means to modify individual P.M. tasks, and also allows the addition of new tasks to the P.M. task list. It is driven by its own sub-menu, which gives the user the capability of doing what is necessary without having to interact with the computer over details not pertinent to the task at hand.

The preparation of the Planning and Scheduling Report involves some of the most complicated programming in the entire Mobile Maintenance module. Before using the routine, all completed job tickets have to be input via the Data Input Routine. The program allows an escape back to the main menu if this has not been done. The next step in the routine is the input of data concerning jobs in service and in queue. This information is taken from the maintenance foreman's Status Report (Figure 3.9). After the data has been entered the program runs through iterative calculations
which result in the weekly maintenance schedule. (See Appendix IV for program documentation.) The program first determines the resources required to complete the jobs in service and in queue. Then it allocates remaining resources (for the week) to a prioritized list of preventive maintenance tasks. The priority of P.M. tasks is determined by reviewing equipment usage subsequent to the last scheduled maintenance for each piece of equipment and for each P.M. task. First priority is assigned to equipment which is longest overdue for preventive maintenance. The program also produces a short summary of the latest maintenance work completed, including comparisons of actual labor requirements with those estimated. Figure 4.5 depicts a sample of the Planning and Scheduling Report. The third and final element of the Planning and Scheduling routine is the printing of the Preventive Maintenance Task List. This is used to provide a hard copy of P.M. tasks. The routine simply prints the contents of the P.M. task list file (PMJOBS.DAT). A sample printout is shown as Figure 4.6.

4.2.4 Fuel and Oil Report

The Fuel and Oil Report routine has as its sole purpose the preparation and printing of the Equipment Fuel and Oil Usage Report. The routine begins by requesting the ending
## MOBILE MAINTENANCE MODULE

### PLANNING AND SCHEDULING REPORT

**WEEK BEGINNING 01-23-89**

<table>
<thead>
<tr>
<th>IN SERVICE</th>
<th>IN QUEUE</th>
<th>PM SCHEDULE</th>
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<td><strong>IN SERVICE</strong></td>
<td><strong>IN QUEUE</strong></td>
<td><strong>PM SCHEDULE</strong></td>
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<tr>
<td><strong>116 H105</strong></td>
<td><strong>118 L002</strong></td>
<td><strong>121 L002</strong></td>
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<tr>
<td><strong>ENGINE OVERHAUL - TRUCKS</strong></td>
<td><strong>REBUILD BUCKET</strong></td>
<td><strong>CHANGE OIL FILTERS</strong></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>2</strong></td>
<td><strong>2</strong></td>
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<tr>
<td><strong>42</strong></td>
<td><strong>6</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>12</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

| **117 GSO2** | **119 DRO3** | **122 L002** |
| **CHANGE RIPPER TEETH** | **REPAIR DRILL MAST** | **REPLACE BUCKET TEETH** |
| **1** | **2** | **1** |
| **2** | **14** | **1** |
| **1** | **10** | **1** |

| **120 H106** | **123 L001** | **124 L001** |
| **999** | **1** | **12** |
| **REALIGN REAR AXLE** | **CHANGE OIL FILTERS** | **REPLACE FUEL FILTER** |
| **2** | **2** | **2** |
| **10** | **10** | **10** |

### LATEST PERFORMANCE

<table>
<thead>
<tr>
<th><strong>JOB</strong></th>
<th><strong>EQUIP</strong></th>
<th><strong>PM#</strong></th>
<th><strong>DESCRIPTION</strong></th>
<th><strong>MECHANICS</strong></th>
</tr>
</thead>
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<td><strong>ID</strong></td>
<td><strong>ID</strong></td>
<td><strong>#</strong></td>
<td><strong>REQ. MN-HRS</strong></td>
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<tr>
<td><strong>142</strong></td>
<td><strong>H101</strong></td>
<td><strong>999</strong></td>
<td><strong>RADIATOR REPAIR</strong></td>
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</tr>
<tr>
<td><strong>127</strong></td>
<td><strong>H101</strong></td>
<td><strong>9</strong></td>
<td><strong>REPLACE BRAKE WEAR PARTS</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>121</strong></td>
<td><strong>H101</strong></td>
<td><strong>999</strong></td>
<td><strong>REPLACE HYDRO-PUMP</strong></td>
<td><strong>2</strong></td>
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<tr>
<td><strong>114</strong></td>
<td><strong>DRO1</strong></td>
<td><strong>12</strong></td>
<td><strong>REPLACE FUEL FILTER</strong></td>
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<td><strong>113</strong></td>
<td><strong>L003</strong></td>
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<td><strong>REPLACE BUCKET TEETH</strong></td>
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</tr>
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<td><strong>111</strong></td>
<td><strong>H104</strong></td>
<td><strong>999</strong></td>
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<td><strong>4</strong></td>
<td><strong>2</strong></td>
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<td><strong>24</strong></td>
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<td><strong>108</strong></td>
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<td><strong>CHANGE OIL FILTERS</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>110</strong></td>
<td><strong>H102</strong></td>
<td><strong>3</strong></td>
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<td><strong>106</strong></td>
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<td><strong>REPLACE HYDRAULIC LINES</strong></td>
<td><strong>2</strong></td>
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<td><strong>115</strong></td>
<td><strong>H101</strong></td>
<td><strong>11</strong></td>
<td><strong>REBUILD DUMP BED</strong></td>
<td><strong>2</strong></td>
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<td><strong>112</strong></td>
<td><strong>GSO2</strong></td>
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<td><strong>L003</strong></td>
<td><strong>999</strong></td>
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<td><strong>236</strong></td>
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## LIST OF PM TASKS

<table>
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<tr>
<th>PM #</th>
<th>DESCRIPTION</th>
<th># MECH. MAN REQUIRED</th>
<th>HRS. PARTS REQUIRED</th>
<th>INTERVAL HOURS</th>
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<tr>
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<td>FILTERS 2</td>
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<tr>
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<td>WIPERBLADES 1</td>
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<td>7</td>
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<td>RIPPIERS 1</td>
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<td>16 DISKS PADS CYLINDERS</td>
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<td>STEELPLATE</td>
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<td>11</td>
<td>REBUILD DUMP BED</td>
<td>2</td>
<td>STEELPLATE</td>
<td>500</td>
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<tr>
<td>12</td>
<td>REPLACE FUEL FILTER</td>
<td>1</td>
<td>FILTER 1</td>
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</table>

### THE FOLLOWING IS A LIST OF MOBILE EQUIPMENT WITH APPLICABLE PM NUMBERS

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>DR01</td>
<td>1 4 8 12</td>
</tr>
<tr>
<td>DR02</td>
<td>1 4 8 12</td>
</tr>
<tr>
<td>DR03</td>
<td>1 4 8 12</td>
</tr>
<tr>
<td>LO01</td>
<td>1 2 5 6 8 9 10 12</td>
</tr>
<tr>
<td>LO02</td>
<td>1 2 5 6 8 9 10 12</td>
</tr>
<tr>
<td>LO03</td>
<td>1 2 5 6 8 9 10 12</td>
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<td>H102</td>
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<td>H103</td>
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<td>1 3 6 8 9 11 12</td>
</tr>
<tr>
<td>GS01</td>
<td>1 4 5 8 9 12</td>
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<tr>
<td>GS02</td>
<td>1 4 5 7 8 9 12</td>
</tr>
<tr>
<td>GS03</td>
<td>1 4 6 8 9 12</td>
</tr>
</tbody>
</table>
date and number of days to be covered in the reporting period. It then accesses the data files containing equipment hours, fuel, and oil usage, and retrieves the information for the report period. The report itself is shown as Figure 4.7. It lists each piece of equipment, equipment operating hours, total fuel consumption and consumption rate, and total oil consumption and oil consumption rate. This information is used both to monitor equipment performance, and also as a source of information for the Summary Performance Report.

4.2.5 Equipment Maintenance History Report

As with the Fuel and Oil Report routine, the Equipment Maintenance History routine’s only function is the preparation and printing of the specified report. Figure 4.8 shows a representative output of the routine. The user specifies the particular piece of equipment for which a report is to be prepared. The program then retrieves the appropriate data from the maintenance history data file, (MNTHST.DAT). This data includes equipment I.D., description and availability along with the maintenance history as documented with job tickets. The principle use of this report is equipment management, including decisions regarding equipment replacement.
## FUEL AND OIL USAGE REPORT

**PERIOD OF 7 DAYS ENDING 01-20-1989**

<table>
<thead>
<tr>
<th>EQUIP ID</th>
<th>HOURS OPERATED</th>
<th>FUEL GAL.</th>
<th>FUEL GAL/HR</th>
<th>OIL QTS.</th>
<th>OIL QTS/HR</th>
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<tr>
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<td>4.9</td>
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<td>3.5</td>
<td>24.0</td>
<td>0.5</td>
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<td>3.2</td>
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<td>LO02</td>
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<td>7.1</td>
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<td>0.5</td>
</tr>
<tr>
<td>LO03</td>
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<td>3.6</td>
<td>19.0</td>
<td>0.2</td>
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<tr>
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<td>32.0</td>
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<td>H102</td>
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<td>267.0</td>
<td>3.6</td>
<td>31.0</td>
<td>0.4</td>
</tr>
<tr>
<td>H103</td>
<td>58.0</td>
<td>273.0</td>
<td>4.7</td>
<td>32.0</td>
<td>0.6</td>
</tr>
<tr>
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<td>50.0</td>
<td>270.0</td>
<td>5.4</td>
<td>7.0</td>
<td>0.1</td>
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<td>287.0</td>
<td>3.5</td>
<td>42.0</td>
<td>0.5</td>
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<tr>
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<td>17.0</td>
<td>0.3</td>
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<tr>
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<td>409.0</td>
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<td>36.0</td>
<td>0.5</td>
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<td>0.4</td>
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<tr>
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<td>279.0</td>
<td>6.5</td>
<td>17.0</td>
<td>0.4</td>
</tr>
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</table>
**FIGURE 4.3: MOBILE MAINTENANCE MODULE - EQUIPMENT MAINTENANCE RECORD**

### EQUIPMENT MAINTENANCE HISTORY

<table>
<thead>
<tr>
<th>DATE</th>
<th>DESCRIPTION</th>
<th>MECHANICAL AVAILABILITY TO DATE</th>
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<tbody>
<tr>
<td>01-31-89</td>
<td></td>
<td>64.9 %</td>
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### MAINTENANCE RECORD

<table>
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<th>PM#</th>
<th>DESCRIPTION</th>
<th>HOURS DOWN</th>
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<td>01-17-1989</td>
<td>11</td>
<td>REBUILD DUMP BED</td>
<td>8</td>
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<tr>
<td>01-13-1989</td>
<td>6</td>
<td>CHANGE WINDSCREEN WIPERS</td>
<td>1</td>
</tr>
<tr>
<td>01-13-1989</td>
<td>1</td>
<td>CHANGE OIL FILTERS</td>
<td>2</td>
</tr>
<tr>
<td>01-19-1989</td>
<td>999</td>
<td>REPLACE HYDRO-PUMP</td>
<td>11</td>
</tr>
<tr>
<td>01-23-1989</td>
<td>9</td>
<td>REPLACE BRAKE WEAR PARTS</td>
<td>7</td>
</tr>
<tr>
<td>01-26-1989</td>
<td>999</td>
<td>RADIATOR REPAIR</td>
<td>6</td>
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</table>
The Equipment Records Report routine allows the user to print out equipment records individually or for the entire fleet. The routine basically retrieves all the information from the equipment records file (MOEQUIP.DAT) and then prints only that information requested. Figure 4.9 depicts a typical equipment record report. The figures for equipment availability and utilization are only meaningful if production data (input via the Data Input Routine) contained in the files is current. These figures are updated whenever maintenance information is input into the system via the Data Input routine. The availability and utilization figures are defined as follows:

\[
\text{Availability} = \frac{(\text{Total Hours Since Acquis.} - \text{Total Down Time})}{\text{Total hours since acquisition}} \times 100
\]

\[
\text{Utilization} = \frac{\text{Total hours of use}}{\text{Total hours available}} \times 100
\]

Again, the major use of this report is to assist in proper equipment management. The availability and utilization figures, along with production rates also aid in mine planning and scheduling.
FIGURE 4.9: MOBILE MAINTENANCE MODULE - EQUIPMENT RECORDS REPORT

EQUIPMENT RECORDS

DATE... 01-23-89

EQUIPMENT ID ... H105
DESCRIPTION ... WABCO 50B 1983

ACQUISITION:
DATE ... 08/86
COST ... $ 350000

INSURANCE:
COMPANY ... AMICA
COVERAGE ... $ 350000
COST ($/YR) .. $ 6000

ESTIMATED TOTAL LIFE ...... 12500 HOURS
TOTAL HOURS OPERATED ....... 7447 HOURS
ESTIMATED LIFE REMAINING .... 5053 HOURS

TOTAL PRODUCTION ... 1117828 TONS
AVE. PRODUCTION ... 150.1 TONS/HR

AVAILABILITY ... 78.0 %
UTILIZATION .... 56.0 %
The Tire Control Report routine is the final report-generating section in the Mobile Maintenance Module. It prints tire data and tire maintenance history for any tire specified by the user. Basically the routine begins by requesting input from the user identifying which tire's history is to be printed. The user also has the option of printing records for all tires. The program then retrieves data from the two data files, TIRE.DAT and TIREHIST.DAT. This data is organized and presented as shown in Figure 4.10. The Tire Control Report is used to help control tire costs and also as a source of information for the Monthly Performance Report.
FIGURE 4.10: MOBILE MAINTENANCE MODULE - TIRE RECORDS REPORT

TIRE RECORDS 02-16-1989

TIRE ID ... TRK002  BRAND ... BRIDGESTON
SIZE ... 21.00X35 3  ORIG. COST ... $3000
WARRANTY HOURS... 2000  HOURS
YEAR...1987

HISTORY

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<thead>
<tr>
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<th>EQUIP ID</th>
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<th>DEPTH COSTS</th>
<th>TOTAL HOURS</th>
<th>STATUS</th>
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<td>.8</td>
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<td>H103</td>
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<td>.6</td>
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<td>H103</td>
<td>3</td>
<td>.4</td>
<td>55</td>
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</table>
4.3 Heap Leach Production Module

As with the other two modules, the Heap Leach Production module is a menu-driven, interactive program. It is similar in size and structure to the Mine Daily Production Report module. The Heap Leach Production module consists of two primary routines, the first of which initiates four files for storage of daily production data, and the second of which is used for data input and preparation of the daily report. The program also uses two of the files associated with the Mobile Maintenance module for storage of mobile equipment usage and production data. Figure 4.11 shows a schematic diagram of the program.

4.3.1 Initialization Routine

The initialization routine is used to create either three or four random access files for storage of daily production and pad status data. Three of the files are set up on an annual basis, with the files having one record for each day of the year. The first file, (HLP1.DAT), is used to store data pertaining to the crushing, agglomerating, pad loading/unloading, and leaching functions. The second file (HLP2.DAT) is used for recording information about adsorption, desorption, and refining functions along with the process inventories. The third file, (HLMOEQ.DAT) is
FIGURE 4.11: HEAP LEACH PRODUCTION REPORT MODULE - SCHEMATIC DIAGRAM

INITIALIZATION ROUTINE

DATA INPUT

HEAP LEACH PRODUCTION REPORT MODULE

HLP1.DAT

HLMOEQ.DAT

HLP2.DAT

HLP3.DAT

UPDATE EQUIPMENT USAGE FILES

MOEQUIP.DAT

EQHRS.DAT

DAILY REPORT
used to store information concerning mobile equipment usage in the heap leach function. The last file (HLP3.DAT) consists of information concerning leach pads, with one record devoted to each pad. These records contain information on total tonnage on the pad, head grades, days in leach, estimated recoveries to date, and pad status. This file is initialized only once, and is updated on a daily basis. If HLP.3 does not already exist, the initialization routine requires the input of information about all pads under construction, in leach, and removed from leach. This information is entered in response to prompting questions posed by the program. Upon successful input of this data, it is stored for subsequent utilization by the report preparation routine, and the program then returns to the main menu.

4.3.2 Daily Report Routine

The Daily Report Routine is used both for input of production data and also for preparation of the Heap Leach Daily Production Report. Data input is achieved interactively in a similar manner to that described previously (Section 4.3.1). The data input routine begins with queries concerning the date and day of the week for which data is to be entered. The program then checks the data file to be sure that information for the specified date
has not already been input. If it has, the user is given the choice of either overwriting existing data, or entering a different date. This gives the user the opportunity to correct any inaccuracies in previously entered data. After the date has been verified, the program launches into a series of questions designed to prompt the user to enter information concerning the various heap leach process functions. Data entry basically follows the process steps in order, beginning with crushing/agglomeration and ending with refining. As with the Mine Daily Production Report module, data is input on a per shift basis. Figure 4.12 shows two input screens, one for crushing/agglomeration data input, and the second for input of adsorption data. If a process is not operated during a particular shift, the prompting questions are by-passed and the routine continues with the next shift.

Upon completion of data input, the program calculates the daily production figures from the shift data and stores this information in the appropriate data files (described in Section 4.3.1). If mobile equipment is utilized, the mobile equipment data files are also updated.

The routine for printing the daily report comprises the remainder of the Heap Leach Production module. The product of this routine is shown as Figure 4.13. The report begins with summary metal production statistics for the day, for the week to date, and for the year to date. Included in the
CRUSHING/AGGLOMERATION

SHIFT # 2

CRUSHER HOURS OPERATED _____
TONS CRUSHED? _____
GOLD ASSAY--OZ/TON? _____
SILVER ASSAY--OZ/TON? _____
% MOISTURE? _____
CEMENT ADDED--LBS? _____
LIME ADDED--LBS? _____
OPERATOR? ______

ADSORPTION

SHIFT # 1

HOURS ADSORBING? _____
TOTAL FLOW--GALLONS? _____
HEADS--GOLD--OZ/TON? _____
HEADS--SILVER--OZ/TON? _____
TAILS--GOLD--OZ/TON _____
TAILS--SILVER--OZ/TON _____
IS INFORMATION CORRECT? (Y/N) _____
### HEAP LEACH PRODUCTION REPORT

**01-12-1989**

#### SUMMARY

<table>
<thead>
<tr>
<th>DAY</th>
<th>WEEK TO DATE</th>
<th>YTD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### ADSORPTION

<p>| | | | | |</p>
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<th></th>
<th></th>
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<th></th>
<th></th>
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<td>SILVER...OZ.</td>
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#### DORE...OZ.

<p>| | | | | |</p>
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<td>32400.0</td>
<td>800.0</td>
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FIGURE 4.13: HEAP LEACH PRODUCTION REPORT - CONTINUED

### ADSORPTION

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### DESORPTION/ELECTROWINNING

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### REFINING

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### IN PROCESS INVENTORY

- **TOTAL OZ AU = 1619.70**
- **RECOVERABLE AU AT 52.1% = 844.64 OZ.**
- **TOTAL OZ AG = 7573.5**
- **RECOVERABLE AG AT 29.5% = 2235.7 OZ.**
FIGURE 4.13: HEAP LEACH PRODUCTION REPORT - CONTINUED

<table>
<thead>
<tr>
<th>PAD #</th>
<th>TOTAL TONS</th>
<th>OPT AU</th>
<th>OPT AG</th>
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<th>EST.REC. AG</th>
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<td>0.17</td>
<td>39</td>
<td>72.9</td>
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**PAD SUMMARY**

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**TOTALS**

| 89950 | 0.05 | 0.18 | 35.8 | 52.1 | 29.5 |

The Heap Leach Production Report is used to monitor the daily performance of the heap leach process functions. This information contained in the report is also a primary source of production information for the Monthly Performance Report.

The three modules discussed in sections 4.1 through 4.3 provide the production and maintenance information necessary for effective operation management. When combined with the other elements described in Chapter 7, the resulting system can benefit a small heap leach operation manager by...
summary are total dore' ounces produced, total contained gold and silver in dore', and calculated system recovery (the ratio of gold and silver recovered to the total gold and silver in ore placed on the pads.) Following the summary, information from each functional area is presented by shift. The crushing/agglomeration function is shown first, followed by heap construction, leaching, adsorption, carbon transfer, desorption/electrowinning, and refining. The report then presents an updated In-Process Inventory. This includes all metal ever placed under leach less dore' produced less contained metal in tonnage removed from leach, (either by physically removing the ore from the leach pad or by ceasing irrigation on a particular pad). The report concludes with the leach pad summary. This shows tonnage, grades, estimated recoveries, time in leach, and status of all pads.

The Heap Leach Production Report is used to monitor the daily performance of the heap leach process functions. The information contained in the report is also a primary source of production information for the Monthly Performance Report.

The three modules discussed in sections 4.1 through 4.3 provide the production and maintenance information necessary for effective operations management. When combined with the other elements described in Chapter 3, the resulting system can benefit a small heap leach operation manager by
formatting relevant information in a timely and useful manner. In the subsequent and concluding chapter, some of the aspects of implementation of this system will be discussed along with alternatives in programming language and additional computer applications.
Chapter 5

CONCLUSION

In Chapter 1, it was stated that a management information system can be defined as "an organized collection of people, procedures, and devices which gathers, interprets, and presents information in support of managerial decision-making." In subsequent chapters, the procedures and devices have been defined for an information system which applies to a small, surface heap leach operation. This system would need to be implemented at an actual operation in order to fully comply with the above definition. In this chapter, discussion will be focused on the viability and possible problems associated with system implementation, additional computerization possibilities, and alternative programming languages for information system development.

5.1 System Implementation

The first problem which must be overcome in achieving the objective of system implementation, is that of finding a mining operation which fits the parameters imposed by the system. Certainly there are many small heap leach operations in existence which not only fit the technical
specifications, but also would benefit by having a formal management information system. The real problem is in locating an operation which has a business structure flexible enough to allow implementation of an alien information system. The pressures and demands placed on an operation manager by various joint venture partners, for instance, often dictate information requirements which might be beyond the flexibility or capability of this system. Yet, a good manager knows that certain information requirements have to be met, no matter what the outside influences are. Therefore, finding a suitable operation is not an insurmountable problem.

Another difficulty which would be encountered has to do with the fact that this information system was developed on a somewhat generalized basis. Because of this, there will never be an exact fit of the system to any particular operation. The manager who adapts this system accepts a compromise, whereby the accuracy, fit and high cost of a custom-designed system are traded for the convenience and low cost of an existing, but more generalized system.

A third problem which might be experienced in gaining operational implementation of the system stems from the use of "GWBASIC" as the programming language for the computerized portions of the system. While "GWBASIC" is used in a great number of microcomputer applications, its file handling capabilities are awkward and somewhat complex.
This presents no real problem with the system as is, but additional computerization and/or development of interfaces with commercial application packages (such as Cost Accounting software) could require a substantial amount of programming effort. Thus, full computerization of this system could be difficult and expensive to achieve. If a manager is willing to accept the limitations of non-complete integration, then this problem is of minimal consequence.

Also, there are software packages available which can handle files from different language formats (for example, qPLEX-IV by Snow Software Corp.). Use of such a package would allow a more complete integration of commercial application software with the mining, heap leaching, and mobile maintenance applications developed in this thesis.

Implementation of individual system components is also a real possibility. The three computer modules can be utilized independently of the rest of the system. In addition, while the modules were developed to interact with each other (through the use of common data files), each can be made to stand alone with minor changes in the code. For example, if a mining operation is using a contractor for mining, the Mine Production Report module and Mobile Maintenance module would be of limited use to the manager. On the other hand, the Heap Leach Production Report module would be useful and could be easily modified to fit the needs of the operation.
5.2 Additional Computerization Possibilities

As previously mentioned, it would be difficult to achieve full computerization of this system. That isn't to say, however, that other elements of the system would not benefit by computerization. For example, the accounting function would be well served by acquisition and implementation of commercially available software. Such software is readily available, including some reasonably priced packages (i.e. MICA-Mine Quarry Cost Accounting System by Argos Software).

Many elements of the Summary Performance Report would also be well suited for computerization. These include Production Statistics, Mobile Equipment Utilization, Analysis of Payroll, and the various functional area performance reports. Computerization of these elements could be sequenced over a period of time to avoid possible problems caused by an abrupt conversion to computer-generated reporting.

The choice of programming language for additional computerized modules would not necessarily be restricted to "GWBASIC". To provide commonality with the existing applications, "GWBASIC" might be the language of choice. Alternative languages would include data base management systems such as "dBASE III", and some of the more advanced spreadsheet languages. Use of one of these would probably
simplify programming tasks, and also provide more flexible reporting formats. Data files generated by the three existing applications could be integrated depending on the programming language used for additional computerization. Certainly the reports generated by the existing programs could be utilized in further computer applications, even if information from these reports had to be manually re-entered into the computer.

Data acquisition is another facet of the information system which could be improved by computerization. For example, large mining shovels can now be equipped with electronic monitoring and data-acquisition devices which keep track of equipment function and productivity, thus increasing operator productivity while reducing data entry tasks. Installation of this type of system on smaller scale equipment is technically feasible, although economic considerations would have to be carefully analyzed. Another product which is currently available, and possibly well suited to small scale heap leach operations, is a hand-held, programmable data entry device with internal memory. These units could be used by various personnel to input information now being recorded on data-entry forms. The units would then be interfaced with a microcomputer, and the data electronically transferred for further processing.
Managers of small heap leach operations are faced with the challenge of profitably mining and processing low grade (sometimes marginal) ore deposits with operational lives of generally short duration. The constraints imposed by this type of operation allow the manager only limited opportunity to recover from errors of judgement or omissions of action. This is why it is very important for heap leach operation managers to obtain relevant operational information in a timely manner. The availability of such information to a competent manager can make the difference between success and failure of the operation. The organized collection of people, procedures, and devices which gathers, interprets, and presents information in support of managerial decision-making can therefore be of as much importance to the small mine manager as it is to the chief executive officer of a multi-national conglomerate. It is not imperative that the heap leach operation manager have a computer-based MIS, but it is essential that they be provided with the information necessary for effective and efficient decision-making. The microcomputer provides a vehicle for a management information system which can lower the costs and decrease the time delay associated with provision of such information.
LIST OF REFERENCES


3. R.L. Paretta, pp. 46-47

4. G.B. Davis, p.9


8. Whitney & Whitney, Inc. In house study, Spring 1988


10. A legal definition of joint venture valid in most jurisdictions is as follows:
    "a special combination of two or more persons where in some specific venture a profit is jointly sought without the necessity of any actual partnership, corporate designation, or other business entity; or
    "an association of persons or legal entities to carry out a single business enterprise for profit, for which purpose they combine their money, effects, skill, and knowledge." 48 A C.J.S. Joint Adventure #2

Joint venture is a term used interchangeably with and/or synonymously to joint adventure or co-venture.
A definition more directly applicable in Nevada, deriving from current case law and binding in all Nevada courts is as follows: "A joint venture is a contractual relationship in the nature of an informal partnership wherein two or more persons conduct some business enterprise, agreeing to share jointly, or in proportion to capital contributed, in profits and losses." (Bruttomesso v.
The relationship between joint adventurers is fiduciary in character and imposes an obligation of loyalty to the enterprise and a duty of good faith, fairness, and honesty in their dealings with each other with respect to property belonging to the venture." Rhine v. Miller, 94 Nev. 647, 583 P. 2d 458 (1978).

Generally the same principles of law regarding general partnerships also apply to joint ventures. See e.g. Haertel By and Through Borregard v Sunshine Carpet Co. 730 P. 2d 428, reh. granted, 757 P 2d 364 (Nev. 1986). In addition, a contract, express or implied, is an essential part of a joint venture. There can be no joint venture without agreement. Ellingson v. Sloan, 22 Ariz. App. 383, 517 P. 2d 1100 (1974).

The only reference to joint ventures in statutory law is found in N.R.S. 624.290. Para. (2) requires a licensed contractor to secure an additional license for a joint venture, where his license is limited to contracts not exceeding certain monetary sums. Para. (1) prohibits two or more such limited licensees to engage in joint ventures without first having secured an additional license. (Nev. Rev. Stat. 624.290.


Bibliography


Kaas, L. Michael "The Evolution of Mining Computer Applications and the Role of the Microcomputer" U.S.B.M.


AN ANALYSIS OF CURRENT MANAGEMENT
AND OPERATING PRACTICES OF SMALL
SURFACE MINES

MINE 101

MINE 49

PRODUCING INCREASED OUTPUT

PETER EDWARD LANE

APPENDIX I
AN ANALYSIS OF CURRENT MANAGEMENT AND OPERATING PRACTICES OF SMALL SURFACE MINES

MINE 701

MINE AD.

PROFESSOR PIERRE MOUSSET-JONES

PETER EDWARD Lenz
Appendix I

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INTRODUCTION

This report discusses the information obtained from visits to twelve operating mines around the state of Nevada. The purpose of the visits was to obtain general information about operating, management, and control practices in current use at small surface mining projects. Information acquired will serve as an important basis for development of a management information system dedicated to small-scale, surface, precious metals mining operations.

Twelve Nevada mines were visited in a series of three trips. These visits were made in December of 1983, and January of 1984. Nine of the mines visited are primarily gold producers. Two mines produce silver, and one mine is a mercury producer. A list of the mines visited and the people interviewed can be found in Appendix I.1.

Each visit consisted of personal interviews with various mine employees. These employees were connected in one way or another to the information flow which leads to managerial decision making. A standard questionnaire was used as the basis for obtaining information in an organized manner. After completing the questionnaire at each mine, an attempt was made to catalogue information sources and flows peculiar to that mine. Also, examples of reports and forms were requested (and generally received) as examples of currently used system outputs and inputs.
QUESTIONNAIRE

The questionnaire was general in nature, however three specific areas were covered in some detail. These were: Mine Operating Statistics, (including organization, personnel, production statistics, etc.), Cost Accounting and Budgeting Practices, and Extent of Computerization. Most of the questions posed were readily answered, although satisfactory completion of the questionnaire was not always possible due to the unavailability of knowledgeable personnel. Some results of the survey will be discussed below. A copy of the questionnaire can be found in Appendix I.2

RESULTS OF QUESTIONNAIRE

The first questions were concerned with determining the size and organization of each specific operation. Table I.1 lists some statistics on the number of personnel and the functional areas to which they were dedicated.

| Table I.1 EMPLOYEES |
|----------------------|-----------------|-----------------|-----------------|-----------------|
|                      | Total # Personnel | % in Mining | % in Proc. | % in Maint. | % in Adm. |
| Ave. 12 mines        | 116 (93)*        | 36            | 22            | 21            | 21        |
| Min. 12 mines        | 15              | 22            | 12            | 11            | 10        |
| Max. 12 mines        | 370 (165)*       | 60            | 40            | 26            | 30        |

*These figures represent the average and maximum when excluding the largest mine visited.
Organization of the mining projects was fairly uniform, with minor variations from project to project. Two of the operations were without formal organization charts. One of these was the smallest operation visited, and the chain of command was very informal. The other operation without a written organization chart was an 80 person operation. The chain of command at this operation was fairly well structured, and a formal organization chart was going to be constructed "soon". The basic organization of different mining projects visited is outlined below:

<table>
<thead>
<tr>
<th>Mining</th>
<th>Processing</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>These three functional areas were consistently found to be directly beneath the General Manager in the chain of command.</td>
<td></td>
</tr>
</tbody>
</table>

- Maintenance Safety
- About half of the operations had separate maintenance and safety departments which reported directly to the General Manager. In the other operations, maintenance and safety were sub-categories of other functional areas.

<table>
<thead>
<tr>
<th>Engineering</th>
<th>Geology</th>
<th>Metallurgy</th>
<th>Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>These categories were generally found as sub-sets of the main functional areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mine production and stripping ratios varied appreciably from project to project. Table 1.2 presents the data.
TABLE 1.2 MINE PRODUCTION

<table>
<thead>
<tr>
<th></th>
<th>Ore st/yr x 1000</th>
<th>Stripping Ratio</th>
<th>Total Prod. Ore + Waste st/yr x 1000</th>
<th>Total Prod./ Employee st/yr-man x10³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave.</td>
<td>676 (610)*</td>
<td>3.9 (2.5)*</td>
<td>3304 (2150)*</td>
<td>28.5 (23.1)*</td>
</tr>
<tr>
<td>Min.</td>
<td>100</td>
<td>1.0</td>
<td>200</td>
<td>11.0</td>
</tr>
<tr>
<td>Max.</td>
<td>1400 (1250)*</td>
<td>10.0 (9.0)*</td>
<td>16000 (3750)*</td>
<td>58.0 (58.0)*</td>
</tr>
</tbody>
</table>

*These figures represent the average and maximum when excluding the largest mine visited.

All of the mines visited maintained mining and stripping on a year around basis. One of the operations had a scheduled process shut-down lasting from December 1 to April 1 each year. This was due to freezing of the heaps. The other heap leach operations had other means of dealing with cold temperatures and had no scheduled downtime other than for maintenance.

At eleven of the mines, loading and haulage was accomplished using front-end loaders and rear dump haul trucks. Three of these mines also utilized hydraulic shovels for loading ore. The only non-precious metal mine visited used scrapers to achieve the loading and haulage functions. Mining equipment was generally well-scaled to the size of the operation in which it was used (small-scale mining equipment). Nothing unconventional was encountered in the way of support equipment.

Methods for determining quantity and quality of ore mined were fairly uniform, with some operations using a number of methods as multiple checks. The most common
methods of quantitative analysis were truck count, periodic survey of stockpiles and "As-built" (Pit in progress), and belt weightometers. Truck count was accomplished using either an employee dedicated solely to counting trucks and recording destinations, or based on truck operators' logs. Grade of mined ore was determined by assays of blasthole samples, conveyor belt samples, and automatic sampling of mill feed. All the precious metal operations visited used atomic absorption for assaying, with fire assaying used as a check. For valuing blocks of mined ore, most operations used simple averaging of sample assay values.

Three of the operations visited had union representation of employees. At one operation, all employees were salaried. Although this is an unusual practice, it seemed to be working quite well.

Independent contracting in some form or another was found to be a common practice. Many operations used independent contractors for initial development, tailings dam construction, engineering studies, and exploration drilling. Only one operation was currently using contractors for mining. Two others used contractors for haulage.

All of the operations had at least some equipment repair work done by outside dealers (i.e. equipment supplier). Conversely, all operations visited performed their own routine maintenance and minor repair work.
The most common type of business organization encountered was the "joint venture". Seven of the twelve mines were joint venture operations. Four others were organized as investment centers of publicly-owned corporations. The smallest operation visited was a privately-owned concern.

None of the operations used Standard Costing techniques for determining production costs. A majority of the mines used Absorption Costing using actual costs, while one operation used Variable-Actual Costing for determining production costs. In this system, actual costs which vary directly with the rate of production are segregated from other costs. These other costs are not applied in reporting of cost per ton statistics.

Mining costs tended to be expensed as period costs at virtually every operation. None of the operations maintained raw ore stockpiles (of any size), so this seems a valid practice. Milling costs of the smaller operations also tended to be expensed as period costs, but the larger operations applied milling costs to work in process inventories. Stripping and other development costs were either expensed or deferred and deducted on a units of production basis.

Budgeting practices at the operations visited were not at all uniform. However, a majority of the operations used what can be loosely defined as a "bottom-up" budgeting
process. Department heads would submit departmental budgets to the manager for his approval. He, in turn, would submit the total budget to the organization hierarchy. One operation used the "bottom-up" approach for capital items only.

Three of the mines used a "top-down" budgeting process. Two of the three had budgets prepared on site by the manager. The third operation had its budget prepared at company headquarters. The manager at this operation seemed to have little to say about what went in the budget. The typical budgeting horizon was one year, with monthly budgets derived from the annual budget.

Performance budgets were prepared monthly at ten of the mines visited. The other two operations didn't make use of performance budgets (reports comparing actual expenses with budgeted expenses, and in some cases analyzing variances). Most of the mines using performance budgets had these reports prepared off-site by "home office" staff. As a result, there was often a serious time delay before operations actually obtained their performance report, thus limiting its use as a managerial tool.

To a certain extent, Responsibility Accounting was used at most operations. Responsibility centers most often consisted of the two main functional areas: mining and processing. A few of the operations had more involved Responsibility Accounting systems, with numerous
responsibility centers.

Frequency and type of production reports varied from mine to mine, depending quite a bit on the particular business structure of each mining venture. All of the operations kept track of daily production, and all of the operations issued formal monthly reports (compiled from daily statistics). About half of the operations also prepared weekly reports, generally for on-site use. It was common for monthly reports to be generated off-site (i.e. at company headquarters) and then distributed at the mine.

At most of the operations visited, no comprehensive set of equipment records was kept. Generally, financial information on equipment (such as acquisition cost, depreciation history, appraised value, and insurance) was kept separately (often off-site) from operating and maintenance history. A few of the operations did have fairly complete records of equipment. Included in the records were the following: equipment description, acquisition cost and date, insurance, depreciation history, maintenance history, and operating history.

None of the operations visited performed valuations of raw ore stockpiles. Either no raw ore stockpiles were maintained, or valuation of stockpiles was left up to company auditors, corporate headquarters, etc. The few operations with raw ore stockpiles tended to inventory the stockpiles on a monthly basis (calculate grade and tonnage).
Likewise, finished goods inventories were kept to a minimum at all operations (usually zero), so valuation of finished goods inventory was rarely made. When finished goods were valued, it was generally at market value rather than at the cost of production. Spare parts and chemicals and supplies inventory control methods varied considerably from operation to operation. Certain high-usage chemicals such as sodium cyanide, were often purchased through long term contracts with suppliers. Therefore, very limited inventories were maintained. The larger operations tended to keep a tighter control on inventories than did the smaller mines. The most common inventory control method used was the minimum-maximum method. Periodic count (usually monthly) determined "quantity on hand" at most operations. Only one mine used a "perpetual record" to determine quantity on hand.

The reporting systems for the majority of mines visited were handed down from parent companies or organizational headquarters. Only two of the operations had custom designed reporting systems, and these had both undergone a certain amount of evolution before reaching the current form.

Microcomputers were found in use at seven of the twelve operations visited. Two other operations had mainframe computers on site, and three mines were without computers. Of these, two had serious plans for acquiring microcomputers
in the near future. Access to timeshare service (or company headquarters' computer facility) was also available at four of the operations. Most of the microcomputers in operation were being used for technical applications only. The following table lists information on management applications of computers at the various mine sites.

Table 1.3
On Site Computer Applications

<table>
<thead>
<tr>
<th>Application</th>
<th># of Mines With Systems</th>
<th>Mines Planning To Get System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Reporting</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>General Ledger</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Parts Inventory</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Chemicals and Supplies</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Payroll</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Equipment Records</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Ore Inventory</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Depreciation/Depletion</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Maintenance Reporting</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Profit Plan</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Income Summary</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Balance Sheet</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Capital Expenditure Budget</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Metallurgical Accounting</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Health/Safety Training</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

The operations with on-site computerized reporting systems (encompassing one or more of the above applications) seemed satisfied with the format and usefulness of the reports output by their respective systems. The chief complaint regarding reports provided from off site (such as performance budgets compiled by company headquarters) was
the time delay in receiving the reports. This often negated their usefulness.

When asked what reports and services a custom-designed management information system should provide, the following responses predominated: Production reporting (including performance budgeting), spare parts inventory, chemical and supplies inventory, equipment records, maintenance reporting, and annual budgeting assistance. Some of the more typical accounting functions were hardly mentioned, but this may be a case of taking things for granted.

Observations and conclusions regarding the results of the questionnaire will be discussed in the final section of this paper. The relative success of the questionnaire in obtaining information was good, but often depended less on the questionnaire itself than on the availability for interview of knowledgable personnel.

INFORMATION: FLOW AND FORMAT

Although the basic sources of information were common to all the operations visited, the structure of flow, and the format of reports varied considerably from mine to mine. While it can be said that no two mines are exactly alike, and therefore information systems should also have a degree of individuality, results of this survey indicate three (3) main reasons for the wide variation in flows and formats:
1. The type of mineral processing influenced the complexity of both the reporting formats and the information flow structure. For instance, the heap leaching operations had simple report format and information flow patterns compared to operations using carbon in pulp processing. 2. It was found that written information did flow along organizational lines at most operations, with the exceptions being those operations with heavy computerization (which tends to allow information to flow horizontally, across organizational lines). Since the on-site organizational structures of the operations were different from each other, they created variation in information flow structure. 3. The business structure under which each mine was organized had a large impact on the mine's information system. The joint venture arrangement sometimes created situations where different reports had to be prepared for different partners. Royalty arrangements also caused reporting difficulties. One operation had to maintain separate records for each claim (due to different owners). This resulted in up to six different production reports daily. Finally, most of the operations had information systems handed down from parent companies. This created inherent differences from mine to mine.

Still, after what's been said about the variation between operations, the fact remains that the primary sources of management information for each operating mine
are the same. Each functional area in a mine's organization generates some primary data which forms the basis of the information flow. This basic information concerns two related topics: production, and the resources required to achieve production (labor, material energy, etc.). As previously indicated, Mining, Processing, and Administration are generally recognized as the three main functional areas of a mining operation. These can be broken down into numerous sub-functional areas. Following is a description of sources of information from sub-functional categories of a typical heap leach operation (surface mine). Sources of information for long-term planning (i.e. exploration) are not included.

Mining can be broken down into the following categories; drilling, blasting, loading, hauling, and maintenance. Drilling provides the samples from which other departments assign qualitative values to ore in place. It also provides information necessary to the costing of production, such as footage drilled, labor required, equipment used, fuel consumed, and supplies used.

The blasting function provides the following data: amount and type of explosives consumed per hole, number of holes blasted, labor used, and other supplies and equipment required.

Loading also provides data necessary to the cost accounting function. This includes equipment hours, labor,
fuel consumed, and number of trucks loaded.

The haulage function provides the first check on the quantity of both ore and waste mined, usually via truck count times a load factor. Information concerning labor, fuel, and equipment usage is also obtained.

The maintenance department collects statistics on equipment availability, servicing (preventive maintenance), repair labor, general equipment information, and parts and supplies consumed.

The Processing function of a heap leach operation consists of three main categories: crushing, heap construction and leaching, and refining (including carbon adsorption-desorption or zinc precipitation depending on the process being used).

Data obtained from the crushing function includes crusher operating time, quantity crushed, size range of crushed material, labor required, maintenance required, other equipment usage, power consumed, and parts and supplies used. In addition, samples are collected for determination of grade.

Heap construction provides information on materials used, labor needed, equipment used, quantity of material in the heap, and time of construction. During the actual leaching cycle, data is collected on chemicals used, labor, time in leach, pH and cyanide concentration of applied solution, pumping requirements, and solution flow rates.
Also samples of pregnant solution are taken for assay.

The refining process is usually one of two types: carbon-column adsorption and desorption along with electro-winning of metallic values, or zinc-precipitate (Merrill-Krowe) process followed by melting. Quantities of chemicals and supplies consumed, flow-rates, power consumed, time in circuit, labor, repair parts, and maintenance labor required are recorded when using either method. Also, samples of barren solution and finished products are collected for assay, and weight measurements on the finished products are taken.

Administration encompasses a wide range of sub-functional areas. Some of these provide little in the way of source data except for employee hours and personnel expense reports. However, the following departments (or activities) do feed the information flow with primary data.

The Assay Lab provides values for samples collected along the entire product flow path (from drilling through refining).

Engineering/Geology conducts surveys to determine drill hole locations for ore control, pit as-built, and other factors important in short-term planning and control.

The purchasing department documents what's been (or needs to be) bought, for how much, and for what reason.

The Warehouse/Inventory department documents quantity on hand, along with departmental requests and inventory
The Payroll department records employee payroll expense based on time records and other information supplied by the various departments.

Sales provides information on quantities sold, prices and dates of sale, along with associated expenses.

While the above list is certainly not exhaustive in regards to primary sources of information, it does include the more significant internal sources.

Seemingly as varied as the sources of information, are the ways of presenting it. Most of the operations visited had a set of standard forms (standard to that particular mine) for the collection, processing, and presentation of the various types of data. At the operations with computerized reporting, the format of reports tended to be similar, while some of the reports issued from manual systems were quite unique. Content of monthly production reports and cost reports (performance budgets) was fairly uniform from operation to operation. Daily reports were not quite as uniform, either in content or format. The following figures are representative examples of some of the reports collected during this survey: Figure I.1 is a daily production report. It is unusual in that it includes a summary of production on a daily, week to date, month to date, and year to date basis. It is also a very simple and
## Figure 1.1: Daily Production Report

<table>
<thead>
<tr>
<th>Date</th>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily</strong></td>
<td></td>
</tr>
<tr>
<td>Ore Mined</td>
<td></td>
</tr>
<tr>
<td>Ore Crushed</td>
<td></td>
</tr>
<tr>
<td>Preg Solution</td>
<td></td>
</tr>
<tr>
<td>Barren Solution</td>
<td></td>
</tr>
<tr>
<td>On Solution</td>
<td></td>
</tr>
<tr>
<td>Dore (OZ.)</td>
<td></td>
</tr>
<tr>
<td>Hrs Crushed</td>
<td></td>
</tr>
<tr>
<td>Hrs Precip.</td>
<td></td>
</tr>
<tr>
<td>Waste Mined</td>
<td></td>
</tr>
<tr>
<td><strong>Wk To Date</strong></td>
<td></td>
</tr>
<tr>
<td>Ore Mined</td>
<td></td>
</tr>
<tr>
<td>Ore Crushed</td>
<td></td>
</tr>
<tr>
<td>Preg Solution</td>
<td></td>
</tr>
<tr>
<td>Barren Solution</td>
<td></td>
</tr>
<tr>
<td>On Solution</td>
<td></td>
</tr>
<tr>
<td>Dore (OZ.)</td>
<td></td>
</tr>
<tr>
<td>Hrs Crushed</td>
<td></td>
</tr>
<tr>
<td>Hrs Precip.</td>
<td></td>
</tr>
<tr>
<td>Waste Mined</td>
<td></td>
</tr>
<tr>
<td><strong>Mth To Date</strong></td>
<td></td>
</tr>
<tr>
<td>Ore Mined</td>
<td></td>
</tr>
<tr>
<td>Ore Crushed</td>
<td></td>
</tr>
<tr>
<td>Preg Solution</td>
<td></td>
</tr>
<tr>
<td>Barren Solution</td>
<td></td>
</tr>
<tr>
<td>On Solution</td>
<td></td>
</tr>
<tr>
<td>Dore (OZ.)</td>
<td></td>
</tr>
<tr>
<td>Hrs Crushed</td>
<td></td>
</tr>
<tr>
<td>Hrs Precip.</td>
<td></td>
</tr>
<tr>
<td>Waste Mined</td>
<td></td>
</tr>
<tr>
<td><strong>Yr To Date</strong></td>
<td></td>
</tr>
<tr>
<td>Ore Mined</td>
<td></td>
</tr>
<tr>
<td>Ore Crushed</td>
<td></td>
</tr>
<tr>
<td>Preg Solution</td>
<td></td>
</tr>
<tr>
<td>Barren Solution</td>
<td></td>
</tr>
<tr>
<td>On Solution</td>
<td></td>
</tr>
<tr>
<td>Dore (OZ.)</td>
<td></td>
</tr>
<tr>
<td>Hrs Crushed</td>
<td></td>
</tr>
<tr>
<td>Hrs Precip.</td>
<td></td>
</tr>
<tr>
<td>Waste Mined</td>
<td></td>
</tr>
</tbody>
</table>
straight forward presentation. Figure I.2 is a daily operators equipment log. It requires information on the equipment condition in addition to a summary of the day's production. Figures I.3 and I.4 are two examples of monthly mine cost reports. Figure I.3 is actually a performance budget which shows a further level of detail than does Figure I.4. Figure I.5 is a partial list of standard forms being used at one operation. It is indicative of the large amount of paperwork associated with even small operations.
FIGURE 1.2
OPERATORS EQUIPMENT LOG

<table>
<thead>
<tr>
<th>NAME</th>
<th>EQUIP.#</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BRAKES:** RPM __________________ HOLDING POWER __________________

**INSTRUMENT PANEL** __________________ **LOADS/BUCKETS** __________________

**FIRE EXTINGUISHER** __________________ **ORE** __________________

**WASTE** __________________

**OTHER** __________________

MALFUNCTIONS AND/OR REPAIRS NEEDED:

____________________________________________________

____________________________________________________

____________________________________________________

SUPERVISOR'S SIGNATURE AND COMMENTS

____________________________________________________

____________________________________________________

____________________________________________________
### FIGURE 1.3. MINING COST DETAIL

<table>
<thead>
<tr>
<th></th>
<th>Budget Amount</th>
<th>Actual Amount</th>
<th>Variance Amount</th>
<th>Var %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRILLING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAGES OPERATING</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>MOBILE EQUIPMENT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>BLASTING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAGES OPERATING</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>GENERAL OPERATING SUPPLIES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>EXPLOSIVES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>MOBILE EQUIPMENT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>ORE CONTROL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SALARIES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>WAGES OPERATING</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>WAGES - MAINTENANCE</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>GENERAL OPERATING SUPPLIES</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>LOADING IN PIT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAGES OPERATING</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>PURCHASED SERVICES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>MOBILE EQUIPMENT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>HAULING IN PIT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAGES OPERATING</td>
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<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>MOBILE EQUIPMENT</td>
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<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>DUMP MAINTENANCE</strong></td>
<td></td>
<td></td>
<td></td>
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SUMMARY OF COSTS

- Drilling
- Blasting
- Loading
- Hauling
- General

Total Mining Costs

STATISTICS

- Tons Mined

COSTS PER TON MINED

- Drilling
- Blasting
- Loading
- Hauling
- General

Total Cost per Ton Mined
Figure I.5

Index of Original Forms

Accounts Receivable 1983
Acknowledge Company Issue
Acknowledge Rcpt.Co.Hanbook
Application for employment Authorization-Pickup Paycheck

Blk Record-I.R. TH-60 Drill
Blue Cross-Blue Shield: Application for Membership
Change Form "E27" Major Medical Claim Form
Budget Breakdown

Contractors Agreement-Sample
Coveralls-Vogue Laundry

Daily Drill Log
Daily Production Report
Daily Vault Transaction
Drill Hole Log

Employee Data Change Form
Employee Data Record
Employee Performance Review
Employee Time Sheet-M75
Eng. IA-Estimate Detail
Equipment Down Time
Equipment Rent
Expense Book
Expense Report

Field Drill Hole Log
Gold Bar Weight Report
Gold Shipment Form Letter
Gold Value Report
Graphic Drill Log-WSMC
Graph
Group Insurance Enrollment
Group Services-Change Form

Itinerary

Minesite Security Cheklst. Recovery/Laboratory
New Employee-Hire Form
Operators Equipment Log

Pass Card
Paycheck Error-D. Logan Performance Appraisal
Pre-Printed Forms

#5 Invoice
#27 Working Fund Cash Voucher
#35 Report of Accident Occurance or Loss
#56 Invoice
#57 Working Cash Fund Cash Replenishment
#59 Invoice Voucher
#60 Contact Status & Sum. Month-End Adj.
#72W Memorandum
AR Attendance Record
#DP-41 Cost master Revision Direct/Ind.
EQP-913 Back Chg. Subm.
#W-4 Employees' Withholding.

Physical Examination
Production Monthly Report

Quantities for Month
Resume'-No Openings Form Letter

Sales Tax Report
Telephone Log Week Ending
Termination Report

Vacation Request
ANALYSIS AND CONCLUSION

Based on this survey, a qualitative judgement on small mine management is generally positive. A good percentage of the mines visited have, or have access to, fairly sophisticated information systems, and most people interviewed were receptive to anything that might improve their operation. Some of the problems encountered that could be solved or reduced are the following: The problem of time-delay between the end of a period and receipt of a performance analysis for that period could be reduced considerably if the analysis were performed on site. In addition, local assignation of costs would probably better reflect the true cost picture, so the analysis would be more accurate. At many of the operations, there seemed to be an over abundance of paperwork. A good management information system would probably enable a reduction and simplification of paperwork without causing deterioration in the quality of reports. Finally, although many of the operations had good information flows, a well designed system of information flow would certainly benefit some of the mines by reducing duplication of data, etc.

Creation of a flexible management information system that could be adapted to similar operations (such as heap
leach) has merit. In addition, the fact that even the smaller mines are acquiring microcomputers indicates that this would be a good vehicle for basing a management information system. Some possible design considerations for such a system will be discussed below.

The results of the study indicate that the size of the operation is not really a large factor in determining whether or not the operation would benefit from a MIS. However, the larger an operation gets, the more data is generated. Microcomputers become less appropriate as a system vehicle as data bases become larger. Therefore, a very flexible limit on size should be set. In terms of employees, this would be around one-hundred maximum.

The mining operations would have to be relatively independent of parent companies, or have permission to set up their own information systems. A general management information system would have to be flexible enough to allow for variability in reporting to off-site interests, such as joint venture partners.

The most important report a management information system should output (as far as the manager is concerned) is the performance budget. A detailed performance budget allows a manager to manage by exception. It incorporates responsibility accounting to a sufficient degree so that a manager can locate problem areas easily, and correct the problems. This also gives those with lesser authority
responsibility) a gauge to monitor their own performance. Therefore, a management information system for a small operation should be built around the performance budget. Since the performance budget is primarily a product of production reporting and cost accounting, these also have to be an integral part of the system. Other functions that the system should incorporate are inventory control, maintenance reporting, metallurgical accounting (actually part of production reporting), and annual budgeting.

Sources of data have been discussed previously, but the questions of where and when data ceases to be processed manually and enters into the electronic data processing system haven't been answered. A management information system based on a microcomputer does not lend itself to full automation. Most management information systems are not fully automated anyway. Also, the small mine concept implies the use of a single-user (one at a time) rather than a multiple user system. Therefore, the most realistic system will incorporate manual handling, and possibly preliminary processing of source data. The point at which the data enters "EDP" will have to be chosen carefully to avoid a bottleneck in the information flow, and really can only be chosen after further development of the management information system model.

In conclusion, the results of this survey indicate that many small mine operations would be receptive to the
implementation of a microcomputer-based management information system. The concept of a general system being fitted to a specific operation is not very different from the practices used currently, and did not seem to be a major concern of small mine operators. Therefore, such a system has a good chance of being accepted in industry.
## APPENDIX I.1

List of Mines Visited and People Interviewed

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<td>M. McGee</td>
<td>Manager</td>
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<tr>
<td>Pinson (Joint Venture)</td>
<td>J. Appelberg</td>
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<td>Chief Engineer</td>
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<td>Cortez Gold Mines(Placer U.S.A.)</td>
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<td>Mine Geologist</td>
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<td>N. Rhoden</td>
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APPENDIX I.2

Mine ___________________ Company _________________________
Date ____________________ Products ___________________________

1. How many employees are at the operation?
   Mining_____ Processing_____ Maint._____ Adm._____ Total____

2. Is there a formal organization chart?____________________


4. What is the mine production?_______________________________
   What is the stripping ratio?_______________________________

5. Is the project a year round operation?
   If not, what is the operating year?
   A. Mining/stripping_______ Processing?

6. What mining equipment is used?
   A. Load:_____________________ Type:_____________________
   B. Transport:_________________ Type:____________________
   C. Drilling:____________________ Type:__________________
   D. Support:____________________ Type:__________________

7. What mobile equipment is used in the processing operation?

8. What is the typical work schedule?
   A. Mine?
   B. Plant?

9. How is the mined tonnage determined?
   How is the grade of mined ore determined?

10. Are mine employees union or non-union?____________________

11. Are any operations carried out by a contractor?_______

12. Are major equipment repairs and maintenance done in-
    house, or by contract with equip. suppliers or others?

13. What type of business organization is the project?
   A. Joint Venture?
   B. Mining Partnership?
   C. Subsidiary or Division?
   D. Publicly-Owned Company?
   E. Privately-Owned Company?
   F. Other?
14. What accounting method is used for determining production costs?
   A. Variable costs only--Standard
   B. Variable costs only--Actual (historical)
   C. Variable + Fixed (Absorption)
   D. Other

15. How are mining costs treated?
   A. Expensed as period costs
   B. Divided into fixed and variable costs and applied to inventory and/or period costs.
   C. Other

16. Who prepares the master budget?

17. Is budgeting a top-down or bottom-up effort?

18. Is a performance budget prepared at the end of each period?

19. What is the budgeting period or horizon?

20. Is responsibility accounting used?

21. Are mining and processing performance judged
   A. Separately?
   B. As an integrated unit?
   C. Both of the above?

22. How often are production reports generated?

23. What is included in records of equipment?
   A. Description?
   B. Acquisition cost?
   C. Acquisition date?
   D. Appraised Value
   E. Insurance?
   F. Depreciation History?
   G. Maintenance History?
   H. Operating History?
   I. Other?

24. What is included in the valuation of raw ore stockpiles?
   A. Property acquisition costs?
   B. Exploration costs?
   C. Development costs?
   D. Variable Mining costs?
   E. Mine overhead?
   F. Other?

25. How is finished goods inventory valued?
   A. Market value?
   B. Cost of production?

26. What types of inventory control methods are used on chemical and supplies inventory? Spare parts inventory?
A. Stock out?
B. Two bin?
C. Minimum-maximum?
D. Moving average?
E. Other?

27. How is quantity on hand determined?
A. Periodic count?
B. Perpetual record?

28. Was the reporting system for this project
A. Custom designed?
B. Handed down from parent company?
C. Evolved to its present state?

29. Do project personnel have access to a computer?
A. Manufacturer? B. Model? C. Operating system?

30. Is a computer used for any of the following?
A. Production reporting
B. General ledger
C. Parts inventory receivable
D. Chemicals and supplies inventory
E. Payroll
F. Accounts payable  G. Accounts receivable
H. Equipment records
I. Ore inventories
J. Depreciation/depletion, etc.
K. Maintenance reporting
L. Profit plan
M. Income summary
N. Balance sheet
O. Capital expenditures budget  P. Other?

31. Are any of the above performed by an outside firm?

32. Does the system generate useful and easily understood reports?

33. If a management information system were designed for this mine, what reports would you like to see output by the system?

34. Who does your financial reporting and tax returns?

35. On behalf of the Mining Department, are there any possibilities for summer employment for mining engineering students? If so whom should we contact?

When?
Appendix II

Catalogue of System Forms and Reports
## Table of Contents

<table>
<thead>
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<th>Report</th>
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<td>Summary Performance Report</td>
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<td>Mobile Maintenance Daily Status Report</td>
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<td>Plant Maintenance Weekly Maintenance Report</td>
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SUMMARY PERFORMANCE REPORT

PERIOD_____________________

TABLE OF CONTENTS:

1. Production Statistics

2. Profit/Loss

3. Capital Budget Status

4. Mobile Equipment Utilization

5. Analysis of Payroll

6. Mine Performance Report
   Summary
   Drilling
   Blasting
   Loading
   Hauling
   General Services
   Eng./Geol
   Mobile Maintenance

7. Process Performance Report
   Summary
   Crushing/Agglomeration
   Pad Loading/Unloading
   Leach/ADR
   Plant Maintenance
   Metallurgy/Assay Lab

8. Administration Performance Report
   Summary
   Accounting/Stores
   Purchasing
   Security/Safety
## SUMMARY PERFORMANCE REPORT

### PROJECT SUMMARY

### PRODUCTION STATISTICS

**PERIOD** 01/01/89 - 01/31/89

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</tr>
<tr>
<td>TROY OZ. Ag</td>
<td>1134.2</td>
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<td>3.1%</td>
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<tr>
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<td>29.8%</td>
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<td>29.8%</td>
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<tr>
<td></td>
<td>1364.4</td>
<td>1100</td>
<td>24.0%</td>
<td>1364.4</td>
<td>1100</td>
<td>24.0%</td>
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<tr>
<td>ENDING</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0%</td>
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<tr>
<td></td>
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</table>
## SUMMARY PERFORMANCE REPORT

### PROFIT/LOSS

**PERIOD 01/01/89 --- 01/31/89**

<table>
<thead>
<tr>
<th>Item</th>
<th>Actual</th>
<th>Budget</th>
<th>Var.</th>
<th>Actual</th>
<th>Budget</th>
<th>Var.</th>
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<tr>
<td><strong>REVENUE</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bullion</td>
<td>278,900</td>
<td>274,850</td>
<td>1.5%</td>
<td>278,900</td>
<td>274,850</td>
<td>1.5%</td>
</tr>
<tr>
<td>Other</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0%</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>278,900</td>
<td>274,850</td>
<td>1.5%</td>
<td>278,900</td>
<td>274,850</td>
<td>1.5%</td>
</tr>
<tr>
<td>$/oz. equiv.</td>
<td>387.89</td>
<td>380.36</td>
<td>2.0%</td>
<td>387.89</td>
<td>380.36</td>
<td>2.0%</td>
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<tr>
<td><strong>VARIABLE COSTS</strong></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td>83,270</td>
<td>79,300</td>
<td>5%</td>
<td>83,270</td>
<td>79,300</td>
<td>5%</td>
</tr>
<tr>
<td>Processing</td>
<td>53,500</td>
<td>52,600</td>
<td>1.7%</td>
<td>53,500</td>
<td>52,600</td>
<td>1.7%</td>
</tr>
<tr>
<td>Sales-Admin.</td>
<td>9,750</td>
<td>9,900</td>
<td>-1.5%</td>
<td>9,750</td>
<td>9,900</td>
<td>-1.5%</td>
</tr>
<tr>
<td>Total</td>
<td>146,520</td>
<td>141,800</td>
<td>3.3%</td>
<td>146,520</td>
<td>141,000</td>
<td>3.3%</td>
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<tr>
<td>$/oz. equiv.</td>
<td>202.76</td>
<td>196.24</td>
<td>3.3%</td>
<td>202.76</td>
<td>196.24</td>
<td>3.3%</td>
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<tr>
<td><strong>FIXED COSTS</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td>13,500</td>
<td>13,500</td>
<td>0%</td>
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<td>13,500</td>
<td>0%</td>
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<td>Processing</td>
<td>15,200</td>
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<td>15,200</td>
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<td>Sales-Admin.</td>
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<td>10,800</td>
<td>10,800</td>
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<td>Interest</td>
<td>12,500</td>
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<td>12,500</td>
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<td>Insurance</td>
<td>6,500</td>
<td>6,500</td>
<td>0%</td>
<td>6,500</td>
<td>6,500</td>
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<td>Other</td>
<td>5,000</td>
<td>5,000</td>
<td>0%</td>
<td>5,000</td>
<td>5,000</td>
<td>0%</td>
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<tr>
<td>Total Fixd. Cost</td>
<td>63,500</td>
<td>63,500</td>
<td>0%</td>
<td>63,500</td>
<td>63,500</td>
<td>0%</td>
</tr>
<tr>
<td>Deprec.</td>
<td>85,400</td>
<td>85,400</td>
<td>0%</td>
<td>85,400</td>
<td>85,400</td>
<td>0%</td>
</tr>
<tr>
<td>NBT</td>
<td>(16520)</td>
<td>(15850)</td>
<td>-4.2%</td>
<td>(16520)</td>
<td>(15850)</td>
<td>-4.2%</td>
</tr>
<tr>
<td>Tax Liability</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Net Profit/Loss</td>
<td>(16520)</td>
<td>(15850)</td>
<td>-4.2%</td>
<td>(16520)</td>
<td>(15850)</td>
<td>-4.2%</td>
</tr>
</tbody>
</table>
**SUMMARY PERFORMANCE REPORT**

**CAPITAL PROJECT STATUS**

**PERIOD 10/10/89 -- 01/31/89**

<table>
<thead>
<tr>
<th></th>
<th>Period</th>
<th>YTD</th>
<th>To Date</th>
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<tr>
<td><strong>PLANT:</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Beginning Cap. Basis</td>
<td>1,833,400</td>
<td>1,833,400</td>
<td>0</td>
</tr>
<tr>
<td><strong>Additions:</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pad Construction</td>
<td>48,000</td>
<td>48,000</td>
<td>192,000</td>
</tr>
<tr>
<td>Plant &amp; Equipment</td>
<td>5,000</td>
<td>5,000</td>
<td>2,095,000</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>Deductions:</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>37,400</td>
<td>37,400</td>
<td>448,000</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>15,000</td>
</tr>
<tr>
<td><strong>Ending Cap. Basis</strong></td>
<td>1,849,000</td>
<td>1,849,000</td>
<td>1,849,000</td>
</tr>
</tbody>
</table>

| **MOBILE EQUIPMENT** |        |      |         |
| Beginning Cap. Basis | 1,752,000 | 1,752,000 | 0       |
| **Additions:**       |        |      |         |
| Drills               | 0      | 0    | 494,000 |
| Loaders              | 0      | 0    | 532,000 |
| Haulers              | 0      | 0    | 1,470,000 |
| General Services     | 0      | 0    | 424,000 |
| **Deductions:**      |        |      |         |
| Depreciation         | 48,000 | 48,000 | 1,216,000 |
| Other                | 0      | 0    | 0       |
| **Ending Cap. Basis**| 1,704,000 | 1,704,000 | 1,704,000 |
**SUMMARY PERFORMANCE REPORT**

**MOBILE EQUIPMENT UTILIZATION**

**PERIOD 01/01/89-01/31/89**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>PERIOD</th>
<th>TO DATE</th>
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</thead>
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<tr>
<td></td>
<td># of Units</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Avail. (%)</td>
<td>78.2</td>
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<tr>
<td></td>
<td>Ave. Unit Utilization (%)</td>
<td>38.1</td>
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<tr>
<td></td>
<td>Ave. Unit Scheduled Util. (%)</td>
<td>87.5</td>
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<td>Drilling:</td>
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<td></td>
</tr>
<tr>
<td></td>
<td># of Units</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Avail. (%)</td>
<td>83.6</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Utilization (%)</td>
<td>43.1</td>
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<td></td>
<td>Ave. Unit Scheduled Util. (%)</td>
<td>90.5</td>
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<td>Loading:</td>
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<td></td>
</tr>
<tr>
<td></td>
<td># of Units</td>
<td>6</td>
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<tr>
<td></td>
<td>Ave. Unit Avail. (%)</td>
<td>76.5</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Utilization (%)</td>
<td>47.3</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Scheduled Util. (%)</td>
<td>89.2</td>
</tr>
<tr>
<td>Hauling:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td># of Units</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Avail. (%)</td>
<td>91.5</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Utilization (%)</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>Ave. Unit Scheduled Util. (%)</td>
<td>96.3</td>
</tr>
</tbody>
</table>

**Availability** = Total hours available/total hours in period

**Utilization** = Hours worked/hours available

**Scheduled Utilization** = Hours worked/ hours scheduled
# SUMMARY PERFORMANCE REPORT
## ANALYSIS OF PAYROLL
### PERIOD 01/01/89 01/31/89

<table>
<thead>
<tr>
<th>COST CENTER</th>
<th>REG. TIME</th>
<th>% OF EQUIV</th>
<th>% OF TIME</th>
<th>VACATION TIME</th>
<th>SICK</th>
<th>TOT. MAN HRS</th>
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<tbody>
<tr>
<td></td>
<td>HRS</td>
<td>% OF TOT.</td>
<td></td>
<td></td>
<td>HRS</td>
<td></td>
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<tr>
<td><strong>MINING:</strong></td>
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<td></td>
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<tr>
<td>Drill</td>
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<td>97.8</td>
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<td>0.0</td>
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<td>8</td>
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<tr>
<td>Blast</td>
<td>230</td>
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<td>0</td>
<td>0.0</td>
<td>40</td>
<td>14.8</td>
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<td>93.3</td>
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<td>0.0</td>
<td>0</td>
<td>0.0</td>
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<tr>
<td>Haul</td>
<td>762</td>
<td>94.1</td>
<td>0</td>
<td>0.0</td>
<td>40</td>
<td>4.9</td>
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<tr>
<td>Gen. Serv.</td>
<td>360</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
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<tr>
<td>Eng./Geol.</td>
<td>524</td>
<td>97.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>M. Maint.</td>
<td>720</td>
<td>97.3</td>
<td>20</td>
<td>2.7</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total Min.</td>
<td>3284</td>
<td>95.5</td>
<td>20</td>
<td>0.6</td>
<td>80</td>
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<td><strong>PROCESSING:</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crushing</td>
<td>180</td>
<td>95.7</td>
<td>8</td>
<td>4.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pad Load./Unloadng.</td>
<td>104</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Leach/Adr. Plant</td>
<td>1417</td>
<td>95.1</td>
<td>16</td>
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<td>40</td>
<td>2.7</td>
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<tr>
<td>Maint.</td>
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<td>6.7</td>
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<td>Metallurg.</td>
<td>712</td>
<td>98.9</td>
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<td>0.0</td>
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<tr>
<td>Tot. Proc.</td>
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<td>64</td>
<td>2.1</td>
<td>40</td>
<td>1.3</td>
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<tr>
<td><strong>ADMINISTR.:</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Acting.</td>
<td>180</td>
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<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
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<td>Stores</td>
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<td>0.0</td>
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<td>8</td>
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<td>Purchasing</td>
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<td>0.0</td>
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<td>0.0</td>
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<td>22.2</td>
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<td>0</td>
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<td>84</td>
<td>1.2</td>
<td>160</td>
<td>2.2</td>
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# MINE SUMMARY PERFORMANCE REPORT

**PERIOD**

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<th>VAR.</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
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<tbody>
<tr>
<td><strong>PERIOD YTD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ACTUAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BUDGET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VAR.</strong></td>
<td></td>
<td></td>
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<td></td>
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</table>

<table>
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<tr>
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<th><strong>ACTUAL</strong></th>
<th><strong>BUDGET</strong></th>
<th><strong>VAR.</strong></th>
<th><strong>ACTUAL</strong></th>
<th><strong>BUDGET</strong></th>
<th><strong>VAR.</strong></th>
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<tbody>
<tr>
<td><strong>ore tons</strong></td>
<td>16200</td>
<td>15500</td>
<td>4.5%</td>
<td>16200</td>
<td>15500</td>
<td>4.5%</td>
</tr>
<tr>
<td><strong>grade Au</strong></td>
<td>0.05</td>
<td>0.05</td>
<td>0.0%</td>
<td>0.05</td>
<td>0.05</td>
<td>0.0%</td>
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<tr>
<td><strong>(opt.) Ag</strong></td>
<td>0.17</td>
<td>0.18</td>
<td>-5.6%</td>
<td>0.17</td>
<td>0.18</td>
<td>-5.6%</td>
</tr>
<tr>
<td><strong>waste tons</strong></td>
<td>63100</td>
<td>62000</td>
<td>1.8%</td>
<td>63100</td>
<td>62000</td>
<td>1.8%</td>
</tr>
<tr>
<td><strong>strip ratio</strong></td>
<td>3.9:1</td>
<td>4.0:1</td>
<td>-2.5%</td>
<td>3.9:1</td>
<td>4.0:1</td>
<td>-2.5%</td>
</tr>
</tbody>
</table>

| **total mined**| 79300      | 77500      | 3.0%     | 79300      | 77500      | 3.0%     |

<table>
<thead>
<tr>
<th><strong>variable costs</strong></th>
<th><strong>ACTUAL</strong></th>
<th><strong>BUDGET</strong></th>
<th><strong>VAR.</strong></th>
<th><strong>ACTUAL</strong></th>
<th><strong>BUDGET</strong></th>
<th><strong>VAR.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>drilling($)</strong></td>
<td>12550</td>
<td>9800</td>
<td>28.1%</td>
<td>12550</td>
<td>9800</td>
<td>28.1%</td>
</tr>
<tr>
<td><strong>blasting ($)</strong></td>
<td>10360</td>
<td>9500</td>
<td>9.1%</td>
<td>10360</td>
<td>9500</td>
<td>9.1%</td>
</tr>
<tr>
<td><strong>loading ($)</strong></td>
<td>8180</td>
<td>8200</td>
<td>-0.2%</td>
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<td>8200</td>
<td>-0.2%</td>
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<tr>
<td><strong>hauling($)</strong></td>
<td>26300</td>
<td>26000</td>
<td>1.2%</td>
<td>26300</td>
<td>26000</td>
<td>1.2%</td>
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<tr>
<td><strong>gen. serv.($)</strong></td>
<td>8180</td>
<td>8170</td>
<td>0.1%</td>
<td>8180</td>
<td>8170</td>
<td>0.1%</td>
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<td><strong>mobile main.($)</strong></td>
<td>8454</td>
<td>8465</td>
<td>0.1%</td>
<td>8454</td>
<td>8465</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

| **tot. var. costs$$| 83270      | 79300      | 5.0%     | 83270      | 79300      | 5.0%     |
| **$/ton mined**   | 1.05       | 1.00       | 5.0%     | 1.05       | 1.00       | 5.0%     |
| **$/oz equiv. at**| 183.05     | 174.32     | 5.0%     | 183.05     | 174.32     | 5.0%     |

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53.3% recovery
### SUMMARY PERFORMANCE REPORT
#### MINE PERFORMANCE
##### DRILLING

**PERIOD** 01/01/89 01/31/89

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## SUMMARY PERFORMANCE REPORT

### MINE PERFORMANCE

### LOADING

**PERIOD** 01/01/89 - 01/31/89  |  01/31/89 YTD

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## SUMMARY PERFORMANCE REPORT

### MINE PERFORMANCE

#### HAULAGE

**PERIOD** 01/01/89 01/31/89

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#### MAINTENANCE

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### SUMMARY PERFORMANCE REPORT
### MINE PERFORMANCE
### GENERAL SERVICES

**PERIOD 01/01/89 - 01/31/89**

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**MINE PERFORMANCE**

**ENGINEERING/GEOLOGY**

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SUMMARY PERFORMANCE REPORT

MINE PERFORMANCE

MOBILE MAINTENANCE

PERIOD 01/01/89 01/31/89

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<th>VAR.</th>
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<td>0.18</td>
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### SUMMARY PERFORMANCE REPORT

**PROCESS PERFORMANCE**

**PAD LOADING/UNLOADING**

**PERIOD** 01/01/89 - 01/31/89

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## SUMMARY PERFORMANCE REPORT

### PROCESS PERFORMANCE

#### LEACH/ADR

**PERIOD** 01/01/89 - 01/31/89

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<th>VAR. %</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR. %</th>
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<table>
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<th>MAINTENANCE</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR. %</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR. %</th>
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<tbody>
<tr>
<td>$</td>
<td>194</td>
<td>194</td>
<td>0.0%</td>
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<td>194</td>
<td>0.0%</td>
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</table>

| $              | 194    | 194    | 0.0%   | 194    | 194    | 0.0%   |
| ASSAYS        | 310    | 300    | 3.3%   | 310    | 300    | 3.3%   |
| $              | 2216   | 2216   | 0.0%   | 2216   | 2216   | 0.0%   |

<table>
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<tr>
<th>TOTAL VARIABLE COSTS</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR. %</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR. %</th>
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<tr>
<td>$</td>
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<td>28100</td>
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<td>28910</td>
<td>28100</td>
<td>2.9%</td>
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| $/OZ EQUIV. IN DORE  | 48.42  | 47.03  | 2.9%   | 48.42  | 47.03  | 2.9%   |
## SUMMARY PERFORMANCE REPORT

### PROCESS PERFORMANCE

### PLANT MAINTENANCE

**PERIOD** 01/01/89  01/31/89

### PERIOD

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<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
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### SUMMARY PERFORMANCE REPORT

#### PROCESS SUMMARY

**METALLURGY/ASSAY LAB.**

**PERIOD** 01/01/89 - 01/31/89  
**YTD**

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<th>Var.</th>
<th>Actual</th>
<th>Budget</th>
<th>Var.</th>
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<table>
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<td>540</td>
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### Assay Expense Applied

| Net Variable Cost | $ | 0 | 0 | 0.0% | 0 | 0 | 0.0% |
### SUMMARY PERFORMANCE REPORT

#### ADMINISTRATION SUMMARY PERFORMANCE

**PERIOD** 01/01/89 01/31/89

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<th>VAR.</th>
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<th>BUDGET</th>
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<td>$ 9750</td>
<td>$ 9900</td>
<td>-1.5%</td>
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<tr>
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<td>-1.5%</td>
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<td>16.57</td>
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<td>0.0%</td>
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<td>10,800</td>
<td>0.0%</td>
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### SUMMARY PERFORMANCE REPORT

**ACCOUNTING/STORES**

**PERIOD** 01/01/89 01/31/89

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<tr>
<th>ACCOUNTING:</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABOR HRS $</td>
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<td>320</td>
<td>0.0%</td>
<td>320</td>
<td>320</td>
<td>0.0%</td>
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<tr>
<td>SUPPLIES $</td>
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<td>0.0%</td>
<td>2560</td>
<td>2560</td>
<td>0.0%</td>
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<td>2680</td>
<td>2660</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

| STORES: | | | | | | |
| SPARE PARTS INVENTORY | | | | | | |
| BEGINNING $ | 12500 | 12000 | 4.2% | 12500 | 12000 | 4.2% |
| ADDITIONS $ | 4200 | 5000 | -16.0% | 4200 | 5000 | -16.0% |
| USAGE $ | 7500 | 5000 | 50.0% | 7500 | 5000 | 50.0% |
| ENDING $ | 9200 | 12000 | -23.3% | 9200 | 12000 | -23.3% |
| SUPPLIES INVEN. | | | | | | |
| BEGINNING $ | 5500 | 5000 | 10.0% | 5500 | 5000 | 10.0% |
| ADDITIONS $ | 2500 | 3000 | -16.7% | 2500 | 3000 | -16.7% |
| USAGE $ | 3000 | 3000 | 0.0% | 3000 | 3000 | 0.0% |
| ENDING $ | 5000 | 5000 | 0.0% | 5000 | 5000 | 0.0% |
| REAGENTS INVEN. | | | | | | |
| BEGINNING $ | 8500 | 9000 | 5.6% | 8500 | 9000 | 5.6% |
| ADDITIONS $ | 16000 | 16000 | 0.0% | 16000 | 16000 | 0.0% |
| USAGE $ | 15500 | 16000 | -3.1% | 15500 | 16000 | -3.1% |
| ENDING $ | 9000 | 9000 | 0.0% | 9000 | 9000 | 0.0% |

| VARIABLE COSTS: | | | | | | |
| LABOR HRS $ | 160 | 160 | 0.0% | 160 | 160 | 0.0% |
| SUPPLIES $ | 1280 | 1280 | 0.0% | 1280 | 1280 | 0.0% |
| OTHER $ | 150 | 150 | 0.0% | 150 | 150 | 0.0% |
| TOT. VAR CSTS $ | 1665 | 1740 | -4.3% | 1665 | 1740 | -4.3% |
| $/$OF INVENT | 0.07 | 0.075 | -4.3% | 0.07 | 0.075 | -4.3% |
## SUMMARY PERFORMANCE REPORT

### ADMINISTRATION PERFORMANCE

### PURCHASING/SECURITY/SAFETY

**PERIOD** 01/01/89 01/31/89

<table>
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<th>ACTUAL</th>
<th>BUDGET</th>
<th>VAR.</th>
<th>ACTUAL</th>
<th>BUDGET</th>
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<tr>
<td>OTHER</td>
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# MINE WEEKLY REPORT

WEEK ENDING ___________

## PRODUCTION:

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<th></th>
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<tbody>
<tr>
<td>ORE TONS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRADE Au</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(OPT) Ag</td>
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<tr>
<td>WASTE TONS</td>
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<td></td>
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<tr>
<td>TOTAL TONNAGE</td>
<td></td>
<td></td>
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<tr>
<td>STRIP RATIO</td>
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## MOBILE MAINTENANCE - EQUIPMENT STATISTICS

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<th>#OF UNITS</th>
<th>TOT. HRS DOWNTIME</th>
<th>TOT. HRS WORKED</th>
<th>WEEKLY AVAIL.</th>
<th>WEEKLY UTIL.</th>
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<td>DRILLS</td>
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<td>HAUL TRUCKS</td>
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<tr>
<td>GEN SER VEHIC</td>
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<tr>
<td>TOTALS/AVE.</td>
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## ORE RESERVE STATUS

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<th>MINEABLE TONS</th>
<th>AVE GRADE Au</th>
<th>(OPT) Ag</th>
<th>CUT-GRADE Au</th>
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**PROCESS WEEKLY REPORT**

**WEEK ENDING _____________**

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<th>VAR</th>
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<tr>
<td>(OPT)</td>
<td>Au</td>
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<td>LOADED TO PAD GRADE (OPT)</td>
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<tr>
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<td></td>
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**PROCESS MAINTENANCE STATISTICS**

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<th>HRS. DOWN</th>
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<th>WEEKLY UTILIZATION</th>
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Signed
MAINTENANCE FOREMAN'S STATUS REPORT

DATE: __________ NAME: __________

<table>
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<tr>
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<th>EQUIP. I.D.</th>
<th>DESCRIPTION</th>
<th>EST. MAN HRS.</th>
<th>PARTS NEEEDED</th>
<th>EST. COMPLETION</th>
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COMMENTS:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Process Maintenance Weekly Report

Week Ending: ---------------

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<th>Job Description</th>
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<td>Est.</td>
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<td>Mn-Hrs.</td>
<td>Date</td>
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Currently In Service:

Past Week's Activity:

Comments

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Process Daily Status Report

Date: ________________________

Crusher/Agglomerator: _____________________________________________

Pad Loading/Unloading: _____________________________________________

Leaching/ADR: _____________________________________________________

General Comments: _______________________________________________

Signed: __________________________________________________________


DRILLER REPORT

DAY_________SHIFT_________CREW________________________

DRILL I.D.____________________

PRODUCTION

FOOTAGE_________NO. HOLES_________HRS. DRILLING______

BENCH #____________________GRID #____________________

CONSUMABLES

STEEL_________BITS_________OTHER____________________

DRILL STATUS AT END OF SHIFT_________________________

COMMENTS:
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<td>SHIFT _______</td>
<td>CREW _______</td>
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<tr>
<td># HOLES LOADED</td>
<td># HOLES SHOT</td>
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<td>BENCH # _____</td>
<td>GRID # ______</td>
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<td>DETCHORD(FT)</td>
<td>DELAYS(#)</td>
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<td>EQUIP. HRS.</td>
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LOADER'S SHIFT REPORT

DATE_________________ SHIFT____________ OPERATOR________

EQUIPMENT I.D._________________ HRS LOADING________________
LOADS CRUSHED ORE________________
LOADS ORE________________
LOADS WASTE________________
BENCH #________________ GRID #________________

EQUIP. STATUS AT END OF SHIFT:___________________________________

COMMENTS

DOWNTIME____________
TRUCK SCHEDULING:________________

OTHER:________________

________________
HAULTRUCK SHIFT REPORT

DATE ___________ SHIFT ___________ OPERATOR __________________

TRUCK I.D. _______________ HRS. OPERATED __________________

BRAKES: RPM _______________ HOLDING POWER __________________

# LOADS: ORE _______________ WASTE __________________

CRUSHED ORE _______________ PAD UNLOADING __________________

TRUCK STATUS AT END OF SHIFT: __________________

COMMENTS __________________

REPAIRS NEEDED: __________________

DOWN TIME: __________________

QUEUE TIME: __________________

OTHER: __________________
GENERAL SERVICE SHIFT REPORT

DATE_________________SHIFT_________________OPERATOR________________

EQUIP. I.D._________________HOURS OPERATED________________

JOB ACTIVITY:______________________________________________________________

EQUIP. STATUS AT END OF SHIFT:___________________________________________

COMMENTS

DOWNTIME:_______________________________________________________________

REPAIRS NEEDED:__________________________________________________________

OTHER:_____________________________________________________________________

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<td>APPARENT PROBLEM: _______</td>
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<td>TOTAL MAN-POWER _______</td>
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<td># OF MECHANICS _______</td>
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<td># OF MECHANIC(S) _______</td>
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MOBILE MAINTENANCE JOB TICKET

JOB #______________________ EQUIPMENT I.D.__________________

SCHEDULED            UNSCHEDULED

JOB DESCRIPTION:  PM #

REASON FOR FAILURE:

PARTS REQUIRED:

STATUS:
   IN QUEUE:   DATE_______ TIME_______
   IN SERVICE: DATE_______ TIME_______
   COMPLETED:  DATE_______ TIME_______

TOTAL MAN-HOURS: __________________

# OF MECHANICS:  _________________

LEAD MECHANIC:  __________________
FUELER SHIFT REPORT

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<th>OIL (QTS)</th>
<th>GREASE (LBS)</th>
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COMMENTS:
MOBILE EQUIPMENT INSPECTION REPORT

EQUIP. I.D.____________________ DATE__________________
EQUIP. OP. HOURS TO DATE__________________

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COMMENTS:

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
PROCESS MAINTENANCE JOB TICKET

JOB # ____________________________

SCHEDULED_______________________ UNSCHEDULED_____________________

JOB DESCRIPTION: ____________________________________________________

REASON FOR FAILURE: ________________________________________________

PARTS REQUIRED: _____________________________________________________

STATUS: ______________________________________________________________
IN QUEUE: DATE___________________ TIME______________________________
IN MAINTENANCE DATE___________________ TIME_________________________
COMPLETED: DATE___________________ TIME____________________________

TOTAL DOWN TIME (HOURS) ________________________________

TOTAL MAN-HOURS: ____________________________

LEAD MECHANIC: ____________________________
CRUSH/AGGLOMERATE SHIFT REPORT

DATE: ________ SHIFT ________ OPERATOR ________

OPERATING HOURS: ________ AV. POWER DRAUGHT (KW) ________

TOTAL TONS CRUSHED:  

CEMENT ADDED (LBS) ________

LIME ADDED (LBS) ________

COMMENTS: ________

DOWNTIME: ________

OTHER: ________
SAMPLE PREP. REPORT

DATE: ____________________  BY ____________________

CRUSHER

SHIFT I  SHIFT II  SHIFT III

% RETAINED

+1/2"  
4  
10  
20  
48  
65  
100  
-100  

% MOISTURE

BLASTHOLES

# OF SAMPLES PREPARED: ____________________

EXPLORATION

# OF SAMPLES PREPARED: ____________________

STOCKPILES

# OF SAMPLES PREPARED: ____________________

OTHER

# OF SAMPLES PREPARED: ____________________
**PLANT OPERATOR'S SHIFT REPORT**

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**BARREN SOLUTION TOTALIZER (GAL):** ____________ HRS__________

**PREG SOLUTION TOTALIZER (GAL):** ____________ HRS__________

**CYANIDE ADDITION (LBS):** _______________

**LIME ADDITION (LBS):** _______________

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<td>#3 TO # 2</td>
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<td>#4 TO # 3</td>
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<td>REGEN CARBON TO # 5</td>
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**DESORPTION/EW:**

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<th>HOURS</th>
<th>FLOW TOTAL (GAL)</th>
<th>TEMP (°F)</th>
<th>TONS CARBON</th>
<th>VOLTS</th>
<th>AMPERES</th>
<th>REGENERATION: HOURS</th>
<th>TEMP (°F)</th>
<th>TONS CARBON</th>
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**ACID WASH:**

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<tr>
<th>HOURS</th>
<th>TOTAL (GAL)</th>
<th>pH</th>
<th>HCL (GAL)</th>
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</thead>
</table>

---
REFINERY REPORT

DATE:_________________________SHIFT:_________________________

# OF CATHODES:_________________________

TOTAL WEIGHT (LBS)_________________________

FLUX: _________PPM
NaNO₃ ___________
Borax ___________
Silica ___________
Na₂CO₃ ___________
Other ___________

DORE Poured (TR. OZ)_________________________
ASSAY LAB SHIFT REPORT

DATE: ________________________  SHIFT ________________________

LABOR:  # __________ TOTAL HOURS ________________________

# OF SAMPLES PREPPED: ________________________

# OF A.A. SAMPLES RUN: ________________________

# OF F.A. SAMPLES RUN: ________________________

COMMENTS: ________________________

____________________________________

BACK LOG: ________________________

DOWNTIME: ________________________

OTHER: ________________________
<table>
<thead>
<tr>
<th>AREA</th>
<th>HAZARDS FOUND</th>
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<tr>
<td>SHOP</td>
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<tr>
<td>LOADING FACES</td>
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<td>PIT WALLS</td>
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<tr>
<td>DRILL BENCHES</td>
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<td>HAUL ROADS</td>
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<td>DITCHES</td>
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<td>DUMPS</td>
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<td>CRUSHER</td>
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<td>PADS</td>
<td></td>
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<tr>
<td>PROCESS PLANT</td>
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<tr>
<td>OTHER</td>
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</table>
INVENTORY RECORD
(EXAMPLE)

ITEM DESCRIPTION:___________________________________________________

USED IN


MAXIMUM # ____________________ REORDER POINT ______________________

DATE

REFERENCE | IN | OUT | BALANCE | COST | LIST


WAREHOUSE ISSUE NOTICE

<table>
<thead>
<tr>
<th>DATE</th>
<th>DEPARTMENT</th>
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<tr>
<td>QUANTITY</td>
<td>I.D. #</td>
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COMMENTS
## PURCHASING REPORT

MONTH ENDING ___________

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<tr>
<th>DATE ORDERED</th>
<th>DATE RECEIVED</th>
<th>SPECIFICATION</th>
<th>VENDOR</th>
<th>COST</th>
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</table>

**COMMENTS:**

- 
- 
- 

**INVENTORY:**

- QUANTITY
- SPECIFICATION
- COST
- COMMENTS
## REQUISITION NOTICE

**REQUESTED BY**

**DEPARTMENT**

**DATE REQUESTED**

**DATE ORDERED**

**EST. DEL. DATE**

*IF NOT IN INVENTORY*

<table>
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<tr>
<th>QUANTITY</th>
<th>SPECIFICATIONS</th>
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**COMMENTs**

- Main Menu
- Initialization Menu
- Initialization Screens
- Crushing/Agglomeration Screen
- Meep/Heap Construction Screen
- Mobile Equipment Management Screen
- Leaching Screen
- Adsorption Screen
- Carbon Transfer Screen
- Desorption/Electrolyzing Screen
- Raffinone Screen
LIST OF COMPUTER INPUT SCREENS

Mine Daily Production Report

Introductory Screen-Menu Presentation
Drilling Information
Blasting Information
Loading Information
Haulage Information
General Services
Initialization Screen
Adjustment Screen

Mobile Maintenance Module

Main Function Menu
Planning and Scheduling Menu
P.M. Modification Menu
P.M. Modification Screen
P.M. Planning Report Screen
Fuel and Oil Report Screen
Maintenance History Screen
Equipment Records Screen
Tire Control Report Screen
Data Input Menu Screen
Fuel and Oil Usage Update Screen
Maintenance History Update Screen
New Equipment Records Screen
Tire Control Update Screen
System Initialization Menu
Equipment Records Initialization Screens
Planning and Scheduling Initialization Screens
Tire Data Base Screen

Heap Leach Production Report Module

Main Menu
Initialization Menu
Initialization Screens
Crushing/Agglomeration Screen
Heap/Dump Construction Screen
Mobile Equipment Usage Screen
Leaching Screen
Adsorption Screen
Carbon Transfer Screen
Desorption/Electrowinning Screen
Refining Screen
Appendix III

Mine Daily Production Report Program
MINE DAILY PRODUCTION REPORT
LIST OF VARIABLES

Z
 ALL VARIABLES BEGINNING WITH "Z", ARE INTEGERS
FU%
 MENU FUNCTION NUMBER INTEGER
E$
 EQUIPMENT I.D.
ZOL
 NUMBER OF RECORDS IN FILE MOEQUIP.DAT
EQIDS
 EQUIPMENT ID OF EQUIPMENT NUMBER "Z"
HRQ(Z)
 HOURS TO DATE ON EQUIPMENT NUMBER "Z"
PR(Z)
 PRODUCTION TO DATE ON EQUIPMENT NUMBER "Z"
DAT$
 DATE OF PRODUCTION
ZOY
 DAY OF THE YEAR (1 THROUGH 366)
ZTD
 DAY OF THE WEEK (1 THROUGH 7)
E
 NUMBER OF DRILLS
C
 NUMBER OF LOADERS/SHOVELS
D
 NUMBER OF TRUCKS OF SIZE 1
DD
 NUMBER OF TRUCKS OF SIZE 2
E
 NUMBER OF GENERAL SERVICE UNITS
HRD(A,S)
 HOURS DRILLING, DRILL "A", SHIFT "S"
HOL(A,S)
 NUMBER OF HOLES DRILLED, DRILL A, SHIFT S
TFOT(A,S)
 TOTAL FOOTAGE, DRILL A, SHIFT S
SAML(A,S)
 NUMBER OF SAMPLES BAGGED, DRILL A, SHIFT S
BTS(A,S)
 NUMBER OF BITS USED, DRILL A, SHIFT S
STL(A,S)
 FEET OF STEEL USED, DRILL A, SHIFT S
BD$(A,S)
 BENCH NUMBER, DRILL A, SHIFT S
GD$(A,S)
 GRID NUMBER, DRILL A, SHIFT S
BB$(S)
 BENCH NUMBER, BLAST LOCATION, SHIFT S
GD$(S)
 GRID NUMBER, BLAST LOCATION, SHIFT S
BL$(A,S)
 BENCH NUMBER, LOADER A, SHIFT S
GL$(A,S)
 GRID NUMBER, LOADER A, SHIFT S
HLOD(S)
 NUMBER OF HOLES LOADED, SHIFT S
SHOT(S)
 NUMBER OF HOLES SHOT, SHIFT S
BROK(S)
 ORE BROKEN (CU. YD.), SHIFT S
BRWT(S)
 WASTE BROKEN (CU. YD.) SHIFT S
ANF(S)
 ANFO CONSUMED-LBS., SHIFT S
DET(S)
 FEET OF DET-CHORD USED, SHIFT S
DEL(S)
 NUMBER OF DELAYS USED, SHIFT S
PMR(S)
 NUMBER OF PRIMERS USED, SHIFT S
SGOR
 ORE DENSITY, LB. PER CU. FT.
SGWT
 WASTE DENSITY, LB. PER CU. FT.
HRL(A,S)
 HOURS LOADING, LOADER A, SHIFT S
LORE(A,S)
 LOADS OF ORE, LOADER A, SHIFT S
LWST(A,S)
 LOADS OF WASTE, LOADER A, SHIFT S
HRH1(A,S)
 HOURS HAULING, TRUCK SIZE 1, #A, SHIFT S
HOR1(A,S)
 LOADS OF ORE, TRUCK SIZE 1, #A, SHIFT S
HWST1(A,S)
 LOADS OF WASTE, TRUCK SIZE 1,#A, SHIFT S
CT1
 TOTAL LOADS OF ORE HAULED, TRUCK SIZE 1
CT2
 TOTAL LOADS OF ORE HAULED, TRUCK SIZE 2
CT3
 TOTAL LOADS OF WASTE HAULED, TRUCK SIZE 1
CT4
 TOTAL LOADS OF WASTE HAULED, TRUCK SIZE 2
HRH2(A,S)
 HOURS HAULING, TRUCK SIZE 2, #A, SHIFT S
HOR2A(A,S)
 LOADS OF ORE, TRUCK SIZE 2, TRUCK #A, SHIFT S
HWST2(A,S) LOADS OF WASTE, TRUCK SIZE 2, TRUCK #A, SHIFT S
AG ESTIMATED ORE GRADE, GOLD, OPT, OF ORE HAULED
AG ESTIMATED ORE GRADE, SILVER, OPT, OF ORE HAULED
HGS(A,S) HOURS WORKING, GENERAL SERVICE UNIT #A, SHIFT S
ST$ (A,S) STATUS AT END OF SHIFT, GENERAL SERVICE UNIT #A, SHIFT S

ACTS$ (A,S) MAIN ACTIVITY, GEN. SERVICE UNIT #A, SHIFT S

DRILLS$ (A) DRILL I.D., DRILL #A
LOADS$ (A) LOADER I.D., LOADER #A
HAUL$ (A) TRUCK I.D., TRUCK SIZE 1, TRUCK #A
HAUL2$ (A) TRUCK I.D., TRUCK SIZE 2, TRUCK #A
GS$ (A) GENERAL SERVICE UNIT I.D., G.S. UNIT A

HRDT TOTAL HOURS DRILLING, ALL DRILLS, SHIFTS 1 THRU 3
HOLT TOTAL HOLES DRILLED, ALL DRILLS, SHIFTS 1 THRU 3
FOT TOTAL FOOTAGE DRILLED, ALL DRILLS, SHIFTS 1 THRU 3
SMLT TOTAL SAMPLES TAKEN, ALL DRILLS, SHIFTS 1 THRU 3
SSTS TOTAL BITS CONSUMED, ALL DRILLS, SHIFTS 1 THRU 3
TSTL TOTAL STEEL CONSUMED, ALL DRILLS, SHIFTS 1 THRU 3

RDR(A) TOTAL HOURS DRILLING, DRILL A, SHIFTS 1 THRU 3
FFOT(A) TOTAL FOOTAGE, DRILL A, SHIFTS 1 THRU 3
HLLD TOTAL HOLES LOADED, SHIFTS 1 THRU 3
HOST TOTAL HOLES SHOT, SHIFTS 1 THRU 3
VOBL TOTAL ORE BLASTED (CU. YDS) SHIFTS 1 THRU 3
ANFO TOTAL LBS. ANFO CONSUMED, SHIFTS 1 THRU 3
DETC TOTAL FOOTAGE OF DET6 CHORD, SHIFTS 1 THRU 3
VOBW TOTAL WASTE BLASTED (CU. YDS.), SHIFTS 1 THRU 3

DELY TOTAL NO. OF DELAYS USED, SHIFTS 1 THRU 3
PRIM TOTAL NO. OF PRIMERS USED, SHIFTS 1 THRU 3

TONR TOTAL ESTIMATED ORE TONNAGE, SHIFTS 1 THRU 3
TONW TOTAL ESTIMATED WASTE TONNAGE, SHIFTS 1 THRU 3

ESTOR(S) TOTAL EST. ORE TONNAGE, SHIFT S
ESTWST(S) TOTAL EST. WASTE TONNAGE, SHIFT S

TFOR1 TONNAGE FACTOR, TRUCK SIZE 1, ORE
TFOR2 TONNAGE FACTOR, TRUCK SIZE 2, ORE
TFWT1 TONNAGE FACTOR, TRUCK SIZE 1, WASTE
TFWT2 TONNAGE FACTOR, TRUCK SIZE 2, WASTE

TFRAV AVE. DAILY TONNAGE FACTOR, ORE, BASED ON NO. OF TRUCK LOADS BY EACH SIZE TRUCK
TFWAV AVE. DAILY TONNAGE FACTOR, WASTE, BASED ON NO. OF TRUCK LOADS BY EACH SIZE TRUCK

TNR(A,S) ORE TONNAGE, LOADER A, SHIFT S
TNW(A,S) WASTE TONNAGE, LOADER A, SHIFT S
ETM(A,S) TOTAL TONNAGE, LOADER A, SHIFT S

HRAD TOTAL HOURS LOADING, ALL LOADERS, SHIFTS 1 THRU 3
WAAD TOTAL LOADS OF ORE, ALL LOADERS, SHIFTS 1 THRU 3
TOWAD TOTAL LOADS OF WASTE, ALL LOADERS, SHIFTS 1 THRU 3

ORAD TOTAL ORE TONNAGE, ALL LOADERS, SHIFTS 1 THRU 3
TORAD TOTAL WASTE TONNAGE, ALL LOADERS, SHIFTS 1 THRU 3

TMAD TOTAL TONNAGE, ALL LOADERS, SHIFTS 1 THRU 3

TOG1(A,S) TOTAL ORE TONNAGE, TRUCK SIZE 1, TRUCK A, SHIFT S
TOG2(A,S) TOTAL ORE TONNAGE, TRUCK SIZE 2, TRUCK A, SHIFT S
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Details</th>
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<tr>
<td>TWG1(A,S)</td>
<td>TOTAL WASTE TONNAGE, TRUCK SIZE 1, TRUCK A, SHIFT S</td>
<td>TWG2(A,S) TOTAL WASTE TONNAGE, TRUCK SIZE 2, TRUCK A, SHIFT S</td>
</tr>
<tr>
<td>ETG1(A,S)</td>
<td>TOTAL TONNAGE, TRUCK SIZE 1, TRUCK A, SHIFT S</td>
<td>ETG2(A,S) TOTAL TONNAGE, TRUCK SIZE 2, TRUCK A, SHIFT S</td>
</tr>
<tr>
<td>RRH1(A)</td>
<td>TOT. HRS. Hauling, Truck Size 1, Truck A, Shifts 1-3</td>
<td>RRH2(A) TOT. HRS. Hauling, Truck Size 2, Truck A, Shifts 1-3</td>
</tr>
<tr>
<td>TET1(A)</td>
<td>TOT. Tonnage Hauled, TRK. Size 1, TRK. A, Shifts 1-3</td>
<td>TET2(A) TOT. Tonnage Hauled, TRK. Size 2, TRK. A, Shifts 1-3</td>
</tr>
<tr>
<td>THRGE</td>
<td>TOT. HRS. Hauling, All Trucks, Shifts 1 Thru 3</td>
<td>HORGE TOTAL LOADS OF ORE, All Trucks, Shifts 1 Thru 3</td>
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<tr>
<td>HWTGE</td>
<td>TOTAL LOADS OF WASTE, All Trucks, Shifts 1 Thru 3</td>
<td>TTOGE TOTAL ORE TONNAGE, All Trucks, Shifts 1 Thru 3</td>
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<tr>
<td>TTWGE</td>
<td>TOTAL WASTE TONNAGE, All Trucks, Shifts 1 Thru 3</td>
<td>TMGGE TOTAL TONNAGE, All Trucks, Shifts 1 Thru 3</td>
</tr>
<tr>
<td>RRGs(A)</td>
<td>TOTAL HRS. WORKED, GENERAL SERVICE UNIT A, Shifts 1 Thru 3</td>
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<tr>
<td>TPHGS</td>
<td>TOTAL HRS. WORKED, ALL G.S. UNITS, Shifts 1 Thru 3</td>
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<tr>
<td>SMORE</td>
<td>WEEK TO DATE ORE TONNAGE</td>
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<tr>
<td>SMWST</td>
<td>WEEK TO DATE WASTE TONNAGE</td>
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</tr>
<tr>
<td>WTAU</td>
<td>WEEK TO DATE, GOLD CONTAINED IN ORE TONNAGE</td>
<td>TTAG WEEK TO DATE, SILVER CONTAINED IN ORE TONNAGE</td>
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<tr>
<td>RE</td>
<td>TOTAL ORE TONNAGE, EQUIV. TO TTOGE</td>
<td>TE TOTAL WASTE TONNAGE, EQUIV. TO TTWGE</td>
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<tr>
<td>GD</td>
<td>EQUIV. TO AU - GOLD GRADE</td>
<td>SI EQUIV. TO AG - SILVER GRADE</td>
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<td>TWDm</td>
<td>WEEK TO DATE, ORE AND WASTE TONNAGE</td>
<td>TDAU WEEK TO DATE, AVERAGE GOLD GRADE, TONNAGE HAULED</td>
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<td>TDAg</td>
<td>WEEK TO DATE, AVERAGE SILVER GRADE-TONNAGE HAULED</td>
<td>CORT CORRECTION - ADJUSTMENT OF RECORDED ORE TONNAGE</td>
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<td>CWST</td>
<td>CORRECTION - ADJUSTMENT OF RECORDED WASTE TONNAGE</td>
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<td>TFR1</td>
<td>CORRECTION-ADJ. OF TRK. FACTOR, TRK.SZ 1, ORE TONS/LOAD</td>
<td>TFR2 CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 2, ORE TONS/LOAD</td>
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<tr>
<td>TFW1</td>
<td>CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 1, WASTE TONS/LOAD</td>
<td>TFW2 CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 2, WASTE TONS/LOAD</td>
</tr>
</tbody>
</table>

**FOR SET PERIOD**

- **TFR1**: CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 1, ORE TONS/LOAD
- **TFR2**: CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 2, ORE TONS/LOAD
- **TFW1**: CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 1, WASTE TONS/LOAD
- **TFW2**: CORRECTION-ADJ. OF TRK. FACTOR, TRK. SIZE 2, WASTE TONS/LOAD
FIELD VARIABLES

**MNPROD1.DAT**
- M1$ = DATE$ = ZOY
- M2$ = DAY$ = ZTD
- M3$ = HRRAD
- M4$ = HORTGE
- M5$ = HWTGE
- M6$ = TTOGE
- M7$ = TTMGE
- M8$ = THRGGE
- N1$ = AU
- N2$ = AG
- N3$ = TFOR1
- N4$ = TFOR2
- N5$ = TFWT1
- M6$ = TFWT2

**MNPROD2.DAT**
- O1$ = DATE$ = ZOY
- O2$ = DAY$ = ZTD
- O3$ = HRTT
- O4$ = HOLT
- O5$ = TTT
- O6$ = SMLT
- O7$ = TBTS
- O8$ = TSTL
- O9$ = HLLD
- P1$ = HOST
- P2$ = VOBW
- P3$ = VOBW
- P4$ = SGOR
- P5$ = SGWT
- P6$ = TONR
- P7$ = TONW
- P8$ = ANFO
- P9$ = DETC
- Q1$ = DEHY
- Q2$ = PRIM
- Q3$ = THGS

**MNDRL.DAT**
- DRB$(1)$ = BD$(1, S)$
- DB$(2)$ = BD$(2, S)$
- DB$(3)$ = BD$(3, S)$
- DB$(4)$ = BD$(4, S)$
- DRG$(1)$ = GD$(1, S)$
- DRG$(2)$ = GD$(2, S)$
- DRG$(3)$ = GD$(3, S)$
- DRG$(4)$ = GD$(4, S)$
- BLB$ = BB$(S)$
- BLG$ = GB$(S)$

**MNLOD.DAT**
- LDB$(1)$ = BL$(1, S)$
- LDB$(2)$ = BL$(2, S)$
- LDB$(3)$ = BL$(3, S)$
- LDB$(4)$ = BL$(4, S)$
- LDG$(1)$ = GL$(1, S)$
- LDG$(2)$ = GL$(2, S)$
- LDG$(3)$ = GL$(3, S)$
- LDG$(4)$ = GL$(4, S)$
Appendix III

General Flowchart
1190 - 1320
INTERACTIVE INPUT
GEN. SERVICES
INFO.
SHIFT 1 - 3
VEH. 1 - E
1330 - 1520
DAILY PRODUCTION CALCS.
DRILLING - BLASTING
1530 - 1670
INPUT TONNAGE
FACTORS FROM
DISK
1680 - 2060
DAILY PRODUCTION CALCS
LOADING, HAULING
GEN. SERVICES
2070 - 2330
SAVE DAILY INFO.
ON DISK
2340

2340 - 2400
INPUT TONS/GRADES
FOR WEEK FROM
DISK
2410 - 2670
SAVE EQUIP., PROD. &
USEAGE ON DISK
2680 - 3580
PRINT DAILY REPORT
50 MAIN MENU
3600 INITIATE FILES

3600 - 3690
SET VALUES = "00"
SAVE ON DISK

Z = 1 TO 366

3700 - 3740
INPUT TONNAGE FACTORS

3750 - 3830
SAVE FACTORS ON DISK

3850 ADJUST PROD. FIGURES

3850 - 3970
PRESENT MENU OF CHOICES

3980 - 4140
SELECT CHOICE

4150 - 4200
TONNAGE ADJUSTMENT

4270 - 4510
ADJUST DAILY TONNAGES FOR PERIOD SPECIFIED

TONNAGE FACTORS

4200 - 4260
SAVE ADJUSTED TONNAGE/FACTORS ON DISK

50 MAIN MENU
SUBROUTINE DAY OF YEAR

4550 - 4580
INPUT DATE OF PRODUCTION

4590 - 4660
CALCULATE THE DAY OF THE YEAR

RETURN

SUBROUTINE DAY OF WEEK

4690
INPUT DAY OF WEEK

4700 - 4720
ASSIGN VALUE 1 - 7 TO DAY OF WEEK

RETURN
Listing of Code

Appendix III
CLS: PRINT "MINE DAILY PRODUCTION REPORT": PRINT
PRINT "THIS REQUIRES DATA FILES ...MNPROD1.DAT, MNPROD2.DAT, MNDBL.DAT, MNLOD.DAT, AND...MOEQUIP.DAT"
PRINT "MOEQUIP.DAT MUST BE INITIALIZED BEFORE THIS PROGRAM CAN BE RUN"
PRINT "REFER TO MOBILE MAINTENANCE MODULE FOR INITIALIZATION OF MOEQUIP.DAT"
PRINT : PRINT "FUNCTIONS ": PRINT : PRINT
PRINT 1," INITIALIZE MINE DAILY PRODUCTION FILES": PRINT
PRINT 2," PREPARE DAILY REPORT": PRINT
PRINT 3," ADJUST PRODUCTION FIGURES TO REFLECT END OF MONTH SURVEYS": PRINT
PRINT 4," EXIT PROGRAM": PRINT
INPUT "FUNCTION # "; FU%
IF (FU%< 1) OR (FU%>4) THEN PRINT "BAD NUMBER, TRY AGAIN": GOTO 50
IF FU%=1 THEN 3600 ELSE IF FU%=3 THEN 3850 ELSE IF FU%=4 THEN 4540
CLS: PRINT "INSERT DISK WITH MOEQUIP.DAT IN DRIVE B"
INPUT "RETURN WHEN READY "; D$
DEFINT Z
FIN OPFN "R" #1,"B:MOEQUIP.DAT",107
FIELD #1,5 AS E$,34 AS DESS,7 AS AQCS,6 AS AQDAT$6 AS LIF$,15 AS INCO$7 AS COV$,5 AS CST$,6 AS HR$,4 AS AVAS,4 AS UT$,8 AS PRO$
ZOL = FIX(LOF(1)/107): DIM EQUIDS(ZOL), HRQ(ZOL), PR(ZOL)
FOR A = 1 TO ZOL: GET #1, A: EQUIDS(A) = E$: HRQ(A) =
CVS(HR$): PR(A) = CVS(PRO$)
NEXT A
GOSUB 4550: GOSUB 4680
B = 0: C = 0: D = 0: DD = 0: E = 0
FOR A = 1 TO ZOL
IF LEFT$(EQUIDS(A),2)="DR" THEN B = B + 1: DRILL$(B) = EQUIDS(A): GOTO 290
IF LEFT$(EQUIDS(A),2)="LO" THEN C = C + 1: LAOD$(C) = EQUIDS(A): GOTO 290
IF LEFT$(EQUIDS(A),2)="H1" THEN D = D + 1: HAUL1$(D) = EQUIDS(A): GOTO 290
IF LEFT$(EQUIDS(A),2)="H2" THEN DD = DD + 1: HAUL2$(DD) = EQUIDS(A): GOTO 290
IF LEFT$(EQUIDS(A),2)="GS" THEN E = E + 1: GS$(E) = EQUIDS(A)
NEXT A
CLS: PRINT " DRILLING INFORMATION ": PRINT
DIM HRD(B,3), HOL(B,3), TFOT(B,3), SAML(B,3), BTS(B,3), STL(B,3), BDS-(4,3), GDS(4,3), BL$$(4,3), GLS(4,3)
FOR A = 1 TO B: FOR S = 1 TO 3
PRINT " DRILL ": DRILL$(A)," SHIFT "; S
214

340 PRINT " : INPUT " WAS THIS DRILL USED , Y OR N "; AN$
350 IF AN$<"Y" THEN 470
360 INPUT " HOURS DRILLING THIS SHIFT"; HRD(A,S): PRINT
370 INPUT " NUMBER OF HOLES DRILLED "; HOL(A,S): PRINT
380 INPUT " TOTAL FOOTAGE "; TFOT(A,S): PRINT
390 INPUT " NUMBER OF SAMPLES LOGGED "; SAML(A,S): PRINT
400 INPUT " NUMBER OF BITS USED "; BTS(A,S): PRINT
410 INPUT " FEET OF STEEL USED "; STL(A,S): PRINT
420 INPUT " BENCH # "; BDS(A,S): PRINT
430 INPUT " GRID # "; GDS(A,S): PRINT
440 INPUT " IS INFORMATION CORRECT (Y/N) "; AN$
450 IF AN$ <"Y" THEN PRINT " TRY AGAIN , PEACH BRAIN": GOTO 330
460 GOTO 480
470 HRD(A,S)= 0: HOL(A,S)= 0: TFOT(A,S)= 0: SAML(A,S)=
0: BTS(A,S)= 0: STL(A,S)= 0: BDS(A,S)=":": GDS(A,S)=":"
480 CLS: PRINT " BLASTING INFORMATION ": PRINT
500 FOR S = 1 TO 3
510 PRINT " SHIFT # "; S: PRINT
520 INPUT " ANY WORK DONE THIS SHIFT, (Y/N) "; AN$
530 IF AN$ <"Y" THEN 670
540 INPUT " NUMBER OF HOLES LOADED "; HLOD(S): PRINT
550 INPUT " NUMBER OF HOLES SHOT "; SHOT(S): PRINT
560 INPUT " VOLUME BROKEN -- ORE (CU.YD.) "; BROK(S): PRINT
570 INPUT " VOLUME BROKEN -- WASTE (CU.YD.) "; BRWT(S): PRINT
580 INPUT " BENCH # "; BB$(S): PRINT
590 INPUT " GRID # "; GB$(S): PRINT
600 INPUT " LBS. ANFO CONSUMED "; ANF(S): PRINT
610 INPUT " DET CHORD -- FEET "; DET(S): PRINT
620 INPUT " NUMBER OF DELAYS USED "; DEL(S): PRINT
630 INPUT " NUMBER OF PRIMERS USED "; PMR(S): PRINT
640 INPUT " IS INFORMATION CORRECT, (Y/N) "; AN$
650 IF AN$ <"Y" THEN PRINT " SCREWED UP AGAIN": GOTO 520
660 GOTO 690
670 HLOD(S)= 0: SHOT(S)= 0: BROK(S)= 0: BRWT(S)=
0: BB$(S)=":": GB$(S)=":"
680 ANF(S)= 0: DET(S)= 0: DEL(S)= 0: PMR(S)= 0
690 CLS: NEXT S
700 INPUT " ORE DENSITY (LB/CU.FT.) "; SGOR: PRINT
710 INPUT " WASTE DENSITY (LB/CU.FT.) "; SGWT: CLS
720 PRINT " LOADING INFORMATION ": PRINT
730 DIM HRL(C,3), LORE(C,3), LWST(C,3)
740 FOR A = 1 TO C: FOR S = 1 TO 3
750 PRINT " LOADER NUMBER "; LOAD$(A), " SHIFT NUMBER "; S: PRINT
760 INPUT " WAS LOADER USED THIS SHIFT, (Y/N) "; AN$
770 IF AN$ <"Y" THEN 860
780 INPUT " HOURS WORKED "; HRL(A,S): PRINT
790 INPUT " LOADS OF ORE "; LORE(A,S): PRINT
800 INPUT " LOADS OF WASTE "; LWST(A, S): PRINT
810 INPUT " BENCH # "; BL$(A, S): PRINT
820 INPUT " GRID # "; GL$(A, S): PRINT
830 INPUT " IS INFORMATION CORRECT , Y OR N "; AN$
840 IF AN$ <> "Y" THEN PRINT " CAN'T YOU DO ANYTHING RIGHT ? "; GOTO 750
850 GOTO 870
860 HRL(A, S) = 0: LORE(A, S) = 0: LWST(A, S) = 0: BL$(A, S) = "": GL$(A, S) = ""
870 CLS: NEXT S, A
880 PRINT " Haulage Information ": PRINT
890 DIM HRH1(D, 3), HRH2(D, 3), HOR1(D, 3), HOR2(D, 3), HWST1(D, 3), HWST2(D, 3)
900 CT1 = 0: CT2 = 0: CT3 = 0: CT4 = 0
910 FOR A = 1 TO D: FOR S = 1 TO 3
920 PRINT " TRUCK NUMBER "; HAU1$(A); " SHIFT NUMBER "; S: PRINT
930 INPUT " WAS TRUCK USED THIS SHIFT , Y OR N "; AN$
940 IF AN$ <> "Y" THEN 1020
950 INPUT " HOURS HAULED "; HRH1(A, S): PRINT
960 INPUT " LOADS OF ORE "; HOR1(A, S): PRINT
970 INPUT " LOADS OF WASTE "; HWST1(A, S): PRINT
980 IF AN$ <> "Y" THEN PRINT " Haste makes Waste ": GOTO 950
990 INPUT " IS INFORMATION CORRECT , Y OR N "; AN$
1000 CT1 = CT1 + HOR1(A, S): CT3 = CT3 + HWST1(A, S)
1010 GOTO 1030
1020 HRH1(A, S) = 0: HOR1(A, S) = 0: HWST1(A, S) = 0
1030 CLS: NEXT S, A
1040 FOR A = 1 TO D: FOR S = 1 TO 3
1050 PRINT " TRUCK NUMBER "; HAU2$(A); " SHIFT NUMBER "; S: PRINT
1060 INPUT " WAS TRUCK USED THIS SHIFT , Y OR N "; AN$
1070 IF AN$ <> "Y" THEN 1150
1080 INPUT " HOURS HAULED "; HRH2(A, S): PRINT
1090 INPUT " LOADS OF ORE "; HOR2(A, S): PRINT
1100 INPUT " LOADS OF WASTE "; HWST2(A, S): PRINT
1110 INPUT " IS INFORMATION CORRECT , Y OR N "; AN$
1120 IF AN$ <> "Y" THEN PRINT " TRY AGAIN ": GOTO 1080
1130 CT2 = CT2 + HOR2(A, S): CT4 = CT4 + HWST2(A, S)
1140 GOTO 1160
1150 HRH2(A, S) = 0: HOR2(A, S) = 0: HWST2(A, S) = 0
1160 CLS: NEXT S, A
1170 INPUT " WHAT IS THE ESTIMATED GRADE OF ORE HAULED... OZ/TON AU "; AU: PRINT
1180 INPUT " WHAT IS THE ESTIMATED GRADE OF ORE HAULED... OZ/TON AG "; AG: PRINT
1190 CLS: PRINT " General Services Information ": PRINT
1200 DIM HGS(E, 3), STS(E, 3), ACT$(E, 3)
1210 FOR A = 1 TO E: FOR S = 1 TO 3
1220 PRINT " EQUIP. NUMBER "; GS$(A); " SHIFT NUMBER "; S
1230 INPUT " WAS THIS USED THIS SHIFT , Y OR N "; AN$
1240 IF ANS <"y" THEN 1310
1250 INPUT "HOURS WORKED ":HGS(A,S):PRINT
1260 INPUT "MAIN ACTIVITY ":ACT$(A,S):PRINT
1270 INPUT "STATUS AT END OF SHIFT.. UP OR DOWN ":ST$(A,S):PRINT
1280 INPUT "IS INFORMATION CORRECT , Y OR N ":ANS
1290 IF ANS <"y" THEN 1220
1300 GOTO 1230
1310 HGS(A,S)= 0:INPUT " WHAT IS EQUIP. STATUS UP OR DOWN ":ST$(A,S)
1320 CLS:NEXT S,A
1330 REM CALCULATIONS
1340 HRDT = 0:HOLT = 0:FTT = 0:SMLT = 0:TBTS = 0:TSTL = 0
1350 FOR A = 1 TO B:RRD(A)= 0:FFOT(A)= 0:FOR S = 1 TO 3
1360 HRDT = HRDT + HRD(A,S) :HOLT = HOLT + HOL(A,S)
1370 FTT = FTT + TFOT(A,S) :SMLT = SMLT + SAML(A,S)
1380 TBTS = TBTS + BTS(A,S)
1390 TSTL = TSTL + STL(A,S)
1400 RRD(A)= RRD(A)+ HRD(A,S):FFOT(A)= FFOT(A)+ TFOT(A,S)
1410 NEXT S , A
1420 REM BLASTING
1430
1440 FOR S = 1 TO 3
1450 ESTOR(S)= SGOR*BROK(S)*(27/2000)
1460 ESTWST(S)= SGWT*BRWT(S)*(27/2000)
1470 HLLD = HLLD + HLOD(S):HOST = HOST + SHOT(S)
1480 VOBL = VOBL + BROK(S):VOBW = VOBW + BRWT(S)
1490 ANFO = ANFO + ANF(S):DETC = DETC + DET(S)
1500 DELY = DELY + DEL(S):PRIM = PRIM + PMR(S)
1510 TONR = TONR + ESTOR (S)  :  TONW = TONW + ESTWST(S)
1520 NEXT S
1530 CLOSE# 1:RESET
1540 PRINT " REMOVE DISK WITH MOEQUIP.DAT AND SET ASIDE ":PRINT
1550 PRINT " INSERT DISK WITH MINE PRODUCTION FILES IN DRIVE B":PRINT
1560 INPUT " HIT RETURN WHEN READY ":QS
1570 GOSUB 1580:GOTO 1650
1580 OPEN "R",#1,"B:MNPROD1.DAT",74:OPEN
1580 OPEN "R",#2,"B:MNPROD2.DAT",99
1590 OPEN "R",#3,"B:MNDBL.DAT",170:OPEN
1620 FIELD #3,17 AS DRB$(1),17 AS DRB$(2),17 AS DRB$(3),17
AS DRBS$(4),17 AS DRG$(1),17 AS DRG$(2),17 AS DRG$(3),17 AS
DRG$(4),17 AS ELB$,17 AS BLG$
1630 FIELD #4,17 AS LDB$(1),17 AS LDB$(2),17 AS LDB$(3),17 AS
LDB$(4),17 AS LDG$(1),17 AS LDG$(2),17 AS LDG$(3),17 AS
LDG$(4)
1640 RETURN
1650 REM LOADING CALCPS
1660 GET #1,367
1670 TFOR1 = CVS(N3$):TFOR2 = CVS(N4$):TFWT1 =
CVS(N5$):TFWT2 = CVS(N6$)
1680 IF (CT1 + CT2+CT3+CT4)< = 0 THEN 1710
1690 TFRAV =(CT1*TFOR1 + CT2*TFOR2)/(CT1 + CT2)
1700 TFWAV =(CT3*TFWT1 + CT4*TFWT2)/(CT3 + CT4)
1710 DIM TNR(C,3),TNW(C,3),ETM(C,3)
1720 HRAD = 0:WAAD = 0:TOWAD = 0:ORAD = 0:TORAD = 0:TMAD = 0
1730 FOR A = 1 TO C:RRL(A)= 0:TEL(A)= 0:FOR S = 1 TO 3
1740 TNR(A,S)= TFRAV*LORE(A,S):TNW(A,S)= TFWAV*LWST(A,S)
1750 ETM(A,S)= TNR(A,S)+ TNW(A,S)
1760 RRL(A)= RRL(A)+ HRL(A,S):TEL(A)= TEL(A)+ ETM(A,S)
1770 HRAD = HRAD + HRL(A,S):WAAD = WAAD + LORE(A,S)
1780 TOWAD = TOWAD + LWST(A,S):ORAD = ORAD + TNR(A,S)
1790 TORAD = TORAD + TNW(A,S):TMAD = TMAD + ETM(A,S)
1800 NEXT S,A
1810 REM HAULAGE CALCPS
1820 DIM TOG1(D,3),TOG2(DD,3),TWG1(D,3),TWG2(DD,3),ETG1(D,3),ETG2-
(DD,3)
1830 DIM RRH1(D),RRH2(DD),TET1(D),TET2(DD)
1840 THRGE = 0:HORGE = 0:HWTGE = 0:TTOGE = 0:TTWGE = 0:TTMGE
= 0
1850 FOR A = 1 TO D:RRH1(A)= 0:TET1(A)= 0:FOR S = 1 TO 3
1870 ETG1(A,S)= TOG1(A,S)+ TWG1(A,S)
1880 RRH1(A)= RRH1(A)+ HRH1(A,S):TET1(A)= TET1(A)+ ETG1(A,S)
1890 THRGE = THRGE + HRH1(A,S):HORGE = HORGE + HRL1(A,S)
1900 HWTGE = HWTGE + HWST1(A,S):TTOGE = TTOGE + TOG1(A,S)
1910 TTWGE = TTWGE + TWG1(A,S):TTMGE = TTMGE + ETG1(A,S)
1920 NEXT S,A
1930 FOR A = 1 TO DD:RRH2(A)= 0:TET2(A)= 0:FOR S = 1 TO 3
1950 ETG2(A,S)= TOG2(A,S)+ TWG2(A,S)
1960 RRH2(A)= RRH2(A)+ HRH2(A,S):TET2(A)= TET2(A)+ ETG2(A,S)
1970 THRGE = THRGE + HRH2(A,S):HORGE = HORGE + HOR2(A,S)
1980 HWTGE = HWTGE + HWST2(A,S):TTOGE = TTOGE + TOG2(A,S)
1990 TTWGE = TTWGE + TWG2(A,S):TTMGE = TTMGE + ETG2(A,S)
2000 NEXT S,A
2010 REM GEN SERVICES CALCPS
2020 DIM RRGS(E)
2030 THGS = 0
2040 FOR A = 1 TO E:RRGS(A) = 0:FOR S = 1 TO 3
2050 THGS = THGS + HGS(A,S):RRGS(A) = RRGS(A) + HGS(A,S)
2060 NEXT S,A
2070 REM STORE ON DISK
2080 GET #1,Z0Y
2090 IF LEFT$(M2$,2)<>"00" THEN PRINT "THIS DATE ALREADY ENTERED":GOSUB 4740
2100 LSET M1$ = DATES$:LSET M2$ = DAYS$:LSET M3$ = MKS$(HRAD)
2110 LSET M4$ = MKS$(HORGE):LSET M5$ = MKS$(HWTGE):LSET M6$ = MKS$(TTGGE)
2120 LSET M7$ = MKS$(TWMGE):LSET M8$ = MKS$(TMMGE):LSET M9$ = MKS$(THGE)
2130 LSET N1$ = MKS$(AU):LSET N2$ = MKS$(AG):LSET N3$ = MKS$(TFOR1)
2140 LSET N4$ = MKS$(TFOR2):LSET N5$ = MKS$(TFWT1):LSET N6$ = MKS$(TFWT2)
2150 PUT #1,Z0Y
2160 LSET O1$ = DATES$:LSET O2$ = DAYS$:LSET O3$ = MKS$(HRDT)
2170 LSET O4$ = MKS$(HOLT):LSET O5$ = MKS$(FTT):LSET O6$ = MKS$(SMLT)
2180 LSET O7$ = MKS$(TBTS):LSET O8$ = MKS$(TSTL):LSET O9$ = MKS$(HLLD)
2190 LSET P1$ = MKS$(HOST):LSET P2$ = MKS$(VOBL):LSET P3$ = MKS$(VOWB)
2200 LSET P4$ = MKS$(SGOR):LSET P5$ = MKS$(SGWT):LSET P6$ = MKS$(TONR)
2210 LSET P7$ = MKS$(TONW):LSET P8$ = MKS$(ANFO):LSET P9$ = MKS$(DELC)
2220 LSET Q1$ = MKS$(DELY):LSET Q2$ = MKS$(PRIM):LSET Q3$ = MKS$(THGS)
2230 PUT #2,Z0Y
2240 LSET DRBS$(1) = BDS$(1,1) +"" + BDS$(1,2) +"" + BDS$(1,3)
2250 LSET DRBS$(2) = BDS$(2,1) +"" + BDS$(2,2) +"" + BDS$(2,3)
2260 LSET DRBS$(3) = BDS$(3,1) +"" + BDS$(3,2) +"" + BDS$(3,3)
2270 LSET DRBS$(4) = BDS$(4,1) +"" + BDS$(4,2) +"" + BDS$(4,3)
2280 LSET BLBS$ = BDS$(1,1) +"" + BDS$(1,2) +"" + BDS$(1,3)
2290 LSET LDBS$(1) = BDS$(2,1) +"" + BDS$(2,2) +"" + BDS$(2,3)
2300 LSET LDBS$(2) = BDS$(3,1) +"" + BDS$(3,2) +"" + BDS$(3,3)
2310 LSET LDBS$(3) = BDS$(4,1) +"" + BDS$(4,2) +"" + BDS$(4,3)
2320 LSET LDBS$(4) = BDS$(1,1) +"" + BDS$(1,2) +"" + BDS$(1,3)
2330 PUT #3,Z0Y:PUT #4,Z0Y
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o-HO SMORE=0:SMWST =0:WTAU=0:WTAG=0:IF ZTD >= ZOY THEN 
ZTD=ZOY-1 
2350 FOR Z = (ZOY-ZTD) TO ZOY 
2360 GET #1,Z 
2370 RE = CVS(M6$):TE = CVS(M7$):GD = CVS(N1$):SI = CVS(N2$) 
2380 SMORE = SMORE + RE:SMWST = SMWST + TE 
2390 WTAU = WTAU + RE*GD:WTAG = WTAG + RE*SI 
2400 NEXT Z 
2410 TWDM = SMORE + SMWST:TDAU = WTAU / SMORE: TDAG = WTAG /
SMORE 
2420 CLOSE #1:CLOSE #2:CLOSE #3:CLOSE #4:RESET 
2430 PRINT " REMOVE DISK WITH MINE PRODUCTION 
FILES":PRINT 
2440 PRINT " REINSERT DISK WITH MOEQUIP.DAT IN DRIVE 
B":PRINT 
2450 INPUT " HIT RETURN WHEN READY ";QS 
2460 OPEN "R","#:1","B:MOEQUIP.DAT",107:OPEN 
"R",#:2,"B:EHRS.DAT",63 
2470 FIELD #1,5 AS E$,34 AS DES$,7 AS AQCS$,6 AS AQDAT$,6 AS 
LIFS$,15 AS INCO$,7 AS COV$,5 AS CST$,6 AS HRSS$,4 AS AVAS$,4 
AS UTI$,8 AS PRO$ 
2480 DIM RRRV(ZOL),G$(21) 
2490 FIELD #2,3 AS G$(0),3 AS G$(1),3 AS G$(2),3 AS G$(3),3 
G$(9),3 AS G$(10),3 AS G$(11),3 AS G$(12),3 AS G$(13),3 AS 
G$(14),3 AS G$(15),3 AS G$(16),3 AS G$(17),3 AS G$(18),3 AS 
G$(19),3 AS G$(20) 
2500 B = 0:C = 0:D = 0:DD = 0:E = 0 
2510 FOR Z = 1 TO ZOL 
2520 GET #1,Z:C1$=
DESS$:=C2=CVS(AQCS$):C3$=AQDAT$:C4=CVS(LIFS$):C5$= INCO$ 
2530 C6 = CVS(COV$):C7 = CVS(CST$):C8 = CVS(AVAS$):C9 = 
CVS(UTI$) 
2540 IF LEFT$(EQUIDS(Z),2)="DR" THEN B = B + 1:HRQ(Z)= 
HRQ(Z)+ RRD(B):PR(Z)=PR(Z)+ FPOT(B):RRRV(Z) = 
RRD(B):GOTO 2590 
2550 IF LEFT$(EQUIDS(Z),2)="LO" THEN C = C + 1:HRQ(Z)= 
HRQ(Z)+ RRL(C):PR(Z)=PR(Z)+ TEL(C):RRRV(Z)= 
RRL(C):GOTO 2590 
2560 IF LEFT$(EQUIDS(Z),2)="HL" THEN D = D + 1:HRQ(Z)= 
HRQ(Z)+RRH1(D):PR(Z)= PR(Z)+ TET1(D):RRRV(Z) = 
RRH1(D):GOTO 2590 
2570 IF LEFT$(EQUIDS(Z),2)="H2" THEN DD = DD + 1:HRQ(Z)= 
HRQ(Z)+RRH2(DD):PR(Z)= PR(Z)+ TET2(DD):RRRV(Z) = 
RRH2(DD):GOTO 2590 
2580 IF LEFT$(EQUIDS(Z),2)="GS" THEN E = E + 1:HRQ(Z)= 
HRQ(Z)+RSGS(E):RRRV(Z) = RSGS(E) 
2590 LSET ES= EQUIDS(Z):LSET HRSS$= MKS$(HRQ(Z)):LSET PRO$=
MKSS$(PR(Z)) 
2600 LSET DES$= C1$:LSET AQCS$= MKS$(C2):LSET AQDAT$=
C3$:LSET LIFS$= MKS$(C4)
2210 LSET INC$ = C5$; LSET COV$ = MKS$(C6); LSET CST$ = MKS$(C7); LSET AVAS$ = MKS$(C8)
2220 LSET UTI$ = MKS$(C9)
2230 PUT #1, Z
2240 LSET G$(Z-1) = MKS$(RRRV(Z))
2250 NEXT Z
2260 PUT #2, ZOY
2270 CLOSE #1, #2: RESET
2280 REM REPORT PRINTING MODULE
2290 CLS: PRINT : PRINT " MAKE SURE PRINTER IS READY"
2300 PRINT
2310 INPUT " IS PAPER IN SEPERATE SHEETS, Y OR N "; QS:
2320 IF QS<> "N" THEN ZCT = 1
2330 PRINT : INPUT " HIT RETURN WHEN PRINTER IS READY"
2340 LPRINT TAB(25); "MINE DAILY PRODUCTION REPORT ": LPRINT
2350 LPRINT TAB(30); "DATE ": DATES: LPRINT
2360 LPRINT TAB(35); "SUMMARY": LPRINT TAB(35); "---------
2370 LPRINT TAB(25); "DAY": TAB(45); "WEEK TO DATE ": LPRINT
2380 LPRINT TAB(10); "ORE MINED": TAB(24); LPRINT USING
2390 "##########": TTGE;
2400 LPRINT " T": TAB(50); LPRINT USING
2410 "##########": SMORE; LPRINT " T"
2420 LPRINT TAB(10); "WASTE MINED": TAB(24); LPRINT USING
2430 "##########": TWGE;
2440 LPRINT " T": TAB(50); LPRINT USING
2450 "##########": SMST; LPRINT " T"
2460 LPRINT TAB(10); "TOTAL MINED": TAB(24); LPRINT USING
2470 "##########": TMGE;
2480 LPRINT " T": TAB(50); LPRINT USING
2490 "##########": TWD: LPRINT " T"
2500 LPRINT TAB(10); "EST. GRADE": TAB(22); LPRINT USING
2510 "##.###": AU: LPRINT " OZ/T GOLD": TAB(48);
2520 LPRINT USING "##.###": TDAU: LPRINT " OZ/T GOLD"
2530 LPRINT TAB(10); "EST. GRADE": TAB(22); LPRINT USING
2540 "##.###": AG: LPRINT " OZ/T SILVER": TAB(48);
2550 LPRINT USING "##.###": TDAG: LPRINT " OZ/T SILVER"
2560 LPRINT USING "##.###": TDAG: LPRINT " OZ/T SILVER"
2570 LPRINT : LPRINT
2580 REM PRINT DRILL INFO
2590 ZPAGE = 0: ZLNS = B*3: ZZ = 12: IF (ZLNS + ZZ + 3) >= 55 THEN ZPAGE = 1: GOSUB 4740
2600 LPRINT TAB(35); "DRILLING": LPRINT TAB(35); "---------
2610 LPRINT TAB(33); " TOTAL SAMPLES": TAB(65); "LOCATION"
2620 LPRINT TAB(8); "DRILL SHIFT HRS HOLES FOOTAGE LOGGED
2630 BITS STEEL BENCH # GRID #"
2640 LPRINT TAB(48); "(#)": TAB(56); "(FT)
2650 TAB(8); "---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
2660 FIG FOR A = 1 TO B: LPRINT TAB(8); DRILLS$(A); 2670 FOR S = 1 TO 3
2970 LPRINT TAB(15); S: LPRINT USING "#######"; HRD(A, S); HOL(A, S); TFOT(A, S); SAML(A, S); BTS-(A, S); STL(A, S): LPRINT TAB(62); BDS(A, S); TAB(69); GD$(A, S)
2980 NEXT S, A
2990 TAB(8); "-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
3000 LPRINT TAB(8); "TOTALS": TAB(18): LPRINT USING "#######": HRD(T); HOLT; FTT; SMLT; TBTS; TSTL
3010 LPRINT : IF ZPAGE = 1 THEN ZZ = ZLNS + 8 ELSE ZZ = ZLNS + 22
3020 ZPAGE = 0: IF (ZZ + 10) >= 55 THEN ZPAGE = 1: GOSUB 4740
3030 LPRINT TAB(35); "BLASTING": LPRINT TAB(35); "-----": TAB(60); "DE- DE- PRI-
3040 LPRINT TAB(13); "HOLES HOLES | VOL. - CU. YD | EST. TONNAGE; ANFO CHRD LAYS MERS"
3050 LPRINT TAB(7); "SHIFT LOADED SHOT | ORE | WASTE | ORE WASTE | LBS FT # # #"
3060 LPRINT TAB(7); "-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
3070 FOR S = 1 TO 3
3080 LPRINT TAB(9); S: LPRINT USING "#######": HLOD(S); SHOT(S); BROK(S); BRWT(S); ESTOR(S); ESTWST-(S); LPRINT USING "#######": ANF(S); DET(S); DEL(S); PMR(S)
3090 NEXT S
3100 LPRINT
3110 LPRINT TAB(6); "TOTALS": LPRINT USING "#######": HLLD; HOST; VOBL; VOBW; TONR; TONW: LPRINT USING "#######": ANFO; DETC; DELY; PRIM
3120 LPRINT: LPRINT: LPRINT TAB(20); "LOCATION SHIFT BENCH GRID #"
3130 TAB(31); "-----": TAB(38); "-----": TAB(47); "-----" LPRINT
3140 FOR S = 1 TO 3: LPRINT TAB(34); S; TAB(39); BB$(S); TAB(48); GBS(S)
3150 NEXT S
3160 LPRINT : IF ZPAGE = 1 THEN ZZ = 22 ELSE ZZ = ZZ + 16
3170 ZPAGE = 0: ZLNS = C*3
3180 IF (ZZ + ZLNS + 8) >= 55 THEN ZPAGE = 1: GOSUB 4740
3190 LPRINT TAB(35); "LOADING": LPRINT TAB(35); "-----"
3200 LPRINT TAB(28); "LOADS": TAB(35); "LOADS": TAB(45); "EST. TONNAGE": TAB(65); "LOCATION"
3210 LPRINT TAB(7); "EQUIP": TAB(13); "SHIFT HRS ORE WASTE ORE WASTE TOTAL BENCH GRID"
3220 LPRINT TAB(6); "-----|-----|-----|-----|-----|-----|-----|-----|-----|-----"
3230 FOR A = 1 TO C:LPRINT TAB(8);LOAD$(A);
3240 FOR S = 1 TO 3
3250 LPRINT TAB(17);S;TAB(20);:LPRINT USING"#####";HRL$(A,S);LORE$(A,S);LWST$(A,S);TNR$(A,S);TNW$(A,S);ETM$(A,S);:LPRINT TAB(64);BS$(A,S);TAB(71);GL$(A,S)
3260 NEXT S,A
3270 LPRINT TAB(6);:"-------";LPRINT TAB(7);"I______1______1------1------1______1______1______1__":LPRINT TAB(9);"TOTALS";LPRINT USING"#####";HRAD;WAAD;TOTAD;ORAD;TORAD;TMAD:PRINT
3280 IF ZPAGE = 1 THEN ZZ = 13 + ZLNS ELSE ZZ = ZZ + ZLNS + 7
3290 ZPAGE = 0:ZLNS = (D + DD)*3
3300 IF (ZZ + ZLNS + 8) >= 55 THEN ZPAGE = 1:GOSUB 4740
3310 IF (ZZ + ZLNS + 8) >= 55 THEN ZPAGE = 1:GOSUB 4740
3320 LPRINT TAB(35);:"HAULAGE";LPRINT TAB(35);":-------":LPRINT TAB(28);:"LOADS LOADS | EST. TONNAGE | TOTAL "\n3330 LPRINT TAB(9);:"TRUCK SHIFT HRS ORE WASTE | ORE HAULED":LPRINT TAB(9);:"| | | | | | | | |
3340 FOR A = 1 TO D:LPRINT TAB(10);HAUL$(A);
3350 FOR S = 1 TO 3
3360 LPRINT TAB(17);S;LPRINT USING"#####";HRH1$(A,S);HOR1$(A,S);HWST1$(A,S);TOG1$(A,S);TWG1$(A,S);ETG1$(A,S)
3370 NEXT S,A
3380 FOR A = 1 TO DD:LPRINT TAB(10);HAUL2$(A);
3390 FOR S = 1 TO 3
3400 LPRINT TAB(17);S;LPRINT USING"#####";HRH2$(A,S);HOR2$(A,S);HWST2$(A,S);TOG2$(A,S);TWG2$(A,S);ETG2$(A,S)
3410 NEXT S,A
3420 LPRINT TAB(9);:"| | | | | | | | |
3430 FOR A = 1 TO D:DPRINT TAB(10);:PRINT USING"#####";HRAD;WAAD;TOTAD;ORAD;TORAD;TMAD
3440 IF ZPAGE = 1 THEN ZZ = 14 + ZLNS ELSE ZZ = ZZ + ZLNS + 8
3450 ZPAGE = 0:ZLNS = E*3
3460 IF ZPAGE = 1 THEN ZZ = 14 + ZLNS ELSE ZZ = ZZ + ZLNS + 8
3470 ZPAGE = 0:ZLNS = E*3
3480 IF (ZZ + ZLNS + 7) >= 56 THEN ZPAGE = 1:GOSUB 4740
3490 IF (ZZ + ZLNS + 7) >= 56 THEN ZPAGE = 1:GOSUB 4740
3500 LPRINT TAB(35);":"GEN. SERVICES":LPRINT TAB(35);":-------":LPRINT
3510 LPRINT TAB(10);:"EQUIP SHIFT HRS ACTIVITY STATUS":LPRINT TAB(10);:"| | | | | | | | |
3520 FOR A = 1 TO E:LPRINT TAB(10);GS$(A);
FOR S=1 TO 3
LPRINT TAB(17);S;TAB(22);:LPRINT USING "###.#";HGS(A,S);:LPRINT TAB(29);ACT$(A,S);TAB(55);ST$(A,S)
NEXT S,A
LPRINT TAB(10);"-----|-----|-----|---------------------------|----- -";
LPRINT TAB(10);"TOTAL HRS":TAB(22);:LPRINT USING "###.#";THGS
REM END PRINTOUT OF REPORT
CLS:GOTO 50
REM INITIALIZE MINE DAILY PRODUCTION FILES
RESET
PRINT " INSERT NEW FORMATTED DISK IN DRIVE B"
INPUT "HIT RETURN WHEN READY";QQ$
GOSUB 1580
FOR Z = 1 TO 366
LSET M2$="00":LSET O2$="00"
LSET M6$= MKS$(0):LSET M7$= MKS$(0):LSET M8$= MKS$(0)
PUT #1,Z:PUT #2,Z
NEXT Z
PRINT " WHAT ARE ESTIMATED LOAD FACTORS....TONS/LOAD "
INPUT " TRUCK SIZE #1 ; FACTOR FOR ORE ";TFOR1
INPUT " TRUCK SIZE #2 ; FACTOR FOR ORE ";TFOR2
INPUT " TRUCK SIZE #1 ; FACTOR FOR WASTE ";TFWT1
INPUT " TRUCK SIZE #2 ; FACTOR FOR WASTE ";TFWT2
LSET N3$= MKS$(TFOR1)
LSET N4$= MKS$(TFOR2)
LSET N5$= MKS$(TFWT1)
LSET N6$= MKS$(TFWT2)
PUT #1,1,367
CLOSE #1,#2,#3,#4
RESET
PRINT " REMOVE DISK AND REINSERT PROGRAM DISK"
INPUT " HIT RETURN WHEN READY ";QQ$
GOTO 50
REM MODIFY - ADJUST PROD. FIGURES
CLS:PRINT " THIS MODULE ALLOWS ADJUSTMENT OF DAILY PRODUCTION":PRINT
PRINT " FIGURES TO REFLECT NEW INFORMATION. THE FIGURES THAT":PRINT
PRINT " CAN BE ALTERED ARE - TONS ORE, TONS WASTE , TOTAL TONS":PRINT
PRINT " AND LOAD FACTORS . LATTER MODIFIED AUTOMATICALLY":PRINT
PRINT " IF TONNAGE FIGURES CHANGE":PRINT
PRINT " WHICH FIGURES DO YOU WANT CHANGED ?":PRINT
3920 INPUT "TONS ORE , (Y/N) ";X1$:PRINT
3930 INPUT "TONS WASTE (Y/N) ";X2$:PRINT
3940 INPUT "TON FACTOR #1 ORE (Y/N) ";X3$:PRINT
3950 INPUT "TON FACTOR #2 ORE (Y/N) ";X4$:PRINT
3960 INPUT "TON FACTOR #1 WASTE (Y/N) ";X5$:PRINT
3970 INPUT "TON FACTOR #2 WASTE (Y/N) ";X6$:PRINT
3980 IF (X1$=<"Y") AND (X2$=<"Y") AND (X3$=<"Y") AND (X4$=<"Y")
AND (X5$=<"Y") AND (X6$=<"Y") THEN GOTO 50
3990 IF (X1$="Y") OR (X2$="Y") THEN 4000 ELSE 4030
4000 PRINT " ENTER INCLUSIVE DATES OF PRODUCTION ":PRINT
4010 PRINT " BEGINNING DATE ":GOSUB 4550 :Z0Y1 = Z0Y:PRINT
4020 PRINT " ENDING DATE ":GOSUB 4550 :Z0Y2 = Z0Y
4030 CLS:IF X1$="Y) THEN 4050
4040 INPUT "CORRECT TOTAL ORE TONNAGE FOR THE PERIOD "; CORT
:PRINT
4050 IF X2$="Y) THEN 4070
4060 INPUT "CORRECT TOTAL WASTE TONNAGE FOR THE PERIOD "; CWST
:PRINT
4070 IF X3$="Y) THEN 4090
4080 INPUT "NEW TON FACTOR #1 TONS/LOAD ORE"; TFR1
:PRINT
4090 IF X4$="Y) THEN 4110
4100 INPUT "NEW TON FACTOR #2 TONS/LOAD ORE"; TFR2 :PRINT
4110 IF X5$="Y") THEN 4130
4120 INPUT "NEW TON FACTOR #1 TONS/LOAD WASTE"; TFW1
:PRINT
4130 IF X6$="Y) THEN 4150
4140 INPUT "NEW TON FACTOR #2 TONS/LOAD WASTE"; TFW2
:PRINT:RESET
4150 PRINT "INSERT DISK WITH MINE DAILY PRODUCTION FILES IN DRIVE B:PRINT
4160 INPUT "HIT RETURN WHEN READY";QQ$ :PRINT
4170 OPEN "R",#1,"M:NPROD1.DAT",74:
OPEN "R",#2,"M:NPROD2.DAT",99:
4180 FIELD 1,10 AS M1$,2 AS M2$,4 AS M3$,4 AS M4$,4 AS M5$,5 AS M6$,5 AS M7$,6 AS M8$,4 AS M9$,5 AS N1$,5 AS N2$,5
AS N3$,5 AS N4$,5 AS N5$,5 AS N6$:
4190 FIELD 1,10 AS O1$,2 AS O2$,4 AS O3$,4 AS O4$,5 AS O5$,4 AS O6$,4 AS O7$,4 AS O8$,4 AS O9$,4 AS P1$,5 AS P2$,5
AS P3$,5 AS P4$,5 AS P5$,5 AS P6$,5 AS P7$,5 AS P8$,5 AS P9$,5 AS Q1$,5 AS Q2$,4 AS Q3$:
4200 IF (X1$="Y") OR (X2$="Y") THEN 4270
4210 GET #1,1,367:TFOR1=CVS(N3$): TFOR2=CVS(N4$): TFWT1=CVS(N5$): TFWT2=CVS(N6$)
4220 IF X3$="Y) THEN LSET N3$= MKSS(TFOR1) ELSE LSET N3$=
MKSS(TFOR2)
4230 IF X4$="Y) THEN LSET N4$= MKSS(TFR1) ELSE LSET N4$=
MKSS(TFOR2)
4240 IF X5$="Y) THEN LSET N5$= MKSS(TFW1) ELSE LSET N5$=
MK$:TFWT1)
4250 IF X6$="Y" THEN LSET N6$ = MK$:TFW2) ELSE LSET N6$ = MK$:TFWT2)
4260 PUT #1,367: GOTO 4520
4270 DIM CTNR(ZOY2), CTNW(ZOY2), CTT0(ZOY2)
4280 SUMR = 0: SUMW = 0
4290 GET #1, Z
4300 FOR Z = ZOY1 TO ZOY2
4310 GET #1, Z
4320 CTNR(Z) = CVS(M6$): CTNW(Z) = CVS(M7$): CTT0(Z) = CVS(M8$)
4330 SUMR = SUMR + CTNR(Z): SUMW = SUMW + CTNW(Z)
4340 NEXT Z
4350 IF X1$="Y" THEN ORETF = CORT / SUMR ELSE ORETF = 1
4360 IF X2$="Y" THEN WSTTF = CWST / SUMW ELSE WSTTF = 1
4370 TFOR1 = TFOR1*ORETF: TFOR2 = TFOR2*ORETF
4380 TFWT1 = TFWT1*WSTTF: TFWT2 = TFWT2*WSTTF
4390 FOR Z = ZOY1 TO ZOY2: GET #1, Z
4400 L1$=M1$: L2$=M2$: L3=CVS(M3$): L4=CVS(M4$): L5=CVS(M5$): L9=CVS(N9$)
4410 K1 = CVS(N1$): K2 = CVS(N2$): K3 = CVS(N3$): K4 = CVS(N4$)
4420 K5 = CVS(N5$): K6 = CVS(N6$)
4430 CTNR(Z) = CTNR(Z)*ORETF: CTNW(Z) = CTNW(Z)*WSTTF
4440 CTT0(Z) = CTT0(Z) + CTNW(Z)
4450 LSET M6$=MK$:CTNR(Z)): LSET M7$=MK$:CTNW(Z)): LSET ML$=L1$: LSET M2$=L2$
4460 LSET M8$=MK$:CTT0(Z)): LSET M3$=MK$:L3): LSET M4$=MK$:L4): LSET M5$=MK$:L5)
4480 LSET N4$ = MK$:K4): LSET N5$ = MK$:K5): LSET N6$ = MK$:K6)
4490 PUT #1, Z
4500 NEXT Z
4510 GOTO 4220
4520 CLOSE #1, #2: RESET: PRINT "REMOVE DATA DISK ": PRINT
4530 INPUT ":HIT RETURN WHEN READY": QS
4540 GOTO 50
4550 END
4560 REM Subroutine - day of the year
4570 INPUT "WHAT IS THE DATE OF PRODUCTION? MM-DD-YY": DATES
4580 IF A$="Y" THEN 4560 ELSE DATES=DATS
4590 Z0Y = 0: M$= LEFT$(DATES,2): D$= MID$(DATES,4,2): Y$= MID$(DATES,9,2)
4600 IF (Y$="88") OR (Y$="92") OR (Y$="96") OR (Y$="00") OR (Y$="04") OR (Y$="08") OR (Y$="12") OR (Y$="16") THEN ZEP = 1
4610 ELSE ZEP = 0
4620 IF M$="10" THEN Z0Y = ZEP + 273 ELSE IF M$="09" THEN
ZOY = ZEP + 243
4620 IF M$= "08" THEN ZOY = ZEP + 212 ELSE IF M$= "07" THEN
ZOY = ZEP + 181
4630 IF M$= "06" THEN ZOY = ZEP + 151 ELSE IF M$= "05" THEN
ZOY = ZEP + 120
4640 IF M$= "04" THEN ZOY = ZEP + 90 ELSE IF M$= "03" THEN ZOY = ZEP + 59
4650 IF M$= "02" THEN ZOY = 31
4660 ZD = VAL(D$); ZOY = ZOY + ZD
4670 RETURN
4680 REM SUBROUTINE - DAY OF WEEK
4690 INPUT "DAY OF WEEK, SU, M, T, W, TH, F, S"; DAY$
4700 IF DAY$ = "SU" THEN ZTD = 0 ELSE IF DAY$ = "M" THEN ZTD = 1
ELSE IF DAY$ = "T" THEN ZTD = 2 ELSE IF DAY$ = "W" THEN ZTD = 3
ELSE IF DAY$ = "TH" THEN ZTD = 4 ELSE IF DAY$ = "F" THEN ZTD = 5
ELSE IF DAY$ = "S" THEN ZTD = 6 ELSE GOTO 4720
4710 GOTO 4730
4720 PRINT "DAY NOT QUITE RIGHT, TRY AGAIN"; GOTO 4680
4730 RETURN
4740 REM SUBROUTINE - PAPER FEED
4750 IF ZCT = 1 THEN INPUT "INSERT NEW SHEET - HIT RETURN"; TS: GOTO 4790
4760 FOR AA = 1 TO (66-ZZ)
4770 LPRINT
4780 NEXT AA
4790 RETURN
Appendix IV

Mobile Maintenance Module
## MOBILE MAINTENANCE MODULE

### LIST OF VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZNU</td>
<td>MENU CHOICE NUMBER</td>
</tr>
<tr>
<td>ZNP</td>
<td>NUMBER OF SERVICE BAYS</td>
</tr>
<tr>
<td>MHW</td>
<td>MAN HRS/WEEK AVAILABLE (MECHANICS AND HELPERS)</td>
</tr>
<tr>
<td>ZMS</td>
<td>MECHANICS AVAILABLE PER SHIFT</td>
</tr>
<tr>
<td>ZPMN</td>
<td>PREVENTIVE MAINTENANCE TASK NO.</td>
</tr>
<tr>
<td>N2S</td>
<td>PREVENTIVE MAINTENANCE TASK DESCRIPTION</td>
</tr>
<tr>
<td>N3S</td>
<td>SERVICE BAY REQUIREMENT(Y/N) FOR P.M. TASK</td>
</tr>
<tr>
<td>N4</td>
<td>NO. OF MECHANICS REQUIRED FOR P.M. TASK</td>
</tr>
<tr>
<td>N5</td>
<td>ESTIMATED MAN HRS. REQUIRED FOR P.M. TASK</td>
</tr>
<tr>
<td>N6S</td>
<td>PARTS LIST FOR P.M. TASK</td>
</tr>
<tr>
<td>N7</td>
<td>INTERVAL BETWEEN SERVICE, P.M. TASK</td>
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<tr>
<td>ZOF</td>
<td>NO. OF P.M. TASKS IN P.M. TASK FILE, PMJOBS.DAT</td>
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<tr>
<td>ZOL</td>
<td>NO. OF RECORDS IN PMEQLIST.DAT</td>
</tr>
<tr>
<td>E1S</td>
<td>EQUIPMENT I.D.</td>
</tr>
<tr>
<td>E2S</td>
<td>LIST OF P.M. TASKS APPLYING TO A PIECE OF EQUIP.</td>
</tr>
<tr>
<td>DTREP$</td>
<td>SAME AS DAT$, INPUT VIA USER</td>
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<tr>
<td>ZOY</td>
<td>DAY OF THE YEAR, 1-366</td>
</tr>
<tr>
<td>ZTREP</td>
<td>SAME ZOY</td>
</tr>
<tr>
<td>ZP</td>
<td>NO. OF JOBS IN SERVICE</td>
</tr>
<tr>
<td>ZQ</td>
<td>NO. OF JOBS IN QUEUE</td>
</tr>
<tr>
<td>ZT</td>
<td>TOTAL JOBS IN SERVICE AND QUEUE</td>
</tr>
<tr>
<td>ZJID(Z)</td>
<td>I.D. OF JOB IN SERVICE OR QUEUE</td>
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<tr>
<td>EQIDS$</td>
<td>EQUIPMENT I.D. IN SERVICE OR QUEUE</td>
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<tr>
<td>ZPMNU(Z)</td>
<td>P.M. TASK NO. OF JOB IN SERVICE OR QUEUE</td>
</tr>
<tr>
<td>JOBS(Z)</td>
<td>JOB DESCRIPTION OF JOB IN SERVICE OR QUEUE</td>
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<tr>
<td>ZMECH(Z)</td>
<td># OF MECHANICS NEEDED FOR JOB IN BAY OR QUEUE</td>
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<td>ZHRS(Z)</td>
<td>REPAIR TIME STILL NEEDED FOR JOB IN BAY OR QUEUE</td>
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<tr>
<td>ZLIST</td>
<td>EQUIVALENT TO ZOL</td>
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<td>ZHIST</td>
<td>NO. OF RECORDS IN MNTHIST.DAT</td>
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<td>ZLPM</td>
<td>NO. OF P.M. TASKS IN PMJOB.DAT</td>
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<td>EQ$</td>
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<tr>
<td>LISS$</td>
<td>EQUIVALENT TO E2S</td>
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<tr>
<td>ZLEN</td>
<td>LENGTH, IN BYTES OF LIS$</td>
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<td>ZDIF(Z,Z1)</td>
<td>HRS UNTIL NEXT SCHED MAINTENANCE, EQUIP. #Z, P.M. TASK #Z1</td>
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<tr>
<td>PJ$</td>
<td>A SPECIFIC TASK # IN A LIST OF P.M. TASK NOS. APPLICABLE TO A PARTICULAR PIECE OF EQUIPMENT</td>
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<tr>
<td>ZZ</td>
<td>COUNTER</td>
</tr>
<tr>
<td>ZL</td>
<td>COUNTER</td>
</tr>
<tr>
<td>ZETA</td>
<td>COUNTER</td>
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<tr>
<td>ZPJ</td>
<td>NUMERICAL VALUE OF THE STRING VARIABLE,PJ$</td>
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<tr>
<td>ZN7</td>
<td>EQUIVALENT TO NZ(INTERVAL BETWEEN SERVICINGS)</td>
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<tr>
<td>EQ1$</td>
<td>EQUIPMENT I.D. FROM RECORDS IN MNTHIST.DAT</td>
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<tr>
<td>ZPUM</td>
<td>P.M. TASK NOS. FROM RECORDS IN MNTHIST.DAT</td>
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<td>ZZNU</td>
<td>COUNTER</td>
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<tr>
<td>REP$</td>
<td>YEAR-LAST 2 CHARACTERS IN DTREPS</td>
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<tr>
<td>RAT$</td>
<td>YEAR-LAST 2 CHARACTERS IN DAT$</td>
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</table>
ZAT

DAY OF YEAR, FROM MNTHIST.DAT

ZAT

EQUIVALENT TO ZAT

ZAT

COUNTER

ZAT

EQUIPMENT HOURS-DAILY

ZAT

TOTAL EQUIPMENT HOURS FROM LAST P.M. MAINTENANCE

ZAT

TO CURRENT DATE

ZAT

COUNTER

ZAT

RANKING OR PRIORITY OF P.M. SCHEDULE

ZAT

(Z1,Z2)

COUNTER

ZAT

EQUIVALENT TO ZLIST

ZAT

EQUIVALENT TO ZLPM

ZAT

EQUIVALENT TO ZPMNU (Z)

ZAT

EQUIVALENT TO N2S

ZAT

EQUIVALENT TO N4

ZAT

TOTAL REPAIR TIME STILL REQUIRED FOR JOBS IN

ZAT

SERVICE AND IN QUEUE

ZAT

EQUIVALENT TO ZJID(Z)

ZAT

COUNTER

ZAT

EQUIVALENT TO E 1S

ZAT

EQUIVALENT TO N2S

ZAT

EQUIVALENT TO N4

ZAT

EQUIVALENT TO N5

ZAT

NUMBER OF RECORDS IN MNTHIST.DAT-25

ZAT

TOTAL MAN-HOURS REQUIRED

ZAT

ACTUAL MAN-HOURS REQUIRED

ZAT

DATE MAINTENANCE JOB COMPLETED, FROM MNTHIST.DAT

ZAT

ACTUAL NUMBER OF MECHANICS REQUIRED

ZAT

ESTIMATED NUMBER OF MECHANICS REQUIRED

ZAT

ESTIMATED MAN-HOURS REQUIRED

ZAT

NUMBER OF DAYS IN PERIOD-FUEL & OIL REPORT

ZAT

NUMBER OF RECORDS IN MOEQUIP.DAT

ZAT

STARTING DAY OF YEAR FOR FUEL & OIL REPORT

ZAT

TOTAL EQUIPMENT HOURS OVER THE STATED PERIOD

ZAT

TOTAL EQUIPMENT FUEL USAGE OVER THE STATED PERIOD

ZAT

TOTAL OIL USAGE OVER THE STATED PERIOD

ZAT

DAILY EQUIPMENT HOURS

ZAT

DAILY EQUIPMENT FUEL USAGE

ZAT

DAILY EQUIPMENT OIL USAGE

ZAT

FUEL USAGE-GAL. PER HOUR

ZAT

OIL USAGE-QUARTS PER HOUR

ZAT

EQUIPMENT DESCRIPTION, FROM MOEQUIP.DAT

ZAT

EQUIPMENT ACQUISITION DATE, FROM MOEQUIP.DAT

ZAT

EQUIPMENT AVAILABILITY TO DATE, FROM MOEQUIP.DAT

ZAT

EQUIVALENT TO ZHIST

ZAT

DATE COMPLETED, FROM MNTHIST.DAT

ZAT

PREVENTIVE MAINTENANCE TASK NUMBER, FROM

ZAT

MNTHIST.DATDU

ZAT

JOB DESCRIPTION FROM MNTHIST.DAT

ZAT

HOURS DOWN (IN QUEUE AND IN SERVICE) FROM

ZAT

MNTHIST.DAT
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<td>ACQUISITION DATE-EQUIVALENT TO AQ$</td>
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<td>INSURANCE COMPANY, FROM MOEQUIP.DAT</td>
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<td>AMT</td>
<td>INSURANCE COVERAGE, FROM MOEQUIP.DAT</td>
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<td>INSURANCE PREMIUM, FROM MOEQUIP.DAT</td>
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<td>HR</td>
<td>EQUIPMENT OPERATING HOURS TO DATE, FROM MOEQUIP.DAT</td>
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<td>AY</td>
<td>EQUIPMENT AVAILABILITY TO DATE, FROM MOEQUIP.DAT</td>
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<td>UT</td>
<td>EQUIPMENT UTILIZATION TO DATE, FROM MOEQUIP.DAT</td>
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<td>EQUIPMENT PRODUCTION TO DATE, FROM MOEQUIP.DAT</td>
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<td>P.M. TASK NUMBER</td>
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<td>EQUIVALENT TO N2$</td>
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<td>PRT$</td>
<td>EQUIVALENT TO N6$</td>
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<td>TOTAL MAN-HOURS REQUIRED</td>
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<td>ZQU</td>
<td>TIME IN QUEUE</td>
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<td>ZSE</td>
<td>TIME IN SERVICE</td>
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<td>ZDT</td>
<td>TIME IN SERVICE AND QUEUE</td>
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<td>EQUIVALENT TO AQ</td>
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<td>EQUIVALENT TO ROD</td>
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</tr>
<tr>
<td>QR</td>
<td>CURRENT YEAR</td>
</tr>
<tr>
<td>QS</td>
<td>HOURS IN YEAR OF ACQUISITION LESS HOURS AT TIME OF ACQUISITION</td>
</tr>
<tr>
<td>TTM</td>
<td>TOTAL HOURS SINCE EQUIPMENT ACQUISITION</td>
</tr>
<tr>
<td>EQ2S</td>
<td>EQUIPMENT I.D., FROM MNTHIST.DAT</td>
</tr>
<tr>
<td>LDA$</td>
<td>DATE OF REPAIR, FROM MNTHIST.DAT</td>
</tr>
<tr>
<td>D10$</td>
<td>EQUIVALENT TO F1$</td>
</tr>
<tr>
<td>D11$</td>
<td>EQUIPMENT DESCRIPTION</td>
</tr>
<tr>
<td>D12</td>
<td>EQUIVALENT TO F2</td>
</tr>
<tr>
<td>D13$</td>
<td>EQUIVALENT TO F3$</td>
</tr>
<tr>
<td>D14</td>
<td>EQUIVALENT TO F4</td>
</tr>
<tr>
<td>D15$</td>
<td>EQUIVALENT TO F5$</td>
</tr>
<tr>
<td>D16</td>
<td>EQUIVALENT TO F6</td>
</tr>
<tr>
<td>D17</td>
<td>EQUIVALENT TO F7</td>
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<td>D21</td>
<td>EQUIVALENT TO F11</td>
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<tr>
<td>ZTD</td>
<td>EQUIVALENT TO ZTIR</td>
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<tr>
<td>RR1$</td>
<td>EQUIVALENT TO TID$</td>
</tr>
<tr>
<td>RR2$</td>
<td>EQUIVALENT TO BR$</td>
</tr>
<tr>
<td>RR3$</td>
<td>EQUIVALENT TO MNS$</td>
</tr>
<tr>
<td>RR4$</td>
<td>EQUIVALENT TO SZ$</td>
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<tr>
<td>RR5</td>
<td>EQUIVALENT TO CST</td>
</tr>
<tr>
<td>RR6</td>
<td>EQUIVALENT TO WH</td>
</tr>
<tr>
<td>RR7$</td>
<td>EQUIVALENT TO YRS$</td>
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<tr>
<td>PP1$</td>
<td>EQUIVALENT TO TRID$</td>
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<tr>
<td>PP2$</td>
<td>EQUIVALENT TO ES$</td>
</tr>
<tr>
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<td>EQUIVALENT TO ZP</td>
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<tr>
<td>PP4</td>
<td>EQUIVALENT TO TRDE</td>
</tr>
<tr>
<td>PP5</td>
<td>EQUIVALENT TO RC</td>
</tr>
<tr>
<td>PP6$</td>
<td>EQUIVALENT TO ST$</td>
</tr>
<tr>
<td>SS3$</td>
<td>TIRE I.D., FROM TIREHIST.DAT</td>
</tr>
<tr>
<td>Z10</td>
<td>NUMBER OF DRILLS</td>
</tr>
<tr>
<td>Z11</td>
<td>NUMBER OF LOADERS</td>
</tr>
<tr>
<td>Z12</td>
<td>NUMBER OF TRUCKS, SIZE 1</td>
</tr>
<tr>
<td>Z13</td>
<td>NUMBER OF TRUCKS, SIZE 2</td>
</tr>
<tr>
<td>Z14</td>
<td>NUMBER OF GENERAL SERVICE VEHICLES</td>
</tr>
</tbody>
</table>
FIELD VARIABLES

MOEQUIP.DAT
E$=D10/$
DESS$=D11$
AQCS$=D12$
AQDAT$=D13
LIF=D14$
IMCOS$=D15
COVS$=D16$
CSTS$=D17
HRS$=D18
AVA$=D19
UTI$=D20
PRO$=D21

PMQLIST.DAT
MI$=E1$
M2$=E2$

EQHRS.DAT
G$ (Z)=HR
Z=0 TO 20

EQFUEL.DAT
I$ (Z)=ZF
Z=0 TO 20

EQUIL.DAT
J$ (Z)=ZOI
Z=0 TO 20

P.M. JOBS.DAT
L1$=ZWP, N1
L2$=MHW, N2
L3$=N3$
L4$=ZMS, N4
L5$=N5
L6$=N6$
L7$=N7

PMNTHIST.DAT

TIRE.DAT

TIREHIST.DAT

Pl$=DTl$
P2$=PP1$
P3$=PP2$
P4$=PP3
P5$=TH
P6$=PP4
P7$=PP5
P8$=PP6
Appendix IV

General Flowchart
START

10 - 130
DISPLAY MAIN
MENU

130
INPUT MENU CHOICE
ZNU

< 1 OR > 8

ZNU =

1 170
PLAN. & SCHED.
ROUTINE

2 2840
FUEL / OIL
REPORT

3 3270
MAINT. HIST.
REPORT

4 3700
EQUIP. RECORD
REPORT

5 4320
TIRE CONTROL
REPORT

6 4770
DATA INPUT
MODULE

7 6750
INITIALIZATION
ROUTINE

8 END

170
PLAN. & SCHED.
ROUTINE

170 - 260
DISPLAY P&S
MENU

270
INPUT MENU CHOICE
ZNU

< 1 OR > 4

ZNU =

1 300
CHANGE PM
TASK LIST

2 1410
PREPARE
REPORT

3 9220
PRINT PM TASK
LIST

4 30
MAIN MENU
300
CHANGE PM TASK LIST

300 - 350
DISPLAY MENU

360 - 380
OPEN FILES, SELECT CHOICE

ZNU =< 1 OR > 5

CHANGE RESTRICTIONS

1
450
CHANGE TASK FACTORS

2
600
ADD TO PM LIST

3
1030
ASSIGN PM TASKS

4
1250

5
220
RETURN TO PLAN & SCHED. MENU

450
CHANGE RESTRICTIONS

450 INPUT CURRENT RESTRICTIONS FROM DISK

460 - 570
INTERACTIVE INPUT CHANGE SPEC. FACTORS

580 - 590
SAVE TO DISK

600 - 710
SAVE NEW INFO. TO DISK

600
CHANGE TASK FACTORS

600 - 640
INPUT TASK INFO. FROM DISK

GOTO SUBROUTINE 800

660 - 710
SAVE NEW INFO. TO DISK

220
RETURN TO PLAN & SCHED. MENU
1410 PREPARE & PRINT PLANNING REPORT

1420 - 1630 INTERACTIVE INPUT DATE, JOBS IN SERVICE & QUEUE

1640 - 1730 OPEN FILES

1740 - 2230 FOR ALL EQUIP. AND ALL PM TASKS, DETERMINE HOURS UNTIL NEXT SCHED. MAINTENANCE, ZDIFF(Z,Z1) SORT IN ASCENDING ORDER FROM SHORTEST TO LONGEST TIME, ZSORT(Z,Z1)

2240 - 2500 PRINT BEGINNING OF REPORT...IN SERVICE...IN QUEUE

2510 - 2560 DETERMINE AVAILABLE RESOURCES (MN-HRS, ETC.) SELECT AS MANY TASKS FROM SORTED LIST AS IS POSSIBLE TO COMPLETE

2590 - 2640 PRINT PM SCHEDULE

2650 - 2750 INPUT FROM DISK LATEST 25 JOBS

2670 - 2600 PRINT LATEST PERFORMANCE

2840 FUEL & OIL REPORT

2850 - 2920 INPUT PERIOD START AND LENGTH OF PER.

2930 - 3260 INPUT FROM DISK, HRS., FUEL, OIL USE FOR PERIOD. PRINT REPORT

30 MAIN MENU
4880 FUEL & OIL UPDATE

4890 - 4990 DESCRIPTION, OPEN FILES

INTERACTIVE INPUT DATE, FUEL & OIL USE

SAVE TO DISK

ANOTHER DAY

YES

NO

4770 DATA INPUT MENU

5150 MAINTENANCE HISTORY UPDATE

5260 - 5270 DESCRIPTION, OPEN FILES

5260 - 5420 INTERACTIVE INPUT COMPLETED JOB TICKETS

5430 - 5460 SAVE TO DISK

5470 - 5510 INPUT FROM DISK SPECIFIED EQUIP. RECORD

5520 - 5650 UPDATE AVAILABILITY AND UTILIZATION

5660 - 5690 SAVE TO DISK

ANOTHER?

YES

NO

4770
INITIALIZE PLAN. & SCHED.FILES

8320 - 8410
DESCRIBE ROUTINE

8420 - 8530
INTERACTIVE INPUT
GEN. RESTRICTION
INFO. SAVE TO DISK

8540 - 8620
INTERACTIVE INPUT
INFO. RE: EACH
PM TASK

8630 - 8650
SAVE TO DISK

ANOTHER?
YES

8690 - 8810
INTERACTIVE INPUT
LIST OF EQUIP. TO
WHICH TASKS APPLY

6750 INIT. FILE

MAINT. HIST.FILE

8840 - 8930
DESCRIBE ROUTINE
OPEN,CLOSE FILE

6750 INIT. MENU

8940
TIRE FILES

8950 - 9020
DESCRIBE ROUTINE
OPEN FILES

9030 - 9100
INTERACTIVE INPUT
INFO. ON EACH TIRE

9110 - 9130
SAVE TO DISK

ANOTHER?
YES

6750 INIT. MENU

NO
Appendix IV

Listing of Code
10 REM MOBILE MAINTENANCE MODULE
20 DEFINT Z: DIM GS(21), I$(21), J$(21)
30 CLS: PRINT TAB(20); "MOBILE MAINTENANCE MODULE " : PRINT
40 PRINT : PRINT TAB(22); "MAIN FUNCTIONS MENU ": PRINT : PRINT
50 PRINT 1, " PLANNING AND SCHEDULING REPORT ": PRINT
60 PRINT 2, " FUEL AND OIL REPORT ": PRINT
70 PRINT 3, " EQUIPMENT MAINTENANCE HISTORY REPORT ": PRINT
80 PRINT 4, " EQUIPMENT RECORDS REPORT ": PRINT
90 PRINT 5, " TIRE CONTROL REPORT ": PRINT
100 PRINT 6, " DATA INPUT MODULE " : PRINT
110 PRINT 7, " SYSTEM INITIALIZATION " : PRINT
120 PRINT 8, " EXIT PROGRAM " : PRINT
130 INPUT " CHOOSE FUNCTION NUMBER ": ZNU
140 IF (ZNU < 1) OR (ZNU > 8) THEN PRINT " BAD NUMBER, TRY AGAIN" : GOTO 30
150 CLS: IF ZNU = 1 THEN 170 ELSE IF ZNU = 2 THEN 2840 ELSE IF ZNU = 3 THEN 3270 ELSE IF ZNU = 4 THEN 3700 ELSE IF ZNU = 5 THEN 4320
160 IF ZNU = 6 THEN 4770 ELSE IF ZNU = 7 THEN 6750 ELSE END
170 CLS: PRINT TAB(20); "PLANNING AND SCHEDULING REPORT MODULE ": PRINT
180 PRINT " THE SYSTEM MUST BE INITIALIZED BEFORE THIS PROGRAM CAN BE" 
190 PRINT " RUN. " 
200 PRINT : INPUT " DO YOU WISH TO CONTINUE (Y/N) ": AN$: CLS 
210 IF AN$ < >" Y" THEN 30
220 PRINT TAB(20); "PLANNING AND SCHEDULING MENU ": PRINT : PRINT 
230 PRINT 1, " CHANGE FACTORS IN OR ADD TO P.M. TASK LIST ": PRINT
240 PRINT 2, " PREPARE REPORT ": PRINT
250 PRINT 3, " PRINT OUT P.M. TASK LIST ": PRINT
260 PRINT 4, " RETURN TO MAIN MENU ": PRINT
270 INPUT " CHOOSE FUNCTION NUMBER ": ZNU : CLS 
280 IF (ZNU < 1) OR (ZNU > 4) THEN PRINT "BAD NUMBER, TRY AGAIN" : GOTO 220
290 IF ZNU = 1 THEN 300 ELSE IF ZNU = 2 THEN 1410 ELSE IF ZNU = 3 THEN 9220 ELSE GOTO 30
300 REM CHANGE FACTORS OR ADD TO P.M. TASK LIST
310 PRINT 1, " CHANGE RESTRICTIONS (SERVICE BAYS, # OF MECHANICS, ETC.): PRINT
320 PRINT 2, " CHANGE FACTORS IN P.M. TASKS ": PRINT
330 PRINT 3, " ADD TO P.M. TASK LIST ": PRINT
340 PRINT 4, " ASSIGN P.M. TASKS TO OTHER EQUIPMENT ": PRINT
350 PRINT 5, " RETURN TO PLANNING AND SCHEDULING MENU"
";AN$:PRINT
700 IF AN$< >"Y" THEN 710 ELSE 620
710 CLOSE #1,#2:RESET: GOTO 220
720 ZOF = FIX(LOF(1)/ 64):FOR Z = 2 TO ZOF
730 GET#1,Z:N1 = CVI(L1$):N2$= L2$:N3$= L3$:N4 = CVI(L4$)
740 N5 = CVS(L5$):N6$= L6$:N7 = CVS(L7$):CLS
750 PRINT " P.M.  TASK # ";N1:" DESCRIPTION : ";N2$:PRINT
760 INPUT " DO YOU WISH TO CHANGE THIS, (Y/N) ";AN$:ZPMN = N1
770 IF AN$< >"Y" THEN 780 ELSE GOSUB 800
780 NEXT Z
790 CLOSE #1,#2:RESET:GOTO 220
800 CLS:PRINT TAB(10);"TASK NUMBER ";ZPMN:PRINT
810 PRINT TAB(10);"DESCRIPTION",N2$:PRINT
820 INPUT " CHANGE DESCRIPTION (Y/N) ";AN$:PRINT
830 IF AN$< >"Y" THEN 850
840 INPUT " NEW DESCRIPTION ";N2$:PRINT
850 IF N3$< >"Y" THEN PRINT " FACILITIES AREN'T REQUIRED" ELSE PRINT " FACILITIES ARE REQUIRED 
860 PRINT :INPUT " CHANGE THIS, (Y/N) ";AN$ 870 IF AN$< >"Y" THEN 890
880 IF N3$< >"Y" THEN N3$="Y" ELSE N3$="N":PRINT " THIS HAS BEEN CHANGED 
890 PRINT :PRINT " # OF MECHANICS REQUIRED IS ";N4$:PRINT 900 INPUT " CHANGE THIS, (Y/N) ";AN$:IF AN$< >"Y" THEN 920
910 PRINT :INPUT " NEW NUMBER REQUIRED ";N4$:PRINT
920 PRINT " ESTIMATED MAN-HOURS REQUIRED IS ";N5;" HOURS":PRINT
930 INPUT " CHANGE THIS, (Y/N) ";AN$
940 IF AN$< >"Y" THEN 960
950 PRINT :INPUT " NEW ESTIMATED MAN-HOURS REQUIRED ";N5$:PRINT
960 PRINT " CURRENT PARTS LIST IS : ";N6$:PRINT
970 INPUT " CHANGE THIS, (Y/N) ";AN$:IF AN$< >"Y" THEN 990
980 PRINT :INPUT " NEW LIST ";N6$:PRINT
990 PRINT " CURRENT INTERVAL FOR P.M. # ";ZPMN;" IS ";N7;" HOURS" 1000 PRINT :INPUT " CHANGE THIS ";AN$:IF AN$< >"Y" THEN 1020
1010 PRINT :INPUT " NEW INTERVAL ";N7$:PRINT
1020 RETURN
1030 ZOF = FIX(LOF(1)/ 64)+ 1:CLS
1040 PRINT TAB(10);"P.M. TASK # ";ZOF-2:PRINT
1050 INPUT " TASK DESCRIPTION (<= 30 CHARACTERS ) ";N2$:PRINT
1060 INPUT " IS A SERVICE BAY REQUIRED FOR THIS JOB (Y/N) ";N3$:PRINT
1070 INPUT "  EST. NUMBER OF MECHANICS REQUIRED (AND
HELPERS )";N4:PRINT
1080 INPUT " ESTIMATED MAN-HOURS REQUIRED " ;N5:PRINT
1090 INPUT " LIST OF MAJOR PARTS - EACH PART SEPARATED
BY A SPACE " ;N6$:PRINT
1100 INPUT " WHAT IS THE INTERVAL BETWEEN SERVICINGS (IN EQUIP. HOURS) " ;N7:PRINT
1110 LSET L1$= MKI$(ZOLE-1) ; LSET L2$= N2$ ; LSET L3$= N3$
1120 LSET L4$= MKI$(N4) ; LSET L5$= MKS$(N5) ; LSET L6$= L$ ;
1130 PUT #1, ZOF: ZOL = FIX(LOF(2)/ 64)
1140 FOR Z = 1 TO ZOL: GET #2, Z: E1$ = M1$: E2$ = M2$
1150 CLS: PRINT " EQUIPMENT # " ; E1$: PRINT
1160 PRINT " DOES NEW TASK NUMBER "; ZOF-2; " APPLY ?" ; PRINT
1170 INPUT " (Y/N) " ; AN$: IF AN$ <> "Y" THEN 1210
1180 E2$ = E2$ + " + STR$(ZOF-2)
1190 LSET M1$ = E1$: LSET M2$ = E2$
1200 PUT #2, Z
1210 NEXT Z
1220 CLS: INPUT " WISH TO ADD ANOTHER TASK, (Y/N) " ; AN$
1230 IF AN$ < > "Y" THEN CLOSE #1, #2: RESET: GOTO 220
1240 ZOF = ZOF + 1: GOTO 1040
1250 REM ASSIGN P.M. TASK
1260 CLS: PRINT TAB(20); " ASSIGNMENT OF P.M. TASKS "; PRINT
1270 INPUT " DO YOU WISH TO CONTINUE (Y/N) " ; AN$: IF
1280 AN$ < > "Y" THEN CLOSE #1, #2: RESET: GOTO 300
1290 CLS: INPUT " WHAT IS THE P.M. NUMBER " ; ZPMN: PRINT
1300 PRINT " WHAT IS THE EQUIPMENT I.D. " ; E$: PRINT
1310 ZOL = FIX(LOF(2)/ 64): FOR Z = 1 TO ZOL: GET #2, Z
1320 IF E1$ <> E$ THEN NEXT Z
1330 IF E1$ < > E$ THEN PRINT " EQUIP. I.D. NOT FOUND "; GOTO 1260
1340 E2$ = E2$ + " + STR$(ZPMN)
1350 LSET M1$ = E1$: LSET M2$ = E2$
1360 PUT #2, Z
1370 CLS: INPUT " ANY OTHER EQUIPMENT (Y/N) " ; AN$: IF
1380 AN$ < > "Y" THEN 1390
1390 GOTO 1290
1390 CLS: INPUT " ANY OTHER P.M. NUMBERS (Y/N) " ; AN$: IF
1390 AN$ < > "Y" THEN CLOSE #1, #2: RESET: GOTO 300
1400 GOTO 1280
1410 REM PREPARING AND PRINTING PLANNING REPORT
1420 CLS: INPUT " WHAT IS THE DATE, MM-DD-YY "; DAT$: PRINT: DTREP$ = DAT$
1430 GOSUB 4150: CLS
1440 DTRP = Z0Y
1450 CLS: INPUT " ALL COMPLETED JOB TICKETS MUST BE RECORDED PRIOR TO " ; PRINT
1460 PRINT " USING THIS ROUTINE . THIS CAN BE DONE USING THE DATA " ; PRINT
1470 PRINT " INPUT ROUTINE "; PRINT
1480 INPUT "DO YOU WISH TO CONTINUE (Y/N) ";AN$:PRINT
1490 IF AN$<>"Y" THEN 220
1500 CLS:PRINT "ALL JOBS IN SERVICE AND IN QUEUE MUST
BE ENTERED ":PRINT
1510 INPUT " HOW MANY IN SERVICE ";ZP:PRINT
1520 INPUT " HOW MANY IN QUEUE ";ZQ:ZT = ZP + ZQ:CLS
1530 DIM ZJID(ZT),EQIDS(ZT),ZPMNU(ZT),JOBS(ZT),ZMECH(ZT),ZHRS(ZT)
1540 PRINT " LIST JOBS IN SERVICE FIRST, THEN JOBS IN
QUEUE ":PRINT
1550 FOR Z = 1 TO ZT:PRINT TAB(10);"JOB #:";Z:PRINT
1560 INPUT " JOB I.D. ";ZJID(Z):PRINT
1570 INPUT " EQUIPMENT I.D. ";EQIDS(Z):PRINT
1580 INPUT " P.M. TASK # (ENTER 999 IF NOT A P.M. TASK)
";ZPMNU(Z):PRINT
1590 IF ZPMNU(Z)<>999 THEN 1620
1600 INPUT " JOB DESCRIPTION ( <= 30 CHARACTERS )
";JOBS(Z):PRINT
1610 INPUT " NUMBER OF MECHANICS REQUIRED
";ZMECH(Z):PRINT
1620 INPUT " ESTIMATED REPAIR TIME STILL REQUIRED
";ZHRS(Z):PRINT
1630 NEXT Z
1640 CLS:PRINT " INSERT DISK WITH PMJOB DATA AND
EQUIPMENT HOURS IN ":PRINT
1650 PRINT " DRIVE B . INSERT DISK WITH MAINTENANCE
HISTORY IN DRIVE A ":PRINT
1660 PRINT :RESET:INPUT " HIT RETURN WHEN READY ";RE$
1670 OPEN "R",#1,"B:PMJOBS.DAT",64:OPEN
"R",#2,"B:PMEQLIST.DAT",64
1680 FIELD #1,3 AS L1$:30 AS L2$,1 AS L3$,2 AS L4$,4 AS
L5$,20 AS L6$,4 AS L7$
1690 FIELD #2,4 AS M1$,20 AS M2$
1700 OPEN "R",#3,"B:EQHRS.DAT",108
1710 FIELD #3,3 AS GS(0),3 AS GS(1),3 AS GS(2),3 AS GS(3),3
AS GS(4),3 AS GS(5),3 AS GS(6),3 AS GS(7),3 AS GS(8),3 AS
GS(9),3 AS GS(10),3 AS GS(11),3 AS GS(12),3 AS GS(13),3 AS
GS(14),3 AS GS(15),3 AS GS(16),3 AS GS(17),3 AS GS(18),3 AS
GS(19),3 AS GS(20)
1720 OPEN "R",#4,"A:MNTHIST.DAT",74
1730 FIELD #4,10 AS K1$,5 AS K2$,4 AS K3$,3 AS K4$,20 AS
K5$,20 AS K6$,3 AS K7$,3 AS K8$,3 AS K9$,3 AS K10$
1740 ZLIST = FIX(LOF(2)/64):ZHIST = FIX(LOF(4)/74):ZLPM =
FIX(LOF(1)/64)-1
1750 DIM ZDIF(ZLIST,ZLPM)
1760 FOR Z = 1 TO ZLIST:Z = 1:ZL = 2
1770 GET #2,Z;EQS$= M1$:LISS$= M2$
1780 FOR ZL = 1 TO ZLPM:ZDIF(Z,ZL)= 888
1790 NEXT Z1
1800 ZLEN = LEN(LISS$)
1810 PJS= MID$(LISS$,ZZ,ZL):IF PJS=" " THEN 2100
1820 IF RIGHTS(PJS,1)=" " THEN 1850
1830 ZZ = ZZ + ZL: ZL = 3
1840 GOTO 1860
1850 ZZ = ZZ + ZL: ZL = 2
1860 FOR Z1 = 1 TO ZT
1870 IF (EQ$ = EQID$(Z1)) AND (VAL(FJS) = ZPMNU(Z1)) THEN ZETA = 1
1880 NEXT Z1
1890 IF ZETA = 1 THEN 2090
1900 ZPJ = VAL(FJS)
1910 GET #1,(ZPJ+1): ZN7 = INT(CVS(L7$)): ZZNU = 1
1920 GET #4,ZZNU: DAT$ = K1$: EQ1$ = K3$: ZPUM = CVI(K4$)
1930 IF (EQ$ = EQ1$) AND (ZPJ = ZPUM) THEN 1960
1940 ZZNU = ZZNU + 1
1950 IF ZZNU <= ZHIST THEN 1920 ELSE 2070
1960 REP$ = RIGHT$(DTREP$, 2): RAT$ = RIGHT$(DAT$, 2)
1970 IF VAL(REP$) > VAL(RAT$) THEN ZYR = 1 ELSE ZYR = 0
1980 GOSUB 4150
1990 ZAT = ZOY: IF ZYR = 1 THEN ZAT = 366 - ZAT: ZZER = 1: GOTO 2010
2000 ZZER = ZAT
2010 ZTHR = 0: FOR ZH = ZZER TO ZTREP
2020 GET #3, ZH: ZTR = CVI(G$(Z))
2030 ZTHR = ZTHR + ZTR
2040 NEXT ZH
2050 IF ZYR = 1 THEN ZTHR = (ZTHR / ZTREP)*(ZAT + ZTREP)
2060 GOTO 2080
2070 ZZER = 1: ZYR = 0: GOTO 2010
2080 ZDIFF(Z, ZPJ) = ZN7 - ZTHR
2090 IF ZZ > (ZLEN - 1) THEN 2100 ELSE 1810
2100 CLS: PRINT TAB(20); "STILL WORKING"
2110 NEXT Z
2120 DIM ZSORT(ZLIST, ZLPM): Z4 = ZLIST: Z3 = ZLPM
2130 FOR Z1 = ZLIST TO 1 STEP -1
2140 FOR Z2 = ZLPM TO 1 STEP -1
2150 ZOO = 1
2160 FOR Z = 0 TO (Z4 - 1)
2170 FOR ZZ = 0 TO (Z3 - 1)
2180 IF ZDIFF(Z1, Z2) > ZDIFF(Z4 - Z, Z3 - ZZ) THEN ZOO = ZOO + 1
2190 IF ZOO > 50 THEN 2210
2200 NEXT ZZ, Z
2210 ZSORT(Z1, Z2) = ZO
2220 CLS: PRINT " WORKING A LONG LOOP": NEXT Z2, Z1
2230 CLOSE #3
2240 CLS: PRINT: PRINT " MAKE SURE PRINTER IS READY"
":PRINT
2250 INPUT " IS PAPER IN SEPERATE SHEETS , (Y/N)"
"; QS: PRINT
2260 INPUT " HIT RETURN WHEN PRINTER IS READY "; QS
2270 IF QS > "N" THEN ZCT = 1
2280 LPRINT TAB(22); "MOBILE MAINTENANCE MODULE "; LPRINT
2290 LPRINT TAB(20); "PLANNING AND SCHEDULING REPORT "; LPRINT
2300 LPRINT TAB(20);"WEEK BEGINNING ";DTREPS:LPRINT :LPRINT
2310 LPRINT TAB(11);"JOEQIP PM # JOB DESCRIPTION ":TAB(56);"MECHANICS EST."
2320 LPRINT TAB(12);"ID ID ":TAB(56);"REQUIRED HOURS"
2330 LPRINT
2340 LPRINT " IN":LPRINT "SERVICE ";
2350 ZTH = 0
2360 FOR Z = 1 TO ZP
2370 IF ZPMNU(Z)< > 999 THEN 2380 ELSE 2400
2380 ZUD = ZPMNU(Z)+ 1
2390 GET #1,ZUD:JOB$(Z)= L2$:ZMECH(Z)= CVI(L4$)
2400 LPRINT TAB(8);:LPRINT USING "#####";ZJID(Z):LPRINT
2410 ZTH = ZTH + ZHRS(Z)
2420 NEXT Z
2430 LPRINT " IN":LPRINT " QUEUE ";
2440 FOR Z = (ZT-ZQ + 1) TO ZT
2450 IF ZPMNU(Z)< > 999 THEN 2460 ELSE 2480
2460 ZUD = ZPMNU(Z)+ 1
2470 GET #1,ZUD:JOB$(Z)= L2$:ZMECH(Z)= CVI(L4$)
2480 LPRINT TAB(8);:LPRINT USING "#####";ZJID(Z):LPRINT
2490 ZTH = ZTH + ZHRS(Z)
2500 NEXT Z
2510 LPRINT " PM":LPRINT "SCHEDULE ";
2520 ZJ = ZJID(ZT):GET #1,1:MHW = CVS(L2$)
2530 ZCOMP = 1:Z2 = 14 + ZT
2540 FOR Z1 = 1 TO ZLIST:FOR Z2 = 1 TO ZLPM
2550 IF ZSORT(Z1,Z2)= ZCOMP THEN 2560 ELSE 2570
2560 GET #1,(Z2+1):JB$= L2$:ZMCH=CVI(L4$):ZNM=CVI(L1$):EHR=CVS(L5$)
2570 GET #2,Z1:EQD$= M1$:ZJ = ZJ + 1
2580 LPRINT TAB(8);:LPRINT USING "#####";ZJ;:LPRINT
2590 LPRINT TAB(8);:LPRINT USING "#####";ZMCH;EHR
2600 ZTH = ZTH + EHR:ZZ = ZZ + 1:IF ZZ > 57 THEN GOSUB 4260
2610 GET #1,(Z2+1):JB$= L2$:ZMCH=CVI(L4$):ZNM=CVI(L1$):EHR=CVS(L5$)
2620 GET #2,Z1:EQD$= M1$:ZJ = ZJ + 1
2630 LPRINT TAB(7);"-
2640 IF ZZ > 30 THEN GOSUB 4260
LPRINT \"LATEST PERFORMANCE\";TAB(26);"MECHANICS";LPRINT
LPRINT TAB(55);"JOB EQUIP PM# DESCRIPTION";TAB(52);"REQUEST MN-HRS";TAB(73);"DATE"
LPRINT TAB(6);"ID ID";TAB(52);"ACT EST ACT EST COMPLETED"
LPRINT 

ZST = ZHIST-25:IF ZST < 1 THEN ZST = 1
FOR Z = ZHIST TO ZST STEP-1
GET #4,Z;ZJ = CVI(K2$);EQD$ = K3$;ZNM = CVI(K4$)
JBS$ = K5$;ZHAC = CVI(K8$);ZSV = CVI(K10$);DC$ = K1$
MACT = ZHAC / ZSV;ZACT = 0;ZES = 0
IF ZNM < 999 THEN 2750 ELSE 2760
GET #1,ZNM + 1:JBS$ = L2$:ZACT = CVI(L4$);ZES = CVS(L5$)
LPRINT TAB(11);EQD$;TAB(17);
LPRINT USING "#####";ZJLPRINT
TAB(11);EQD$;TAB(17);
LPRINT USING "###";ZNM;LPRINT TAB(21);JBS$;TAB(51);LPRINT USING "####";MACT;ZACT;ZSV;ZES;
LPRINT TAB(69);DC$
NEXT Z
CLOSE #1,#2,#4:RESET
CLS:PRINT \"REMOVE DATA DISKS AND REINSERT PROGRAM DISK \";PRINT
INPUT \"HIT RETURN WHEN READY \";QS
GOTO 220
REM FUEL AND OIL REPORT
CLS:PRINT \"THIS ROUTINE prepares THE EQUIPMENT FUEL AND OIL USAGE\";PRINT
CLS:PRINT \"REPORT. DATA ON FILE SHOULD BE UP TO DATE USE THE DATA INPUT\";PRINT
CLS:PRINT \"ROUTINE OF THIS MODULE AND -MDPR- MODULE FOR ENTERING DATA.\";PRINT
INPUT \"DO YOU WISH TO CONTINUE, (Y/N) \";AN$:IF AN$< >"Y" THEN 30
CLS:PRINT \"INSERT DISK WITH FILES MOEQUIP.DAT, EQHRS.DAT, EQFUEL.DAT\";PRINT
PRINT \"AND EQOIL.DAT IN DRIVE B\";RESET:INPUT "HIT RETURN WHEN READY \";ANS:PRINT
INPUT \"PERIOD ENDING MM-DD-YY \";DAT$:GOSUB 4150
INPUT \"NUMBER OF DAYS IN PERIOD \";ZDD
OPEN \"R\",#1,\"B:MOEQUIP.DAT\",107
FIELD #1,5,AS ES,34 AS DESS,7 AS AQC$,.6 AS AQDATS,.6 AS LIFS,15 AS INCO$,7 AS COV$,5 AS CST$,6 AS HRS$,4 AS AVA$,4 AS UTI$,8 AS PRO$
OPEN \"R\",#2,\"B:EQHRS.DAT\",63
OPEN \"R\",#3,\"B:EQFUEL.DAT\",63
OPEN \"R\",#4,\"B:EQOIL.DAT\",63
FIELD #2,3 AS GS(0),3 AS GS(1),3 AS GS(2),3 AS GS(3),3 AS GS(4),3 AS GS(5),3 AS GS(6),3 AS GS(7),3 AS GS(8),3 AS GS(9),3 AS GS(10),3 AS GS(11),3 AS GS(12),3 AS GS(13),3 AS
G$(14),3 AS G$(15),3 AS G$(16),3 AS G$(17),3 AS G$(18),3 AS G$(19),3 AS G$(20)
3010 ZMED = FIX(LOF(1)/107);ZDIV = ZOY-ZDD
3020 CLS;PRINT "MAKE SURE PRINTER IS READY";PRINT
3030 INPUT "HIT RETURN WHEN PRINTER IS READY";S$
3040 LPRINT TAB(20);"FUEL AND OIL USAGE REPORT";LPRINT
3050 LPRINT TAB(16);"PERIOD OF";ZDD;"DAYS ENDING"
3060 LPRINT TAB(20);"HOURS";TAB(35);"FUEL";TAB(55);"OIL"
3070 LPRINT TAB(9);"EQUIP ID OPERATED GAL. GAL/HR QTS. QTS/HR"
3080 LPRINT TAB(9)"
-------------------------
3090 FOR Z1 = 1 TO ZMED
3100 GET #1,Z1:EQDS = ES$:THR = 0:THF = 0:THO = 0:Z = Z1-1
3110 FOR Z2 = ZDIV TO ZOY
3120 GET #2,Z2:GET #3,Z2:GET #4,Z2
3130 HR = CVI(GS(Z)):THR = THR + HR
3140 HF = CVI(IS(Z)):THF = THF + HF
3150 HO = CVI(JS(Z)):THO = THO + HO
3160 NEXT Z2
3170 IF THR <= 0 THEN 3180 ELSE 3190
3180 FPH = 0:OPH = 0:GOTO 3200
3190 FPH = THF / THR:OPH = THO / THR
3200 LPRINT TAB(10);EQDS;TAB(15);LPRINT USING "#####.#####;THR;THF;FPH;THO;OPH"
3210 NEXT Z1
3220 LPRINT TAB(9)"
------------------------
3230 CLOSE #1,#2,#3,#4:RESET
3240 PRINT "REMOVE DATA DISKS .REINSERT PROGRAM DISK"
3250 INPUT "HIT RETURN WHEN READY";Q$
3260 GOTO 30
3270 REM EQUIPMENT MAINTENANCE HISTORY
3280 CLS:PRINT "THIS ROUTINE PREPARES AN EQUIPMENT MAINTENANCE REPORT BY":PRINT
3290 PRINT "PIECE OF EQUIPMENT AS SPECIFIED BY USER . THE MAINTENANCE":PRINT
3300 PRINT "HISTORY DATA BASE SHOULD BE UP TO
DATE.";PRINT
3310 INPUT " DO YOU WISH TO CONTINUE , (Y/N) "; AN$: IF
3315 AN$ < > "Y" THEN 30
3320 CLS: PRINT " INSERT DISK WITH MOEQUIP.DAT IN DRIVE A
3325 ."; PRINT
3330 PRINT " INSERT DISK WITH MNTHST.DAT IN DRIVE B
3335 ."; RESET: PRINT
3340 INPUT " HIT RETURN WHEN READY "; Q$: CLS
3350 OPEN "R", #1, "A:MOEQUIP.DAT", 107
3360 FIELD #1, 5 AS ES$, 34 AS DES$, 7 AS AQCS$, 6 AS AQDAT$, 6 AS
3365 LIFS$, 15 AS INCO$, 7 AS COV$, 5 AS CST$, 6 AS HR$, 4 AS AVA$, 4
3370 AS UTI$, 8 AS PRO$
3375 OPEN "R", #3, "A:PMJOBS.DAT", 64
3380 FIELD #2, 10 AS K1$, 5 AS K2$, 4 AS K3$, 3 AS K4$, 20 AS
3385 K5$, 20 AS K6$, 3 AS K7$, 3 AS K8$, 3 AS K9$, 3 AS K10$
3390 FIELD #3, 3 AS L1$, 30 AS L2$, 1 AS L3$, 2 AS L4$, 4 AS
3395 L5$, 20 AS L6$, 4 AS L7$
3400 INPUT " CURRENT DATE (MM-DD-YY) "; DAT$: PRINT
3410 PRINT " MAKE SURE PRINTER IS READY ": PRINT
3420 INPUT " IS PAPER IN SEPERATE SHEETS , (Y/N) "; AN$: IF
3425 AN$ < > "N" THEN ZCT = 1 ELSE ZCT = 0
3430 PRINT : INPUT " HIT RETURN WHEN PRINTER IS READY "; Q$
3440 CLS: INPUT " WHAT IS EQUIP. ID "; EQ$: PRINT
3450 Z = 1
3460 GET #1, Z: EQD$ = ES$: DES$ = DES$: AQ$ = AQDAT$: AV = CVS(AVA$)
3470 IF LEFT$(EQD$, 4) = EQ$ THEN 3480 ELSE Z = Z + 1: GOTO
3480
3490 LPRINT TAB(20); "EQUIPMENT MAINTENANCE HISTORY": LPRINT
3495 LPRINT TAB(30); "DATE "; DAT$: LPRINT TAB(61); "MECHANICAL": LPRINT
3500 LPRINT "AVAILABILITY" TAB(10); "EQUIP ID": TAB(20); "DESCRIPTION": TAB(62); "TO DATE"
3505 LPRINT TAB(10): "-------------------" LPRINT
3510 TAB(10); "-------------------" LPRINT
3515 TAB(13); "EOS": TAB(20); DES$: TAB(64): LPRINT USING
3520 "###.###": AV*100; LPRINT " %": LPRINT: LPRINT
3525 LPRINT TAB(25); "MAINTENANCE RECORD": LPRINT
3530 LPRINT TAB(16); "DATE PM# DESCRIPTION": TAB(60); "HOURS
3535 DOWN"
3540 LPRINT
3545 TAB(9): "-------------------" LPRINT
3550 ZZ = 19: ZMH = FIX(LOF(2)/ 74)
3555 FOR Z = 1 TO ZMH
3560 GET #2, Z: EQD$ = K3$: IF EQD$ < > EQ$ THEN 3650
3565 DTS$ = K1$: ZP = CVI(K4$): REAS$ = K5$: ZDU = CVI(K7$)
3570 IF ZP < 999 THEN 3610 ELSE 3620
3575 GET #3, ZP + 1: REAS$ = L2$
256

3620 LPRINT TAB(9);DT$;TAB(22);ZP;TAB(27);REAS$;TAB(64);ZDU
3630 ZZ = ZZ + 1
3640 IF ZZ >= 56 THEN GOSUB 4260:ZZ = 6
3650 NEXT Z
3660 CLS:INPUT " DO YOU WANT ANOTHER HISTORY ,(Y/N)
";AN$  
3670 IF AN$<"Y" THEN 3680 ELSE 3440
3680 CLOSE #1,#2,#3:RESET;PRINT " REMOVE DATA DISKS AND
REINSERT PROGRAM DISK IN DRIVE A ";PRINT
3690 INPUT " HIT RETURN WHEN READY ";QS:GOTO 30
3700 REM EQUIPMENT RECORDS
3710 CLS:PRINT 
" THIS ROUTINE PRINTS OUT EQUIPMENT
RECORDS BY PIECE OF ";PRINT
3720 PRINT " EQUIPMENT AS DESIGNATED BY USER. FOR
AVAILABILITY AND UTIL. ";PRINT
3730 PRINT " FIGURES TO BE MEANINGFUL , DATA INPUT
SHOULD BE UP TO DATE."
3740 PRINT " DO YOU WISH TO CONTINUE ,(Y/N)
";AN$:IF AN$<"Y" THEN 30
3750 CLS:INPUT " ENTER DATE (MM-DD-YY) ";DAT$:PRINT
3760 INPUT " DO YOU WISH RECORDS FOR ALL PIECES OF
EQUIPMENT ,(Y/N) ";ALL$
3770 IF ALL$<"Y" THEN 3780 ELSE 3790
3780 PRINT :INPUT " EQUIP. ID ";EQ$
3790 CLS:PRINT " INSERT DISK WITH MOEQUIP.DAT IN DRIVE B
":RESET;PRINT
3800 INPUT " HIT RETURN WHEN READY ";QS
3810 OPEN "R",#1,"B:MOEQUIP.DAT",107
3820 FIELD #1,5 AS E$,34 AS DES$,7 AS AQCS,6 AS AQDATS,6 AS
LIFS,15 AS INCOS,7 AS COV$,5 AS CST$,6 AS HRSS$,4 AS AVAS,4
AS UTIS,8 AS PRO$
3830 ZMO = FIX(LOF(1)/107)
3840 CLS:INPUT " IS PAPER IN SEPERATE SHEETS ,(Y/N)
";AN$:IF AN$<"N" THEN ZCT = 1 ELSE ZCT = 0
3850 PRINT :INPUT " HIT RETURN WHEN PRINTER IS READY
";QS:CLS
3860 FOR Z = 1 TO ZMO:GET #1,Z:EP$= E$
3870 IF (ALL$ = "Y") OR (LEFT$(EP$,1)=EQ$) THEN 3880 ELSE 4120
3880 DSS = DESS:$AQ = CVS(AQCS$:ADATS = AQDATS:LI = CVS(LIFS)
3890 INCS = INCOS$:AMT = CVS(COV$):PRE = CVS(CST$):HR =
CVS(HRSS)
3900 AY = CVS(AVAS$:UT = CVS(UTIS):ROD = CVS(PRO$
3910 IF LEFT$(EP$,1)="D" THEN UNITS="FEET" ELSE IF
LEFT$(EP$,1)="L" THEN UNITS="TONS" ELSE IF LEFT$(EP$,1)="H"
THEN UNITS="UNITS" ELSE UNITS="UNITS"
3920 LPRINT TAB(30);"EQUIPMENT RECORDS ":LPRINT
3930 LPRINT TAB(30);" Date... ";DAT$:LPRINT
TAB(39);"---------
3940 LPRINT TAB(10);"EQUIPMENT ID ... ";EPS$:LPRINT
3950 LPRINT TAB(10);"DESCRIPTION ... ";DSS$:LPRINT
3960 LPRINT TAB(10);"ACQUISITION ":LPRINT TAB(22);"DATE...
";ADATS$
3970 LPRINT TAB(22);"COST ... $";AQ:LPRINT
3980 LPRINT TAB(10);"INSURANCE :";LPRINT TAB(22);"COMPANY ... ";INCS
3990 LPRINT TAB(22);"COVERAGE ... $";AMT:LPRINT
4000 LPRINT :LPRINT TAB(10);"ESTIMATED TOTAL LIFE .......
4010 LPRINT TAB(10);"TOTAL HOURS OPERATED ........ ";LPRINT USING "#####":HR;LPRINT " HOURS"
4020 LPRINT TAB(10);"ESTIMATED LIFE REMAINING .... ";LPRINT USING "#####";(LI-HR);LPRINT " HOURS"
4030 LPRINT :LPRINT TAB(10);"TOTAL PRODUCTION ...";ROD",";
4040 AVRD = ROD / HR
4050 LPRINT TAB(10);"AVE. PRODUCTION ... ";LPRINT USING 
4060 LPRINT :LPRINT TAB(10);"AVAILABILITY ... ";LPRINT USING 
4070 LPRINT TAB(10);"UTILIZATION .... ";LPRINT USING 
4080 LPRINT USING 
4090 ZZ = 35
4100 IF ALL$< >"Y" THEN 4130
4110 GOSUB 4260
4120 NEXT Z
4130 CLOSE #1:RESET:PRINT "REMOVE DATA DISK FROM DRIVE B"
4140 LPRINT :INPUT "HIT RETURN WHEN READY ";Q$:CLS:GOTO 30
4150 REM SUBROUTINE DAY OF YEAR
4160 DATE$ = DAT$ %
4170 ZOY = 0:M$= LEFT$(DATE$,2):D$=
4180 IF (Y$ = "88") OR (Y$="92") OR (Y$="96") OR (Y$="00") OR (Y$="04") OR (Y$="08") OR (Y$="12") OR (Y$="16") THEN ZEP = 1 ELSE IF M$="12" THEN ZOY = ZEP + 334 ELSE IF ZOY = ZEP + 273 ELSE IF M$="09" THEN ZOY = ZEP + 151 ELSE IF M$="06" THEN ZE
4190 IF M$="03" THEN ZOY = ZEP + 90 ELSE IF M$="09" THEN ZOY = ZEP + 273 ELSE IF M$="07" THEN ZOY = ZEP + 212 ELSE IF M$="07" THEN ZOY = ZEP + 181 ELSE IF M$="05" THEN ZOY = ZEP + 151 ELSE IF M$="05" THEN ZOY = ZEP + 90 ELSE IF M$="03" THEN ZOY = ZEP + 59 ELSE IF M$="02" THEN ZOY = 31 ELSE IF ZCT = 1 THEN INPUT " INSERT NEW SHEET ".
4200 IF M$="08" THEN ZOY = ZEP + 212 ELSE IF M$="07" THEN ZOY = ZEP + 181 ELSE IF M$="06" THEN ZOY = ZEP + 151 ELSE IF M$="05" THEN ZOY = ZEP + 90 ELSE IF M$="03" THEN ZOY = ZEP + 59 ELSE IF M$="02" THEN ZOY = 31 ELSE IF ZCT = 1 THEN INPUT " INSERT NEW SHEET ".
4240 ZD = VAL(D$);ZOY = ZOY + ZD
4250 RETURN
4260 REM PAPER SUBROUTINE
4270 IF ZCT = 1 THEN INPUT " INSERT NEW SHEET ";TS:GOTO 4310
4280 FOR AA = 1 TO (72-ZZ)
4290 LPRINT
4300 NEXT AA
4310 RETURN
4320 REM TIRE CONTROL REPORT
4330 CLS:PRINT " THIS ROUTINE PRINTS OUT TIRE DATA AND
HISTORY FOR EACH":PRINT
4340 PRINT " TIRE DESIGNATED. DATA INPUT SHOULD BE UP TO
DATE."":PRINT
4350 INPUT " DO YOU WISH TO CONTINUE ,(Y/N) " ;AN$:IF
AN$< >"Y" THEN 30
4360 CLS:INPUT " CURRENT DATE ... MM-DD-YY ";DAT$:PRINT
4370 INPUT " DO YOU WANT RECORDS FOR ALL TIRES ,(Y/N)
" ;ALL$
4380 IF ALL$< >"Y" THEN 4390 ELSE 4400
4390 PRINT :INPUT " TIRE ID, 6 DIGITS (IE TO01__) " ;TD$
4400 CLS:PRINT "INSERT DISK WITH TIRE.DAT AND TIREHIST.DAT
IN DRIVE B ":PRINT
4410 RESET: INPUT " HIT RETURN WHEN READY ":Q$
4420 OPEN "R", #2, "B:TIREHIST.DAT", 40
4430 FIEL DM #1, 6 AS R1$ ,10 AS R2$,10 AS R3$,10 AS R4$,5 AS
R5$,5 AS R6$,4 AS R7$
4440 FIEL DM #2,10 AS P1$,6 AS P2$,4 AS P3$,3 AS P4$,5 AS
P5$,4 AS P6$,4 AS P7$,4 AS P8$
4450 ZTIR = FIX(LOF(1)/ 50):ZTHS = FIX(LOF(2)/ 40)
4460 PRINT :PRINT " INSERT PAPER IN PRINTER ":PRINT
4470 INPUT " IS PAPER IN SEPERATE SHEETS , (Y/N) " ;AN$:IF
AN$< >"Y" THEN ZCT = 0 ELSE ZCT = 1
4480 PRINT :INPUT " HIT RETURN WHEN READY ":Q$
4490 FOR Z = 1 TO ZTIR:GET #1,Z:TID$= R1$
4500 IF (ALL$="Y") OR (TD$=TID$) THEN 4510 ELSE 4700
4510 BR$ = R2$:MN$ = R3$:SZ$ = R4$:CST = CVS(R5$)
4520 WH = CVS(R6$):YR$= R7$
4530 LPRINT TAB(30);"TIRE RECORDS";TAB(45);DATE$:LPRINT
TAB(30); "--------" ;TAB(45); "--------"
4540 LPRINT "NEW TIRE ":TAB(10);"TIRE ID ...
":;TID$;TAB(30);"BRAND ...
":;BR$;TAB(50);"MAKER ...
":;MN$:LPRINT
4550 LPRINT TAB(10);"SIZE .. ";SZ$;TAB(36);"ORIG. COST ...
":;CST:LPRINT:LPRINT TAB(10);"WARRANTY HOURS... ";WH;
HOURS";TAB(36);"YEAR... ";YR$
4560 LPRINT TAB(10); "--------
-----------------------------------------------
4570 LPRINT:LPRINT TAB(40);"HISTORY":LPRINT
4580 LPRINT TAB(34);"TREAD";TAB(40);"REPAIR":LPRINT
TAB(34);"DEPTH";TAB(40);"COSTS";TAB(48);"TOTAL"
4590 LPRINT TAB(10);"DATE";TAB(16);"EQUIP ID";TAB(25);"POSITION";TAB(34);"(IN.)";TAB(40);" ($)
";TAB(48);"HOURS";TAB(60);"STATUS"
4600 TAB(5);"-----------------------------------"
4610 ZZ = 18
4620 FOR Z1 = 1 TO ZTHS: GET #2,Z1: TRID$ = P2$
4630 IF TRID$ < > TID$ THEN 4680
4640 ATES$ = P1$; E$ = P3$; ZP = CVI(P4$); HS = CVS(P5$)
4650 TRDE = CVS(P6$); RC = CVS(P7$); ST$ = P8$
4660 LPRINT TAB(5); ATES$; TAB(20); E$; TAB(30); ZP; TAB(35); TRDE; TAB(42); RC; TAB(49); HS; TAB(63); ST$
4670 ZZ = ZZ + 1: IF ZZ > = 56 THEN GOSUB 4260: ZZ = 6
4680 NEXT Z1
4690 GOSUB 4260
4700 NEXT Z
4710 IF ALL$ < >"Y" THEN 4720 ELSE 4750
4720 PRINT : INPUT " ANOTHER , (Y/N) "; AN$
4730 IF AN$ < >"Y" THEN 4750
4740 PRINT : INPUT " TIRE ID, 6 DIGITS IN LENGTH "; TD$: GOTO 4490
4750 CLOSE #1,#2: RESET: PRINT " REMOVE DATA DISK FROM DRIVE B "; PRINT
4760 INPUT " HIT RETURN WHEN READY "; QS$: GOTO 30
4770 REM DATA INPUT ROUTINE
4780 CLS: PRINT "DATA INPUT MENU": PRINT : PRINT
4790 PRINT 1;" FUEL AND OIL USAGE UPDATE": PRINT
4800 PRINT 2;" MAINTENANCE HISTORY UPDATE": PRINT
4810 PRINT 3;" ADDITIONS TO EQUIPMENT RECORDS": PRINT
4820 PRINT 4;" TIRE CONTROL UPDATE": PRINT
4830 PRINT 5;" RETURN TO MAIN MENU": PRINT : PRINT
4840 INPUT " CHOOSE FUNCTION NUMBER "; ZNU
4850 IF (ZNU < 1) OR (ZNU>5) THEN PRINT"BAD NUMBER, TRY AGAIN" : GOTO 4780
4860 IF ZNU = 1 THEN 4880 ELSE IF ZNU = 2 THEN 5150 ELSE IF ZNU = 3 THEN 5750
4870 IF ZNU = 4 THEN 6000 ELSE IF ZNU = 5 THEN 30
4880 REM FUEL AND OIL UPDATE
4890 CLS: PRINT " THIS ROUTINE ALLOWS UPDATING OF FUEL AND OIL FILES. "; PRINT
4900 INPUT " DO YOU WISH TO CONTINUE , (Y/N) "; AN$: IF AN$ < >"Y" THEN 4780
4910 PRINT : PRINT " INSERT DISK WITH MOEQUIP.DAT, ETC. IN DRIVE B "; PRINT
4920 RESET: INPUT " HIT RETURN WHEN READY "; QS$
4930 OPEN "R",#1,"B: MOEQUIP.DAT",107
4940 FIELD #1,5 AS E$, 34 AS DESS$, 7 AS AQCS$, 6 AS AQDAT$, 6 AS LIFS$, 15 AS INCO$, 7 AS COV$, 5 AS CST$, 6 AS HRSS$, 4 AS AVA$, 4 AS UTS$, 8 AS PRO$
4950 OPEN "R",#2,"B: EQFUEL.DAT",63
INPUT THE FOLLOWING INFORMATION

DATE OF USEAGE , MM-DD-YY

FUEL USED THIS DATE (GAL)

OIL CONSUMED (QTS)

IS DATA CORRECT , (Y/N)

DO YOU WISH TO INPUT FOR ANOTHER DAY , (Y/N)

INSERT DISK WITH MNTHIST.DAT IN DRIVE A . INSERT DISK" :PRINT

PRINT " WITH MOEQUIP.DAT IN DRIVE B .":RESET

OPEN "R",#1,"A:MNTHIST.DAT",74

FIELD #1,10 AS K1$,5 AS K2$,4 AS K3$,3 AS K4$,20 AS K5$,20 AS K6$,3 AS K7$,3 AS K8$,3 AS K9$,3 AS K10$

OPEN "R",#2,"B:MOEQUIP.DAT",107

FIELD #2,5 AS E$,34 AS DES$,7 AS AQC$,6 AS AQD$,6 AS LIFS$,15 AS INC$,7 AS COV$,5 AS CST$,6 AS HR$,4 AS AVA$,4 AS UTI$,8 AS PRO$

Z = FIX(LOF(1)/74):ZMQP = FIX(LOF(2)/107)
CLS: Z = Z + 1
PRINT "ENTER THE FOLLOWING INFORMATION FOR EACH COMPLETED JOB"
;DAT$:PRINT :GOSUB 4150
PRINT "DATE COMPLETED, MM-DD-YY"
PRINT "COMPLETED JOB"
PRINT
INPUT "JOB # ";ZJB:PRINT
INPUT "EQUIP ID ";EQ$:PRINT
PRINT PM #: (999 IF NOT A PM TASK ");ZPM:PRINT
IF ZPM = 999 THEN 5350 ELSE 5370
PRINT "JOB DESCRIPTION (> 21 CHARACTERS )"
PRINT
INPUT "PARTS REQUIRED (SEPERATED BY A SPACE )"
PRINT
INPUT "TOTAL MAN-HOURS REQUIRED ";ZMNR:PRINT
PRINT "TIME IN QUEUE ";ZQU:PRINT
INPUT "TIME IN SERVICE ";ZSE:ZDT = ZSE + ZQU:PRINT
PRINT IS INFORMATION CORRECT , (Y/N) ";AN$:IF AN$< >"Y" THEN 5290
LSET K1$= DATE$:LSET K2$= MKI$(ZJB):LSET K3$= EQ$:LSET K4$= MKI$(ZPM)
LSET K5$= DS$:LSET K6$= PRT$:LSET K7$= MKI$(ZDT):LSET K8$= MKI$(ZMNR)
LSET K9$= MKI$(ZQU):LSET K10$= MKI$(ZSE)
PUT #1,Z
FOR Z1 = 1 TO ZMQP: GET #2,Z1:EP$= E$
IF LEFT$(EP$, 4) = EQ$ THEN 5490 ELSE NEXT Z1:GOTO 5730
Fl$= DES$:F2 = CVS(AQC$):F3$= AQDAT$:F4 = CVS(LIF$):F5$= INCO$
F6 = CVS(COV$):F7 = CVS(CST$):F8 = CVS(HRS$):F9 = CVS(AVA$)
F10 = CVS(UTI$):F11 = CVS(PRO$)
QP = VAL(MIDS(F3$, 4, 2)) + 1:QR = VAL(RIGHT$(DAT$, 2))
QS = (12 - VAL(LEFT$(F3$, 2)))*720: IF QP = QR + 1 THEN TTM = ZOY* 24-(8760-QS):GOTO 5550
TTM = (QR-QP)*8760 + QS + ZOY*24:Z2 = Z
Z2 = Z2-1:IF Z2 < 1 THEN 5640 ELSE GET #1,Z2:EQ2$= K3$
IF EQ2$= EQ$ THEN 5570 ELSE 5550
LDA$= K1$:Y1 = VAL(RIGHT$(LDA$, 2))
IF Y1 = QR THEN 5590 ELSE 5610
Z01 = ZOY:DAT$= LDAS:GOSUB 4150:Z02 = ZOY
TBE = Z01-Z02:GOTO 5630
Y2 = VAL(MIDS(LDA$, 4, 2)):Y3 = VAL(LEFT$(LDA$, 2))
TTM = (QR-Y2-1)*8760 + (30-Y2)*24 +(12-Y3)*720 + ZOY*24
TM1 = TTM-TBE:F9 = 1-(((1-F9)*TM1 + ZDT)/ TTM):GOTO 5650
F9 = 1-(((1-F9)*TTM + ZDT)/ TTM)
F10 = F8 /(F9*TTM)
LSET E$= EPS:LSET DES$= F1$:LSET AQC$= MKS$(F2):LSET AQDAT$= F3$
5670  LSET LIFS= MKS$(F4):LSET INCO$= F5$:LSET COV$= MKS$(F6):LSET CST$= MKS$(F7)
5680  LSET HRS$= MKS$(F8):LSET AVA$= MKS$(F9):LSET UTI$= MKS$(F10):LSET PRO$= MKS$(F11)
5690  PUT #2,21
5700  CLS:INPUT " INPUT ANOTHER ,(Y/N) ";AN$:IF AN$< >"Y" THEN 5710 ELSE 5280
5710  CLOSE #1,#2:RESET:PRINT :PRINT "REMOVE DATA DISKS . REINSERT PROGRAM DISK"
5720  PRINT :INPUT " HIT RETURN WHEN READY ";Q$:GOTO 4780
5730  PRINT " EQUIP ID DOESN'T MATCH ANY ON FILE . YOU'LL HAVE TO RE-ENTER"
5740  PRINT :PRINT " DATA":GOTO 5290
5750  REM ADD TO EQUIPMENT RECORDS
5760  CLS:PRINT " THIS ROUTINE ALLOWS INPUT OF NEW EQUIPMENT RECORDS ":PRINT
5770  INPUT " DO YOU WISH TO CONTINUE ,(Y/N) ";AN$:IF AN$< >"Y" THEN 4780
5780  PRINT :PRINT " INSERT DISK WITH MOEQUIP.DAT IN DRIVE B ":PRINT
5790  INPUT " HIT RETURN WHEN READY ";Q$
5800  OPEN "R",#1,"B:MOEQUIP.DAT",107
5810  FIELD #1,5 AS E$,34 AS DES$,7 AS AQC$,6 AS AQDAT$,6 AS LIFS,15 AS INCO$,7 AS COV$,5 AS CST$,6 AS HRS$,4 AS AVA$,4 AS UTI$,8 AS PRO$
5820  ZME = FIX(LOF(1)/107)
5830  CLS:PRINT "EQUIP ID SHOULD BE 4 CHARACTERS LONG , BEGINNING WITH THE LETTERS":PRINT
5840  PRINT " DR FOR DRILLS , LO FOR LOADING EQUIP. ,H1 FOR HAUL TRUCKS OF":PRINT
5850  PRINT " SIZE 1 , H2 FOR HAULTRUCKS OF SIZE 2 , AND GS FOR OTHER HEAVY":PRINT
5860  PRINT " MOBILE EQUIPMENT ":PRINT
5870  INPUT :INPUT " ":D10$
5880  IF LEFT$(D10$,2)="DR" THEN CC$=" TOTAL FOOTAGE TO DATE ":PRINT
5890  IF (LEFT$(D10$,2)="LO") OR (LEFT$(D10$,2)="H1") OR (LEFT$(D10$,2)="H2") THEN CC$=" TOTAL TONNAGE TO DATE ":PRINT
5900  IF LEFT$(D10$,2)="GS" THEN CC$=" USEAGE PARAMETER (IE. MILEAGE) ":PRINT
5910  IF CC$="" THEN PRINT " IMPROPER EQUIP ID, TRY AGAIN":GOTO 5870
5920  GOSUB 7910
5930  PRINT :PRINT TAB(6);CC$;INPUT D21$;PRINT
5940  INPUT " IS INFORMATION CORRECT ,(Y/N) ";AN$:IF AN$< >"Y" THEN 5830
5950  GOSUB 8030
5960  ZME = ZME + 1:PUT #1,ZME
5970  PRINT :INPUT " DO YOU WISH TO ENTER ANOTHER ,(Y/N) ";AN$:IF AN$< >"Y" THEN 5980 ELSE 5830
5980 CLOSE #1:RESET:PRINT " REMOVE DATA DISK FROM DRIVE B ":PRINT
5990 INPUT " HIT RETURN WHEN READY ";Q$:GOTO 4780
6000 REM TIRE CONTROL UPDATE
6010 CLS:PRINT TAB(20):"TIRE CONTROL MENU"
6020 PRINT :PRINT :PRINT 1,": ADD TIRES TO TIRE DATABASE 
6030 PRINT 2," UPDATE TIRE HISTORY":PRINT
6040 PRINT 3,": RETURN TO DATA INPUT MENU ":PRINT
6050 INPUT " CHOOSE FUNCTION NUMBER ":ZNU:PRINT
6060 IF (ZNU < 1) OR (ZNU>3) THEN PRINT " BAD NUMBER, TRY AGAIN ":GOTO 6010
6070 IF ZNU=1 THEN 6080 ELSE IF ZNU=2 THEN 6280 ELSE 4780
6080 CLS: PRINT " INSERT DISK WITH TIRE.DAT IN DRIVE B 
6090 RESET: INPUT " HIT RETURN WHEN READY ";Q$
6100 OPEN "R",#1,"B:TIRE.DAT",50
6110 FIELD #1,6 AS R1$,10 AS R2$,10 AS R3$,10 AS R4$,5 AS R5$,5 AS R6$,4 AS R7$
6120 ZTD = FIX(LOF(1)/ 50):ZTD = ZTD + 1
6130 PRINT " FOR EACH TIRE 
6140 INPUT " ENTER THE FOLLOWING 
6150 INPUT " TIRE I.D. ( = 6 DIGITS ) ";RR1$:PRINT
6160 INPUT " TIRE BRAND ";RR2$:PRINT
6170 INPUT " MANUFACTURER ";RR3$:PRINT
6180 INPUT " SIZE ";RR4$:PRINT
6190 INPUT " TIRE COST ";RR5 :PRINT
6200 INPUT " WARRANTY HOURS ";RR6:PRINT
6210 INPUT " YEAR OF MANUFACTURE ";RR7$:PRINT
6210 LSET R1$= RR1$:LSET R2$= RR2$:LSET R3$= RR3$:LSET R4$= RR4$
6220 LSET R5$ = MKS$(RR5):LSET R6$= MKS$(RR6):LSET R7$= RR7$
6230 PUT #1,ZTD
6240 INPUT " ANY MORE TIRES (Y/N) ";AN$
6250 IF AN$< >"Y" THEN 6260 ELSE 6120
6260 CLOSE #1:RESET:PRINT :PRINT " REMOVE DATA DISK FROM DRIVE B 
6270 PRINT " HIT RETURN WHEN READY ";Q$:GOTO 6010
6280 REM UPDATE TIRE HISTORY
6290 CLS:PRINT 
6300 PRINT " THIS ROUTINE ALLOWS UPDATING OF TIRE HISTORY 
6310 INPUT " DO YOU WISH TO CONTINUE ,(Y/N) ";AN$:IF
6320 AN$< >"Y" THEN 6000
6330 OPEN "R",#1,"A:TIREHIST.DAT",40
6340 PRINT :PRINT " INSERT DISK WITH TIREHIST.DAT IN DRIVE A . INSERT":PRINT
6350 PRINT " DISK WITH MOEQUIP.DAT IN DRIVE B 
6360 OPEN "R",#2,"B:MOEQUIP.DAT",107
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6370 FIELD #2,5 AS ES$.34 AS DES$.7 AS AQCS$.6 AS AQDAT$.6 AS LIP$.15 AS INCS$.7 AS COVS$.5 AS CST$.6 AS HRSS$.4 AS AVAS$.4 AS UTI$.8 AS PRO$
6380 OPEN "R",#3,"B:EQHRS.DAT",63
6390 FIELD #3,3 AS GS$(0),3 AS GS$(1),3 AS GS$(2),3 AS GS$(3),3 AS GS$(4),3 AS GS$(5),3 AS GS$(6),3 AS GS$(7),3 AS GS$(8),3 AS GS$(9),3 AS GS$(10),3 AS GS$(11),3 AS GS$(12),3 AS GS$(13),3 AS GS$(14),3 AS GS$(15),3 AS GS$(16),3 AS GS$(17),3 AS GS$(18),3 AS GS$(19),3 AS GS$(20)
6400 Z1 = FIX(LOF(1)/ 40):Z2 = FIX(LOF(2)/ 107)
6410 Z1 = Z1 + 1:CLS
6420 PRINT " ENTER THE FOLLOWING INFORMATION FOR EACH TIRE MAINTENANCE":PRINT
6430 PRINT " JOB COMPLETED.";PRINT :PRINT
6440 INPUT " DATE COMPLETED , MM-DD-YY ";DAT$:GOSUB 4150:PRINT
6450 ZOl = ZOY:DT1$=DATE$
6460 INPUT " TIRE ID ":PP1$:PRINT
6470 INPUT " EQUIP ID ":PP2$:PRINT
6480 INPUT " TIRE POSITION ";PP3:PRINT
6490 INPUT " TREAD DEPTH ";PP4:PRINT
6500 INPUT " REPAIR COST ";PP5:PRINT
6510 INPUT " STATUS (ON, OFF, SCRAP) ";PP6$
1 TO Z2:GET #2,Z:EQ$= E$
6520 IF LEFT$(EQ$,4) = PP2$ THEN 6540 ELSE NEXT Z : GOTO 6660
6530 IF LEFT$(EQ$,4) = PP2$ THEN 6540 ELSE NEXT Z : GOTO 6660
6540 Z3 = Z-1
6550 FOR Z = (Z1-1) TO 1 STEP -1:GET #1,Z:SS3$= P2$
6560 IF SS3$= PP1$ THEN 6570 ELSE NEXT Z:GOTO 6680
6570 DATS= P1$:TH = CVS(P5$)
6580 IF (RIGHT$(DAT$,2))=(RIGHT$(DT1$,2)) THEN GOSUB 4150:Z02 = ZOY:GOTO 6610
6590 FOR Z = 1 TO ZOl:GET #3,Z:DH = CVI(G$(Z3)):TH = TH + DH
6600 NEXT Z:GOTO 6620
6610 FOR Z = Z02 TO ZOl:GET #3,Z:DH = CVI(G$(Z3)):TH = TH + DH
6620 LSET P1$= DT1$LSET P2$= PP1$LSET P3$= PP2$LSET P4$= MKS$(PP3)
6630 LSET P5$= MKS$(TH)LSET P6$= MKS$(PP4)LSET P7$= MKS$(PP5)
6640 LSET P8$= PP6$
6650 PUT #1,Z1:GOTO 6700
6660 PRINT " EQUIPMENT ID DOESN'T MATCH ANY ON FILE ":PRINT
6670 INPUT " CORRECT EQUIPMENT ID ";PP2$:GOTO 6520
6680 PRINT " TIRE IS NOT RECORDED IN TIRE HISTORY . PLEASE INPUT AN ";PRINT
6690 INPUT " ESTIMATE OF TOTAL HOURS ON TIRE ";TH:GOTO 6620
6700 PRINT :INPUT " DO YOU WISH TO INPUT ANOTHER ,(Y/N) ";AN$
6710 IF ANS< >"Y" THEN 6720 ELSE 6410
6720 CLOSE #1,#2,#3:RESET:PRINT
6730 PRINT " REMOVE DATA DISKS AND REINSERT PROGRAM DISK
IN DRIVE A"
6740 PRINT :INPUT " HIT RETURN WHEN READY " ;Q$:GOTO 6000

6750 REM INITIALIZATION OF MOBILE MAINTENANCE MODULE FILES
6760 PRINT " SYSTEM INITIALIZATION MENU " :PRINT
6770 PRINT 1," INITIALIZATION OF EQUIPMENT RECORDS
(MOEQUIP.DAT)" :PRINT
6780 PRINT 2," SETUP OF EQUIPMENT HOURS, FUEL, AND OIL
FILES" :PRINT
6790 PRINT 3," PLANNING AND SCHEDULING FILES (P.M. JOB
LIST, ETC.)" ;PRINT
6800 PRINT 4," SETUP OF MAINTENANCE HISTORY FILE " ;PRINT
6810 PRINT 5," SETUP OF TIRE DATA BASE ":PRINT :PRINT 6," RETURN TO MAIN MENU"
6820 PRINT :INPUT " MENU SELECTION... 1 THRU 6... " ;ZU:IF
(ZU<1) OR (ZU>6) THEN PRINT " BAD NUMBER ":GOTO 6760
6830 IF ZU=1 THEN 6840 ELSE IF ZU=2 THEN 8090 ELSE IF ZU=3
THEN 8310 ELSE IF ZU=4 THEN 8830 ELSE IF ZU=5 THEN 8940 ELSE
GOTO 9210
6840 CLS:PRINT " EQUIPMENT RECORDS CONSIST OF ONE RECORD
FOR EACH PIECE OF " ;PRINT
6850 PRINT " MOBILE EQUIPMENT. EACH RECORD CONTAINS THE
EQUIP. I.D., " ;PRINT
6860 PRINT " DESCRIPTION ( MAKE, MODEL, YEAR ),
ACQUISITION COST, AC- " ;PRINT
6870 PRINT " QUI SITION DATE, ESTIMATED LIFE, INSURER,
COVERAGE, COST ":PRINT
6880 PRINT " OF INSURANCE, EQUIPMENT HOURS, AVAILABILITY,
UTILIZATION," ;PRINT
6890 PRINT " AND PRODUCTION " ;PRINT
6900 PRINT " INSERT FORMATTED DISK IN DRIVE A ":PRINT
6910 RESET
6920 INPUT " HIT RETURN WHEN READY ";QQ$
6930 OPEN "R",#1,"A:MOEQUIP.DAT",107
6940 FIELD #1,5 AS ES,34 AS DES$,7 AS AQC$,6 AS AQDAT$,6 AS
LIF$,15 AS INCO$,7 AS COV$,5 AS CST$,6 AS HRS$,4 AS AVA$,4
AS UTI$,8 AS PRO$
6950 PRINT " THE ROUTINE WILL NOW COMMENCE OBTAINING THE
REQUIRED " ;PRINT
6960 PRINT " INFORMATION FOR EACH PIECE OF EQUIPMENT,
BEGINNING WITH" ;PRINT
6970 PRINT " DRILLS. " ;PRINT
6980 INPUT " HOW MANY DRILLS " ;Z10:IF Z10 < = 0 THEN
7120
6990 PRINT " EACH DRILL I.D. SHOULD BE FOUR
CHARACTERS IN LENGTH" 7000 PRINT " , BEGINNING WITH THE LETTERS -- DR
--. FOR EXAMPLE, "
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7010 PRINT :PRINT "DR01, OR DR25 ":PRINT
7020 FOR Z = 1 TO Z10:PRINT "DRILL # ":Z:PRINT
7030 INPUT " DRILL I.D. ";D10$
7040 IF LEFT$(D10$,2)< >"DR" THEN PRINT "INVALID DRILL I.D.":GOTO 7030
7050 GOSUB 7910
7060 INPUT " TOTAL FOOTAGE TO DATE ";D21:PRINT
7070 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$
7080 IF AN$< >"Y" THEN 7030
7090 GOSUB 8030
7100 PUT #1,Z
7110 NEXT Z
7120 CLS
7130 INPUT " HOW MANY LOADERS ";Z11:PRINT
7140 IF Z11 < = 0 THEN 7290
7150 PRINT :PRINT " EACH LOADER I.D SHOULD BE FOUR CHARACTERS LONG,"
7160 PRINT :PRINT " BEGINNING WITH THE LETTERS -- LO --"
7170 PRINT :PRINT " FOR EXAMPLE, LO01, OR LO23 
7180 FOR Z = 1 TO Z11:PRINT " LOADER # ":Z:PRINT
7190 INPUT " LOADER I.D. ";D10$
7200 IF LEFT$(D10$,2)< >"LO" THEN PRINT "INVALID LOADER I.D.:GOTO 7200
7210 GOSUB 7910
7220 INPUT " TOTAL TONNAGE TO DATE ";D21:PRINT
7230 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$
7240 IF AN$< >"Y" THEN 7190
7250 GOSUB 8030
7260 PUT #1,(Z + Z10)
7270 NEXT Z
7280 CLS
7290 PRINT " THIS PROGRAM HANDLES TWO SIZES OF HAUL TRUCKS. IF MORE":PRINT
7300 PRINT " THAN TWO SIZES, MODIFY PROGRAM. INPUT EACH SIZE CATEGORY":PRINT
7310 PRINT " SEPARATELY. IF ONLY ONE SIZE IS BEING USED, INPUT 0 FOR":PRINT
7320 PRINT " THE NUMBER OF TRUCKS OF SIZE 2 ."
7330 INPUT " HOW MANY TRUCKS OF SIZE 1 ":Z12:PRINT
7340 IF Z12 < = 0 THEN 7480
7350 PRINT :PRINT " EACH TRUCK I.D SHOULD BE FOUR CHARACTERS LONG,"
7360 PRINT :PRINT " BEGINNING WITH THE LETTERS -- H1 --"
7370 PRINT :PRINT " FOR EXAMPLE, H101, OR H122 
7380 FOR Z = 1 TO Z12:PRINT " TRUCK # ":Z:PRINT
7390 INPUT " TRUCK I.D. ";D10$:PRINT
7400 IF LEFT$(D10$,2)< >"H1" THEN PRINT "INVALID TRUCK I.D.";GOTO 7390
7410 GOSUB 7910
7420 INPUT " TOTAL TONNAGE TO DATE ";D21:PRINT
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7430 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$
7440 IF AN$< >"Y" THEN 7390
7450 GOSUB 8030
7460 PUT #1,(Z + Z10 + Z11)
7470 NEXT Z
7480 CLS
7490 INPUT " HOW MANY TRUCKS OF SIZE 2 ";Z13:PRINT
7500 IF Z13 < = 0 THEN 7650
7510 PRINT : PRINT " EACH TRUCK I.D SHOULD BE FOUR
CHARACTERS LONG,"
7520 PRINT : PRINT " BEGINNING WITH THE LETTERS -- H2 --"
7530 PRINT : PRINT " FOR EXAMPLE, H201, OR H222"
7540 FOR Z = 1 TO Z13:PRINT "TRUCK # ";Z:PRINT
7550 INPUT " TRUCK I.D. ";D10$
7560 IF LEFT$(D10$,2)< >"H2" THEN PRINT "INVALID TRUCK
I.D.":GOTO 7550
7570 GOSUB 8030
7580 INPUT " TOTAL TONNAGE TO DATE ";D21:PRINT
7590 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$
7600 IF AN$< >"Y" THEN 7550
7610 GOSUB 8030
7620 ZZZZ = Z + Z10 + Z11 + Z12
7630 PUT #1,ZZZZ
7640 NEXT Z
7650 CLS
7660 PRINT " GENERAL SERVICE MOBILE EQUIPMENT ":PRINT
7670 PRINT " THIS INCLUDES ANY HEAVY MOBILE EQUIPMENT
NOT INCLUDED"
7680 PRINT : PRINT " ABOVE. ":PRINT
7690 INPUT " HOW MANY GEN. SERVICE VEHICLES ";Z14:PRINT
7700 IF Z14 < = 0 THEN 7860
7710 PRINT : PRINT " EACH VEHICLE I.D SHOULD BE FOUR
CHARACTERS LONG,"
7720 PRINT : PRINT " BEGINNING WITH THE LETTERS -- GS --"
7730 PRINT : PRINT " FOR EXAMPLE, GS01, OR GS22"
7740 FOR Z = 1 TO Z14
7750 PRINT : PRINT " G.S. VEHICLE # ";Z:PRINT
7760 INPUT " VEHICLE I.D. ";D10$
7770 IF LEFT$(D10$,2)< >"GS" THEN PRINT "INVALID VEHICLE
I.D.":GOTO 7760
7780 GOSUB 8030
7790 INPUT " USAGE PARAMETER (MILEAGE TO DATE ,ETC.)
";D21:PRINT
7800 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$
7810 IF AN$< >"Y" THEN 7760
7820 GOSUB 8030
7830 ZZZZ = Z + Z10 + Z11 + Z12 + Z13
7840 PUT #1,ZZZZ
7850 NEXT Z
7860 CLS
7870 CLOSE #1:RESET
7880 PRINT " REMOVE DATA DISK AND REINSERT PROGRAM DISK IN DRIVE A"
7890 PRINT: INPUT " HIT RETURN WHEN READY ";QQS
7900 GOTO 6760
7910 REM SUBROUTINE INFO-ASKER
7920 INPUT " DESCRIPTION, (MAKE - MODEL - YEAR)
",;D11$:PRINT
7930 INPUT " ACQUISITION COST ";D12:PRINT
7940 INPUT " ACQUISITION DATE (MM/YY) ";D13$:PRINT
7950 INPUT " EST. LIFE (IN HOURS) ";D14:PRINT
7960 INPUT " INSURER'S NAME ";D15$:PRINT
7970 INPUT " AMOUNT OF COVERAGE ";D16:PRINT
7980 INPUT " ANNUAL PREMIUM ";D17:PRINT
7990 INPUT " HOURS USED TO DATE ";D18:PRINT
8000 INPUT " AVAILABILITY (NEW = 1.00) ";D19:PRINT
8010 INPUT " UTILIZATION (NEW = 0.00) ";D20:PRINT
8020 RETURN
8030 REM SUBROUTINE LSET
8050 LSET LIFS$ = MKS$(D14): LSET INCOS$ = D15$: LSET COVS$ = MKS$(D16)
8060 LSET CSTS$ = MKS$(D17): LSET HRS$ = MKS$(D18): LSET AVAS$ = MKS$(D19)
8070 LSET UTIS$ = MKS$(D20): LSET PROS$ = MKS$(D21)
8080 RETURN
8090 REM SETUP OF EQUIPMENT HOURS, FUEL, AND OIL FILES
8100 CLS: PRINT "INITIALIZATION OF EQUIPMENT RECORDS MUST PRECEDE THIS ROUTINE": PRINT
8110 INPUT " DO YOU WISH TO CONTINUE,(Y/N) ";AN$
8120 IF AN$ < > "Y" THEN 6760
8130 PRINT: PRINT " THIS SETS UP OPERATING HOURS, FUEL CONSUMED, AND OIL CONSUMED PER": PRINT
8140 PRINT " DAY FOR EACH PIECE OF EQUIPMENT LISTED IN THE EQUIPMENT FILES": PRINT
8150 PRINT " INSERT DISK WITH MOEQUIP.DAT IN DRIVE E"": PRINT
8160 INPUT " HIT RETURN WHEN READY ";RQS
8170 PRINT: PRINT " THIS ROUTINE TAKES A FEW MINUTES TO COMPLETE": PRINT
8180 OPEN "R", #1, "B:EQHRS.DAT", 63
8190 OPEN "R", #2, "B:EQFUEL.DAT", 63
8200 OPEN "R", #3, "B:EOIL.DAT", 63
8210 FIELD #1, 3 AS GS$(0), 3 AS GS$(1), 3 AS GS$(2), 3 AS GS$(3), 3 AS GS$(4), 3 AS GS$(5), 3 AS GS$(6), 3 AS GS$(7), 3 AS GS$(8), 3 AS GS$(9), 3 AS GS$(10), 3 AS GS$(11), 3 AS GS$(12), 3 AS GS$(13), 3 AS GS$(14), 3 AS GS$(15), 3 AS GS$(16), 3 AS GS$(17), 3 AS GS$(18), 3 AS GS$(19), 3 AS GS$(20)
8220 FIELD #2, 3 AS IS$(0), 3 AS IS$(1), 3 AS IS$(2), 3 AS IS$(3), 3


8240 ZN = 0:FOR Z2 = 1 TO 366:FOR Z3 = 0 TO 20

8250 LSET G$(Z3) = MKI$(ZN):LSET I$(Z3) = MKI$(ZN):LSET J$(Z3) = MKI$(ZN)

8260 NEXT Z3

8270 PUT #1,Z2:PUT #2,Z2:PUT #3,Z2

8280 NEXT Z2

8290 CLOSE #1,#2,#3:RESET

8300 GOTO 6760

8310 REM SETUP OF FILES USED IN PLANNING AND SCHEDULING

8320 CLS:PRINT " EQUIPMENT RECORDS MUST EXIST BEFORE PRINT"

8330 INPUT " DO YOU WISH TO CONTINUE (Y/N) ";AN$ 

8340 IF AN$ < > "Y" THEN 6760

8350 PRINT:PRINT " THIS ROUTINE ESTABLISHES A FILE CONSISTING OF PREVENTIVE"

8360 PRINT " MAINTENANCE TASKS. EACH RECORD CONTAINS A P.M. TASK #,DESCRIPTION "

8370 PRINT " AND OTHER FACTORS PERTAINING TO THE SPECIFIC TASK.":PRINT

8380 PRINT " INSERT DISK WITH MOEQUIP.DAT IN DRIVE B "

8390 INPUT " HIT RETURN WHEN READY ";AN$:RESET

8400 OPEN "R",#1,"B:MOEQUIP.DAT",107

8410 FIELD #1,5 AS E$,34 AS DES$,7 AS AQC$,6 AS AQDAT$,6 AS LIF$,15 AS INCO$,7 AS COV$,5 AS CST$,6 AS HRSS$,4 AS AVA$,4 AS UTI$,8 AS PRO$

8420 ZOL = FIX(LOF(1)/107) :DIM EQUIP$(ZOL)

8430 FOR Z = 1 TO ZOL

8440 GET #1,Z :EQUIP$(Z) = ES:NEXT Z:CLOSE #1:RESET

8450 CLS:PRINT " GENERAL RESTRICTIONS ":PRINT

8460 INPUT " WHAT IS THE NUMBER OF SERVICE BAYS AVAILABLE ";ZWP:PRINT

8470 INPUT " WHAT IS THE AVE. MECHANIC-HOURS/WEEK AVAILABLE ";MHW:PRINT

8480 INPUT " WHAT IS THE AVE. NUMBER OF MECHANICS/SHIFT AVAILABLE ";ZMS:PRINT

8490 OPEN "R",#2,"B:PMJOBS.DAT",64:OPEN

8500 FIELD #1,3 AS L1$,30 AS L2$,1 AS L3$,2 AS L4$,4 AS L5$,20 AS L6$,4 AS L7$

8510 FIELD #2,4 AS M1$,60 AS M2$

8520 LSET L1$ = MKI$(ZWP):LSET L2$ = MKI$(MHW):LSET L4$ = MKI$(ZMS)
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8530 PUT #1,1
8540 PRINT "FOLLOWING IS A LIST OF QUESTIONS CONCERNING"
8550 PRINT EACH P.M. TASK"
8560 PRINT "P.M. TASK NUMBER ";(ZOLE-1);PRINT
8570 INPUT " Task description (<= 30 characters )";N2$;PRINT
8580 INPUT " IS A SERVICE BAY REQUIRED FOR THIS JOB (Y/N) ";N3$;PRINT
8590 INPUT " EST. NUMBER OF MECHANICS REQUIRED (AND"
8600 PRINT HELPER S )";N4;PRINT
8610 INPUT " ESTIMATED MAN-HOURS REQUIRED ";N5;PRINT
8620 INPUT " LIST OF MAJOR PARTS - EACH PART SEPERATED"
8630 PRINT BY A SPACE ";N6$;PRINT
8640 INPUT " WHAT IS THE INTERVAL BETWEEN SERVICINGS (IN"
8650 PRINT EQUIP. HOURS) ";N7;PRINT
8660 INPUT " ANY MORE TASKS (Y/N) ";AN$;PRINT
8670 IF AN$="Y" THEN 8690
8680 ZOLE = ZOLE + 1;CLS:GOTO 8560
8690 CLOSE #1:ZOLE = ZOLE - 1;CLS
8700 PRINT " FOR EACH PIECE OF EQUIPMENT LISTED BELOW ,"
8710 PRINT " LIST APPLICABLE P.M. TASK NUMBERS. LIST EACH NUMBER"
8720 PRINT " SEPERATED BY A SPACE ";PRINT :PRINT
8730 FOR Z = 1 TO ZOL
8740 PRINT " EQUIPMENT NUMBER ";EQUIP$(Z):PRINT
8750 INPUT " LIST ALL APPLICABLE TASK NUMBERS (IN"
8760 PRINT QUOTES )";MM2$
8770 LSET M1$= EQUIP$(Z):LSET M2$= MM2$
8780 PUT #2,Z
8790 NEXT Z
8800 CLOSE #2:RESET ;CLS
8810 IF AN$="Y" THEN 8830
8820 GOTO 8660
8830 REM SETUP OF MAINTENANCE HISTORY FILE
8840 PRINT " THIS MODULE SETS UP THE MAINTENANCE HISTORY"
8850 PRINT " DATA FILE. IT";PRINT
8860 PRINT " IS BASED ON JOB TICKET FORMAT. THIS FILE"
8870 PRINT " INCREASES IN ";PRINT
8880 PRINT " SIZE WITH EACH ENTRY. " ;PRINT
8890 PRINT " INSERT FORMATTED DISK IN DRIVE A ";PRINT
8900 INPUT " HIT RETURN WHEN READY ";AN$;
8910 OPEN "R",#1,"A:MNTHIST.DAT",74
8920 FIELD #1,10 AS K1$:5 AS K2$:4 AS K3$:3 AS K4$:20 AS
8930 K5$:20 AS K6$:3 AS K7$:3 AS K8$:3 AS K9$:3 AS K10$
8940 CLOSE #1:RESET
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8920 PRINT ""; "REINSERT PROGRAM DISK IN DRIVE A ";:PRINT
8930 INPUT "HIT RETURN WHEN READY ";AN$:CLS:GOTO 6760
8940 REM TIRE DATA BASE INITIALIZATION
8950 CLS:PRINT ""; THIS ROUTINE SETS UP TWO FILES, A TIRE
DATA BASE AND ";:PRINT
8960 PRINT ""; A TIRE MAINTENANCE HISTORY ";:PRINT
8970 RESET:PRINT ""; INSERT A FORMATTED DISK IN DRIVE A --
THIS DISK CAN "":PRINT
8980 PRINT ""; HAVE MNTST.DAT ON IT ";:PRINT
8990 INPUT "HIT RETURN WHEN READY ";AN$:CLS
9000 OPEN "R",#1,"A:TIRE.DAT",50:OPEN
9010 FIELD #1,6 AS R1$,10 AS R2$,10 AS R3$,10 AS R4$,5 AS
R5$,5 AS R6$,4 AS R7$
9020 PRINT ""; FOR EACH TIRE , ENTER THE FOLLOWING
INFORMATION ";:PRINT
9030 INPUT "TIRE I.D. (= 6 DIGITS) ";RR1$:PRINT
9040 INPUT "TIRE BRANDNAME ";RR2$:PRINT
9050 INPUT "MANUFACTURER ";RR3$:PRINT
9060 INPUT "SIZE ";RR4$:PRINT
9070 INPUT "TIRE COST ";RR5$:PRINT
9080 INPUT "WARRANTY HOURS ";RR6$:PRINT
9090 INPUT "YEAR OF MANUFACTURE ";RR7$:PRINT
9100 LSET R1$= RR1$: LSET R2$= RR2$: LSET R3$= RR3$: LSET R4$ =
RR4$ 
9110 LSET R5$= MKS$(RR5): LSET R6$= MKS$(RR6): LSET R7$= RR7$
9120 LSET R5$= MKS$(RR5): LSET R6$= MKS$(RR6): LSET R7$= RR7$
9130 PUT #1,ZOL
9140 INPUT " ANY MORE TIRES (Y/N) ";AN$:CLS
9150 IF AN$<>"Y" THEN 9150
9160 CLS:ZOL = ZOL + 1:GOTO 9040
9170 CLOSE #1,#2:RESET
9180 PRINT ""; "REINSERT PROGRAM DISK IN DRIVE A":PRINT
9190 INPUT "HIT RETURN WHEN READY ";AN$:CLS
9200 GOTO 6760
9210 GOTO 30
9220 REM PRINT OUT PM TASK LIST
9230 CLS:PRINT ""; THIS ROUTINE PRINTS OUT THE PM TASK
LIST "":PRINT
9240 INPUT ""; DO YOU WISH TO CONTINUE .(Y/N) ";AN$:IF
AN$<>"Y" THEN 9240
9250 CLS:PRINT ""; INSERT DISK WITH PMJOB.DAT IN DRIVE B
":PRINT
9260 INPUT ""; "HIT RETURN WHEN READY ";:Q$
9270 OPEN "R",#1,"B:PMJOBS.DAT",64:OPEN
9280 FIELD #1,3 AS L1$,30 AS L2$,1 AS L3$,2 AS L4$,4 AS
L5$,20 AS L6$,4 AS L7$
9290 FIELD #2,4 AS M1$,60 AS M2$
9300 CLS:INPUT ""; IS PAPER IN SEPERATE SHEETS .(Y/N)
";AN$:IF AN$<>"Y" THEN ZCT = 0 ELSE ZCT = 1
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9310 PRINT : INPUT "HIT RETURN WHEN PRINTER IS READY " ; QS
9320 LPRINT TAB(30) ; "LIST OF PM TASKS" ; LPRINT
   TAB(30) ; "------------------"
9330 LPRINT : LPRINT : GET #1, 1 ; ZWP = CVI(L1$) ; MHW = 
   CVS(L2$) ; ZMS = CVI(L4$)
9340 LPRINT TAB(10) ; "# OF SERVICE BAYS .............."
   ; ZWP ; LPRINT
9350 LPRINT TAB(10) ; "AVERAGE MN-HOURS/WEEK AVAILABLE ..."
   ; MHW ; LPRINT
9360 LPRINT TAB(10) ; "AVERAGE # OF MECHANICS/SHIFT ....."
   ; ZMS ; LPRINT
9370 LPRINT : LPRINT TAB(38) ; "# MECH. MAN " TAB(72) ; "INTERVAL"
   LPRINT TAB(8) ; "PM # DESCRIPTION " ; TAB(37) ; "REQUIRED HRS."
   " PARTS REQUIRED" ; TAB(74) ; "(HOURS)"
9390 LPRINT TAB(8) ; "-----------------------------------------------"
9400 ZJBS = FIX(LOF(1) / 64) ; ZZ = 20 : FOR Z = 2 TO ZJBS : GET
   #1, Z
9410 N2$ = L2$ ; N4 = CVI(L4$) ; N5 = CVS(L5$) ; N6$ = L6$ ; N7 = 
   CVS(L7$)
9420 LPRINT TAB(7) ; LPRINT USING "###" ; (Z - 1) ; LPRINT
   TAB(11) ; N2$ ; TAB(41)
9430 LPRINT USING "####" ; N4 ; N5 ; LPRINT
   TAB(51) ; N6$ ; TAB(72) ; N7
9440 ZZ = ZZ + 1 : IF ZZ > 56 THEN GOSUB 4260 : ZZ = 6
9450 NEXT Z
9460 LPRINT
9470 ZPEQ = FIX(LOF(2) / 64) : IF ZZ > (54 - ZPEQ) THEN GOSUB 4260
9480 LPRINT : LPRINT TAB(10) ; "THE FOLLOWING IS A LIST OF
   MOBILE EQUIPMENT WITH APPLICABLE PM NUMBERS " ; LPRINT
9490 LPRINT TAB(8) ; "EQUIP ID PM NUMBERS"
9500 LPRINT TAB(8) ; "-----------------------------------------------"
9510 FOR Z = 1 TO ZPEQ : GET #2, Z ; EIDS = M1$ ; PTS = M2$
9520 LPRINT TAB(8) ; EIDS ; " ; " ; PTS
9530 NEXT Z
9540 CLOSE #1, #2 : RESET ; CLS ; PRINT " REMOVE DATA DISK FROM
   DRIVE B" ; PRINT
9550 INPUT "HIT RETURN WHEN READY " ; QS
9560 GOTO 220
9570 END
Appendix V

Heap Leach Production Report Program
### HEAP LEACH PRODUCTION REPORT

#### LIST OF VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
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<tbody>
<tr>
<td>ZNU</td>
<td>MENU CHOICE</td>
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<tr>
<td>ZNU2</td>
<td>INITIALIZATION MENU CHOICE</td>
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<tr>
<td>T20$</td>
<td>ZERO</td>
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<tr>
<td>YPAD</td>
<td>TOTAL NUMBER OF PADS TO DATE</td>
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<tr>
<td>AB1(Y)</td>
<td>TOTAL NUMBER OF TONS (DRY), PAD #Y</td>
</tr>
<tr>
<td>AB2(Y)</td>
<td>AVERAGE GOLD GRADE, PAD #Y</td>
</tr>
<tr>
<td>AB3(Y)</td>
<td>AVERAGE SILVER GRADE, PAD #Y</td>
</tr>
<tr>
<td>AB4(Y)</td>
<td>DAYS IN LEACH, PAD #Y</td>
</tr>
<tr>
<td>AB5(Y)</td>
<td>GOLD RECOVERY TO DATE, PAD #Y</td>
</tr>
<tr>
<td>AB6(Y)</td>
<td>SILVER RECOVERY TO DATE, PAD #Y</td>
</tr>
<tr>
<td>YAB7(Y)</td>
<td>PAD STATUS</td>
</tr>
<tr>
<td>X7</td>
<td>TOTAL OZ GOLD CONTAINED IN TONNAGE TO THE PADS</td>
</tr>
<tr>
<td>X8</td>
<td>TOTAL OZ SILVER CONTAINED IN TONNAGE TO THE PADS</td>
</tr>
<tr>
<td>X9</td>
<td>TOTAL OZ GOLD POURRED TO DATE (IN DORE')</td>
</tr>
<tr>
<td>X10</td>
<td>TOTAL OZ SILVER POURRED TO DATE (IN DORE')</td>
</tr>
<tr>
<td>AUIP</td>
<td>IN PROCESS INVENTORY - GOLD</td>
</tr>
<tr>
<td>AGIP</td>
<td>IN PROCESS INVENTORY - SILVER</td>
</tr>
<tr>
<td>X13</td>
<td>TOTAL GOLD RECOVERED FROM PADS REMOVED FROM LEACH</td>
</tr>
<tr>
<td>X14</td>
<td>TOTAL SILVER RECOVERED FROM PADS REMOVED FROM LEACH</td>
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<tr>
<td>X15</td>
<td>INITIAL ESTIMATE OF GOLD RECOVERED FROM PAD IN LEACH</td>
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<td>X16</td>
<td>INITIAL ESTIMATE OF SILVER RECOVERED FROM PAD IN LEACH</td>
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<tr>
<td>XPD</td>
<td>NUMBER OF RECORDS IN HLP3.DAT</td>
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#### HLPM

#### LIST OF VARIABLES

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<td>DTCR</td>
<td>DAILY TONS CRUSHED</td>
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<tr>
<td>TCHR</td>
<td>DAILY HOURS CRUSHING</td>
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<tr>
<td>TCRAU</td>
<td>DAILY AVERAGE GOLD GRADE IN CRUSHED ORE</td>
</tr>
<tr>
<td>TCRAG</td>
<td>DAILY AVERAGE SILVER GRADE IN CRUSHED ORE</td>
</tr>
<tr>
<td>CHR(Z)</td>
<td>CRUSHER HOURS, SHIFT Z</td>
</tr>
<tr>
<td>CRT(Z)</td>
<td>TONS CRUSHED, SHIFT Z</td>
</tr>
<tr>
<td>CRAU(Z)</td>
<td>CRUSHED ORE GOLD ASSAY, SHIFT Z</td>
</tr>
<tr>
<td>CRAG(Z)</td>
<td>CRUSHED ORE SILVER ASSAY, SHIFT Z</td>
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<tr>
<td>CRM0(Z)</td>
<td>%MOISTURE CONTENT, SHIFT Z</td>
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<tr>
<td>CRCE(Z)</td>
<td>CEMENT ADDED, SHIFT Z</td>
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<tr>
<td>REAG(Z)</td>
<td>LIME ADDED, SHIFT Z</td>
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<tr>
<td>CROPS(Z)</td>
<td>CRUSHER OPERATOR, SHIFT Z</td>
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<tr>
<td>TTPH</td>
<td>DAILY AVERAGE CRUSHING RATE</td>
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<tr>
<td>TTLD</td>
<td>DAILY TONS LOADED TO PADS</td>
</tr>
<tr>
<td>THLD</td>
<td>DAILY HOURS LOADING</td>
</tr>
<tr>
<td>ANUL</td>
<td>AVERAGE GOLD GRADE, TONS LOADED TO PAD</td>
</tr>
<tr>
<td>AAGL</td>
<td>AVERAGE SILVER GRADE, TONS LOADED TO PAD</td>
</tr>
<tr>
<td>Symbol</td>
<td>Description</td>
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<tr>
<td>--------</td>
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<tr>
<td>TTUD</td>
<td>Daily Tons Removed (Unloaded) from pads</td>
</tr>
<tr>
<td>THUD</td>
<td>Daily Hours Unloading</td>
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<tr>
<td>AAUU</td>
<td>Average Gold Grade, Tons Removed</td>
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<tr>
<td>AAGU</td>
<td>Average Silver Grade, Tons Removed</td>
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<tr>
<td>TLD(Z)</td>
<td>Tons Loaded to pads, Shift Z</td>
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<tr>
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<td>Hours Loading, Shift Z</td>
</tr>
<tr>
<td>AUL(Z)</td>
<td>Gold Assay, Tons Loaded, Shift Z</td>
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<tr>
<td>AGL(Z)</td>
<td>Silver Assay, Tons Loaded, Shift Z</td>
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<td>Hours Unloading, Shift Z</td>
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<td>AAU(Z)</td>
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<td>AGU(Z)</td>
<td>Silver Grade of Tons Removed, Shift Z</td>
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<td>TPHU(Z)</td>
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<td>Pad # to which tonnage was added</td>
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<td>Y2</td>
<td>Pad # from which tonnage was removed</td>
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<tr>
<td>PHL</td>
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<tr>
<td>PHU</td>
<td>Daily Average Unloading Rate, TPH</td>
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<td>MEGS(Z)</td>
<td>Equip. I.D. Used for loading and unloading, Equip. # Z</td>
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<td>EHR(Z)</td>
<td>Hrs. used for for loading and unloading, Equip. # Z</td>
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<td>Estimated Production, Equip. # Z</td>
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<td>Daily Hours Leaching</td>
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<td>TLCN</td>
<td>Daily Cyanide Added</td>
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<tr>
<td>TLLM</td>
<td>Daily Lime Added</td>
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<td>Cyanide Added, Shift Z</td>
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<td>LLM(Z)</td>
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<td>AHAU</td>
<td>Total Head Grade, Gold</td>
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<tr>
<td>AHAG</td>
<td>Total Head Grade, Silver</td>
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<td>Daily Tail Grade, Gold</td>
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<tr>
<td>ATAG</td>
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<td>Daily Gold Adsorbed</td>
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<td>AEFU</td>
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<tr>
<td>AFAG(Z)</td>
<td>Adsorption Efficiency, Silver, Shift Z</td>
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</table>
CRDES  DAILY CARBON TO ADSORPTION
CTAU  DAILY GOLD TO ADSORPTION
CTAG  DAILY SILVER TO ADSORPTION
CRREG  DAILY TONS CARBON FROM REGENERATION
CRNEW  DAILY NEW CARBON
RDES(Z)  TONS CARBON TO ADSORPTION, SHIFT Z
CAU(Z)  GOLD ASSAY-CARBON, SHIFT Z
CAG(Z)  SILVER ASSAY-CARBON, SHIFT Z
REG(Z)  TONS CARBON FROM REGENERATION, SHIFT Z
RNEW(Z)  NEW CARBON, SHIFT Z
DWHR  DAILY HOURS IN DESORPTION-ELECTROWINNING
DWFL  DAILY FLOW IN DESORPTION-ELECTROWINNING
DPBAU  DAILY PREG. ASSAY, GOLD
DPBAG  DAILY PREG. ASSAY, SILVER
DWBAU  DAILY BARREN ASSAY, GOLD
DWBAG  DAILY BARREN ASSAY, SILVER
WRH(Z)  HOURS IN DESORPTION-ELECTROWINNING, SHIFT Z
WFL(Z)  TOTAL FLOW, SHIFT Z
WPAU(Z)  PREG. ASSAY, GOLD, SHIFT Z
WPAG(Z)  PREG. ASSAY, SILVER, SHIFT Z
WBZU(Z)  BARREN ASSAY, GOLD, SHIFT Z
WBZG(Z)  BARREN ASSAY, SILVER, SHIFT Z
RFHR  DAILY HOURS REFINING
RECP  DAILY CATHODES PULLED
DOAU  DAILY GOLD CONTENT IN DORE'
DOAG  DAILY SILVER CONTENT IN DORE'
FHR(Z)  HOURS REFINING, SHIFT Z
ECP(Z)  CATHODES PULLED, SHIFT Z
DORE(Z)  DORE Poured, SHIFT Z
OAU(Z)  GOLD CONTENT %, SHIFT Z
OAG(Z)  SILVER CONTENT %, SHIFT Z
ZPDN  EQUIVALENT TO ZPD
TTLTN  EQUIVALENT TO TTP
WDAU  WEEKLY GOLD ADSORBED
Wdag  WEEKLY SILVER ADSORBED
CCC9  WEEKLY GOLD IN DORE'
CCC10  WEEKLY SILVER IN DORE'
XYADAU  YEAR TO DATE GOLD ADSORBED
XYADAG  YEAR TO DATE SILVER ADSORBED
### HLP1.DAT

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<td>T3$</td>
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</tr>
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<td>AB6(Y)</td>
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### HLMEOQ.DAT

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<td>R$(Z)</td>
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<td>S$(Z)</td>
<td>EHR(Z)</td>
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Z = 0-9
Appendix V

General Flowchart
1230 DAILY REPORT

1240 - 1360
DESCRIBE ROUTINE, OPEN FILES

1370 - 2890
INTERACTIVE INPUT, INFO. FOR EACH UNIT OP., FOR EACH SHIFT, CALC. DAILY TOTALS

2900 - 3850
SAVE DAILY INFO. ON DISK, UPDATE FILES: HLP3.DAT, MOEQUIP.DAT, EQHRS.DAT

3860 - 4010
CALCULATE WEEKLY & YEAR TO DATE TOTALS

4020 - 5860
PRINT REPORT

20 MAIN MENU
Appendix V

Listing of Code
20 CLS:PRINT TAB(20);"HEAP LEACH PRODUCTION MODULE ":PRINT :PRINT
30 PRINT TAB(20);"MAIN MENU":PRINT :PRINT
40 PRINT 1," SET-UP ANNUAL FILES":PRINT
50 PRINT 2," PREPARE DAILY REPORT":PRINT
60 PRINT 3," EXIT PROGRAM":PRINT :PRINT
70 INPUT " CHOOSE FUNCTION NUMBER ";ZNU
80 IF ZNU<1 OR ZNU>3 THEN PRINT " BAD NUMBER, TRY AGAIN ":GOTO 20
90 IF ZNU = 1 THEN 100 ELSE IF ZNU = 2 THEN 1230 ELSE END
100 CLS:REM SET UP OF ANNUAL FILES
110 PRINT " THIS ROUTINE SETS UP FOUR DATA FILES FOR 
120 PRINT " STORING INFORMATION":PRINT
130 INPUT " PERTINENT TO OPERATION OF THE HEAP LEACH 
140 PRINT " PROCESS." :PRINT
150 CLS:PRINT TAB(20);"INITIALIZATION MENU":PRINT
160 PRINT 1," SETUP ALL FILES, INCLUDING PAD DATA 
170 PRINT 2," SETUP ANNUAL FILES ONLY":PRINT
180 INPUT " CHOOSE FUNCTION NUMBER ";ZNU2:IF ZNU2<1 OR 
190 IF ZNU2=2 THEN 960
200 PRINT " INSERT FORMATTED DISKS IN DRIVES A AND B 
210 INPUT " HIT RETURN WHEN READY ":Q$:PRINT
220 OPEN "R",#1,"B:HLP1.DAT",92
230 OPEN "R",#2,"B:HLP2.DAT",131
240 OPEN "R",#3,"B:HLMOEQ.DAT",70
260 GOSUB 270:GOSUB 330:GOTO 480
270 REM SUBROUTINE FIELDS
280 FIELD #1,4 AS T0$,5 AS T1$,5 AS T2$,5 AS T3$,5 AS T4$,5 
290 FIELD #2,4 AS V0$,5 AS V1$,5 AS V2$,5 AS V3$,5 AS V4$,5 
300 FIELD #3,4 AS R$(0),5 AS S$(0),5 AS R$(1),5 AS S$(1),4 
310 FIELD #4,5 AS Q1$,5 AS Q2$,5 AS Q3$,3 AS Q4$,5 AS Q5$,5 

310 FIELD #4,5 AS Q1$,5 AS Q2$,5 AS Q3$,3 AS Q4$,5 AS Q5$,5
AS Q6$,2 AS Q7$
320 RETURN
330 REM SUBROUTINE LSET
340 FOR Z = 1 TO 366
450 PUT #1,Z:PUT #2,Z:PUT #3,Z
460 NEXT Z
470 RETURN
480 CLS:PRINT " PLEASE ANSWER THE FOLLOWING QUESTIONS"
500 INPUT " TOTAL NUMBER OF PADS TO DATE ";YPAD
510 FOR Y=1 TO YPAD:PRINT:PRINT " PAD # ";Y:PRINT
520 INPUT " TOTAL DRY TONS TO THIS PAD AS OF THIS SETUP ";AB1(Y)
530 INPUT " AVERAGE GOLD GRADE (OPT) ";AB2(Y)
540 INPUT " AVERAGE SILVER GRADE (OPT) ";AB3(Y)
550 X7=X7+AB1(Y)*AB2(Y):X8=X8+AB1(Y)*AB3(Y)
560 CLS:PRINT " PAD STATUS ":PRINT
570 PRINT 1,";PAD ";Y;": HAS NOT BEEN PLACED UNDER LEACH";PRINT
580 PRINT 2,";PAD ";Y;": IS PRESENTLY UNDER LEACH";PRINT
590 PRINT 3,";PAD ";Y;": HAS BEEN REMOVED FROM LEACH";PRINT
600 INPUT " CHOOSE PAD STATUS NUMBER, 1 TO 3 ";YAB7(Y)
610 IF YAB7(Y)<1 OR YAB7(Y)>3 THEN PRINT " BAD NUMBER ";GOTO 560
620 IF YAB7(Y)=1 THEN 630 ELSE IF YAB7(Y)=2 THEN 640 ELSE 660
630 YAB4(Y)=0:YAB5(Y)=0:YAB6(Y)=0:GOTO 700
640 PRINT " HOW MANY DAYS HAS PAD ";Y;": BEEN UNDER LEACH ?";INPUT YAB4(Y)
650 TTP=TTP +AB1(Y):GOTO 700
MANY DAYS WAS PAD #";Y;" LEACHED

RECOVERY IN %

AUIP=X7-X9-X11:AGIP=X8-X10-X12
LSET X1$= MKS$(AUIP):LSET X2$= MKS$(AGIP)
LSET X3$=MKS$(X7):LSET X4$=MKS$(X8):LSET X5$=MKS$(X9):LSET X6$=MKS$(X10)

PUT #2,367
LSET U6$= MKS$(TTP):PUT #1,367

IF YAB7(Y)=3 THEN 800 ELSE 810
AB5(Y)=X15/(AB1(Y)*AB2(Y)) IF AB5(Y)>.8 THEN AB5(Y)=.8
AB6(Y)=X16/(AB1(Y)*AB3(Y)) IF AB6(Y)>.8 THEN AB6(Y)=.8

Q1$=MKS$(AB1(Y)):LSET Q2$=MKS$(AB2(Y)):LSET Q3$=MKS$(AB3(Y))
Q4$=MKS$(YAB4(Y)):LSET Q5$=MKS$(AB5(Y)):LSET Q6$=MKS$(AB6(Y))
LSET Q7$=MKI$(YAB7(Y))

PUT #4,Y

CLOSE #1,#2,#3,#4:RESET
CLS:PRINT " REMOVE DATA DISKS FROM A AND B ":PRINT
INPUT " HIT RETURN WHEN READY ";Q$:GOTO 20
CLS:PRINT " INSERT DISK WITH HLP3.DAT IN DRIVE A ":PRINT
PRINT " INSERT A FORMATTED DISK IN DRIVE B ":PRINT
OPEN "R",#1,"B:HLP1.DAT",92
OPEN "R",#2,"B:HLP2.DAT",131
OPEN "R",#3,"B:HLMOEQ.DAT",70
OPEN "R",#4,"A:HLP3.DAT",30
GOSUB 270:GOSUB 330
ZPD=LOF(4)/30:X7=0:X8=0:X11=0:X12=0:TTP=0
FOR Y=1 TO ZPD:GET #4,Y
1140 INPUT " TOTAL TR.OZ. GOLD POURED TO DATE ";X9:PRINT
1150 AU$=X7-X9-X11:AGIP=X8-X10-X12
1160 LSET X15$= MKS$(AU$):LSET X25$= MKS$(AGIP)
1170 LSET X35$=MKSS(X7):LSET X45$=MKSS(X8):LSET
1180 PUT #2,367
1190 LSET U6$= MKS$(TTP):PUT #1,367
1200 CLOSE #1,#2,#3,#4:RESET
1210 CLS:PRINT " REMOVE DATA DISKS FROM A AND B ":PRINT
1220 INPUT " HIT RETURN WHEN READY ";Q$:GOTO 20
1230 REM PREPARE DAILY REPORT
1240 CLS:PRINT " THIS ROUTINE ALLOWS DATA ENTRY AND PREPARES THE DAILY":PRINT
1250 PRINT " REPORT.":PRINT :INPUT " DO YOU WISH TO CONTINUE ,(Y/N) ";AN$
1260 IF AN$<>"Y" THEN 20
1270 CLS:INPUT " WHAT IS THE DATE OF PRODUCTION (MM-DD-YY)";DAT$:GOSUB 5890
1280 PRINT :PRINT " WHAT IS THE DAY OF THE WEEK (SU,M,T,W,TH,F,S) ";DAY$
1290 GOSUB 6010
1300 CLS:PRINT " INSERT DISK WITH HLP3.DAT IN DRIVE A,DISK WITH DAILY LEACH DATA IN DRIVE B":PRINT
1310 INPUT " HIT RETURN WHEN READY ";Q$:CLS
1320 OPEN "R",#1,"B:HLP1.DAT",92
1330 OPEN "R",#2,"B:HLP2.DAT",131
1340 OPEN "R",#3,"B:HLMOEQ.DAT",70
1350 OPEN "R",#4,"A:HLP3.DAT",30
1360 GOSUB 270
1370 PRINT TAB(20);"DATA INPUT ROUTINE":PRINT :PRINT
1380 PRINT TAB(20);"CRUSHING/AGGLOMERATION":PRINT
1390 DT0 = 0:TCHR = 0:TCRAU = 0:TCRE = 0:TREAG = 0
1400 FOR Z = 1 TO 3:PRINT TAB(20);"SHIFT # ";Z:PRINT :PRINT
1410 INPUT " CRUSHER HOURS OPERATED ";CHR(Z):PRINT
1420 IF CHR(Z)= 0 THEN 1520
1430 INPUT " TONS CRUSHED ";CRT(Z):PRINT
1440 INPUT "GOLD ASSAY.... OZ/TON ";CRAU(Z):PRINT 
1450 INPUT "SILVER ASSAY.... OZ/TON ";CRAG(Z):PRINT 
1460 INPUT "% MOISTURE ";CRMO(Z):PRINT:CRT(Z) = 
CRT(Z)*((1-CRMO(Z)/100) 
1470 INPUT "CEMENT ADDED.... LBS ";CRCE(Z):PRINT 
1480 INPUT "LIME ADDED.... LBS ";REAG(Z):PRINT 
1490 INPUT "OPERATOR ";CROP$(Z):PRINT :PRINT 
1500 INPUT "IS THE INFORMATION CORRECT (Y/N) ";AN$:IF AN$<"Y" THEN 1410 
1510 GOTO 1530 
1520 CRT(Z)= 0:CRAU(Z)= 0:CRAG(Z)= 0:CRMO(Z)= 0:CRCE(Z)= 0:REAG(Z)= 0:AN$ 
1530 DTCR = DTCR + CRT(Z):TCHR = TCHR + CHR(Z):TCRAU = TCRAU 
+ CRT(Z)*CRAU(Z) 
1540 TCRAG = TCRAG + CRT(Z)* CRAG(Z):TCRCE = TCRCE + 
+ CRCE(Z):TREAG = TREAG + REAG(Z) 
1550 CLS:PRINT TAB(20);"CRUSHING/AGGLOMERATION":PRINT :PRINT 
1560 NEXT Z 
1570 TTPH = DTCR/TCHR:TCRAU = TCRAU/DTCR:TCRAG = TCRAG/DTCR 
1580 CLS:PRINT TAB(20);"HEAP/DUMP CONSTRUCTION":PRINT :PRINT 

1590 TTPH = DTCR/TCHR:TCRAU = TCRAU/DTCR:TCRAG = TCRAG/DTCR 
1600 FOR Z = 1 TO 3:PRINT TAB(20);"SHIFT ":PRINT:PRINT 
1610 INPUT "DOES TONNAGE LOADED TO THE PAD = TONS 
CRUSHED (Y/N) ";AN$:IF AN$<"Y" THEN PRINT :GOTO 1640 
1620 IF AN$<"Y" THEN PRINT :GOTO 1640 
1630 TLD(Z) = CRT(Z):AUL(Z)= CRAU(Z):AGL(Z)= CRAG(Z):PRINT 
1640 INPUT "TONS LOADED TO HEAPS ";TLD(Z):PRINT 
1650 IF TLD(Z)< = .01 THEN 1700 
1660 INPUT "HOURS LOADING ";HLD(Z):PRINT 
1670 INPUT "GOLD ASSAY.... OZ/TON ";AUL(Z):PRINT 
1680 INPUT "SILVER ASSAY.... OZ/TON ";AGL(Z):PRINT 
1690 GOTO 1720 
1700 HLD(Z)= 0:AUL(Z)= 0:AGL(Z)= 0:GOTO 1720 
1710 INPUT "HOURS LOADING ";HLD(Z):PRINT 
1720 INPUT "TONS UNLOADED FROM HEAPS ";TUD(Z):PRINT 
1730 IF TUD(Z)< = .01 THEN 1780 
1740 INPUT "HOURS UNLOADING ";HUD(Z):PRINT 
1750 INPUT "GOLD ASSAY.... OZ/TON ";AAU(Z):PRINT 
1760 INPUT "SILVER ASSAY.... OZ/TON ";AGU(Z):PRINT 
1770 GOTO 1790 
1780 HUD(Z)= 0:AAU(Z)= 0:AGU(Z)= 0:GOTO 1790 
1790 INPUT "IS INFORMATION CORRECT (Y/N) ";AN$:IF AN$<"Y" THEN 1640 
1800 TTPH = TTPH + TLD(Z):THLD = TLD + HLD(Z):AAUL = AAUL + 
TLD(Z)* AUL(Z):AAGL = AAGL + TLD(Z)* AGL(Z) 
1810 TPHU(Z)= TPHU(Z)/(HLD(Z)+ .0001):TPHU(Z)= 
TUD(Z)/(HUD(Z)+ .0001):AAUU = AAUU + TUD(Z)* AAU(Z) 
1820 TTUD = TTUD + TUD(Z):THUD = THUD + HUD(Z):AAGU = AAGU +
TUD(Z)* AGU(Z)
1830 CLS:PRINT TAB(20);"HEAP/DUMP CONSTRUCTION":PRINT :PRINT
1840 NEXT Z
1850 Y1=0:Y2=0:CLS
1860 IF TTLD>.1 THEN INPUT " TO WHICH PAD WAS TONNAGE ADDED ";Y1:PRINT
1870 IF TTUD>.1 THEN INPUT " FROM WHICH PAD WAS TONNAGE REMOVED ";Y2:PRINT
1880 PHL = TTLD / (THLD + .001):AAUL = AAUL / (TTLD + .0001):AAGL = AAGL / (TTLD + .0001)
1890 PHU = TTUD / (THUD + .001):AAUU = AAUU / (TTUD + .0001):AAGU = AAGU / (TTUD + .0001)
1900 CLS:IF (TTLD + TTUD)< = .01 THEN 2030
1910 PRINT TAB(20);"MOBILE EQUIPMENT USEAGE":PRINT :PRINT
1920 PRINT " LIST EACH PIECE OF EQUIPMENT USED, HOURS USED, AND PRODUCTION":PRINT
1930 Z = 0
1940 INPUT " EQUIPMENT ID (4 CHARACTERS );MEQ$(Z):PRINT
1950 INPUT " HOURS USED ";EHR(Z):PRINT
1960 IF (LEFT$(MEQ$(Z),1)="L") OR (LEFT$(MEQ$(Z),1)="H") THEN UNI$="TONS" ELSE UNI$="UNITS OF PRO."
1970 PRINT " ESTIMATED ";UNI$;INPUT " THIS DAY ";EUN(Z):CLS
1980 INPUT " ANY OTHER EQUIPMENT USED, (Y/N) ";AN$:PRINT
1990 IF AN$="Y" THEN 2020 ELSE Z = Z+1
2000 IF Z >= 9 THEN PRINT " YOU NEED TO EXPAND THE PROGRAM ":GOTO 2020
2010 CLS:GOTO 1940
2020 ZEQU = Z
2030 CLS:PRINT TAB(20);"LEACHING":PRINT :PRINT
2040 TLHR = 0:TLFL = 0:TLTN = 0:TLCN = 0:TLLM = 0
2050 FOR Z = 1 TO 3
2060 PRINT TAB(20);"SHIFT # ";Z:PRINT :PRINT
2070 INPUT " HOURS LEACHING ";LHR(Z):PRINT
2080 IF LHR(Z)< = .01 THEN 2120
2090 INPUT " TOTAL GALLONS ";LFL(Z):PRINT:LFL(Z)=LFL(Z)* 8.346/2000
2100 INPUT " CYANIDE ADDED... LBS ";LCN(Z):PRINT
2110 INPUT " LIME ADDED... LBS ";LLM(Z):PRINT :GOTO 2130
2120 LFL(Z) = 0:LCN(Z) = 0:LLM(Z) = 0
2130 INPUT " IS INFORMATION CORRECT (Y/N) ";AN$:IF AN$="Y" THEN 2060
2140 TLHR = TLHR + LHR(Z):TLFL = TLFL + LFL(Z)
2150 TLCN = TLCN + LCN(Z):TLLM = TLLM + LLM(Z)
2160 CLS:PRINT TAB(20);"LEACHING":PRINT :PRINT
2170 NEXT Z
2180 Y3=0:IF TLHR>.1 THEN INPUT " WHICH PAD WAS UNDER LEACH THIS DAY ";Y3
CLS:PRINT TAB(20);"ADSORPTION":PRINT :PRINT
THAD = 0:TFAD = 0:AHAU = 0:AHAG = 0:ATAU = 0:ATAG = 0
FOR Z = 1 TO 3:PRINT TAB(20);"SHIFT # ";Z:PRINT :PRINT
INPUT " HOURS ADSORBING ";HAD(Z):IF HAD(Z)< = .01 THEN 2280

PRINT :INPUT " TOTAL GALLONS ":FAD(Z):PRINT:PRINT
THAD = THAD + HAD(Z):TFAD = TFAD + FAD(Z):AHAU = AHAU + FAD(Z)*HAU(Z)
AHAG = AHAG + FAD(Z)*HAG(Z):ATAU = ATAU + FAD(Z)*TAU(Z):ATAG = ATAG + FAD(Z)*TAG(Z)
ADU(Z) = FAD(Z)*(HAU(Z)-TAU(Z)):ADG(Z) = FAD(Z)*(HAG(Z)-TAG(Z))
ADAU = ADU(Z)/(FAD(Z)*HAU(Z)+.0001)*100:AFAG(Z) = ADG(Z)/(FAD(Z)*HAG(Z)+.0001)*100
CLS:PRINT TAB(20);"ADSORPTION":PRINT :PRINT
NEXT Z:CLS:ADAU = AHAU-ATAU:ADAG = AHAG-ATAG
AEFU = ADAU/(AHAU+.0001)*100:AEFG = ADAG/(AHAG+.0001)*100
AHAU = AHAU/TFAD:ATAU = ATAU/TFAD:AHAG = AHAG/TFAD:ATAG = ATAG/TFAD
PRINT TAB(20);"CARBON TRANSFER":PRINT :PRINT
CRDES = 0:CTAU = 0:CTAG = 0:CRREG = 0:CRNEW = 0
FOR Z = 1 TO 3
PRINT TAB(20);"SHIFT ";PRINT :PRINT
PRINT " TONS CARBON LOADED TO DESORPTION ":RDES(Z):PRINT
IF RDES(Z)< = .001 THEN 2490
PRINT " GOLD ASSAY ... OZ/TON ";CAU(Z):PRINT
PRINT " SILVER ASSAY ... OZ/TON ";CAG(Z):PRINT
PRINT " TONS FROM CARBON REGENERATION ":REG(Z):PRINT
PRINT " IS INFORMATION CORRECT (Y/N) ";ANS:IF ANS< >"Y" THEN 2410
PRINT TAB(20);"DESORPTION/ELECTROWINNING":PRINT :PRINT
RNEW(Z) = RDES(Z)-REG(Z):GOTO 2500
CAU(Z) = 0:CAG(Z) = 0:REG(Z) = 0:RNEW(Z) = 0
CRDES = CRDES + RDES(Z):CTAU = CTAU + RDES(Z)*CAU(Z)
CTAG = CTAU + RDES(Z)*CAG(Z):CRREG = CRREG + RREG(Z):CRNEW = CRNEW + RNEW(Z)
CLSA:PRINT TAB(20);"CARBON TRANSFER":PRINT :PRINT
NEXT Z:CLS
PRINT TAB(20);"DESORPTION/ELECTROWINNING":PRINT :PRINT
DWR = 0:DWFL = 0:DPWAU = 0:DPWAG = 0:DBWBAU = 0:DBWAG = 0
2560 FOR Z = 1 TO 3
2570 PRINT TAB(20);"SHIFT # ";Z:PRINT :PRINT
2580 INPUT " HOURS IN DESORP/ELECTROWINNING ":WHR(Z):PRINT
2590 IF WHR(Z)< = .01 THEN 2660
2600 INPUT " TOTAL GALLONS ";WFL(Z):PRINT:WFL(Z) = WFL(Z)*8.346/2000
2610 INPUT " PREG ASSAY .. GOLD .. OZ/TON ":WPAU(Z):PRINT
2620 INPUT " PREG ASSAY .. SILVER .. OZ/TON ":WPAG(Z):PRINT
2630 INPUT " BARREN ASSAY ... GOLD ";WB(AU(Z):PRINT
2640 INPUT " BARREN ASSAY ... SILVER ";WB(AG(Z):PRINT
2650 GOTO 2670
2660 WFL(Z)= 0:WPAU(Z)= 0:WPAG(Z)= 0:WB(AU(Z)= 0:WB(A)G(Z)= 0
2670 INPUT " IS INFORMATION CORRECT (Y/N) ";ANS:IF ANS< >"Y" THEN 2570
2680 DWHR = DWHR + WHR(Z):DWFL = DWFL + WFL(Z)
2690 DWPAU = DWPAU + WFL(Z)*WPAU(Z):DWPAU = DWPAU + WFL(Z)*WPAG(Z)
2700 DW(AU = DW(BAU + WFL(Z)*WBAU(Z):DWBAG = DWBAG + WFL(Z)*WBAG(Z)
2710 CLS:PRINT TAB(20);"DESORPTION/ELECTROWINNING":PRINT :PRINT
2720 NEXT Z:CLS
2730 DWPAU = DWPAU /(DWFL + .0001):DWPAU = DWPAU /(DWFL + .0001)
2740 PRINT TAB(20);"REFINING":PRINT :PRINT
2750 REFHR = 0:RECP = 0:DOAU = 0:DOAG = 0
2760 FOR Z = 1 TO 3
2770 PRINT TAB(20);"SHIFT ":Z:PRINT:PRINT
2780 INPUT " HOURS REFINING ":FHR(Z):PRINT
2790 IF FHR(Z)<= .01 THEN 2850
2800 ECP(Z)= 0:DORE(Z)= 0:OAU(Z)= 0:OAG(Z) = 0
2810 INPUT " IS INFORMATION CORRECT (Y/N) ";ANS:IF ANS< >"Y" THEN 2770
2820 INPUT " NUMBER OF CATHODES PULLED ";ECP(Z):PRINT
2830 INPUT " TOTAL DORE' PRODUCED ... OZ. ":DORE(Z):PRINT
2840 INPUT " % GOLD ":OAU(Z):OAU(Z) = DORE(Z)*OAU(Z)/100 :PRINT
2850 INPUT " % SILVER ":OAG(Z):OAG(Z) = DORE(Z)*OAG(Z)/100 :PRINT
2860 GOTO 2860
2870 ECP(Z)= 0:DORE(Z)= 0:OAU(Z)= 0:OAG(Z) = 0
2880 INPUT " IS INFORMATION CORRECT (Y/N) ";ANS:IF ANS< >"Y" THEN 2770
2890 REFHR = REFHR + FHR(Z):RECP = RECP + ECP(Z):DOAU = DOAU + OAU(Z):DOAG = DOAG + OAG(Z)
2880 CLS:PRINT TAB(20);"REFINING":PRINT :PRINT
2890 NEXT Z:CLS
2900 REM WRITE TO DISK
2910 ZPDN=LOF(4)/30:IF Y1>0 THEN 2920 ELSE 3040
2920 IF Y1>ZPDN THEN 2990
2930 GET #4, Y1
2940 AB1(Y1)=CVS(Q1$):AB2(Y1)=CVS(Q2$):AB3(Y1)=CVS(Q3$):
   YAB4(Y1)=CVI(Q4$)
2950 AB5(Y1)=CVS(Q5$):AB6(Y1)=CVS(Q6$):YAB7(Y1)=CVI(Q7$)
2960 AB2(Y1)=(AB1(Y1)*AB2(Y1)+TTLD*AAUL)/(AB1(Y1)+TTLD)
2970 AB3(Y1)=(AB1(Y1)*AB3(Y1)+TTLD*AAGL)/(AB1(Y1)+TTLD)
2980 AB1(Y1)=AB1(Y1)+TTLD:GOTO 3000
2990 Y1=ZP DN+1:AB1(Y1)=TTLD:AB2(Y1)=AAUL:AB3(Y1)=AAGL: 
   YAB4(Y1)=0:AB5(Y1)=0:AB6(Y1)=0:YAB7(Y1)=1
3000 LSET Q1$=MKS$(AB1(Y1)):LSET Q2$=MKS$(AB2(Y1)):LSET 
   Q3$=MKS$(AB3(Y1))
3010 LSET Q4$=MKI$(YAB4(Y1)):LSET Q5$=MKS$(AB5(Y1)):LSET 
   Q6$=MKS$(AB6(Y1))
3020 LSET Q7$=MKI$(YAB7(Y1))
3030 PUT #4, Y1
3040 IF Y3>0 THEN 3050 ELSE 3230
3050 IF Y3>ZPDN THEN INPUT " BAD LEACH PAD # , WHAT IS 
   CORRECT PAD UNDER LEACH ";Y3:GOTO 3040
3060 GET #4, Y3
3070 AB1(Y3)=CVS(Q1$):AB2(Y3)=CVS(Q2$):AB3(Y3)=CVS(Q3$):
   YAB4(Y3)=CVI(Q4$)
3080 AB5(Y3)=CVS(Q5$):AB6(Y3)=CVS(Q6$):YAB7(Y3)=CVI(Q7$)
3090 IF YAB7(Y3)<2 THEN 3100 ELSE 3180
3100 YAB7(Y3)=2:Y6=Y3-1:IF Y6<1 THEN 3180 ELSE GET #4, Y6
3110 AB1(Y6)=CVS(Q1$):AB2(Y6)=CVS(Q2$):AB3(Y6)=CVS(Q3$):
   YAB4(Y6)=CVI(Q4$)
3120 AB5(Y6)=CVS(Q5$):AB6(Y6)=CVS(Q6$):YAB7(Y6)=CVI(Q7$)
3130 IF YAB7(Y6)=2 THEN 3140 ELSE 3180
3140 LSET Q1$=MKS$(AB1(Y6)):LSET Q2$=MKS$(AB2(Y6)):LSET 
   Q3$=MKS$(AB3(Y6))
3150 LSET Q4$=MKI$(YAB4(Y6)):LSET Q5$=MKS$(AB5(Y6)):LSET 
   Q6$=MKS$(AB6(Y6))
3160 LSET Q7$=MKI$(YAB7(Y6))
3170 PUT #4, Y6
3180 YAB4(Y3)=YAB4(Y3)+1:AB5(Y3)=(AB5(Y3)*AB1(Y3)*AB2(Y3)+ADAU)/ 
   (AB1(Y3)*AB2(Y3)):AB6(Y3)=(AB6(Y3)*AB1(Y3)*AB3(Y3)+ADAG)/ 
   (AB1(Y3)*AB3(Y3))
3190 LSET Q1$=MKS$(AB1(Y3)):LSET Q2$=MKS$(AB2(Y3)):LSET 
   Q3$=MKS$(AB3(Y3))
3200 LSET Q4$=MKI$(YAB4(Y3)):LSET Q5$=MKS$(AB5(Y3)):LSET 
   Q6$=MKS$(AB6(Y3))
3210 LSET Q7$=MKI$(YAB7(Y3))
3220 PUT #4, Y3
3230 GET #1, ZOY:CMPR = CVS(U2$)
3240 IF CMPR > = .01 THEN 3250 ELSE 3330
3250 CLS:PRINT " DATA FOR THIS DATE HAS ALREADY BEEN 
   ENTERED ON DISK.";PRINT
3260 INPUT " DO YOU WISH TO RE-ENTER THE DATE, (Y/N) 
   ";AN$:PRINT
3270 IF AN$< >"Y" THEN 3280 ELSE 3300
3280 INPUT " DO YOU WISH TO OVER-WRITE DATA , (Y/N) 
   ";AN$:PRINT
";AN2$":PRINT
3290 IF AN2$>"y" THEN 20 ELSE 3330
3300 CLS:INPUT "WHAT IS THE DATE OF PRODUCTION
(MM-DD-YY)";DAT$:GOSUB 5890
3310 PRINT :INPUT "WHAT IS THE DAY OF THE WEEK
(SU,M,T,W,TH,F,S) ";DAY$
3320 GOSUB 6010
3330 GET #1,367:STOTL = CVS(U6$):TTLTN = ABl(Y3)
3340 LSET TO$= MKS$(TCHR):LSET T1$= MKS$(DTCR):LSET T2$= MKS$(TCAU)
3350 LSET T3$= MKS$(TCRA):LSET T4$= MKS$(TCRCE):LSET T5$= MKS$(TREAG)
3360 LSET T6$= MKS$(TTLT):LSET T7$= MKS$(THLD):LSET T8$= MKS$(AAUL)
3370 LSET T9$= MKS$(AAGL):LSET U0$= MKS$(TTUD):LSET U1$= MKS$(THUD)
3380 LSET U2$= MKS$(AAU):LSET U3$= MKS$(AAGU):LSET U4$= MKS$(TLHR)
3390 LSET U5$= MKS$(TLFL):LSET U6$= MKS$(TTLTN):LSET U7$= MKS$(TLCN)
3400 LSET U8$= MKS$(TLLM):PUT #1,2,367:AU$= CVS(X1$):AGIP =
3410 GET #2,367:AU$= CVS(X1$):AGIP =
3420 LSET V0$= MKS$(THAD):LSET V1$= MKS$(TFAD):LSET V2$= MKS$(AHAD)
3430 LSET V3$= MKS$(AHAG):LSET V4$= MKS$(ATAU):LSET V5$= MKS$(ATAG)
3440 LSET V6$= MKS$(CRDES):LSET V7$= MKS$(CTAU):LSET V8$= MKS$(CTAG)
3450 LSET V9$= MKS$(CRREG):LSET W0$= MKS$(CRNEW):LSET W1$= MKS$(CRNEW)
3460 LSET W2$= MKS$(DWFL):LSET W3$= MKS$(DWPAU):LSET W4$= MKS$(DWHR)
3470 LSET W5$= MKS$(DWBAU):LSET W6$= MKS$(DWBag):LSET W7$= MKS$(REFHR)
3480 LSET W8$= MKS$(RECF):LSET W9$= MKS$(DOAU):LSET X0$= MKS$(DOAG)
3490 AU$= AU$+TTLT*AAUL-TTUD*AAUU-DOAU
3500 AGIP=AGIP+TTLT*AAUL-TTUD*AAUU-DOAU
3510 X7=X7+TTLT*AAUL:X8=X8+TTLT*AAUL:X9=X9+DOAU:X10=X10+DOAU
3520 LSET XL$= MKS$(AU$):LSET X2$= MKS$(AGIP):LSET
3530 LSET XL$= MKS$(X7):LSET X4$=MKS$(X8):LSET X5$=MKS$(X9):LSET
3540 LSET XL$= MKS$(AU$):LSET X2$= MKS$(AGIP):LSET
3550 LSET XL$= MKS$(X7):LSET X4$=MKS$(X8):LSET X5$=MKS$(X9):LSET
3560 IF (TTLT + TTUD)> = .1 THEN 3570 ELSE 3660
3570 FOR Z = 0 TO ZEQU:LSET R$(Z)= MEQ$(Z):LSET S$(Z)=
MKI$(EHR(Z))
3580 NEXT Z: PUT #3, ZOY
3590 CLOSE #1, #2, #3, #4: RESET: CLS
3600 PRINT " REMOVE DATA DISK AND INSERT DISK WITH
MOBILE EQUIPMENT DATA"
3610 PRINT : PRINT " IN DRIVE B": INPUT " HIT RETURN
WHEN READY": QQ$
3620 OPEN "R", #1, "B: MOEQUIP.DAT", 107: OPEN
"R", #2, "B: EQLRS.DAT", 63
3630 FIELD #1, 15 AS E$, 34 AS DES$, 7 AS AQC$, 6 AS
AQDAT$, 15 AS INCO$, 7 AS COV$, 5 AS CST$, 6 AS HR$, 4 AS AVA$, 4
AS UTI$, 8 AS PRO$
3640 FIELD #2, 3 AS G$(0), 3 AS G$(1), 3 AS G$(2), 3 AS G$(3), 3
G$(9), 3 AS G$(10), 3 AS G$(11), 3 AS G$(12), 3 AS G$(13), 3 AS
G$(14), 3 AS G$(15), 3 AS G$(16), 3 AS G$(17), 3 AS G$(18), 3 AS
G$(19), 3 AS G$(20)
3650 ZMQ = LOF(1)/107: FOR Y = 0 TO ZEQU: FOR Z = 1 TO ZMQ
3660 GET #1, Z: MQ$ = E$: IF LEFT$(MQ$, 4) = MEQ$(Y) THEN 3670
ELSE 3770
3670 M1$ = DES$: M2 = CVS(AQC$): M3$ = AQDAT$: M4 =
CVS(LIFS$): M5$ = INCO$: M6 = CVS(COV$)
3680 M7 = CVS(CST$): M8 = CVS(HRS$): M9 = CVS(AVAS$): M10 =
CVS(UTI$): M11 = CVS(PRO$)
3690 M8 = M8 + EHR(Y): M11 = M11 + EUN(Y)
3700 LSET E$ = MQ$: LSET DES$ = M1$: LSET AQC$ = MKS$(M2): LSET
AQDAT$ = M3$: LSET INCO$ = MKS$(M4)
3710 LSET COV$ = M5$: LSET CST$ = MKS$(M6): LSET HR$ =
MKS$(M7): LSET AVA$ = MKS$(M9): LSET UTI$ = MKS$(M10): LSET PRO$ =
MKS$(M11)
3730 PUT #1, Z: GET #2, ZOY
3740 FOR Z2 = 0 TO 20: GG(Z2) = CVI(G$(Z2)) : NEXT Z2
3750 GG(Z) = GG(Z) + EHR(Y): FOR Z2 = 0 TO 20: LSET G$(Z2) =
MKI$(GG(Z2)): NEXT Z2
3760 PUT #2, ZOY: GOTO 3780
3770 NEXT Z
3780 NEXT Y
3790 CLOSE #1, #2: RESET: CLS: PRINT " REMOVE MOBILE EQUIP.
DISK AND REINSERT PAD DATA DISK IN DRIVE A, LEACH DATA DISK
IN DRIVE B": PRINT
3800 INPUT " HIT RETURN WHEN READY": QQ$
3810 OPEN "R", #1, "B: HP1.DAT", 92
3820 OPEN "R", #2, "B: HP2.DAT", 131
3830 OPEN "R", #3, "B: HLMOEQ.DAT", 70
3840 OPEN "R", #4, "A: HP3.DAT", 30
3850 GOSUB 270
3860 REM REPORT WRITING
3870 WADAU = 0: WADAG = 0: CCC9 = 0: CCC10 = 0
3880 IF ZTD >= ZOY THEN ZTD = ZOY - 1
3890 FOR Z = (ZOY - ZTD) TO ZOY: GET #2, Z
3900 CA1 = CVS(V1$): CA2 = CVS(V2$): CA3 = CVS(V3$): CA4 =
CVS(V4$):CA5=CVS(V5$)
3910 CA11 = CVS(W9$):CA12 = CVS(X0$)
3920 WADAU=WADAU+CA1*(CA2-CA4):WADAG=WADAG+CA1*(CA3-CA5)
3930 CCC9 = CCC9 + CA11:CCC10 = CCC10 + CA12
3940 NEXT Z
3950 XYADAU=0:XYADAG=0:CCC9=0:CCC10=0
3960 FOR Z=1 TO ZOY:GET #2,Z
3970 CA1= CVS(V1$):CA2 = CVS(V2$):CA3 = CVS(V3$):CA4 =
3980 CA5=CVS(V4$):CA5=CVS(V5$)
3990 XYADAU=XYADAU+CA1*(CA2-CA4):XYADAG=XYADAG+CA1*(CA3-CA5)
4000 CCC9 = CCC9 + CA11:CCC10 = CCC10 + CA12
4010 NEXT Z
4020 CLS:PRINT TAB(20);"MAKE SURE PRINTER IS READY":PRINT
4030 INPUT "HIT RETURN WHEN READY ";Q$:PRINT
4040 FOR Y=1 TO 3:LPRINT:NEXT Y
4050 LPRINT TAB(25);"HEAP LEACH PRODUCTION REPORT"
4060 LPRINT :LPRINT TAB(34);DATE$:LPRINT
4070 LPRINT TAB(35);"SUMMARY":LPRINT TAB(35);"-------"
4080 LPRINT TAB(28);"DAY";TAB(40);"WEEK TO DATE"
4090 LPRINT TAB(28);"---";TAB(40);"--------------";TAB(60);"---"
4100 LPRINT TAB(10);"ADSORPTION":LPRINT TAB(13);"GOLD..OZ.";
4110 LPRINT TAB(24);:LPRINT USING "####.##";ADAU;
4120 LPRINT TAB(45);:LPRINT USING "####.##";WADAU;
4130 LPRINT TAB(55);:LPRINT USING "#####.##";XYADAU
4140 LPRINT TAB(11);"SILVER..OZ.";TAB(24);:LPRINT USING
4150 LPRINT TAB(44);:"GOLD..OZ.";TAB(45);:LPRINT USING
4160 LPRINT TAB(54);:LPRINT USING "#####.##";(CCC9 +
4170 LPRINT TAB(10);"DORE...OZ.";TAB(44);:LPRINT USING
4180 LPRINT TAB(55);:LPRINT USING "#####.##";(CCC9 +
4190 LPRINT TAB(13);"GOLD..OZ.";TAB(45);:LPRINT USING
4200 LPRINT TAB(55);:LPRINT USING "#####.##";CCC9
4210 LPRINT TAB(11);"SILVER..OZ.";TAB(45);:LPRINT USING
4220 LPRINT TAB(55);:LPRINT USING "#####.##";CCC10
4230 LPRINT TAB(10);"SYSTEM RECOVERY";TAB(55);"TO DATE"
4240 LPRINT TAB(15);"GOLD";TAB(55);:LPRINT USING
4250 LPRINT TAB(61);"%"
4260 LPRINT TAB(13);"SILVER";TAB(55);:LPRINT USING
4270 LPRINT TAB(61);"%"
4280 GOSUB 4290;GOTO 4310
4290 LPRINT ""
295

4300 RETURN
4310 LPRINT "CRUSHING/AGGLOMERATION"; LPRINT
4320 LPRINT TAB(27); "ORE"; TAB(37); "REAGENTS"; TAB(55); "GRADE"

4330 LPRINT TAB(23); "DRY"; TAB(35); "CMNT LIME"; TAB(52); "GOLD SILVER"
4340 LPRINT TAB(8); "SHIFT HRS"; TAB(22); "TONS"; TAB(30); "TPH"; TAB(36);
4350 LPRINT "LBS LBS"; TAB(52); "OZ/T"; TAB(61); "OZ/T OPERATOR"
4360 GOSUB 4290
4370 FOR Z = 1 TO 3: LPRINT TAB(10); Z; TAB(14); : LPRINT USING "##.#"; CHR(Z);
4380 LPRINT TAB(19); : LPRINT USING "#####.#"; CRT(Z);
4390 LPRINT TAB(27); : LPRINT USING "#####.#"; CRT(Z) / (CHR(Z) + .0001);
4400 LPRINT TAB(34); : LPRINT USING "#####.#"; CRCE(Z); REAG(Z);
4410 LPRINT TAB(47); : LPRINT USING "#####.#"; CRAU(Z); CRAG(Z);
4420 LPRINT TAB(67); CROP$(Z)
4430 NEXT Z
4440 GOSUB 4290
4450 LPRINT TAB(7); "TOTALS"; TAB(14); : LPRINT USING "##.#"; CHRS(Z);
4460 LPRINT TAB(19); : LPRINT USING "#####.#"; DTCR; TTPH;
4470 LPRINT TAB(34); : LPRINT USING "#####.#"; TCRCE; TREA;
4480 LPRINT TAB(47); : LPRINT USING "#####.#"; TCRAU; TCRAG
4490 LPRINT TAB(52); "HEAP/DUMP CONSTRUCTION": LPRINT
4500 LPRINT IF Y1 > 0 THEN LPRINT TAB(10); "LOADING PAD #"; Y1; TAB(33); "AU";
4510 IF Y2 > 0 THEN LPRINT "UNLOADING PAD #"; Y2; TAB(68); "AU";
4520 IF Y2 > 0 THEN LPRINT "UNLOADING PAD #"; Y2; TAB(68); "AU"; TAB(39); "AG";
4530 IF Y2 > 0 THEN LPRINT "LOADING PAD #"; Y1; TAB(33); "AU";
4540 LPRINT TAB(19); TAB(39); "AG"; TAB(44); GOTO 4530
4550 GOSUB 4290
4560 IF Y2 > 0 THEN LPRINT "UNLOADING PAD ".FOR Z = 1 TO 3: LPRINT TAB(7); Z; TAB(11); : LPRINT USING "##.#"; HLD(Z);
4570 GOSUB 4290
4580 IF Y2 > 0 THEN LPRINT "UNLOADING PAD ".FOR Z = 1 TO 3: LPRINT TAB(7); Z; TAB(11); : LPRINT USING "##.#"; TLD(Z); TPHL(Z);
4600 LPRINT TAB(29); : LPRINT USING "#####.#"; AUL(Z); AGL(Z);
4610 LPRINT TAB(43); " "; : LPRINT USING "#####.#"; HUD(Z);
4620 LPRINT TAB(49); : LPRINT USING "#####.#"; TUD(Z); TPHU(Z);
4630 LPRINT TAB(64); : LPRINT USING "#####.#"; AAU(Z); AGU(Z)
4640 NEXT Z
4650 GOSUB 4290
LPRINT TAB(5);"TOTAL";TAB(11);:LPRINT USING "#####.#";THLD;
LPRINT TAB(15);:LPRINT USING "#####.#";TTLD;PHL;
LPRINT TAB(29);:LPRINT USING "#####.#";AAUL;AAGL;
LPRINT TAB(43);:";":LPRINT USING "#####.#";THUD;
LPRINT TAB(49);:LPRINT USING "#####.#";TTUD;PHU;
LPRINT TAB(64);:LPRINT USING "#####.#";AAUU;AAGU;
LPRINT :LPRINT
LPRINT TAB(35);"LEACHING - PAD ";Y3
LPRINT TAB(24);"SOLUTION";TAB(38);"ORE";TAB(54);"REAGENTS ADDED"
LPRINT TAB(54);"NACN LIME"
LPRINT TAB(10);"SHIFT HRS FLOW-TONS TONS IN LEACH"
LPRINT LB. LB/T LB LB/T
GOSUB 4290

FOR Z = 1 TO 3:LPRINT TAB(12);Z;TAB(16);:LPRINT USING LHR(Z);
LPRINT TAB(20);:LPRINT USING "#########.#";LFL(Z);TTLTN;
LPRINT TAB(48);:LPRINT USING "#####.#";LCN(Z);LCN(Z)/(LFL(Z)+.0001);LLM(Z);LLM(Z)/(LFL(Z)+.0001)
NEXT Z
GOSUB 4290
LPRINT TAB(9);"TOTALS";TAB(16);:LPRINT USING "##.#";TLHR;
LPRINT TAB(20);:LPRINT USING "#####.#";TLFL;TTLTN;
LPRINT TAB(48);:LPRINT USING "#####.#";TLCN;TLCN /(TLFL+ .0001);TLLM;TLLM /(TLFL + .0001)
CLS:PRINT " INSERT NEW SHEET OF PAPER ":PRINT
INPUT " HIT RETURN WHEN READY ";Q$
FOR Z = 1 TO 3 :LPRINT :NEXT Z
LPRINT TAB(39);"ADSORPTION ":LPRINT
LPRINT TAB(19);"FLOW";TAB(29);"HEADS";TAB(43);"TAILS";TAB(55);-
"ADSORBED";TAB(68);"% EFF."
LPRINT TAB(6);"SHIFT HRS TONS ";TAB(25);"AU OPT";TAB(32);"AG OPT";
LPRINT TAB(39);"AU OPT";TAB(46);"AG OPT";TAB(54);"OZ AU OZ AG AU % AG %"
GOSUB 4290
FOR Z = 1 TO 3 :LPRINT TAB(8);Z;
LPRINT TAB(12);:LPRINT USING "#####.#";HAD(Z);
LPRINT TAB(17);:LPRINT USING "#####.#";FAD(Z);
LPRINT TAB(24);:LPRINT USING "#####.#";HAU(Z);HAG(Z);TAU(Z);TAG(Z);
LPRINT TAB(53);:LPRINT USING "#####.#";ADU(Z);ADG(Z);AFAU(Z);AFAG(Z)
NEXT Z
GOSUB 4290

LPRINT TAB(5);"TOTALS";TAB(12);:LPRINT USING "#####.#";THAD;
5020 LPRINT TAB(17);:LPRINT USING "#####.#";TFAD;
5030 LPRINT TAB(24);:LPRINT USING "###.#";AHAU;AHAG;ATAU;ATAG;
5040 LPRINT TAB(53);:LPRINT USING "###.#";ADAU;ADAG;AEFU;AEFG
5050 LPRINT :LPRINT
5060 LPRINT TAB(38);"CARBON TRANSFER";LPRINT
5070 LPRINT TAB(24);"TO DESORPTION";TAB(48);"FROM REGEN.";TAB(61);"NEW CARBON"
5080 LPRINT TAB(10);"SHIFT";TAB(22);"TONS";TAB(31);"OZ AU";TAB(41);"OZ AG"
5090 LPRINT TAB(52);"TONS";TAB(62);"TONS"
5100 GOSUB 4290
5110 FOR Z = 1 TO 3:LPRINT TAB(12);Z;
5120 LPRINT TAB(16);:LPRINT USING "#######.##";RDES(Z);RDES(Z)*CAU(Z);RDES(Z)*CAG(Z);REG(Z);- RNEW(Z)
5130 NEXT Z
5140 GOSUB 4290
5150 LPRINT TAB(10);"TOTALS";TAB(16);
5160 LPRINT USING "############.##";CRDES;CTAU;CTAG;CRREG;CRNEW
5170 LPRINT :LPRINT
5180 LPRINT TAB(31);"DESORPTION/ELECTROWINNING";LPRINT
5190 LPRINT TAB(20);"FLOW";TAB(29);"PREG";TAB(42);"BARREN";TAB(55);-
"PRODUCTION";TAB(70);"& EFF."
5200 LPRINT TAB(6);"SHIFT HRS TONS";TAB(25);"AU OPT";TAB(32);"AG OPT"
5210 LPRINT TAB(39);"AU OPT";TAB(46);"AG OPT OZ AU OZ AG
5220 GOSUB 4290
5230 FOR Z = 1 TO 3:LPRINT TAB(8);Z;TAB(12);
5240 LPRINT USING "##.#";WHR(Z);:LPRINT TAB(17);
5250 LPRINT USING "############.##";WFL(Z);:LPRINT TAB(24);
5260 LPRINT USING "##.##";WPAU(Z);WPAG(Z);WBAU(Z);WBAG(Z);WFL(Z)*(WPAU(Z)-- WBAU(Z));WFL(Z)*(WPAG(Z)-WBAG(Z));
5270 LPRINT TAB(67);:LPRINT USING "##.##";(1-WBAU(Z))/(WPAU(Z)+ .0001))*100;(1-WBAG(Z))/(WPAG(Z)+.0001))*100
5280 NEXT Z:GOSUB 4290
5290 LPRINT TAB(5);"TOTALS";TAB(12)
5300 LPRINT USING "###.#";DWHR;:LPRINT TAB(17);
5310 LPRINT USING "#####.#";DWFL;:LPRINT TAB(24);
5320 LPRINT USING "#####.#";DWPAU;DWPG;DBWAU;DBWAG;DWFL*(DWPAU-DWBAU);DWFL*-
(DWPAU-DWBAU);DWFL;
5330 LPRINT TAB(67);:LPRINT USING "#####.#";(1-DWBAU /(DWPAU + .0001))*100;(1-DWAG /DWPG+.0001))*100
5340 LPRINT
5350 LPRINT TAB(41);"REFINING"
5360 LPRINT TAB(53);"DORE PRODUCED"
LPRINT TAB(11);"SHIFT";TAB(21);"HOURS";TAB(31);"# CATHODES PULLED";TAB(53);"OZ AU OZ AG"
5380 GOSUB 4290
5390 FOR Z = 1 TO 3:LPRINT TAB(15);Z;TAB(22);
5400 LPRINT USING "###.##";FHR(Z);:LPRINT TAB(43);
5410 LPRINT USING "###";ECP(Z);:LPRINT TAB(51);
5420 LPRINT USING "####.##";OAU(Z);OAG(Z)
5430 NEXT Z:GOSUB 4290
5440 LPRINT TAB(11);"TOTALS";TAB(22);
5450 LPRINT USING "###.##";REC#:LPRINT TAB(43);
5460 LPRINT USING "####.##";DOAU;DOAG
5480 LPRINT :LPRINT
5490
5500 LPRINT TAB(35);"IN PROCESS INVENTORY";LPRINT
5510 LPRINT TAB(11);"TOTAL OZ AU = ";:LPRINT USING "#####.##";AUIP;
5520 LPRINT TAB(36);"RECOVERABLE AU AT ";TAB(54);
5530 LPRINT USING "####.##";PEFAU;LPRINT " % = ";TAB(64);
5540 LPRINT USING "####.##";AU*PEFAU/100;:LPRINT " OZ.";LPRINT
5550 LPRINT TAB(11);"TOTAL OZ AG = ";LPRINT USING "#####.##";AGIP;
5600 LPRINT TAB(36);"RECOVERABLE AG AT ";TAB(54);
5570 LPRINT USING "####.##";PEFAG;LPRINT " % = ";TAB(64);
5580 LPRINT USING "####.###.##";AGIP*PEFAG/100;:LPRINT " OZ."
5590 CLS:PRINT " INSERT NEW SHEET OF PAPER PRINT"
5600 INPUT " HIT RETURN WHEN READY ";Q$
5610 FOR Z = 1 TO 5 :LPRINT :NEXT Z
5620 LPRINT TAB(25);"GRADE";TAB(33);"DAYS";TAB(41);"EST. REC."
5640 LPRINT TAB(17);"TOTAL";TAB(24);"AU AG";TAB(34);"IN";TAB(41);"AU AG"
5650 LPRINT TAB(9);"PAD # TONS OPT OPT LEACH";TAB(42);"% %";TAB(53);"PAD STATUS"
5660 GOSUB 4290:ZPDN=LOF(4)/30:TAB1=0:AAB2=0:AAB3=0:AYAB4=0:AAB5=0:-AAB6=0
5670 FOR Y=1 TO ZPDN:GET #4,Y
5680 AB1(Y)=CVS(Q1$):AB2(Y)=CVS(Q2$):AB3(Y)=CVS(Q3$):YAB4(Y)=CVS(Q4$)
5690 AB5(Y)=CVS(Q5$):AB6(Y)=CVS(Q6$):YAB7(Y)=CVS(Q7$)
5700 TAB1=TAB1+AB1(Y):AAB2=AAB2+AB1(Y)*AB2(Y):YAB3=AAB3+AB1(Y)*
5710 AAB6=AAB6+AB1(Y)*AB3(Y)*AB6(Y)
5720 AYAB4=AYAB4+YAB4(Y)*AB1(Y):AAB5=AAB5+AB1(Y)*AB2(Y)*AB5(Y)
5720 IF YAB7(Y)=1 THEN PS$="IN CONSTRUCTION" ELSE IF YAB7(Y)=2 THEN PS$="IN LEACH" ELSE PS$="FINISHED LEACH"
5730 LPRINT TAB(11):LPRINT USING "###":Y;
5740 LPRINT TAB(15):LPRINT USING "#####":AB1(Y);
5750 LPRINT TAB(22):LPRINT USING "##.##":AB2(Y);AB3(Y);
5760 LPRINT TAB(34):LPRINT USING "###":YAB4(Y);
5770 LPRINT TAB(39):LPRINT USING "###.#":AB5(Y)*100;AB6(Y)*100;
5780 LPRINT TAB(53):PS$
5790 NEXT Y
5800 GOSUB 4290:LPRINT TAB(9):"TOTALS";
5810 LPRINT TAB(15):LPRINT USING "#####":TAB1;
5820 LPRINT TAB(22):LPRINT USING "##.##":AAB2/TAB1;AAB3/TAB1;
5830 LPRINT TAB(33):LPRINT USING "###.#":AYAB4/TAB1;
5840 LPRINT TAB(39):LPRINT USING "###.#":AAB5/AAB2*100;AAB6/AAB3*100
5850 LPRINT:LPRINT
5860 REM END PRINT ROUTINE
5870 CLOSE #1,#2,#3,#4:RESET:GOTO 20
5880 END
5890 REM SUBROUTINE DAY OF YEAR
5900 DATE$=DAT$
5910 ZOY = 0:M$= LEFT$(DATE$,2):D$= MID$(DATE$,4,2) :  Y$ = MID$(DATE$,9,2)
5920 IF (Y$="88") OR (Y$="92") OR (Y$="96") OR (Y$="00") OR (Y$="04") OR (Y$="08") OR (Y$="12") OR (Y$="16") THEN ZEP=1 ELSE ZEP=0
5930 IF M$="12" THEN ZOY = ZEP + 334 ELSE IF M$="11" THEN ZOY = ZEP + 304
5940 IF M$="10" THEN ZOY = ZEP + 273 ELSE IF M$="09" THEN ZOY = ZEP + 243
5950 IF M$="08" THEN ZOY = ZEP + 212 ELSE IF M$="07" THEN ZOY = ZEP + 181
5960 IF M$="06" THEN ZOY = ZEP + 151 ELSE IF M$="05" THEN ZOY = ZEP + 120
5970 IF M$="04" THEN ZOY = ZEP + 90 ELSE IF M$="03" THEN ZOY = ZEP + 59
5980 IF M$="02" THEN ZOY = 31
5990 ZD = VAL(D$):ZOY = ZOY + ZD
6000 RETURN
6010 REM DAY OF WEEK SUBROUTINE
6020 IF DAYS="SU" THEN ZTD = 0 ELSE IF DAYS="M" THEN ZTD = 1 ELSE IF DAYS="T" THEN ZTD = 2 ELSE IF DAYS="W" THEN ZTD = 3 ELSE IF DAYS="TH"THEN ZTD = 4 ELSE IF DAYS="F" THEN ZTD = 5 ELSE IF DAYS="S" THEN ZTD = 6 ELSE 6040
6030 GOTO 6050
6040 PRINT "DAY NOT QUITE CORRECT,TRY AGAIN":PRINT
6050 GOTO 1280
6050 RETURN