

**EXPERT SYSTEM IN GEOGRAPHICAL LOCATION OF  
STRUCTURES / FACILITIES IN AN INDUSTRY**

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**APRIL, 2002.**

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**APPROVAL PAGE**

The undersigned certify that this project by Onwudinjo, E.C.U. has been read and found to be adequate both in scope and quality and approved for the award of Post Graduate Diploma (PGD) in the department of Mathematics and Computer Science of the Federal University of Technology, Minna.

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Date

### III

#### DEDICATION

This work is dedicated to you if you are trustworthy and hardworking.



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My special gratitude goes to my project supervisor Dr. Reju, S.A, for his guidance and encouragement all through the project work

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## ABSTRACT

The research on the use of computer to simulate location of structures / facilities in a specific industrial site with the aid of a well-defined topographical map, has been carried out.

On this topo map, a site would be selected at a point of intersection of two lines such as the Y-axis and X-axis. The coordinate point of intersection then entered as input data. The distance between the selected site of the new structure and each of the resources such as water, production equipment, fuel, raw materials and maintenance equipment it will interact with, would be computed. The shorter the distance the lower the efficiency rating and the better the site. Several sites would be selected and each would be marked in order of their efficiency rating. The site that has the lowest efficiency rating would be chosen as the best site.

The use of computer : reduces backtracking and handling; saves cost in terms of time and money; ensures flexibility, good housekeeping and immediate feedback; allows experimentation, effective utilization of manpower and space; and provides opportunity for group work and increase in employees' morale.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 General

Expert Systems are computer programmes designed to emulate the logic and reasoning processes human experts would use to solve a problem in their field of expertise (Huggins, et al, 1986; Palmer and Morris, 1982). For example, a food manufacturing industry can use an expert system to preserve the production expertise ( internal and external expertise to the industry) of experienced Engineers who are nearing retirement .

Expert systems do not make final decisions. They only display logical alternatives. The decision making is left to people ( experts). The idea is to design a computer programme that can draw conclusions from a wide variety of specialised data base. Users would simply need to ask the right question.

Expert systems are made up of three components:

- I. **Knowledge Base-** this contains codified facts, data relationships, and assumptions of a specific knowledge field (domain), which the knowledge engineer combines together to form the heuristics or rules for decision making. Here , the experts in a specific field are interviewed to obtain their knowledge and problem solving skills. These obtained data are then codified ( converted into machine usable form) and entered into the knowledge base.
- II. **User Interface-** whether the 'user' is a person or sensory equipped machinery, that user must supply current case-specific data to the expert

system. The user interface provides mechanisms for obtaining such information from a key board, sensors, data bases or simulation programmes external to the expert system knowledge base. For human user, an interface also permits elaboration on unclear prompts (helps / messages) plus elective display of the emulated reasoning process at intermediate execution points. Much more than just 'user friendly', good interface enables a user to become educated about the domain of application during use.

**III. Inference Engine-** this combines the user supplied, case-specific input with knowledge base searching and reasoning to reach conclusions. The Inference engine is to determine what data it needs to solve the problem at hand, to get data via the support software, to lodge it in the database, to employ the contents of the knowledge base to draw inferences, and to record these well in the database. When presented with a problem, the Inference Engine software can draw new conclusion and add this information to its knowledge base.

### **Expert System Development**

Expert System is developed by the domain experts ( who provide the knowledge base ) and or knowledge engineers ( who are familiar with the total development environment) using LISP or PROLOG language ( the two most common expert system programming languages). Equally an established method for developing an Expert System is to build the particular required expert system from a standard non-application-specific basic system called a shell. It is possible to purchase a complete expert system or merely a shell from which an expert system can be created. Examples of popular shells include:

GCLISP, EXPEROPS, INSIGHT, VP-EPERET, AND GURU.

The development phase of an expert system contains the following stages:

**Problem Analysis-:** determines if the problem is appropriate for an expert system development;

**Problem Formalization-:** designs the basic structure of the expert system.

**Knowledge Acquisition-:** locates and acquires knowledge from an expert.

**Knowledge Representation-:** determines how the knowledge should be represented and chooses a development tool;

**Prototype Development-:** initially tests the system design, knowledge representation, and development tool choices.

**Full System Development-:** constructs the full expert system ;

**System Evaluation and Documentation-:** finalizes system evaluation and documentation before system goes into use.

In the developing process of expert system, there are a number of sources where errors can occur. These sources of error are summarized below.

Source	Error
Human Expert	Incorrect or incomplete knowledge .
Knowledge Engineer	Semantic errors in communication with expert; knowledge gap.
Knowledge Base	syntax errors in format, errors caused by incorrect or incomplete knowledge and uncertainty.
Inference Engine	Bugs in the inference engine or development tool; incorrect rule priority or rule locations in the knowledge base.
User Interface	Incorrect content of communication between the expert system and end user.



Expert system of Geographical location of Structures / Departments and facilities in an Industry, is a simulation by which different sites for structure / facilities would be selected in a topographic map that shows the exact point of various immovable (natural) resources such as sources of water, fuel, and raw materials, workshop, store for finished product, etc. On these map a site would be selected as the best due to its nearness to the resources, and this will be done by using the computer to calculate the efficient rating and will be very easy to compare them without feeling bored, and with less time consumption. Here, flows among industrial resources / departments are analysed and the result used to generate layouts by constructing layouts from scratch or by improving an existing layout.

Generally, geographical location of structures / departments in an industry or simply facilities layout is the field of selecting the most effective arrangement of physical facilities to allow the greatest efficiency in the combination of resources to produce a product or service (Tompkin, 1992; Payne, et al, 1980; Magure, 1983). The physical facilities laid out are those for processing ( manufacturing) plants, administrative offices, service and workshop centres, clinics, and other departments in the industry.

The data requirements for the layout of each department are its area and relationships with other departments. The department area is based on the services rendered by the department and the corresponding estimated area. While the relationship with other departments may be obtained quantitatively from the volume of flow of materials, information and people, between adjacent departments (considering quantities moved and the length of the moves); or qualitatively from a closeness relationship requirements (rating) of each department.

Facility layout is planned ( designed) by individually reviewing and altering as required the structures and their proposed sites. The planning consists of the facilities planners drawing schematics of structures / offices locations and manually evaluating the pros and cons of each drawing.

## **1.2 Research Problems**

In our society today, there are industrialists who do not believe in the idea of going to layout designers or site planners for location of structures as a result of illiteracy and inadequate exposure to modern way of life.

However, other problems associated with the presently existing system include:-

1. Time consuming : it is time consuming process when selecting the best site in a topographic map of specified area where one has to be very close to various needed resources, and this has been done manually; it will lead to boring and lack of interest in the selection.
2. There are a lot of reliability and comfort problems in a site being chosen manually due to poor flow of people, information and materials. Such problems include much backtracking, delay and handling; minimal flexibility; ineffective utilization of manpower and space; low employee morale; poor housekeeping and difficult maintenance operations.
3. There are a lot of risk such as erosion, wind and lack of needed resources at a site chosen manually; and
4. Environmental deterioration:- resulting from over-crowdness.

### **1.3 Objectives of the Research**

This research work is composed of the following objectives:

1. to review the manual system of facilities layout in the industry / establishment.
2. to develop a software ( an expert system) that would permit industrialists and layout designers to explore time and space in selecting several sites from which the best site will be chosen, thereby overcoming the problems associated with manual site selection.
3. to develop and link substantive area of geography with information technology and decision making process .

### **1.4. Scope of the Research**

This research work focuses on facilities layout / industrial resources allocation. It is intended to cover all aspects of simulation in layout design and site allocation.

### **1.5 Significance of the Research**

This research work will be useful not only to computer scientists and those researching in software science, but also to programmers, constructors, industrialists and their employees, students, teachers, and designers. The work is particularly significant in saving time and in enabling designers to experiment in order to establish the quality of their intuitive guesses and perhaps identify with the problem in the earlier located structures, since the use of computer ensures immediate feedback.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Industrial Layout Design

In Industries, activities associated with production of goods and services are carried out with specific equipment, materials and corresponding personnel at specific work centres. A group of specific work centres are in turn, classified into a specific department / office.

During the Industrial layout design, , an area / location is provided for the:

1. **Primary Activities** at work centres, and the consequent departments directly associated with production of the goods / service;
2. **Secondary ( Support) Activities** such as receiving, shipping, storage and maintenance functions ( Tompkin, 1992);
3. **Tertiary Activities** such as Offices, food services, medical, library/reading, and recreation structures, subsidized residential houses, fire fighting provisions and other stringent safety, health and welfare facilities.

The resulting departments are normally established as structures (buildings). The arrangement or location of these structures within this industry is based on the flow of materials, information and people among the departments. Some of these departments deal on unique resources required in the industry, but are some how naturally located or immovable. Such include water, fuel raw materials departments or sections. Hence, they form the basics from which other departments are related to and located (laid out).

The layout of these structures/facilities is planned ( designed) by individually reviewing and altering as required the structures and their proposed sites. The planning involves the facilities planners, drawing schematics of structures / offices locations, and manually evaluating the pros and cons of each drawing.

Qualitative and / or quantitative interrelationships among departments relate(s) to their measures of flow of materials, information and people among them, and are/is used while evaluating their alternative arrangements / layout.

**The qualitative measure of flow** may include:

- the absolute necessity that two departments be close to each other;
- the importance of two departments being close to each other; or
- the preference that two departments not be close to each other.

In other words, qualitative interrelationships between departments is recorded by using closeness relationship values, the reasons for “closeness” values being:

i.Frequency of use; ii.Degree of personal contact; iii.Use of common equipment; iv.Share some space; v.use common records; vi.Information flow, among others.

**The quantitative interrelationships** on the other hand, indicates the flow volume from one department to another (From – to conditions). It should be noted that the flow volumes of materials, information and people (M.I.P) from department say A, to department say B, are not always the same from B to A. Also, in facilities, say water having large volumes of MIP movement between departments, a quantitative measure of flow (M.O.F) will typically be the basis for arrangement of departments, while qualitative M.O.F is used in facilities having low volumes of M.I.P movement but significant communication and organizational interrelationships.

The qualitative interrelationship conditions are used to generate new layouts by improving an existing layout, based on the closeness relationship (rating) of each department involved. Similarly, the quantitative interrelationship conditions are used to generate new layouts by constructing the layout “from scratch”, based on the volume of flow (moves) between the departments.

## **2.2 Factors to be Considered While Planning (Designing) the Layout**

Generally, layout needs careful planning to ensure the most efficient use of materials and processes, and good environmental conditions in relation to welfare facilities, accident prevention and industrial hygiene. In other words the objectives of facilities layout in an industry include:

- to minimize backtracking, delay and handling;
- to maintain flexibility;
- to utilize manpower and space effectively;
- to promote high employee morale; and
- to provide for good housekeeping and ease of maintenance .

There are factors, which determine the departmental flow of materials, information and people, and thus affect the designing of the layout of the department . These factors whose acceptable and legislative specifications are strictly adhered to during layout design, are as follows:

1. safe distances between certain types of machines
2. ergonomic factors
3. free space around machinery for easy operation, exercise of supervision, maintenance, and for work-in-progress
4. type, quality and quantity of information, equipment, processes, raw materials, production and design



5. platforms, lifting, appliances, suspension points
6. washing facilities, sanitary, lavatory, library, residential accommodation, canteen, rest rooms, medical facilities with respect to cleanliness, distance from work stations, and accessibility
7. building and foundation design on solid and made ground sites and with respect to direction of wind and sun
8. floors, stair-cases, and landings with respect to surface materials, strength and dimensions, lighting and ventilation
9. other building regulations concerning roofing, drainage, waste disposal, air-space, site preparation, structural requirements, construction materials, damp-proofing, lightening, storm and wind pressure
10. noisy machines and processes, water ways, reservoirs, ditches, and illumination in and around the industry
11. warning, precautions, notices, signals, limits and designs, with respect to fire outbreak, in-plant transportation, pedestrians, operators, visitors, emergency exits, and gangways.
12. Processes that are of hot, wet, dusty, fummy, toxic, and combustible materials
13. Receiving, shipping, storage and preservation with respect to raw materials, products, materials of containers, space for loading and unloading, inspection and testing (quality control), and other support services.

### **2.3 Evaluation of Alternative Layout Designs**

The alternative Department / facility layouts are evaluated by considering the layout ratings generated and how well the flow within each layout would conform to several basic flow principles (rules that result in effective flow). The flow principles as identified by Tompkins (1992) are:

1. **maximize the use of directed flow paths.** A directed flow path is an uninterrupted (un-intersected) flow path progressing ( with no backtracking) directly from the origin to destination.
2. **Minimize flow .** This is work simplification approach to material flow and includes:
  - a. **eliminate flow** – plan for the delivery of materials, information, or people directly to the point of ultimate use and eliminate intermediate steps.
  - b. **Minimize multiple handling** – plan for the flow between two consecutive points of use to take place in as few movements as possible preferably one.
  - c. **Combine operations when ever possible** – plan for movement of materials, information or people to be combined with processing step.
3. **minimize the cost of flow.** This can be viewed as:
  - i. **minimize manual handling** – minimize walking, manual travel distance, and motions
  - ii. **eliminate manual handling** – mechanize or automate flow to allow workers to spend full time on their assigned tasks. For each evaluation method, both views should be applied and the one resulting in the least total cost should be selected.

Alternative facility layouts that do not allow or that in fact encourage the application of these basic flow principles should be revised or eliminated from further considerations. The layout that scores well on the measurable qualitative and quantitative criteria and that allows effective application of the basic flow principles should be selected as the best facility layout.

Generally, any layout planning in a complete plant(industry) or a department /section of it, will be based on the arrangement of the production and service



departments in the plant, and the arrangement of the production facilities with which the operators / employees must work at a particular work centre in the department / section.

#### **2.4 Expert System: a Simulation**

Expert System is an important and most raining branch of artificial intelligence . Artificial intelligence on its own is the study of human machine (an automation) to simulate or emulate human methods for detective acquisition and application of knowledge and reason.

Expert systems are software based on certain concepts of artificial intelligence that imitate the thought processes of human expert in a domain or a field to solve complex problems or to help make a decision in that domain. They can be made for analysis, diagnose or commercial products, such as analyzing geographical data or chemical structures.

Geographical allocation of Industrial structures/departments or facilities is a simulation. It is a simulation concerned with the sitting of structures / offices in a well topographical map of a specific industrial premises (area). The word simulation on the other hand is the process of designing a model of a real system and conducting experiments with the model for the purpose of describing, predicting and explaining the operation of the system.

A number of different types of simulation model are normally recognized. Scale or hardware models are physical models which are miniature copies of reality. For example, in a model of valley glacier, clay may be used to simulate ice movement.

Conceptual models are usually box and arrows (flow) diagrams drawn on papers which can be used to organize ideas. In mathematical models, the key features of a system are translated into the symbolic logic of mathematics. All computer simulation models are mathematical models. The development of computer simulation models is one consequence of the quantitative and theoretical revolution which generally encourage the use of system theory, models, and modeling techniques.

The key features of simulation are:

1. **INPUT:-** which might be rainfall value, population levels, population rate of innovation diffusion, or relocation.
2. **ALGORITHM:-** which is usually implemented as a series of equations.
3. **OUTPUT:-** which might be tables of figures, map or graphs.

## CHAPTER THREE

### ANALYSIS OF THE EXISTING SYSTEM

Generally, geographical location of structures or facilities layout in an Industry is the field of selecting the most effective arrangement of physical facilities to allow the greatest efficiency in the combination of resources to produce a product or service. It is carried out by individually reviewing and altering as required, each developed preliminary department or facility, and locating it on the topographic map of the industrial site (premises) to obtain a fully integrated facilities layout.

The existing system operates manually, with each task of the allocation of structures being performed by the industry owners or layout designers (site planners). When manually done, it consists of site planners drawing schematics of departments / structures locations and mentally evaluating their pros and cons.

The system is very slow as a result of long and many processes involved. This is especially in our modern industry where a lot of resources, facilities or structures requiring many and different levels of interactions are employed to achieve its goals. In other words, the system is characterized with much backtracking, delay and handling; poor system maintenance, housekeeping, and flexibility; ineffective utilization of manpower and space; and decreasing of employees' morale.

#### **3.1 Analysis of the Procedure and Method**

The procedure and method in the presently existing system is by which the industrialist, decides to add or locate a facility (department, structure, or resource) in the industrial premises. He / she then goes for a location within that

premises, considering that this facility will depend on (relate with) other facilities and resources such as water, workshop, store, fuel, etc, for successful operation.

In the allocation of, say departments, the industrialist will commonly, put the considerations aside and locate the department serially. That is, the department whose need has first been identified, is first served (located) to a near resource followed by others. Thereby, leaving the rest interacting departments far away. But as time goes on and industrial expansion continues, over crowding will take over that site while some other sites which may even be better than the earlier site selected are left unselected. This defeats the idea of location of departments / offices or facilities being “family” centered with each family of departments being located in a particular section of the industrial premises and coming close together. Consequently, these earlier located facilities’ respond to the need for protection, privacy, and enough space / allowance is not satisfied.

### **3.1. Analysis of Input**

The input required by the system operation is supplied by the Industrialist during contact with the site planner. This input analysis is done on the following areas:

- ( i ). The name of the structure / facility
- ( ii ). The area it is to be located
- ( iii ). The size of the structure

### **3.2 Analysis of Output**

The output is the result generated at the end of the exercise which is dependent on the input data or information analysed by the site planner (layout designer) in the allocation processes. In this output, the site allocated to the structure is respectively out of its needed resources. The structure may be either close or far away from the needed resources.

The information contained in this output is as follows:

- (i).the name of the new structure      (ii).the area at which the site is allocated
- (iii).the size of the site, and      (iv).how close is the site to the various resources.

### **3.4. Files Maintained**

The files maintained in the existing system includes:

- i. all new structures presented to the existing system for allocation process
- ii. names of successful structures for geographical allocation process.

This geographical allocation list file consists of the following information:

- (a) where the site is located at in that area      (b) name of the structure
- (c) how many metres is the land ( that is the size of the land for the site)
- (d) name of the site planner      (e) name of the construction supervisor

### **3.5 Human Elements involved in the System**

This section describes all the personnel and their functions in the existing system:

1. **The site planners** :- they are supplied with data to search for site for a structure. These data are used as input to the geographical allocation processes of the industrial structures / offices.
2. **Construction supervisors**:- they are the ones that will ensure that the geographical allocation exercise is properly done as designed.
3. **Industrialist / resource owner**:- he/she supplies the data necessary for the geographical allocation process to start. This data is in the form of activities/ functions to be carried out in the structure.
4. **The engineers**:- these are the people that will measure the land for the structure with the tape and other equipment.

## CHAPTER FOUR

### ANALYSIS OF THE NEW SYSTEM

#### 4.1 System Design

System design is the utilization information collected during the analysis of a system to accomplish the logical desire of the information system. In the previous chapter, we carried out analysis on the current system of generating expert system in geographical location of structures and some problems were identified in it. Henceforth, the system design involves the design of a new expert system that will be able to overcome most of the identified problems.

In designing a new system, we will consider the following conditions, which contribute immensely to the effective functioning of the system:

- i. The earlier stated problems and our objectives on the study;
- ii. New input to the system;
- iii. New output requirement ;
- iv. New procedure and methods for processing settlement allocation;
- v. Files to be maintained;
- vi. Equipment to be used ; and
- vii. Human elements to be involved.

The new system design has the following criteria:

- i. efficient system procedure, that is , it has the ability to measure the distance from each of the other interacting structures(resources) to the proposed site of the new structure (department);

- ii. identification of different locations of the new structure on the industry premises and manipulation and handling of these different locations to determine the best among them;
- iii. Flexibility and security.

#### **4.2 Re-statement of the Problem**

As stated in the previous chapters, the problems associated with present system of manual geographical location of structures in an industry premises are many. Some of these problems identified are:

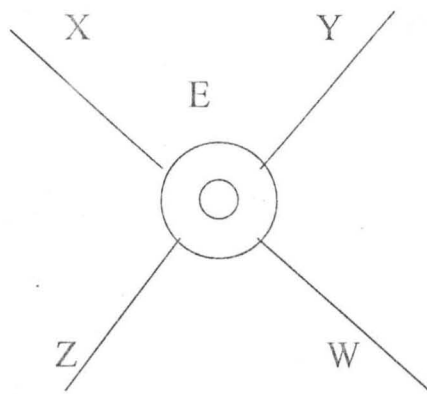
- i. it is a time consuming process as almost every thing is done manually;
- ii. there are a lot of unreliability and discomfort that is manually chosen;
- iv. environmental deterioration :- resulting from where a large number of different structures are located in a small area (over crowded or clustered);
- iv. the engineers sometimes make mistakes in measuring the land;
- v. there are a lot risks as a result of inconsistency resulting from the manual system. i.e, such as water erosion, wind destruction, etc.
- vi. lack of expertise.

#### **4.3 New Input Requirements**

At this point, we are essentially concerned with the design of inputs to the system, ie, from the manual system to a user friendly automated system.

The input required by the new system is the map at which the site is to be selected, and the name of the new structure should be known.

If these departments or resources that will be interacting with the new structure were distributed as suggested in the map below, and a site for the new structure proposed is (E), then the method for establishing its efficiency rating would be as follows:



- i. it measures the distance from the proposed site to each interacting resource/structure;
- ii. doubles the distance to allow for the return journey;
- iii. it multiplies the distance in each case by the number of visits; and
- iv. adds the result to give the total travels involved.

This can be converted into an efficiency rating by the computer in order to make a comparison between different sites easier.

Resources	Distance from the new structure (E)	Number of visits per day
Fuel	X unit	1
Raw materials department	Y unit	1
Water	Z	3
Workshop	W	1

Total travelling distance =  $(2[X] \times 1) + (2[Y] \times 1) + (2[Z] \times 3) + (2[W] \times 1)$



The best site can be found by comparing total distance for several sites. And it should be clear that the smaller the distance walked each day the less time will be wasted in travelling to the new structure (resource).

Hence, the smaller the total distance traveled per day, the lower the efficiency rating and the better the site. This formula involved in calculating the efficiency rating is

$$E.R = (T/120.46 + 0.5)$$

This formula is the basis of the simulation.

#### **4.4 New Output Requirements**

The major output from this system is of course the allocation of optimal geographical site for various structures/facilities in a specific topographic map. There are other outputs from the system that will be used in map analysis and map interpretation that form a small section yet compulsory in any geography analysis and examination. The output of this system will enable industrialists and students to experiment in order to establish the quality of their intuitive guesses, and perhaps identify with problems in earlier sited structures.

The most important aspect of the output of this system is that, it is a user friendly automated system. it will prompt the user with several questions such as :-

- i. if the user has the map of the area before him?
- ii. Type in your choice now as in the form (E.G, A/3, C/8)
- iii. It will produce the efficiency rating

If the user typed in the wrong input, the system will prompt him/her to please type, in this form (E.G, A/4, C/9). In-fact, the system output is friendly to the user and even a computer illiterate can operate this system.

#### 4.5 New System Procedure

The new system which is an expert system is unlike the former system which is manual. It involves computer operation. The input data to the new system is obtained from the various input forms. The information contained in these forms are entered into the computer system by the operator. All the required information about the allocation of site is given by the system due to its user friendly nature.

The new system process the input data and calculates the efficiency rating of a particular chosen site for the structure about to be located. Then, it compares this rating with that of each of the alternative sites chosen for that structure. The best site for that structure becomes the site with the lowest efficiency rating.

In the former system, when ever an industrialist wants to add a new facility in the industry premises, he/she will go to the facility/site planner and present him/herself and the intention of having a site for a new structure/facility. The site planners will ask him questions to know which area he/she wants the site and the other structures/departments that will interact with the new facility. On answering, a grid map of the area will also be presented to the planner.

In the modern days, things are done very fast and the new system allows fast solution to any aspect of problems encountered. In the new system procedure, the industrialist is not going to express the problems and answers to the site planner. Because it is an expert system, the system will ask questions and the user who may be the industrialist, types in the correct answers as input data to the system.

#### 4.6 File to be Maintained

File maintained is concerned with the procedure and technique in keeping or handling of files. And it depends on an organization or institution desire.

Therefore, the system has taken into consideration of the problems and develops a file that will contain all the results. The file will contain the stages under gone in solving a particular problem and the solution attained.

The new system will maintain file that will store the result of the operation, including the structures' type, size (land area), and date of location. The result of the operation being the efficiency rating that compares and contracts between different sites selected.

This file of the new system is easier to maintain than that of the existing system.

(1). **Structure/Facility Information File:-** this is the file that consists of all the information about the industrialist.

Name of structure	Type	Size	Date of allocation

(2). **The Result File:-** this file produces the result of different sites chosen by the site designer.

Name of structure	Different sites chosen	Efficiency rating of each site	remarks

#### 4.7 Equipment Required

The new system required the following equipment:-

- (i) Up to three powerful large microcomputers with large memory space;
- (ii) A powerful and efficient standby generator and ups;
- (iii) Stabilizer and transformer
- (iv) Cooling system such as air conditioner
- (v) Printer such as laser jet and dot matrix; and
- (vi) Diskettes and diskette banks.

#### 4.8 Human Elements

The new system requires some staff such as programmer, system analyst, computer operator, and facilities layout designer/planner.

The new system can make use of the human elements available by training them to become computer operators, so that they will be able to make use of the computers for entering and printing out records. The programmer or system analyst can be an employee or just an expert that will be informed when ever his/her service is required. So he/she may not necessarily be permanent employee of the organization.

#### 4.9 Program Specification.

This work has the following program specifications or program layout.

1. **Procedure Password:-** this is the security screen. It functions thus:

- clears the screen
- gives the screen background
- displays enter your password
- searches for a match list
- if password is wrong, it clears the screen and displays

“you don’t have access to this software”

- if password is right, then it goes to the next procedure for map.

2. **Procedure Map:-** this shows the type of map needed for the program. It functions thus:

- displays map on the screen
- displays question at the top of the map, asking  
“do you have this type of topo map in front of you ? ”
- if the response is “no”, then it clears the screen and displays  
“you can not run this program”
- if response is “yes”, then it takes you to procedure of introduction.

3. **Procedure Introduction:-** this displays the introduction, showing the :

- Name
- Position in the industry
- Department
- Welcoming you to the software.

4. **Procedure for Structure Information:-** this shows for the structure:

- its name
- its type
- its size (land area)
- date of its allocation

5. **Procedure for Calculating Efficiency Rating:-** this procedure calculates efficiency rating of each site and produces the best site. It:

- allows user to enter a site , then the computer will calculate the efficiency rating
- if the input is wrong, it will prompt the user with the specified alphabet and numbers that is supposed to enter
- if the input is right, it will produce the result as the efficiency rating
- it also allows users to enter different sites up to four or five sites before it will produce the best site out of them.

6. **Procedure output Screen:-** this is the procedure that displays all the information and result to the output screen.

#### **4.10 Procedure Testing and Implementation**

In this stage a sample data were collected and supplied to the program where output and all the required reports were generated.

Necessary changes were also made and data validation and other checks take place in this stage. In order for the designed system to meet its requirements and hence ensure reliability in operation, the outputs were obtained at the end of this stage.

#### **Program Implementation**

This is the phase in the system development when users actually work with the new system.

The introduction of computer system will surely affect the system of facilities allocation pattern. Hence, there is need to educate and train staff on the need and the use of the new system, that is like organizing lectures and demonstration on how the new system works.

## **Method of Change Over**

To enhance the change over from the existing system to the new system, the following should be involved:- programmers, analysts, and operating staff. The three methods of change over in program implementation are:

- (a). direct change over
- (b). parallel change over
- (c). pilot change over

Of the above methods, parallel change over is recommended as the best for the new system because of its numerous advantages over the others. Also, the implementation of the new system will conform with all its processes and regulations.

## **Maintenance**

The system should not be bounded once it becomes operational. There is need to monitor it to ensure that the requirements are still being meet.

To achieve this, control and security measures are often introduced at these level.

The control types are:

- (i. management control (ii. system control, and ( iii. procedure control. This

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

One of the most exciting things about interactive information and retrieval systems is that they are user oriented. In other words, the idea of implementing a new system is to support the users to satisfy their needs of processing in a less time and with ease.

Should any of these objectives be missing, the system could as well be called a waste of resources and time. As such, the design and implementation of computer system requires an intensive planning at every stage. This planning covers training, experience and patience on the part of the analyst.

Conclusively, the new system designed should be in use relatively to the old system. This proposed system is expected to be in parallel operation with the manual operation. The automation of the system can not stand-alone at first. It functions along side with some parts of the manual system.

#### 5.2 Recommendations

Due to its importance, significance, and benefit, computerization of other units should be done. Such units include Expert System in Vesico Vaginal Fistula (VVF) data in health, and Expert System in transportation model in mathematics. This will speed up the entire performance of all fields.

To this end, for the new system to meet its said goals, enough jobs have to be done. A good and conducive environment has to be established for both the



hardware and software that will accompany the trend. Selected staff are also trained on how to go about the use of the computers. System engineers have to be contacted for installation and connectivity. A good installation in the first stage will allow for easy expansion. If the implementation is effectively connected, the tedious nature of creating, updating, and maintaining files associated with the existing system will be encountered.

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```

DECLARE FUNCTION MAP! ()
CLS
LOCATE 9, 25
PRINT " *****"
LOCATE 12, 30
PRINT " *****"
LOCATE 10, 30
PRINT "TYPE IN YOUR PASSWORD "
PRINT ""
LOCATE 11, 30
COLOR 0, 0
INPUT p$
PASS$ = CHR$(69) + CHR$(67) + CHR$(85) + CHR$(79)
IF UCASE$(p$) = PASS$ THEN
CLS
GOSUB 8
ELSE
CLS
SCREEN 1
FOR I = 0 TO 320
LINE (320 - I, 0)-(320 - I, 400)
LINE (320 + I, 0)-(320 + I, 400)
NEXT I
LOCATE 10, 25
BEEP: BEEP
LOCATE 10, 25
PRINT "YOU DON"
'T HAVE ACCESS TO THIS SOFTWARE"
GOTO 7000
END IF
CLS
8 SCREEN 2
LOCATE 4, 9
PRINT "1"
LOCATE 6, 9
PRINT "2"
LOCATE 8, 9
PRINT "3"
LOCATE 10, 9
PRINT "4"
LOCATE 12, 9
PRINT "5"
LOCATE 14, 9
PRINT "6"
LOCATE 16, 9
PRINT "7"
LOCATE 18, 9
PRINT "8"
LOCATE 20, 9
PRINT "9"
LOCATE 22, 8
PRINT "10"
LINE (560, 20)-(560, 170)
FOR X = 75 TO 560 STEP 27
LINE (X, 20)-(X, 170)
NEXT X
LINE (75, 20)-(560, 20)
FOR Y = 20 TO 170 STEP 15
LINE (75, Y)-(560, Y)
NEXT Y

```

```

LOCATE 2, 14
PRINT "^^I HOPE YOU HAVE THIS TYPE OF TOPO_MAP ON YOUR TABLE?^^"
LOCATE 3, 12
PRINT "A"
LOCATE 3, 16
PRINT "B"
LOCATE 3, 19
PRINT "C"
LOCATE 3, 22
PRINT "D"
LOCATE 3, 25
PRINT "E"
LOCATE 3, 29
PRINT "F"
LOCATE 3, 32
PRINT "G"
LOCATE 3, 36
PRINT "H"
LOCATE 3, 39
PRINT "I"
LOCATE 3, 42
PRINT "J"
LOCATE 3, 45
PRINT "K"
LOCATE 3, 49
PRINT "L"
LOCATE 3, 52
PRINT "M"
LOCATE 3, 56
PRINT "N"
LOCATE 3, 59
PRINT "O"
LOCATE 3, 62
PRINT "P"
LOCATE 3, 66
PRINT "Q"
LOCATE 3, 69
PRINT "R"
LOCATE 7, 20
PRINT "*"
LOCATE 8, 18
PRINT "WATER"
LOCATE 22, 50
PRINT "*"
LOCATE 23, 49
PRINT "FUEL"
LOCATE 12, 50
PRINT "*"
LOCATE 13, 49
PRINT "MAINTENANCE"
LOCATE 14, 49
PRINT "WORKSHOP"
LOCATE 20, 17
PRINT "*"
LOCATE 21, 16
PRINT "PRODUCTION"
LOCATE 22, 16
PRINT "WORKSHOP"
LOCATE 18, 61
PRINT "*"

```

```

LOCATE 19, 58
PRINT "RAW"
LOCATE 20, 58
PRINT "MATERIALS"
INPUT ST$
  IF ST$ = "YES" OR ST$ = "Y" OR ST$ = "y" OR ST$ = "yes" THEN
    FOR I = 0 TO 320
      LINE (320 - I, 0)-(320 - I, 400)
      LINE (320 + I, 0)-(320 + I, 400)
    NEXT I
  ELSE
    FOR I = 0 TO 320
      LINE (320 - I, 0)-(320 - I, 400)
      LINE (320 + I, 0)-(320 + I, 400)
    NEXT I
  LOCATE 5, 10
  PRINT "***EXPERT  SYSTEM IN GEOGRAPHICAL LOCATION OF FACILITIES/STRUCTURES IN AN
  INDUSTRY**"
  LOCATE 6, 10
  PRINT "=====
  LOCATE 10, 25
  PRINT "*YOU CAN NOT RUN THIS PROGRAM SINCE YOU DON'T HAVE THE MAP IN FRONT OF
  YOU :OK *"
  END
  END IF
  LOCATE 10, 25
  REM
  CLS
  2  PRINT "                UNAUTHORISED DUPLICATE IS PROHIBITED"
  3  PRINT "                *****"
  6  PRINT
  LOCATE 4, 18
  PRINT "*****THIS SOFTWARE IS DESIGNED BY ERASMUS CUFU UJUNWA ONWUDINJO*****"
  PRINT "                -----"
  LOCATE 6, 19
  PRINT "  ADDM.NO := PGD/MCS/1999/2000/971."
  LOCATE 7, 21
  PRINT "  DEPT.:= COMPUTER SCIENCE."
  LOCATE 8, 24

  PRINT " YOU ARE WELCOME TO "
  PRINT ""
  PRINT "      EXPERT SYSTEM IN GEOGRAPHICAL LOCATION OF FACILITIES/STRUCTURES
  IN AN INDUSTRY PROJECT"
  PRINT "      =====
  PRINT
  PRINT "      I HOPE YOU HAVE BEFORE YOU THE MAP OF THE AREA"
  PRINT "  WHERE YOU WANT TO ESTABLISH YOUR FACILITY/STRUCTURE ?"
  PRINT

10 PRINT " Name"
15 INPUT m$
16 PRINT ""
20 PRINT " Choose a site for your Facility/Structure"
25 INPUT a$
26 IF a$ = "c/2" THEN 315
27 IF a$ = "l/5" THEN 360
28 IF a$ = "b/11" THEN 410
29 IF a$ = "l/12" THEN 485
30 IF a$ = "o/8" THEN 525
31 IF a$ = "a/1" THEN 610

```

```

32 IF a$ = "b/1" THEN 670
33 IF a$ = "c/1" THEN 720
34 IF a$ = "d/1" THEN 755
35 IF a$ = "e/1" THEN 775
36 IF a$ = "f/1" THEN 795
37 IF a$ = "g/1" THEN 820
38 IF a$ = "h/1" THEN 850
39 IF a$ = "i/1" THEN 870
40 IF a$ = "j/1" THEN 895
41 IF a$ = "k/1" THEN 1020
42 IF a$ = "l/1" THEN 1050
43 IF a$ = "m/1" THEN 1085
44 IF a$ = "n/1" THEN 1120
45 IF a$ = "o/1" THEN 1155
46 IF a$ = "p/1" THEN 1190
47 IF a$ = "p/2" THEN 1225
48 IF a$ = "p/3" THEN 1260
49 IF a$ = "p/4" THEN 1300
50 IF a$ = "p/5" THEN 1340
51 IF a$ = "p/6" THEN 1375
52 IF a$ = "p/7" THEN 1410
53 IF a$ = "p/8" THEN 1445
54 IF a$ = "p/9" THEN 1475
55 IF a$ = "p/10" THEN 1505
56 IF a$ = "p/11" THEN 1535
57 IF a$ = "p/12" THEN 1570
58 IF a$ = "p/13" THEN 1600
59 IF a$ = "o/5" THEN 1730
60 IF a$ = "o/2" THEN 1635
61 IF a$ = "o/3" THEN 1670
62 IF a$ = "o/4" THEN 1700
63 IF a$ = "o/6" THEN 1760
64 IF a$ = "o/7" THEN 1790
65 IF a$ = "o/10" THEN 1850
66 IF a$ = "o/9" THEN 1820
67 IF a$ = "o/11" THEN 1880
68 IF a$ = "o/12" THEN 1910
69 IF a$ = "o/13" THEN 1940
70 IF a$ = "n/2" THEN 1970
72 IF a$ = "n/3" THEN 2000
73 IF a$ = "n/4" THEN 2030
74 IF a$ = "n/5" THEN 2060
75 IF a$ = "n/6" THEN 2090
76 IF a$ = "n/7" THEN 2125
77 IF a$ = "n/8" THEN 2160
78 IF a$ = "n/9" THEN 2190
79 IF a$ = "n/10" THEN 2220
80 REM IF a$ = "n/11" THEN 2250
81 REM IF a$ = "n/12" THEN 2280
82 IF a$ = "n/13" THEN 2310
83 IF a$ = "m/2" THEN 2340
84 IF a$ = "m/3" THEN 2375
85 IF a$ = "m/4" THEN 2410
86 IF a$ = "m/5" THEN 2450
87 IF a$ = "m/6" THEN 2480
88 IF a$ = "m/7" THEN 2520
89 IF a$ = "m/8" THEN 2550
90 IF a$ = "m/9" THEN 2580
91 IF a$ = "m/10" THEN 2620
92 IF a$ = "m/11" THEN 2650

```

```

375 LET Tg = g
380 PRINT "This site has an Efficiency Rating of"; INT(Tg / 120.46 + .5)
385 PRINT ""
386 PRINT " This position is also a very good site, but (c/2) is better."
390 PRINT "Now try and choose a better site for your structure"
400 GOTO 25
410 PRINT " You have chosen a site near production equipment location."
415 LET a = b / 11
420 a = (2 * 390 * 3) + (2 * 360 * 1) + (2 * 370 * 1) + (2 * 360 * 1) + (2 * 80
* 1)
425 LET Ta = a
430 PRINT " This site has an Efficiency Rating of"; INT(Ta / 120.46 + .5)
435 PRINT ""
440 PRINT "Where would you site your facility/structure now"
445 PRINT "      Claerly some sites are better than others.Assuming early"
450 PRINT " planners know the way of finding which was the"
455 PRINT "best possible site,they would have made rational/sensible"
460 PRINT "choices. But one can imagine that a good deal of trail and"
465 PRINT "error would have been involved."
470 PRINT ""
475 PRINT " Try and choose a better position for your structure."
480 GOTO 25
485 PRINT "You have again chosen a site that is nearer to Fuel location"
490 LET F = 1 / 12
495 F = (2 * 350 * 3) + (2 * 440 * 1) + (2 * 380 * 1) + (2 * 345 * 1) + (2 * 90
* 1)
500 LET Tf = F
505 PRINT " This site has an Efficiency Rating of"; INT(Tf / 120.46 + .5)
510 PRINT ""
511 PRINT "This site is good for locating facility/structure, but not as good as
(1/5). "
515 PRINT "Type in your new location for your structure."
520 GOTO 25
525 PRINT " You have located your new site on one of the resources i.e"
530 PRINT "Raw materials "
535 LET b = o / 8
540 b = (2 * 440 * 3) + (2 * 360 * 1) + (2 * 350 * 1) + (2 * 340 * 1) + (2 * 100
* 1)
545 LET Tb = b
550 PRINT " This site has an Efficiency Rating of"; INT(Tb / 120.46 + .5)
555 PRINT ""
560 PRINT " When you are ready type con to continue or exit to quit."
561 PRINT "      -          ===          ====="
562 INPUT c$
563 IF c$ = "con" OR c$ = "CON" THEN 350
565 IF c$ = "EXIT" OR c$ = "exit" THEN 7000
566 IF c$ <> "con" OR c$ <> "CON" THEN 560
567 IF c$ <> "exit" OR c$ <> "EXIT" THEN 560
570 PRINT " This typed site, is out of the range in the Map"
575 PRINT "Please type in this form (E.G. a/5,1/11)"
580 GOTO 560
610 LET q = a / 1
620 q = (2 * 310 * 3) + (2 * 440 * 1) + (2 * 410 * 1) + (2 * 390 * 1) + (2 * 420
* 1)
630 LET Tq = q
640 PRINT " This site has an Efficiency Rating of"; INT(Tq / 120.46 + .5)
650 GOTO 20
670 LET r = b / 1
675 r = (2 * 305 * 3) + (2 * 430 * 1) + (2 * 400 * 1) + (2 * 380 * 1) + (2 * 410
* 1)

```

93 IF a\$ = "m/12" THEN 2680  
94 IF a\$ = "m/13" THEN 2710  
95 IF a\$ = "1/2" THEN 2740  
96 IF a\$ = "1/3" THEN 2770  
97 IF a\$ = "1/4" THEN 2800  
98 IF a\$ = "1/6" THEN 2830  
99 IF a\$ = "1/7" THEN 2860  
100 IF a\$ = "1/8" THEN 2890  
101 IF a\$ = "1/9" THEN 2925  
102 IF a\$ = "1/10" THEN 2960  
103 IF a\$ = "1/11" THEN 2990  
104 IF a\$ = "1/13" THEN 3025  
105 IF a\$ = "c/3" THEN 5970  
106 IF a\$ = "c/4" THEN 6000  
107 IF a\$ = "c/5" THEN 6030  
108 IF a\$ = "c/6" THEN 6060  
109 IF a\$ = "c/7" THEN 6090  
110 IF a\$ = "c/8" THEN 6120  
111 IF a\$ = "c/9" THEN 6155  
112 IF a\$ = "c/10" THEN 6185  
113 IF a\$ = "c/11" THEN 6220  
114 IF a\$ = "c/12" THEN 6250  
115 IF a\$ = "c/13" THEN 6280  
116 IF a\$ = "d/2" THEN 5660  
117 IF a\$ = "d/3" THEN 5590  
118 IF a\$ = "d/4" THEN 5620  
119 IF a\$ = "d/5" THEN 5655  
120 IF a\$ = "d/6" THEN 5685  
121 IF a\$ = "d/7" THEN 5725  
122 IF a\$ = "d/8" THEN 5755  
123 IF a\$ = "d/9" THEN 5785  
124 IF a\$ = "d/10" THEN 5815  
125 IF a\$ = "d/11" THEN 5850  
126 IF a\$ = "d/12" THEN 5880  
127 IF a\$ = "d/13" THEN 5905  
128 IF a\$ = "e/2" THEN 5200  
129 IF a\$ = "e/3" THEN 5230  
130 IF a\$ = "e/4" THEN 5260  
131 IF a\$ = "e/5" THEN 5290  
132 IF a\$ = "e/6" THEN 5320  
133 IF a\$ = "e/7" THEN 5350  
134 IF a\$ = "e/8" THEN 5385  
135 IF a\$ = "e/9" THEN 5415  
136 IF a\$ = "e/10" THEN 5445  
137 IF a\$ = "e/11" THEN 5470  
138 IF a\$ = "e/12" THEN 5500  
139 IF a\$ = "e/13" THEN 5530  
192 IF a\$ = "i/6" THEN 3900  
193 IF a\$ = "i/7" THEN 3930  
194 IF a\$ = "i/8" THEN 3955  
195 IF a\$ = "i/9" THEN 3980  
196 IF a\$ = "i/10" THEN 4005  
197 IF a\$ = "i/11" THEN 4035  
198 IF a\$ = "i/12" THEN 4070  
199 IF a\$ = "i/13" THEN 4100  
200 IF a\$ = "h/2" THEN 4130  
201 IF a\$ = "h/3" THEN 4165  
202 IF a\$ = "h/4" THEN 4195  
203 IF a\$ = "h/5" THEN 4225  
204 IF a\$ = "h/6" THEN 4250



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205 IF a$ = "h/7" THEN 4280
206 IF a$ = "h/8" THEN 4310
207 IF a$ = "h/9" THEN 4340
208 IF a$ = "h/10" THEN 4370
209 IF a$ = "h/11" THEN 4400
210 IF a$ = "h/12" THEN 4425
211 IF a$ = "h/13" THEN 4455
212 IF a$ = "a/2" THEN 6630
213 IF a$ = "a/3" THEN 6660
214 IF a$ = "a/4" THEN 6690
215 IF a$ = "a/5" THEN 6720
216 IF a$ = "a/6" THEN 6745
217 IF a$ = "a/7" THEN 6770
218 IF a$ = "a/8" THEN 6800
219 IF a$ = "a/9" THEN 6830
220 IF a$ = "a/10" THEN 6860
221 IF a$ = "a/11" THEN 6890
222 IF a$ = "a/12" THEN 6915
223 IF a$ = "a/13" THEN 6945
224 IF a$ = "b/3" THEN 6340
225 IF a$ = "b/4" THEN 6370
226 IF a$ = "b/5" THEN 6400
227 IF a$ = "b/6" THEN 6430
228 IF a$ = "b/7" THEN 6460
229 IF a$ = "b/8" THEN 6490
230 IF a$ = "b/9" THEN 6520
231 IF a$ = "b/10" THEN 6550
232 IF a$ = "b/2" THEN 6310
233 IF a$ = "b/12" THEN 6570
234 IF a$ = "b/13" THEN 6600
300 IF a$ <> "a/1" OR a$ <> "a/2" OR a$ <> "a/3" OR a$ <> "a/4" OR a$ <> "a/5"
OR a$ <> "a/6" OR a$ <> "a/7" THEN 570
301 IF a$ <> "a/8" OR a$ <> "a/9" OR a$ <> "a/10" OR a$ <> "a/11" OR a$ <>
"a/12" OR a$ <> "a/13" THEN 570
302 IF a$ <> "b/1" OR a$ <> "b/2" OR a$ <> "b/3" OR a$ <> "b/4" OR a$ <> "b/5"
OR a$ <> "b/6" OR a$ <> "b/7" THEN 570
303 IF a$ <> "b/8" OR a$ <> "b/9" OR a$ <> "b/10" OR a$ <> "b/11" OR a$ <>
"b/12" OR a$ <> "b/13" THEN 570
304
315 PRINT " You have chosen a site that is resited near Water location"
316 LET z = c / 2
317 z = (2 * 440 * 1) + (2 * 460 * 1) + (2 * 460 * 1) + (2 * 540 * 1) + (2 * 100
* 1)
318 LET Tz = z
319 PRINT "This site has an Efficiency Rating of"; INT(Tz / 120.46 + .5)
320 PRINT "This location has low Efficiency Rating but there are still "
322 PRINT " other positions that are better than this."
324 PRINT ""
325 PRINT "Note: The lower the Efficiency Rating, The better the site."
330 PRINT " The range of the alphabet is between 'A' to 'P', and"
335 PRINT " The range of the number is between '1' to '13'."
345 PRINT ""
350 PRINT " Type in your new choice now."
355 PRINT
356 GOTO 25
360 PRINT "You have chosen a site that is resited near Maintenance Equipment
location"
365 LET g = 1 / 5
370 g = (2 * 340 * 3) + (2 * 330 * 1) + (2 * 360 * 1) + (2 * 370 * 1) + (2 * 105
* 1)

```

```

680 LET Tr = r
685 PRINT "This site has an Efficiency Rating of"; INT(Tr / 120.46 + .5)
690 PRINT ""
695 PRINT " Note: The lower the Efficiency Rating the better the site."
700 PRINT " keep on selecting the site until a better position is chosen"
705 PRINT " "
710 PRINT "Type in your new location now."
715 GOTO 25
720 LET s = c / 1
725 s = (2 * 305 * 3) + (2 * 425 * 1) + (2 * 395 * 1) + (2 * 375 * 1) + (2 * 405
* 1)
730 LET Ts = s
735 PRINT "This site has an Efficiency Rating of"; INT(Ts / 120.46 + .5)
740 PRINT ""
745 PRINT " Type in another site"
750 GOTO 25
755 LET T = d / 1
760 T = (2 * 305 * 3) + (2 * 420 * 1) + (2 * 405 * 1) + (2 * 375 * 1) + (2 * 405
* 1)
765 LET Tt = T
770 PRINT "This site has an Efficiency Rating of"; INT(Tt / 120.46 + .5)
772 GOTO 475
775 LET u = e / 1
780 u = (2 * 315 * 3) + (2 * 420 * 1) + (2 * 410 * 1) + (2 * 375 * 1) + (2 * 400
* 1)
785 LET Tu = u
790 PRINT "This site has an Efficiency Rating of"; INT(Tu / 120.46 + .5)
791 PRINT ""
793 GOTO 20
795 LET v = F / 1
800 v = (2 * 330 * 3) + (2 * 430 * 1) + (2 * 415 * 1) + (2 * 360 * 1) + (2 * 445
* 1)
805 LET Tv = v
810 PRINT "This site has an Efficiency Rating of"; INT(Tv / 120.46 + .5)
815 GOTO 475
820 LET w = g / 1
825 w = (2 * 340 * 3) + (2 * 400 * 1) + (2 * 405 * 1) + (2 * 305 * 1) + (2 * 400
* 1)
830 LET Tw = w
835 PRINT " This site has an Efficiency Rating of"; INT(Tw / 120.46 + .5)
840 PRINT ""
845 GOTO 560
850 LET X = h / 1
855 X = (2 * 350 * 3) + (2 * 405 * 1) + (2 * 430 * 1) + (2 * 340 * 1) + (2 * 405
* 1)
860 LET Tx = X
865 PRINT " This site has an Efficiency Rating of"; INT(Tx / 120.46 + .5)
862 PRINT ""
864 GOTO 20
870 LET Y = I / 1
875 Y = (2 * 360 * 3) + (2 * 400 * 1) + (2 * 440 * 1) + (2 * 335 * 1) + (2 * 400
* 1)
880 LET Ty = Y
885 PRINT " This site has an Efficiency Rating of"; INT(Ty / 120.46 + .5)
890 GOTO 475
895 LET z = j / 1
900 z = (2 * 375 * 3) + (2 * 395 * 1) + (2 * 455 * 1) + (2 * 350 * 1) + (2 * 470
* 1)
905 LET Tz = z
1000 PRINT "This site has an Efficiency Rating of "; INT(Tz / 120.46 + .5)

```

```

1001 PRINT ""
1005 PRINT " Clearly some sites are better than others.If early planners known"
1006 PRINT "the way of determining which was the best position,they would have
made a"
1007 PRINT " rational/sensible choice. But one can imagine that a good deal of
trail and"
1010 PRINT " error would have been involved."
1012 PRINT ""
1013 GOTO 560
1020 LET k1 = k / 1
1025 k1 = (2 * 390 * 3) + (2 * 380 * 1) + (2 * 480 * 1) + (2 * 340 * 1) + (2 *
475 * 1)
1030 LET Tk1 = k1
1035 PRINT "This site has an Efficiency Rating of "; INT(Tk1 / 120.46 + .5)
1036 PRINT ""
1037 PRINT " This site would have been a good position but it is very far from
production equipment."
1040 GOTO 475
1050 LET l1 = l / 1
1055 l1 = (2 * 395 * 3) + (2 * 395 * 1) + (2 * 495 * 1) + (2 * 320 * 1) + (2 *
460 * 1)
1060 LET Tl1 = l1
1065 PRINT "This site has an Efficiency Rating of "; INT(Tl1 / 120.46 + .5)
1067 PRINT ""
1070 GOTO 20
1085 LET m1 = m / 1
1090 m1 = (2 * 410 * 3) + (2 * 400 * 1) + (2 * 500 * 1) + (2 * 300 * 1) + (2 *
440 * 1)
1095 LET Tm1 = m1
1100 PRINT "This site has an Efficiency Rating of "; INT(Tm1 / 120.46 + .5)
1105 PRINT ""
1110 GOTO 555
1120 LET n1 = n / 1
1125 n1 = (2 * 425 * 3) + (2 * 390 * 1) + (2 * 510 * 1) + (2 * 305 * 1) + (2 *
435 * 1)
1130 LET Tn1 = n1
1135 PRINT "This site has an Efficiency Rating of "; INT(Tn1 / 120.46 + .5)
1140 PRINT ""
1145 PRINT " However with this system one can be able to select different sites
and to know"
1148 PRINT " which will involve the least walking distance.The shorter the
distance"
1150 PRINT " the better the position."
1152 GOTO 555
1155 LET o1 = o / 1
1160 o1 = (2 * 430 * 3) + (2 * 380 * 1) + (2 * 525 * 1) + (2 * 310 * 1) + (2 *
440 * 1)
1165 LET To1 = o1
1170 PRINT "This site has an Efficiency Rating of "; INT(To1 / 120.46 + .5)
1175 PRINT ""
1180 GOTO 1005
1190 LET p1 = p / 1
1195 p1 = (2 * 435 * 3) + (2 * 375 * 1) + (2 * 540 * 1) + (2 * 315 * 1) + (2 *
450 * 1)
1200 LET Tp1 = p1
1205 PRINT "This site has an Efficiency Rating of "; INT(Tp1 / 120.46 + .5)
1210 PRINT ""
1215 PRINT "This site is very far from most of the important resources."
1217 PRINT " "
1218 PRINT "Try and choose a better site now."

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1220 GOTO 20
1225 LET p2 = p / 2
1230 p2 = (2 * 440 * 3) + (2 * 370 * 1) + (2 * 550 * 1) + (2 * 310 * 1) + (2 *
450 * 1)
1235 LET Tp2 = p2
1240 PRINT "This site has an Efficiency Rating of "; INT(Tp2 / 120.46 + .5)
1245 PRINT ""
1247 GOTO 20
1260 LET p3 = p / 3
1265 p3 = (2 * 450 * 3) + (2 * 365 * 1) + (2 * 560 * 1) + (2 * 305 * 1) + (2 *
445 * 1)
1270 LET Tp3 = p3
1275 PRINT "This site has an Efficiency Rating of "; INT(Tp3 / 120.46 + .5)
1280 GOTO 440
1300 LET p4 = p / 4
1305 p4 = (2 * 460 * 3) + (2 * 350 * 1) + (2 * 540 * 1) + (2 * 300 * 1) + (2 *
430 * 1)
1310 LET Tp4 = p4
1315 PRINT "This site has an Efficiency Rating of "; INT(Tp4 / 120.46 + .5)
1318 PRINT " Nevertheless this site is close to maintenance equipment."
1320 PRINT " But it is better you try another position."
1325 PRINT " check your map and select the site."
1330 GOTO 705
1340 LET p5 = p / 5
1345 p5 = (2 * 375 * 3) + (2 * 340 * 1) + (2 * 520 * 1) + (2 * 340 * 1) + (2 *
410 * 1)
1350 LET Tp5 = p5
1355 PRINT "This site has an Efficiency Rating of "; INT(Tp5 / 120.46 + .5)
1357 PRINT " This site is at the last line of the map;in between maintenance
equipment and"
1360 PRINT " raw materials."
1365 PRINT " I think is high time you moved to better position."
1370 GOTO 555
1375 LET p6 = p / 6
1380 p6 = (2 * 390 * 3) + (2 * 330 * 1) + (2 * 520 * 1) + (2 * 350 * 1) + (2 *
400 * 1)
1385 LET Tp6 = p6
1390 PRINT "This site has an Efficiency Rating of "; INT(Tp6 / 120.46 + .5)
1392 PRINT ""
1394 GOTO 560
1410 LET p7 = p / 7
1415 p7 = (2 * 400 * 3) + (2 * 320 * 1) + (2 * 515 * 1) + (2 * 345 * 1) + (2 *
395 * 1)
1420 LET Tp7 = p7
1425 PRINT "This site has an Efficiency Rating of "; INT(Tp7 / 120.46 + .5)
1430 PRINT ""
1435 GOTO 25
1445 LET p8 = p / 8
1450 p8 = (2 * 410 * 3) + (2 * 325 * 1) + (2 * 505 * 1) + (2 * 350 * 1) + (2 *
490 * 1)
1455 LET Tp8 = p8
1460 PRINT "This site has an Efficiency Rating of "; INT(Tp8 / 120.46 + .5)
1465 PRINT " Remember the lower the Efficiency rating the better the site"
1468 GOTO 745
1475 LET p9 = p / 9
1480 p9 = (2 * 425 * 3) + (2 * 305 * 1) + (2 * 510 * 1) + (2 * 360 * 1) + (2 *
395 * 1)
1485 LET Tp9 = p9
1490 PRINT "This site has an Efficiency Rating of "; INT(Tp9 / 120.46 + .5)
1494 PRINT " Please try some other choice"

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1500 GOTO 560
1505 LET p10 = p / 10
1510 p10 = (2 * 450 * 3) + (2 * 315 * 1) + (2 * 500 * 1) + (2 * 380 * 1) + (2 *
360 * 1)
1515 LET Tp10 = p10
1520 PRINT "This site has an Efficiency Rating of "; INT(Tp10 / 120.46 + .5)
1525 PRINT ""
1530 GOTO 20
1535 LET p11 = p / 11
1540 p11 = (2 * 470 * 3) + (2 * 335 * 1) + (2 * 490 * 1) + (2 * 390 * 1) + (2 *
350 * 1)
1545 LET Tp11 = p11
1550 PRINT " This site has an Efficiency Rating of"; INT(Tp11 / 120.46 + .5)
1555 PRINT ""
1560 PRINT " This site is far from some of the resources"
1565 GOTO 745
1570 LET p12 = p / 12
1575 p12 = (2 * 490 * 3) + (2 * 340 * 1) + (2 * 470 * 1) + (2 * 400 * 1) + (2 *
340 * 1)
1580 LET Tp12 = p12
1585 PRINT " This site has an Efficiency Rating of"; INT(Tp12 / 120.46 + .5)
1590 GOTO 20
1600 LET p13 = p / 13
1605 p13 = (2 * 540 * 3) + (2 * 350 * 1) + (2 * 480 * 1) + (2 * 410 * 1) + (2 *
335 * 1)
1610 LET Tp13 = p13
1615 PRINT " This site has an Efficiency Rating of"; INT(Tp13 / 120.46 + .5)
1620 GOTO 695
1635 LET o2 = o / 2
1640 o2 = (2 * 435 * 3) + (2 * 370 * 1) + (2 * 515 * 1) + (2 * 300 * 1) + (2 *
430 * 1)
1645 LET To2 = o2
1650 PRINT " This site has an Efficiency Rating of"; INT(To2 / 120.46 + .5)
1655 GOTO 745
1670 LET o3 = o / 3
1675 o3 = (2 * 440 * 3) + (2 * 365 * 1) + (2 * 520 * 1) + (2 * 295 * 1) + (2 *
420 * 1)
1680 LET To3 = o3
1685 PRINT " This site has an Efficiency Rating of"; INT(To3 / 120.46 + .5)
1690 GOTO 6961
1700 LET o4 = o / 4
1705 o4 = (2 * 445 * 3) + (2 * 360 * 1) + (2 * 525 * 1) + (2 * 285 * 1) + (2 *
400 * 1)
1710 LET To4 = o4
1715 PRINT " This site has an Efficiency Rating of"; INT(To4 / 120.46 + .5)
1720 PRINT ""
1725 PRINT " Always make sure you are jotting the efficiency rating of each
site"
1726 PRINT "   before the system produces its best site."
1728 GOTO 20
1730 LET o5 = o / 5
1735 o5 = (2 * 450 * 3) + (2 * 350 * 1) + (2 * 525 * 1) + (2 * 285 * 1) + (2 *
400 * 1)
1740 LET To5 = o5
1745 PRINT " This site has an Efficiency Rating of"; INT(To5 / 120.46 + .5)
1750 PRINT ""
1755 GOTO 20
1760 LET o6 = o / 6
1765 o6 = (2 * 450 * 3) + (2 * 320 * 1) + (2 * 530 * 1) + (2 * 270 * 1) + (2 *
420 * 1)

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1770 LET To6 = o6
1775 PRINT " This site has an Efficiency Rating of"; INT(To6 / 120.46 + .5)
1780 PRINT ""
1785 GOTO 560
1790 LET o7 = o / 7
1795 o7 = (2 * 460 * 3) + (2 * 200 * 1) + (2 * 520 * 1) + (2 * 280 * 1) + (2 *
390 * 1)
1800 LET To7 = o7
1805 PRINT " This site has an Efficiency Rating of"; INT(To7 / 120.46 + .5)
1810 PRINT ""
1815 GOTO 6961
1820 LET o9 = o / 9
1825 o9 = (2 * 480 * 3) + (2 * 180 * 1) + (2 * 510 * 1) + (2 * 290 * 1) + (2 *
360 * 1)
1830 LET To9 = o9
1835 PRINT " This site has an Efficiency Rating of"; INT(To9 / 120.46 + .5)
1840 PRINT ""
1845 GOTO 1460
1850 LET o10 = o / 10
1855 o10 = (2 * 500 * 3) + (2 * 190 * 1) + (2 * 500 * 1) + (2 * 300 * 1) + (2 *
355 * 1)
1860 LET To10 = o10
1865 PRINT " This site has an Efficiency Rating of"; INT(To10 / 120.46 + .5)
1870 GOTO 1005
1880 LET o11 = o / 11
1885 o11 = (2 * 520 * 3) + (2 * 200 * 1) + (2 * 490 * 1) + (2 * 310 * 1) + (2 *
340 * 1)
1890 LET To11 = o11
1895 PRINT " This site has an Efficiency Rating of"; INT(To11 / 120.46 + .5)
1897 PRINT "Type in your choice"
1900 GOTO 25
1910 LET o12 = o / 12
1915 o12 = (2 * 550 * 3) + (2 * 220 * 1) + (2 * 480 * 1) + (2 * 320 * 1) + (2 *
290 * 1)
1920 LET To12 = o12
1925 PRINT " This site has an Efficiency Rating of"; INT(To12 / 120.46 + .5)
1926 PRINT ""
1928 PRINT " It measures the distance in millimetres on the map from the
point"
1930 PRINT " chosen to the nearest point of each resource and then doubles "
1931 PRINT " these distances to allow for the return journey."
1932 PRINT " It then multiplies the new distances by the number of visits in "
1933 PRINT " each case. It then adds up these distances to obtain a total."
1934 PRINT " The total is then converted into an Efficiency Rating for
simplicity."
1935 GOTO 560
1940 LET o13 = o / 13
1945 o13 = (2 * 560 * 3) + (2 * 230 * 1) + (2 * 490 * 1) + (2 * 330 * 1) + (2 *
300 * 1)
1950 LET To13 = o13
1955 PRINT " This site has an Efficiency Rating of"; INT(To13 / 120.46 + .5)
1960 GOTO 20
1970 LET n2 = n / 2
1975 n2 = (2 * 430 * 3) + (2 * 400 * 1) + (2 * 500 * 1) + (2 * 300 * 1) + (2 *
430 * 1)
1980 LET Tn2 = n2
1985 PRINT "This site has an Efficiency Rating of"; INT(Tn2 / 120.46 + .5)
1990 GOTO 695
2000 LET n3 = n / 3

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2005 n3 = (2 * 440 * 3) + (2 * 395 * 1) + (2 * 495 * 1) + (2 * 290 * 1) + (2 *
425 * 1)
2010 LET Tn3 = n3
2015 PRINT "This site has an Efficiency Rating of"; INT(Tn3 / 120.46 + .5)
2020 GOTO 1005
2030 LET n4 = n / 4
2035 n4 = (2 * 450 * 3) + (2 * 390 * 1) + (2 * 490 * 1) + (2 * 285 * 1) + (2 *
420 * 1)
2040 LET Tn4 = n4
2045 PRINT "This site has an Efficiency Rating of"; INT(Tn4 / 120.46 + .5)
2055 GOTO 475
2060 LET n5 = n / 5
2065 n5 = (2 * 455 * 3) + (2 * 385 * 1) + (2 * 485 * 1) + (2 * 270 * 1) + (2 *
410 * 1)
2070 LET Tn5 = n5
2075 PRINT "This site has an Efficiency Rating of"; INT(Tn5 / 120.46 + .5)
2080 GOTO 1897
2090 LET n6 = n / 6
2095 n6 = (2 * 460 * 3) + (2 * 380 * 1) + (2 * 480 * 1) + (2 * 260 * 1) + (2 *
400 * 1)
2100 LET Tn6 = n6
2105 PRINT "This site has an Efficiency Rating of"; INT(Tn6 / 120.46 + .5)
2110 GOTO 475
2125 LET n7 = n / 7
2130 n7 = (2 * 465 * 3) + (2 * 370 * 1) + (2 * 470 * 1) + (2 * 265 * 1) + (2 *
390 * 1)
2135 LET Tn7 = n7
2140 PRINT "This site has an Efficiency Rating of"; INT(Tn7 / 120.46 + .5)
2145 PRINT " Type in your new choice now"
2150 GOTO 25
2160 LET n8 = n / 8
2165 n8 = (2 * 475 * 3) + (2 * 360 * 1) + (2 * 460 * 1) + (2 * 275 * 1) + (2 *
385 * 1)
2170 LET Tn8 = n8
2175 PRINT "This site has an Efficiency Rating of"; INT(Tn8 / 120.46 + .5)
2180 GOTO 560
2190 LET n9 = n / 9
2195 n9 = (2 * 490 * 3) + (2 * 365 * 1) + (2 * 455 * 1) + (2 * 280 * 1) + (2 *
380 * 1)
2200 LET Tn9 = n9
2205 PRINT "This site has an Efficiency Rating of"; INT(Tn9 / 120.46 + .5)
2210 GOTO 20
2220 LET n10 = n / 10
2225 n10 = (2 * 500 * 3) + (2 * 370 * 1) + (2 * 450 * 1) + (2 * 290 * 1) + (2 *
370 * 1)
2230 LET Tn10 = n10
2235 PRINT "This site has an Efficiency Rating of"; INT(Tn10 / 120.46 + .5)
2300 PRINT " "
2305 PRINT " Bearing in mind this method,select another site.However, do not"
2307 PRINT " try to measure distance at this stage."
2309 GOTO 20
2310 LET n13 = n / 13
2315 n13 = (2 * 530 * 3) + (2 * 390 * 1) + (2 * 460 * 1) + (2 * 320 * 1) + (2 *
355 * 1)
2320 LET Tn13 = n13
2325 PRINT "This site has an Efficiency Rating of"; INT(Tn13 / 120.46 + .5)
2330 GOTO 475
2340 LET m2 = m / 2
2345 m2 = (2 * 420 * 3) + (2 * 395 * 1) + (2 * 495 * 1) + (2 * 295 * 1) + (2 *
435 * 1)

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2350 LET Tm2 = m2
2355 PRINT "This site has an Efficiency Rating of"; INT(Tm2 / 120.46 + .5)
2360 GOTO 745
2375 LET m3 = m / 3
2380 m3 = (2 * 425 * 3) + (2 * 390 * 1) + (2 * 490 * 1) + (2 * 290 * 1) + (2 *
430 * 1)
2385 LET Tm3 = m3
2390 PRINT "This site has an Efficiency Rating of"; INT(Tm3 / 120.46 + .5)
2400 GOTO 695
2410 LET m4 = m / 4
2415 m4 = (2 * 430 * 3) + (2 * 380 * 1) + (2 * 470 * 1) + (2 * 270 * 1) + (2 *
420 * 1)
2420 LET Tm4 = m4
2425 PRINT "This site has an Efficiency Rating of"; INT(Tm4 / 120.46 + .5)
2430 GOTO 6961
2450 LET m5 = m / 5
2455 m5 = (2 * 440 * 3) + (2 * 350 * 1) + (2 * 475 * 1) + (2 * 250 * 1) + (2 *
400 * 1)
2460 LET Tm5 = m5
2465 PRINT "This site has an Efficiency Rating of"; INT(Tm5 / 120.46 + .5)
2466 PRINT ""
2467 PRINT " If you follow this procedure with a number of sites, you will be
able"
2468 PRINT " to work out which will involve the least walking distance."
2470 GOTO 20
2480 LET m6 = m / 6
2485 m6 = (2 * 450 * 3) + (2 * 340 * 1) + (2 * 470 * 1) + (2 * 360 * 1) + (2 *
395 * 1)
2490 LET Tm6 = m6
2495 PRINT "This site has an Efficiency Rating of"; INT(Tm6 / 120.46 + .5)
2500 PRINT ""
2502 PRINT " Note: The shorter the distance the better the position"
2505 PRINT ""
2510 GOTO 25
2520 LET m7 = m / 7
2525 m5 = (2 * 460 * 3) + (2 * 320 * 1) + (2 * 464 * 1) + (2 * 370 * 1) + (2 *
390 * 1)
2530 LET Tm7 = m7
2535 PRINT "This site has an Efficiency Rating of"; INT(Tm7 / 120.46 + .5)
2540 GOTO 745
2550 LET m8 = m / 8
2555 m8 = (2 * 475 * 3) + (2 * 323 * 1) + (2 * 460 * 1) + (2 * 375 * 1) + (2 *
385 * 1)
2560 LET Tm8 = m8
2565 PRINT "This site has an Efficiency Rating of"; INT(Tm8 / 120.46 + .5)
2570 GOTO 560
2580 LET m9 = m / 9
2585 m9 = (2 * 480 * 3) + (2 * 326 * 1) + (2 * 450 * 1) + (2 * 380 * 1) + (2 *
380 * 1)
2590 LET Tm9 = m9
2595 PRINT "This site has an Efficiency Rating of"; INT(Tm9 / 120.46 + .5)
2600 GOTO 1897
2620 LET m10 = m / 10
2625 m10 = (2 * 490 * 3) + (2 * 327 * 1) + (2 * 448 * 1) + (2 * 386 * 1) + (2 *
374 * 1)
2630 LET Tm10 = m10
2635 PRINT "This site has an Efficiency Rating of"; INT(Tm10 / 120.46 + .5)
2640 GOTO 695
2650 LET m11 = m / 11

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2655 m11 = (2 * 496 * 3) + (2 * 330 * 1) + (2 * 441 * 1) + (2 * 390 * 1) + (2 *
370 * 1)
2660 LET Tm11 = m11
2665 PRINT "This site has an Efficiency Rating of"; INT(Tm11 / 120.46 + .5)
2670 GOTO 20
2680 LET m12 = m / 12
2685 m12 = (2 * 516 * 3) + (2 * 333 * 1) + (2 * 435 * 1) + (2 * 400 * 1) + (2 *
330 * 1)
2690 LET Tm12 = m12
2695 PRINT "This site has an Efficiency Rating of"; INT(Tm12 / 120.46 + .5)
2700 GOTO 6961
2710 LET m13 = m / 13
2715 m13 = (2 * 530 * 3) + (2 * 338 * 1) + (2 * 440 * 1) + (2 * 410 * 1) + (2 *
320 * 1)
2720 LET Tm13 = m13
2725 PRINT "This site has an Efficiency Rating of"; INT(Tm13 / 120.46 + .5)
2730 GOTO 560
2740 LET 12 = 1 / 2
2745 12 = (2 * 400 * 3) + (2 * 390 * 1) + (2 * 490 * 1) + (2 * 315 * 1) + (2 *
455 * 1)
2750 LET T12 = 12
2755 PRINT "This site has an Efficiency Rating of "; INT(T12 / 120.46 + .5)
2760 GOTO 20
2770 LET 13 = 1 / 3
2775 13 = (2 * 405 * 3) + (2 * 385 * 1) + (2 * 485 * 1) + (2 * 310 * 1) + (2 *
450 * 1)
2780 LET T13 = 13
2785 PRINT "This site has an Efficiency Rating of "; INT(T13 / 120.46 + .5)
2790 GOTO 475
2800 LET 14 = 1 / 4
2805 14 = (2 * 410 * 3) + (2 * 375 * 1) + (2 * 470 * 1) + (2 * 300 * 1) + (2 *
440 * 1)
2810 LET T14 = 14
2815 PRINT "This site has an Efficiency Rating of "; INT(T14 / 120.46 + .5)
2820 GOTO 1720
2830 LET 16 = 1 / 6
2835 16 = (2 * 420 * 3) + (2 * 350 * 1) + (2 * 460 * 1) + (2 * 290 * 1) + (2 *
435 * 1)
2840 LET T16 = 16
2845 PRINT "This site has an Efficiency Rating of "; INT(T16 / 120.46 + .5)
2850 GOTO 6961
2860 LET 17 = 1 / 7
2865 17 = (2 * 425 * 3) + (2 * 330 * 1) + (2 * 450 * 1) + (2 * 295 * 1) + (2 *
430 * 1)
2870 LET T17 = 17
2875 PRINT "This site has an Efficiency Rating of "; INT(T17 / 120.46 + .5)
2880 GOTO 20
2890 LET 18 = 1 / 8
2895 18 = (2 * 430 * 3) + (2 * 335 * 1) + (2 * 445 * 1) + (2 * 300 * 1) + (2 *
425 * 1)
2900 LET T18 = 18
2905 PRINT "This site has an Efficiency Rating of "; INT(T18 / 120.46 + .5)
2910 GOTO 560
2925 LET 19 = 1 / 9
2930 19 = (2 * 435 * 3) + (2 * 320 * 1) + (2 * 440 * 1) + (2 * 305 * 1) + (2 *
420 * 1)
2935 LET T19 = 19
2940 PRINT "This site has an Efficiency Rating of "; INT(T19 / 120.46 + .5)
2950 GOTO 475
2960 LET 110 = 1 / 10

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2965 110 = (2 * 440 * 3) + (2 * 325 * 1) + (2 * 425 * 1) + (2 * 315 * 1) + (2 *
405 * 1)
2970 LET T110 = 110
2975 PRINT "This site has an Efficiency Rating of "; INT(T110 / 120.46 + .5)
2980 GOTO 1897
2990 LET 111 = 1 / 11
2995 111 = (2 * 450 * 3) + (2 * 330 * 1) + (2 * 430 * 1) + (2 * 335 * 1) + (2 *
390 * 1)
3000 LET T111 = 111
3005 PRINT "This site has an Efficiency Rating of "; INT(T111 / 120.46 + .5)
3010 GOTO 20
3025 LET 113 = 1 / 13
3030 113 = (2 * 455 * 3) + (2 * 340 * 1) + (2 * 450 * 1) + (2 * 340 * 1) + (2 *
350 * 1)
3035 LET T113 = 113
3040 PRINT "This site has an Efficiency Rating of "; INT(T113 / 120.46 + .5)
3050 GOTO 6961
3055 LET k2 = k / 2
3060 k2 = (2 * 395 * 3) + (2 * 375 * 1) + (2 * 475 * 1) + (2 * 330 * 1) + (2 *
475 * 1)
3065 LET Tk2 = k2
3070 PRINT "This site has an Efficiency Rating of "; INT(Tk2 / 120.46 + .5)
3080 GOTO 475
3090 LET k3 = k / 3
3095 k3 = (2 * 400 * 3) + (2 * 365 * 1) + (3)
3100 LET Tk3 = k3
3105 PRINT "This site has an Efficiency Rating of "; INT(Tk3 / 120.46 + .5)
3110 GOTO 1897
3120 LET k4 = k / 4
3125 k4 = (2 * 405 * 3) + (2 * 350 * 1) + (2 * 465 * 1) + (2 * 315 * 1) + (2 *
460 * 1)
3130 LET Tk4 = k4
3135 PRINT "This site has an Efficiency Rating of "; INT(Tk4 / 120.46 + .5)
3140 GOTO 1720
3155 LET k5 = k / 5
3160 k5 = (2 * 410 * 3) + (2 * 345 * 1) + (2 * 445 * 1) + (2 * 300 * 1) + (2 *
430 * 1)
3165 LET Tk5 = k5
3170 PRINT "This site has an Efficiency Rating of "; INT(Tk5 / 120.46 + .5)
3180 GOTO 1926
3185 LET k6 = k / 6
3190 k6 = (2 * 420 * 3) + (2 * 330 * 1) + (2 * 435 * 1) + (2 * 290 * 1) + (2 *
420 * 1)
3195 LET Tk6 = k6
3200 PRINT "This site has an Efficiency Rating of "; INT(Tk6 / 120.46 + .5)
3210 GOTO 560
3220 LET k7 = k / 7
3225 k7 = (2 * 425 * 3) + (2 * 325 * 1) + (2 * 425 * 1) + (2 * 300 * 1) + (2 *
415 * 1)
3230 LET Tk7 = k7
3235 PRINT "This site has an Efficiency Rating of "; INT(Tk7 / 120.46 + .5)
3240 GOTO 20
3250 LET k8 = k / 8
3255 k8 = (2 * 420 * 3) + (2 * 320 * 1) + (2 * 420 * 1) + (2 * 320 * 1) + (2 *
410 * 1)
3260 LET Tk8 = k8
3265 PRINT "This site has an Efficiency Rating of "; INT(Tk8 / 120.46 + .5)
3270 GOTO 475
3280 LET k9 = k / 9

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3285 k9 = (2 * 417 * 3) + (2 * 304 * 1) + (2 * 419 * 1) + (2 * 314 * 1) + (2 *
406 * 1)
3290 LET Tk9 = k9
3295 PRINT "This site has an Efficiency Rating of "; INT(Tk9 / 120.46 + .5)
3300 GOTO 6961
3310 LET k10 = k / 10
3315 k10 = (2 * 426 * 3) + (2 * 308 * 1) + (2 * 418 * 1) + (2 * 326 * 1) + (2 *
394 * 1)
3320 LET Tk10 = k10
3325 PRINT "This site has an Efficiency Rating of "; INT(Tk10 / 120.46 + .5)
3330 GOTO 1720
3340 LET k11 = k / 11
3345 k11 = (2 * 436 * 3) + (2 * 304 * 1) + (2 * 407 * 1) + (2 * 332 * 1) + (2 *
379 * 1)
3350 LET Tk11 = k11
3355 PRINT "This site has an Efficiency Rating of "; INT(Tk11 / 120.46 + .5)
3360 GOTO 475
3370 LET k12 = k / 12
3375 k12 = (2 * 447 * 3) + (2 * 362 * 1) + (2 * 400 * 1) + (2 * 372 * 1) + (2 *
350 * 1)
3380 LET Tk12 = k12
3385 PRINT "This site has an Efficiency Rating of "; INT(Tk12 / 120.46 + .5)
3390 GOTO 1897
3400 LET k13 = k / 13
3405 k13 = (2 * 490 * 3) + (2 * 372 * 1) + (2 * 405 * 1) + (2 * 381 * 1) + (2 *
340 * 1)
3410 LET Tk13 = k13
3415 PRINT "This site has an Efficiency Rating of "; INT(Tk13 / 120.46 + .5)
3420 GOTO 560
3430 LET j2 = j / 2
3435 j2 = (2 * 380 * 3) + (2 * 390 * 1) + (2 * 450 * 1) + (2 * 345 * 1) + (2 *
465 * 1)
3440 LET Tj2 = j2
3445 PRINT "This site has an Efficiency Rating of"; INT(Tj2 / 120.46 + .5)
3450 GOTO 1720
3460 LET j3 = j / 3
3465 j3 = (2 * 385 * 3) + (2 * 385 * 1) + (2 * 445 * 1) + (2 * 340 * 1) + (2 *
460 * 1)
3470 LET Tj3 = j3
3475 PRINT "This site has an Efficiency Rating of"; INT(Tj3 / 120.46 + .5)
3480 GOTO 20
3485 LET j4 = j / 4
3490 j4 = (2 * 390 * 3) + (2 * 370 * 1) + (2 * 435 * 1) + (2 * 330 * 1) + (2 *
445 * 1)
3495 LET Tj4 = j4
3500 PRINT "This site has an Efficiency Rating of"; INT(Tj4 / 120.46 + .5)
3510 GOTO 1897
3515 LET j5 = j / 5
3520 j5 = (2 * 395 * 3) + (2 * 362 * 1) + (2 * 422 * 1) + (2 * 321 * 1) + (2 *
437 * 1)
3525 LET Tj5 = j5
3530 PRINT "This site has an Efficiency Rating of"; INT(Tj5 / 120.46 + .5)
3540 GOTO 1926
3545 LET j6 = j / 6
3550 j6 = (2 * 401 * 3) + (2 * 343 * 1) + (2 * 413 * 1) + (2 * 302 * 1) + (2 *
422 * 1)
3555 LET Tj6 = j6
3560 PRINT "This site has an Efficiency Rating of"; INT(Tj6 / 120.46 + .5)
3570 GOTO 20
3580 LET j7 = j / 7

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3585 j7 = (2 * 408 * 3) + (2 * 327 * 1) + (2 * 408 * 1) + (2 * 297 * 1) + (2 *
406 * 1)
3590 LET Tj7 = j7
3595 PRINT "This site has an Efficiency Rating of"; INT(Tj7 / 120.46 + .5)
3600 GOTO 6961
3610 LET j8 = j / 8
3615 j8 = (2 * 416 * 3) + (2 * 318 * 1) + (2 * 400 * 1) + (2 * 300 * 1) + (2 *
394 * 1)
3620 LET Tj8 = j8
3625 PRINT "This site has an Efficiency Rating of"; INT(Tj8 / 120.46 + .5)
3630 GOTO 20
3640 LET j9 = j / 9
3645 j9 = (2 * 426 * 3) + (2 * 304 * 1) + (2 * 401 * 1) + (2 * 309 * 1) + (2 *
389 * 1)
3650 LET Tj9 = j9
3655 PRINT "This site has an Efficiency Rating of"; INT(Tj9 / 120.46 + .5)
3660 GOTO 1897
3675 LET j10 = j / 10
3680 j10 = (2 * 233 * 3) + (2 * 308 * 1) + (2 * 392 * 1) + (2 * 312 * 1) + (2 *
371 * 1)
3685 LET Tj10 = j10
3690 PRINT "This site has an Efficiency Rating of"; INT(Tj10 / 120.46 + .5)
3700 GOTO 475
3705 LET j11 = j / 11
3710 j11 = (2 * 441 * 3) + (2 * 312 * 1) + (2 * 384 * 1) + (2 * 326 * 1) + (2 *
336 * 1)
3715 LET Tj11 = j11
3720 PRINT "This site has an Efficiency Rating of"; INT(Tj11 / 120.46 + .5)
3730 GOTO 560
3740 LET j12 = j / 12
3745 j12 = (2 * 453 * 3) + (2 * 325 * 1) + (2 * 391 * 1) + (2 * 333 * 1) + (2 *
320 * 1)
3750 LET Tj12 = j12
3755 PRINT "This site has an Efficiency Rating of"; INT(Tj12 / 120.46 + .5)
3760 GOTO 1897
3770 LET j13 = j / 13
3775 j13 = (2 * 465 * 3) + (2 * 329 * 1) + (2 * 400 * 1) + (2 * 338 * 1) + (2 *
322 * 1)
3780 LET Tj13 = j13
3785 PRINT "This site has an Efficiency Rating of"; INT(Tj13 / 120.46 + .5)
3790 GOTO 1720
3795 LET i2 = I / 2
3800 i2 = (2 * 355 * 3) + (2 * 395 * 1) + (2 * 435 * 1) + (2 * 330 * 1) + (2 *
395 * 1)
3805 LET Ti2 = i2
3810 PRINT "This site has an Efficiency Rating of"; INT(Ti2 / 120.46 + .5)
3815 GOTO 6961
3820 LET i3 = I / 3
3825 i3 = (2 * 350 * 3) + (2 * 390 * 1) + (2 * 425 * 1) + (2 * 325 * 1) + (2 *
390 * 1)
3830 LET Ti3 = i3
3835 PRINT "This site has an Efficiency Rating of"; INT(Ti3 / 120.46 + .5)
3840 GOTO 20
3850 LET i4 = I / 4
3855 i4 = (2 * 360 * 3) + (2 * 385 * 1) + (2 * 415 * 1) + (2 * 320 * 1) + (2 *
385 * 1)
3860 LET Ti4 = i4
3865 PRINT "This site has an Efficiency Rating of"; INT(Ti4 / 120.46 + .5)
3870 GOTO 475
3875 LET i5 = I / 5

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3880 i5 = (2 * 365 * 3) + (2 * 363 * 1) + (2 * 406 * 1) + (2 * 314 * 1) + (2 *
378 * 1)
3885 LET Ti5 = i5
3890 PRINT "This site has an Efficiency Rating of"; INT(Ti5 / 120.46 + .5)
3895 GOTO 1926
3900 LET i6 = I / 6
3905 i6 = (2 * 381 * 3) + (2 * 351 * 1) + (2 * 392 * 1) + (2 * 302 * 1) + (2 *
366 * 1)
3910 LET Ti6 = i6
3915 PRINT "This site has an Efficiency Rating of"; INT(Ti6 / 120.46 + .5)
3920 GOTO 475
3930 LET i7 = I / 7
3935 i7 = (2 * 387 * 3) + (2 * 347 * 1) + (2 * 381 * 1) + (2 * 312 * 1) + (2 *
351 * 1)
3940 LET Ti7 = i7
3945 PRINT "This site has an Efficiency Rating of"; INT(Ti7 / 120.46 + .5)
3950 GOTO 1720
3955 LET i8 = I / 8
3960 i8 = (2 * 385 * 3) + (2 * 335 * 1) + (2 * 385 * 1) + (2 * 322 * 1) + (2 *
348 * 1)
3965 LET Ti8 = i8
3970 PRINT "This site has an Efficiency Rating of"; INT(Ti8 / 120.46 + .5)
3975 GOTO 1926
3980 LET i9 = I / 9
3985 i9 = (2 * 396 * 3) + (2 * 324 * 1) + (2 * 373 * 1) + (2 * 314 * 1) + (2 *
329 * 1)
3990 LET Ti9 = i9
3995 PRINT "This site has an Efficiency Rating of"; INT(Ti9 / 120.46 + .5)
4000 GOTO 475
4005 LET i10 = I / 10
4010 i10 = (2 * 408 * 3) + (2 * 346 * 1) + (2 * 367 * 1) + (2 * 338 * 1) + (2 *
307 * 1)
4015 LET Ti10 = i10
4020 PRINT "This site has an Efficiency Rating of"; INT(Ti10 / 120.46 + .5)
4030 GOTO 20
4035 LET i11 = I / 11
4040 i11 = (2 * 416 * 3) + (2 * 352 * 1) + (2 * 361 * 1) + (2 * 348 * 1) + (2 *
301 * 1)
4045 LET Ti11 = i11
4050 PRINT "This site has an Efficiency Rating of"; INT(Ti11 / 120.46 + .5)
4060 GOTO 475
4070 LET i12 = I / 12
4075 i12 = (2 * 422 * 3) + (2 * 358 * 1) + (2 * 350 * 1) + (2 * 358 * 1) + (2 *
300 * 1)
4080 LET Ti12 = i12
4085 PRINT "This site has an Efficiency Rating of"; INT(Ti12 / 120.46 + .5)
4090 GOTO 6961
4100 LET i13 = I / 13
4105 i13 = (2 * 435 * 3) + (2 * 364 * 1) + (2 * 340 * 1) + (2 * 368 * 1) + (2 *
295 * 1)
4110 LET Ti13 = i13
4115 PRINT "This site has an Efficiency Rating of"; INT(Ti13 / 120.46 + .5)
4120 GOTO 1720
4130 LET h2 = h / 2
4135 h2 = (2 * 353 * 3) + (2 * 402 * 1) + (2 * 431 * 1) + (2 * 338 * 1) + (2 *
407 * 1)
4140 LET Th2 = h2
4145 PRINT "This site has an Efficiency Rating of"; INT(Th2 / 120.46 + .5)
4150 GOTO 20
4165 LET h3 = h / 3

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4170 h3 = (2 * 357 * 3) + (2 * 417 * 1) + (2 * 428 * 1) + (2 * 329 * 1) + (2 *
401 * 1)
4175 LET Th3 = h3
4180 PRINT "This site has an Efficiency Rating of"; INT(Th3 / 120.46 + .5)
4185 GOTO 560
4195 LET h4 = h / 4
4200 h4 = (2 * 352 * 3) + (2 * 408 * 1) + (2 * 416 * 1) + (2 * 318 * 1) + (2 *
397 * 1)
4205 LET Th4 = h4
4210 PRINT "This site has an Efficiency Rating of"; INT(Th4 / 120.46 + .5)
4215 GOTO 475
4225 LET h5 = h / 5
4230 h5 = (2 * 368 * 3) + (2 * 400 * 1) + (2 * 410 * 1) + (2 * 309 * 1) + (2 *
385 * 1)
4235 LET Th5 = h5
4240 PRINT "This site has an Efficiency Rating of"; INT(Th5 / 120.46 + .5)
4245 GOTO 6961
4250 LET h6 = h / 6
4255 h6 = (2 * 372 * 3) + (2 * 394 * 1) + (2 * 402 * 1) + (2 * 300 * 1) + (2 *
381 * 1)
4260 LET Th6 = h6
4265 PRINT "This site has an Efficiency Rating of"; INT(Th6 / 120.46 + .5)
4270 GOTO 1720
4280 LET h7 = h / 7
4285 h7 = (2 * 301 * 3) + (2 * 351 * 1) + (2 * 332 * 1) + (2 * 301 * 1) + (2 *
321 * 1)
4290 LET Th7 = h7
4295 PRINT "This site has an Efficiency Rating of"; INT(Th7 / 120.46 + .5)
4297 PRINT ""
4300 PRINT "This site is the best site among all others that you have chosen"
4305 PRINT ""
4307 GOTO 560
4310 LET h8 = h / 8
4315 h8 = (2 * 388 * 3) + (2 * 372 * 1) + (2 * 364 * 1) + (2 * 335 * 1) + (2 *
363 * 1)
4320 LET Th8 = h8
4325 PRINT "This site has an Efficiency Rating of"; INT(Th8 / 120.46 + .5)
4330 PRINT "This position is far better than others"
4333 GOTO 560
4340 LET h9 = h / 9
4345 h9 = (2 * 404 * 3) + (2 * 360 * 1) + (2 * 353 * 1) + (2 * 351 * 1) + (2 *
355 * 1)
4350 LET Th9 = h9
4355 PRINT "This site has an Efficiency Rating of"; INT(Th9 / 120.46 + .5)
4360 PRINT " "
4365 PRINT " type in another site now"
4366 GOTO 25
4370 LET h10 = h / 10
4375 h10 = (2 * 416 * 3) + (2 * 368 * 1) + (2 * 341 * 1) + (2 * 368 * 1) + (2 *
341 * 1)
4380 LET Th10 = h10
4385 PRINT "This site has an Efficiency Rating of"; INT(Th10 / 120.46 + .5)
4390 GOTO 20
4400 LET h11 = h / 11
4405 h11 = (2 * 426 * 3) + (2 * 374 * 1) + (2 * 337 * 1) + (2 * 372 * 1) + (2 *
332 * 1)
4410 LET Th11 = h11
4415 PRINT "This site has an Efficiency Rating of"; INT(Th11 / 120.46 + .5)
4420 GOTO 475
4425 LET h12 = h / 12

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4430 h12 = (2 * 430 * 3) + (2 * 365 * 1) + (2 * 330 * 1) + (2 * 380 * 1) + (2 *
322 * 1)
4435 LET Th12 = h12
4440 PRINT "This site has an Efficiency Rating of"; INT(Th12 / 120.46 + .5)
4445 GOTO 1897
4455 LET h13 = h / 13
4460 h13 = (2 * 436 * 3) + (2 * 369 * 1) + (2 * 322 * 1) + (2 * 384 * 1) + (2 *
311 * 1)
4465 LET Th13 = h13
4470 PRINT "This site has an Efficiency Rating of"; INT(Th13 / 120.46 + .5)
4475 GOTO 745
4485 LET g2 = g / 2
4490 g2 = (2 * 337 * 3) + (2 * 391 * 1) + (2 * 400 * 1) + (2 * 320 * 1) + (2 *
391 * 1)
4495 LET Tg2 = g2
4500 PRINT "This site has an Efficiency Rating of"; INT(Tg2 / 120.46 + .5)
4505 GOTO 695
4510 LET g3 = g / 3
4515 g3 = (2 * 345 * 3) + (2 * 386 * 1) + (2 * 394 * 1) + (2 * 313 * 1) + (2 *
387 * 1)
4520 LET Tg3 = g3
4525 PRINT "This site has an Efficiency Rating of"; INT(Tg3 / 120.46 + .5)
4530 GOTO 6961
4535 LET g6 = g / 6
4540 g6 = (2 * 361 * 3) + (2 * 380 * 1) + (2 * 368 * 1) + (2 * 292 * 1) + (2 *
368 * 1)
4545 LET Tg6 = g6
4550 PRINT "This site has an Efficiency Rating of"; INT(Tg6 / 120.46 + .5)
4555 GOTO 1897
4560 LET g7 = g / 7
4565 g7 = (2 * 367 * 3) + (2 * 384 * 1) + (2 * 363 * 1) + (2 * 285 * 1) + (2 *
365 * 1)
4570 LET Tg7 = g7
4575 PRINT "This site has an Efficiency Rating of"; INT(Tg7 / 120.46 + .5)
4580 GOTO 560
4590 LET g8 = g / 8
4595 g8 = (2 * 305 * 3) + (2 * 240 * 1) + (2 * 206 * 1) + (2 * 205 * 1) + (2 *
260 * 1)
4600 LET Tg8 = g8
4605 PRINT "This site has an Efficiency Rating of"; INT(Tg8 / 120.46 + .5)
4610 PRINT " There is no site as good as this. Infact this is the best site so
far"
4612 PRINT " among all the rest sites."
4613 PRINT " Its Efficiency Rating is very low."
4615 PRINT " Note: The lower the Efficiency rating the better the site"
4618 GOTO 6961
4620 LET g9 = g / 9
4625 g9 = (2 * 384 * 3) + (2 * 398 * 1) + (2 * 355 * 1) + (2 * 312 * 1) + (2 *
356 * 1)
4630 LET Tg9 = g9
4635 PRINT "This site has an Efficiency Rating of"; INT(Tg9 / 120.46 + .5)
4640 GOTO 560
4650 LET g10 = g / 10
4655 g10 = (2 * 395 * 3) + (2 * 400 * 1) + (2 * 350 * 1) + (2 * 320 * 1) + (2 *
352 * 1)
4660 LET Tg10 = g10
4665 PRINT "This site has an Efficiency Rating of"; INT(Tg10 / 120.46 + .5)
4670 GOTO 20
4680 LET g11 = g / 11

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4685 g11 = (2 * 405 * 3) + (2 * 407 * 1) + (2 * 346 * 1) + (2 * 335 * 1) + (2 *
349 * 1)
4690 LET Tg11 = g11
4695 PRINT "This site has an Efficiency Rating of"; INT(Tg11 / 120.46 + .5)
4700 GOTO 475
4710 LET g12 = g / 12
4715 g12 = (2 * 415 * 3) + (2 * 413 * 1) + (2 * 330 * 1) + (2 * 350 * 1) + (2 *
333 * 1)
4720 LET Tg12 = g12
4725 PRINT "This site has an Efficiency Rating of"; INT(Tg12 / 120.46 + .5)
4730 GOTO 1005
4740 LET g13 = g / 13
4745 g13 = (2 * 425 * 3) + (2 * 417 * 1) + (2 * 312 * 1) + (2 * 370 * 1) + (2 *
314 * 1)
4750 LET Tg13 = g13
4755 PRINT "This site has an Efficiency Rating of"; INT(Tg13 / 120.46 + .5)
4760 GOTO 745
4765 LET g4 = g / 4
4770 g4 = (2 * 351 * 3) + (2 * 372 * 1) + (2 * 386 * 1) + (2 * 303 * 1) + (2 *
375 * 1)
4775 LET Tg4 = g4
4780 PRINT "This site has an Efficiency Rating of"; INT(Tg4 / 120.46 + .5)
4785 GOTO 6961
4795 LET g5 = g / 5
4800 g5 = (2 * 358 * 3) + (2 * 379 * 1) + (2 * 371 * 1) + (2 * 297 * 1) + (2 *
370 * 1)
4805 LET Tg5 = g5
4810 PRINT "This site has an Efficiency Rating of"; INT(Tg5 / 120.46 + .5)
4820 GOTO 560
4825 LET f2 = F / 2
4830 f2 = (2 * 320 * 3) + (2 * 425 * 1) + (2 * 410 * 1) + (2 * 345 * 1) + (2 *
440 * 1)
4835 LET Tf2 = f2
4840 PRINT "This site has an Efficiency Rating of"; INT(Tf2 / 1207.46 + .5)
4850 GOTO 20
4855 LET f3 = F / 3
4860 f3 = (2 * 317 * 3) + (2 * 421 * 1) + (2 * 403 * 1) + (2 * 334 * 1) + (2 *
431 * 1)
4865 LET Tf3 = f3
4870 PRINT "This site has an Efficiency Rating of"; INT(Tf3 / 1207.46 + .5)
4875 GOTO 695
4885 LET f4 = F / 4
4890 f4 = (2 * 319 * 3) + (2 * 417 * 1) + (2 * 395 * 1) + (2 * 330 * 1) + (2 *
428 * 1)
4895 LET Tf4 = f4
4900 PRINT "This site has an Efficiency Rating of"; INT(Tf4 / 1207.46 + .5)
4910 GOTO 745
4915 LET f5 = F / 5
4920 f5 = (2 * 325 * 3) + (2 * 410 * 1) + (2 * 390 * 1) + (2 * 335 * 1) + (2 *
423 * 1)
4925 LET Tf5 = f5
4930 PRINT "This site has an Efficiency Rating of"; INT(Tf5 / 1207.46 + .5)
4940 GOTO 1897
4950 LET f6 = F / 6
4955 f6 = (2 * 335 * 3) + (2 * 403 * 1) + (2 * 382 * 1) + (2 * 327 * 1) + (2 *
417 * 1)
4960 LET Tf6 = f6
4965 PRINT "This site has an Efficiency Rating of"; INT(Tf6 / 1207.46 + .5)
4970 GOTO 560
4980 LET f7 = F / 7

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5010 GOTO 475
5015 f8 = F / 8
400 * 1)
5020 LET Tf8 = f8
5025 PRINT "This site has an Efficiency Rating of"; INT(Tf7 / 1207.46 + .5)
5030 GOTO 1005
5040 LET f9 = F / 9
5045 f9 = (2 * 362 * 3) + (2 * 385 * 1) + (2 * 371 * 1) + (2 * 345 * 1) + (2 *
393 * 1)
5050 LET Tf9 = f9
5055 PRINT "This site has an Efficiency Rating of"; INT(Tf8 / 1207.46 + .5)
5060 GOTO 20
5070 LET f10 = F / 10
5075 f10 = (2 * 374 * 3) + (2 * 380 * 1) + (2 * 367 * 1) + (2 * 350 * 1) + (2 *
380 * 1)
5080 LET Tf10 = f10
5085 PRINT "This site has an Efficiency Rating of"; INT(Tf9 / 1207.46 + .5)
5090 GOTO 1897
5100 LET f11 = F / 11
5105 f11 = (2 * 384 * 3) + (2 * 388 * 1) + (2 * 361 * 1) + (2 * 360 * 1) + (2 *
370 * 1)
5110 LET Tf11 = f11
5115 PRINT "This site has an Efficiency Rating of"; INT(Tf10 / 1207.46 + .5)
5120 GOTO 1897
5130 LET f12 = F / 12
5135 f12 = (2 * 394 * 3) + (2 * 3 * 1) + (2 * 341 * 1) + (2 * 376 * 1) + (2 *
51 * 1)
5140 LET Tf12 = f12
5145 PRINT "This site has an Efficiency Rating of"; INT(Tf11 / 1207.46 + .5)
5150 GOTO 6961
5165 LET f13 = F / 13
5170 f13 = (2 * 404 * 3) + (2 * 403 * 1) + (2 * 331 * 1) + (2 * 386 * 1) + (2 *
1 * 1)
5175 LET Tf13 = f13
5180 PRINT "This site has an Efficiency Rating of"; INT(Tf12 / 1207.46 + .5)
5190 GOTO 560
5200 LET e2 = e / 2
5205 e2 = (2 * 307 * 3) + (2 * 416 * 1) + (2 * 404 * 1) + (2 * 363 * 1) + (2 *
6 * 1)
5210 LET Te2 = e2
5215 PRINT "This site has an Efficiency Rating of "; INT(Te2 / 120.46 + .5)
5220 GOTO 20
5230 LET e3 = e / 3
5235 e3 = (2 * 314 * 3) + (2 * 410 * 1) + (2 * 400 * 1) + (2 * 358 * 1) + (2 *
0 * 1)
5240 LET Te3 = e3
5245 PRINT "This site has an Efficiency Rating of "; INT(Te3 / 120.46 + .5)
5250 GOTO 475
5260 LET e4 = e
5265 e4 = (2 * 3 * 3) + (2 * 403 * 1) + (2 * 391 * 1) + (2 * 350 * 1) + (2 *
385 * 1)
5270 LET Te4 = e4
5275 PRINT "This site has an Efficiency Rating of "; INT(Te4 / 120.46 + .5)
5280 GOTO 172
5290 LET e5

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5295 e5 = (2 * 328 * 3) + (2 * 397 * 1) + (2 * 386 * 1) + (2 * 345 * 1) + (2 *
385 * 1)
5300 LET Te5 = e5
5305 PRINT "This site has an Efficiency Rating of "; INT(Te5 / 120.46 + .5)
5310 GOTO 1926
5320 LET e6 = e / 6
5325 e6 = (2 * 335 * 3) + (2 * 392 * 1) + (2 * 386 * 1) + (2 * 337 * 1) + (2 *
380 * 1)
5330 LET Te6 = e6
5335 PRINT "This site has an Efficiency Rating of "; INT(Te6 / 120.46 + .5)
5340 GOTO 6961
5350 LET e7 = e / 7
5355 e7 = (2 * 341 * 3) + (2 * 386 * 1) + (2 * 380 * 1) + (2 * 330 * 1) + (2 *
370 * 1)
5360 LET Te7 = e7
5365 PRINT "This site has an Efficiency Rating of "; INT(Te7 / 120.46 + .5)
5370 GOTO 20
5385 LET e8 = e / 8
5390 e8 = (2 * 348 * 3) + (2 * 380 * 1) + (2 * 375 * 1) + (2 * 340 * 1) + (2 *
360 * 1)
5395 LET Te8 = e8
5400 PRINT "This site has an Efficiency Rating of "; INT(Te8 / 120.46 + .5)
5410 GOTO 1897
5415 LET e9 = e / 9
5420 e9 = (2 * 356 * 3) + (2 * 375 * 1) + (2 * 370 * 1) + (2 * 345 * 1) + (2 *
355 * 1)
5425 LET Te9 = e9
5430 PRINT "This site has an Efficiency Rating of "; INT(Te9 / 120.46 + .5)
5440 GOTO 560
5445 LET e10 = e / 10
5450 e10 = (2 * 361 * 3) + (2 * 370 * 1) + (2 * 365 * 1) + (2 * 351 * 1) + (2 *
347 * 1)
5455 LET Te10 = e10
5460 PRINT "This site has an Efficiency Rating of "; INT(Te10 / 120.46 + .5)
5465 GOTO 475
5470 LET e11 = e / 11
5475 e11 = (2 * 368 * 3) + (2 * 384 * 1) + (2 * 335 * 1) + (2 * 371 * 1) + (2 *
340 * 1)
5480 LET Te11 = e11
5485 PRINT "This site has an Efficiency Rating of "; INT(Te11 / 120.46 + .5)
5490 GOTO 1720
5500 LET e12 = e / 12
5505 e12 = (2 * 377 * 3) + (2 * 390 * 1) + (2 * 330 * 1) + (2 * 376 * 1) + (2 *
335 * 1)
5510 LET Te12 = e12
5515 PRINT "This site has an Efficiency Rating of "; INT(Te12 / 120.46 + .5)
5520 GOTO 6961
5530 LET e13 = e / 13
5535 e13 = (2 * 385 * 3) + (2 * 400 * 1) + (2 * 336 * 1) + (2 * 382 * 1) + (2 *
345 * 1)
5540 LET Te13 = e13
5545 PRINT "This site has an Efficiency Rating of "; INT(Te13 / 120.46 + .5)
5550 GOTO 20
5560 LET d2 = d / 2
5565 d2 = (2 * 300 * 3) + (2 * 416 * 1) + (2 * 400 * 1) + (2 * 370 * 1) + (2 *
400 * 1)
5570 LET Td2 = d2
5575 PRINT "This site has an Efficiency Rating of"; INT(Td2 / 120.46 + .5)
5580 GOTO 1897
5590 LET d3 = d / 3

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5595 d3 = (2 * 307 * 3) + (2 * 410 * 1) + (2 * 395 * 1) + (2 * 366 * 1) + (2 *
394 * 1)
5600 LET Td3 = d3
5605 PRINT "This site has an Efficiency Rating of"; INT(Td3 / 120.46 + .5)
5610 GOTO 560
5620 LET d4 = d / 4
5625 d4 = (2 * 315 * 3) + (2 * 406 * 1) + (2 * 390 * 1) + (2 * 360 * 1) + (2 *
394 * 1)
5630 LET Td4 = d4
5635 PRINT "This site has an Efficiency Rating of"; INT(Td4 / 120.46 + .5)
5640 GOTO 475
5655 LET d5 = d / 5
5660 d5 = (2 * 321 * 3) + (2 * 400 * 1) + (2 * 383 * 1) + (2 * 354 * 1) + (2 *
390 * 1)
5665 LET Td5 = d5
5670 PRINT "This site has an Efficiency Rating of"; INT(Td5 / 120.46 + .5)
5680 GOTO 1926
5685 LET d6 = d / 6
5690 d6 = (2 * 329 * 3) + (2 * 395 * 1) + (2 * 380 * 1) + (2 * 348 * 1) + (2 *
382 * 1)
5700 LET Td6 = d6
5705 PRINT "This site has an Efficiency Rating of"; INT(Td6 / 120.46 + .5)
5710 GOTO 20
5725 LET d7 = d / 7
5730 d7 = (2 * 338 * 3) + (2 * 389 * 1) + (2 * 375 * 1) + (2 * 340 * 1) + (2 *
370 * 1)
5735 LET Td7 = d7
5740 PRINT "This site has an Efficiency Rating of"; INT(Td7 / 120.46 + .5)
5750 GOTO 6961
5755 LET d8 = d / 8
5760 d8 = (2 * 330 * 3) + (2 * 381 * 1) + (2 * 370 * 1) + (2 * 335 * 1) + (2 *
370 * 1)
5765 LET Td8 = d8
5770 PRINT "This site has an Efficiency Rating of"; INT(Td8 / 120.46 + .5)
5775 GOTO 475
5785 LET d9 = d / 9
5790 d9 = (2 * 340 * 3) + (2 * 374 * 1) + (2 * 364 * 1) + (2 * 338 * 1) + (2 *
363 * 1)
5795 LET Td9 = d9
5800 PRINT "This site has an Efficiency Rating of"; INT(Td9 / 120.46 + .5)
5810 GOTO 1926
5815 LET d10 = d / 10
5820 d10 = (2 * 351 * 3) + (2 * 378 * 1) + (2 * 358 * 1) + (2 * 348 * 1) + (2 *
354 * 1)
5825 LET Td10 = d10
5830 PRINT "This site has an Efficiency Rating of"; INT(Td10 / 120.46 + .5)
5840 GOTO 1897
5850 LET d11 = d / 11
5855 d11 = (2 * 362 * 3) + (2 * 388 * 1) + (2 * 346 * 1) + (2 * 349 * 1) + (2 *
343 * 1)
5860 LET Td11 = d11
5865 PRINT "This site has an Efficiency Rating of"; INT(Td11 / 120.46 + .5)
5870 GOTO 20
5880 LET d12 = d / 12
5885 d12 = (2 * 373 * 3) + (2 * 398 * 1) + (2 * 332 * 1) + (2 * 369 * 1) + (2 *
333 * 1)
5890 LET Td12 = d12
5895 PRINT "This site has an Efficiency Rating of"; INT(Td12 / 120.46 + .5)
5900 GOTO 560
5905 LET d13 = d / 13

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5910 d13 = (2 * 383 * 3) + (2 * 408 * 1) + (2 * 335 * 1) + (2 * 379 * 1) + (2 *
343 * 1)
5915 LET Td13 = d13
5920 PRINT "This site has an Efficiency Rating of"; INT(Td13 / 120.46 + .5)
5930 GOTO 1720
5970 LET c3 = c / 3
5975 c3 = (2 * 307 * 3) + (2 * 415 * 1) + (2 * 385 * 1) + (2 * 368 * 1) + (2 *
427 * 1)
5980 LET Tc3 = c3
5985 PRINT " This site has an Efficiency rating of "; INT(Tc3 / 120.46 + .5)
5990 GOTO 475
6000 LET c4 = c / 4
6005 c4 = (2 * 300 * 3) + (2 * 400 * 1) + (2 * 380 * 1) + (2 * 360 * 1) + (2 *
420 * 1)
6010 LET Tc4 = c4
6015 PRINT " This site has an Efficiency rating of "; INT(Tc4 / 120.46 + .5)
6020 GOTO 6961
6030 LET c5 = c / 5
6035 c5 = (2 * 310 * 3) + (2 * 390 * 1) + (2 * 375 * 1) + (2 * 355 * 1) + (2 *
415 * 1)
6040 LET Tc5 = c5
6045 PRINT " This site has an Efficiency rating of "; INT(Tc5 / 120.46 + .5)
6050 GOTO 475
6060 LET c6 = c / 6
6065 c6 = (2 * 326 * 3) + (2 * 383 * 1) + (2 * 376 * 1) + (2 * 355 * 1) + (2 *
405 * 1)
6070 LET Tc6 = c6
6075 PRINT " This site has an Efficiency rating of "; INT(Tc6 / 120.46 + .5)
6080 GOTO 1926
6090 LET c7 = c / 7
6095 c7 = (2 * 335 * 3) + (2 * 376 * 1) + (2 * 365 * 1) + (2 * 358 * 1) + (2 *
400 * 1)
6100 LET Tc7 = c7
6105 PRINT " This site has an Efficiency rating of "; INT(Tc7 / 120.46 + .5)
6110 GOTO 20
6120 LET c8 = c / 8
6125 c8 = (2 * 347 * 3) + (2 * 370 * 1) + (2 * 360 * 1) + (2 * 364 * 1) + (2 *
390 * 1)
6130 LET Tc8 = c8
6135 PRINT " This site has an Efficiency rating of "; INT(Tc8 / 120.46 + .5)
6140 GOTO 1720
6155 LET c9 = c / 9
6160 c9 = (2 * 355 * 3) + (2 * 375 * 1) + (2 * 350 * 1) + (2 * 373 * 1) + (2 *
381 * 1)
6165 LET Tc9 = c9
6170 PRINT " This site has an Efficiency rating of "; INT(Tc9 / 120.46 + .5)
6175 GOTO 1897
6185 LET c10 = c / 10
6190 c10 = (2 * 366 * 3) + (2 * 381 * 1) + (2 * 320 * 1) + (2 * 384 * 1) + (2 *
370 * 1)
6195 LET Tc10 = c10
6200 PRINT " This site has an Efficiency rating of "; INT(Tc10 / 120.46 + .5)
6210 GOTO 6961
6220 LET c11 = c / 11
6225 c11 = (2 * 375 * 3) + (2 * 390 * 1) + (2 * 310 * 1) + (2 * 395 * 1) + (2 *
360 * 1)
6230 LET Tc11 = c11
6235 PRINT " This site has an Efficiency rating of "; INT(Tc11 / 120.46 + .5)
6240 GOTO 20
6250 LET c12 = c / 12

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6255 c12 = (2 * 387 * 3) + (2 * 401 * 1) + (2 * 305 * 1) + (2 * 407 * 1) + (2 *
347 * 1)
6260 LET Tc12 = c12
6265 PRINT " This site has an Efficiency rating of "; INT(Tc12 / 120.46 + .5)
6270 GOTO 560
6280 LET c13 = c / 13
6285 c13 = (2 * 311 * 3) + (2 * 406 * 1) + (2 * 300 * 1) + (2 * 412 * 1) + (2 *
340 * 1)
6290 LET Tc13 = c13
6295 PRINT " This site has an Efficiency rating of "; INT(Tc13 / 120.46 + .5)
6300 GOTO 475
6310 LET b2 = b / 2
6315 b2 = (2 * 300 * 3) + (2 * 425 * 1) + (2 * 395 * 1) + (2 * 375 * 1) + (2 *
415 * 1)
6320 LET Tb2 = b2
6325 PRINT " This site has an Efficiency rating of "; INT(Tb2 / 120.46 + .5)
6330 GOTO 1720
6340 LET b3 = b / 3
6345 b3 = (2 * 308 * 3) + (2 * 427 * 1) + (2 * 391 * 1) + (2 * 370 * 1) + (2 *
400 * 1)
6350 LET Tb3 = b3
6355 PRINT " This site has an Efficiency rating of "; INT(Tb3 / 120.46 + .5)
6360 GOTO 1897
6370 LET b4 = b / 4
6375 b4 = (2 * 312 * 3) + (2 * 420 * 1) + (2 * 386 * 1) + (2 * 366 * 1) + (2 *
395 * 1)
6380 LET Tb4 = b4
6385 PRINT " This site has an Efficiency rating of "; INT(Tb4 / 120.46 + .5)
6390 GOTO 20
6400 LET b5 = b / 5
6405 b5 = (2 * 322 * 3) + (2 * 425 * 1) + (2 * 380 * 1) + (2 * 360 * 1) + (2 *
395 * 1)
6410 LET Tb5 = b5
6415 PRINT " This site has an Efficiency rating of "; INT(Tb5 / 120.46 + .5)
6420 GOTO 6961
6430 LET b6 = b / 6
6435 b6 = (2 * 327 * 3) + (2 * 420 * 1) + (2 * 374 * 1) + (2 * 352 * 1) + (2 *
387 * 1)
6440 LET Tb6 = b6
6445 PRINT " This site has an Efficiency rating of "; INT(Tb6 / 120.46 + .5)
6450 GOTO 475
6460 LET b7 = b / 7
6465 b7 = (2 * 335 * 3) + (2 * 412 * 1) + (2 * 363 * 1) + (2 * 359 * 1) + (2 *
380 * 1)
6470 LET Tb7 = b7
6475 PRINT " This site has an Efficiency rating of "; INT(Tb7 / 120.46 + .5)
6480 GOTO 1897
6490 LET b8 = b / 8
6495 b8 = (2 * 345 * 3) + (2 * 402 * 1) + (2 * 350 * 1) + (2 * 369 * 1) + (2 *
367 * 1)
6500 LET Tb8 = b8
6505 PRINT " This site has an Efficiency rating of "; INT(Tb8 / 120.46 + .5)
6510 GOTO 1926
6520 LET b9 = b / 9
6525 b9 = (2 * 358 * 3) + (2 * 396 * 1) + (2 * 340 * 1) + (2 * 379 * 1) + (2 *
360 * 1)
6530 LET Tb9 = b9
6535 PRINT " This site has an Efficiency rating of "; INT(Tb9 / 120.46 + .5)
6540 GOTO 560
6550 LET b10 = b / 10

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6835 a9 = (2 * 339 * 3) + (2 * 427 * 1) + (2 * 350 * 1) + (2 * 365 * 1) + (2 *
372 * 1)
6840 LET Ta9 = a9
6845 PRINT "This site has an Efficiency rating of "; INT(Ta9 / 120.46 + .5)
6850 GOTO 20
6860 LET a10 = a / 10
6865 a10 = (2 * 345 * 3) + (2 * 435 * 1) + (2 * 335 * 1) + (2 * 370 * 1) + (2 *
367 * 1)
6870 LET Ta10 = a10
6875 PRINT "This site has an Efficiency rating of "; INT(Ta10 / 120.46 + .5)
6880 GOTO 1926
6890 LET a11 = a / 11
6895 a11 = (2 * 354 * 3) + (2 * 446 * 1) + (2 * 327 * 1) + (2 * 381 * 1) + (2 *
372 * 1)
6900 LET Ta11 = a11
6905 PRINT "This site has an Efficiency rating of "; INT(Ta11 / 120.46 + .5)
6910 GOTO 475
6915 LET a12 = a / 12
6920 a12 = (2 * 364 * 3) + (2 * 455 * 1) + (2 * 320 * 1) + (2 * 386 * 1) + (2 *
369 * 1)
6925 LET Ta12 = a12
6930 PRINT "This site has an Efficiency rating of "; INT(Ta12 / 120.46 + .5)
6935 PRINT ""
6940 GOTO 745
6945 LET a13 = a / 13
6950 a13 = (2 * 370 * 3) + (2 * 463 * 1) + (2 * 310 * 1) + (2 * 390 * 1) + (2 *
355 * 1)
6955 LET Ta13 = a13
6960 PRINT "This site has an Efficiency rating of "; INT(Ta13 / 120.46 + .5)
6961 PRINT " Do you wish to enter any other name (Y/N)?"
6962 INPUT an$
6963 IF an$ = "y" OR an$ = "Y" OR an$ = "yes" OR an$ = "YES" THEN 10
6964 IF an$ = "n" OR an$ = "N" OR an$ = "no" OR an$ = "NO" THEN 560
7000 END

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GRID MAP OF THE AREA SHOWING EXACT POINT OF EACH  
RESOURCE / FACILITY THE NEW STRUCTURE / FACILITY /  
DEPARTMENT IS TO INTERACT WITH.

