

DEVELOPMENT OF A COMPUTER-ASSISTED SLUDGE MANAGEMENT SYSTEM

FOR

SUPPLY AND SERVICES CANADA

ENVIRONMENT CANADA

ONTARIO MINISTRY OF THE ENVIRONMENT

AND

REGION OF HALTON

TD

772

S55

1983

Simcoe Engineering Group Limited

Envirosearch Limited

PART 1

DEVELOPMENT OF A COMPUTER-ASSISTED
SLUDGE MANAGEMENT SYSTEM

FUNDED BY:

SUPPLY AND SERVICES CANADA

ENVIRONMENT CANADA

and

ONTARIO MINISTRY OF THE ENVIRONMENT

with the Assistance and Co-operation of the

REGIONAL MUNICIPALITY OF HALTON

by:

SIMCOE ENGINEERING GROUP LIMITED
Consulting Engineers, Pickering, Ontario

and

ENVIROSEARCH LIMITED
Consulting Engineers and Environmental Specialists
Milton, Ontario

FOREWORD

The computer programs provided with the manual are designed to assist in the making of decisions and the sorting of data normally associated with sewage sludge utilization. The computer programs have been tested and the developers have made every effort to ensure that the computer processes information in accordance with the requirements of the Ontario Guidelines for Sewage Sludge Utilization on Agricultural Land. The developers are not responsible for any decisions taken by the operating authority even though decisions might be based upon output from the computer programs.

ENVIROSEARCH LIMITED

SIMCOE ENGINEERING GROUP LIMITED

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	
1.1 General -----	1.1
1.2 History of Project -----	1.2
1.3 Technical Committee -----	1.3
1.4 Past and Current Practices -----	1.3
1.5 Need for More Advanced Sludge Management Systems -----	1.6
2.0 CURRENT APPROACH TO SLUDGE MANAGEMENT	
3.0 PROPOSED AUTOMATED APPROACH TO SEWAGE SLUDGE MANAGEMENT	
3.1 Advantage of Micro-Computers -----	3.1
3.2 Factors Affecting Field Selection -----	3.2
3.3 Field Data Input Requirements -----	3.4
4.0 CONCEPTUAL CHANGES	
4.1 Sludge Transportation -----	4.1
4.2 Sludge Blending -----	4.1
4.3 Daily Weather Data -----	4.2
4.4 Remote Sensing -----	4.3
4.4.1 Assessment of Water Pollution Control Plants ----	4.3
4.4.2 Field Trial at Georgetown Water Pollution Control Plant -----	4.4
4.4.3 Use of Compression Cycle to Allow Measurement of Sludge Density -----	4.5
5.0 SLUDGE UTILIZATION	
5.1 Data Input -----	5.1
5.2 Data Storage -----	5.2
5.3 Operating Sub-Routine -----	5.2
5.3.1 Field Approval Sub-Routine	5.2
5.3.2 Sludge Suitability Sub-Routine	5.4
5.3.3 Sludge History Sub-Routine	5.5
5.4.4 Transportation Sub-Routine	5.5
5.4.5 System Reporting Sub-Routine	5.5
6.0 SLUDGE QUALITY DATA	
6.1 Data Input -----	6.1
6.2 Data Storage -----	6.2
6.3 Use of Sludge Quality Data for Evaluation of Operations -----	6.2

TABLE OF CONTENTS
(cont'd)

	<u>Page No.</u>
6.4 Suitability of Sludge Quality for Utilization on Farmland -----	6.3
6.5 Sludge Nutrient Content -----	6.4
6.6 Sludge Blending -----	6.4
7.0 SLUDGE QUANTITY DATA	
7.1 Data Input -----	7.1
7.2 Data Storage -----	7.2
7.3 Status of Sludge Inventory -----	7.3
7.4 Sludge Quantity Forecasts -----	7.4
8.0 OFF-SITE STORAGE	
9.0 TRANSPORTATION AND SPREADING	
10.0 REPORTING	

TABLES

<u>Table</u>	<u>After Page No.</u>
5.1 Data Input Options -----	5.5
6.1 Sludge Quality Data -----	6.5
6.2 Liquid Digested Sewage Sludge - Ontario Requirements ---	6.5
7.1 Sludge Production and Digested Sludge Storage Status - Data Required -----	7.4

FIGURES

<u>Figure 1</u>	<u>After</u>
Schematic Flow Diagram -----	Section 1

APPENDIX

PROGRAM LISTINGS

1.0 INTRODUCTION

1.1 General

This report deals with the development of a computer-assisted sludge management system for the utilization of sewage sludge on agricultural land.

The computer software which has been prepared to provide the necessary automation has been developed for use on an Apple II + 48K computer. Other hardware requirements for use with this system include a 16K memory card (slot 0), two disk drives with controller card (slot 6), monitor (CRT), printer with interface card (slot 1), and Z-80 Softcard (slot 4). The programs can be adapted to other CPM computing systems.

The computer-assisted sludge management system is designed with the capability to analyse a sludge utilization program with up to 26 water pollution control plants and/or off-site sludge storage facilities. Program modifications are required to facilitate the inclusion of additional water pollution control plants and off-site storage. The system can handle spreading fields as necessary, with records for 2000 to 3500 spreading fields maintained per disk. The sewage sludge utilization practices of the Regional Municipality of Halton were modelled as a practical test of the computer programs developed during the project. This sludge management program provides data management capabilities for sludge spreading on approximately 5200 hectares of agricultural land in the Region of Halton. Approximately 135 000 m³ of digested sludge is spread each year. This sludge is generated by six water pollution control plants treating sewage from a combined service population of 219 000 persons. A schematic

flow diagram for the system is included (Figure 1) along with a complete program listing (Appendix).

Included as part 2 of this report is a User Guide which has been prepared to assist an actual user of the system. The User Guide describes and illustrates all features of the system and assists a user step-by-step in loading data, modifying data, carrying out calculations and printing out data, as required.

1.2 History of Project

This project has been jointly funded by Supply and Services Canada, under their Unsolicited Projects Program, by Environment Canada, by the Ontario Ministry of the Environment and by the Regional Municipality of Halton. The proposal to carry out the development and demonstration of this computer assisted sludge management system was submitted to the Federal Government in April 1982. This project was formally accepted in August 1982.

Through prior discussions with the Ontario Ministry of the Environment (MOE) and the Region of Halton, the consultants were able to obtain the manpower and financial support of these two government bodies. The MOE agreed to provide \$10,000.00 towards the funding of the project and to provide technical staff assistance as required. The Region of Halton agreed to fund \$15,000.00/year towards the second and third year demonstration phase of the project, to provide technical manpower assistance during the three years of the project and to allow their sludge utilization program to be used as a model for the development of the computer program and for trial run purposes in the second and third years of the project.

Work on the project began in August, 1982. The completion date for the report on the development of the computer assisted sludge management system was set for October 31, 1983. A draft version of the report was scheduled to be submitted by September 30, 1983.

1.3 Technical Committee

A Technical Committee was established to assist with the management of the project, to provide technical advice and make decisions affecting the course of the study. The representatives on this Technical Committee were:

- Dr. M. D. Webber - Scientific Authority, Environmental Protection Service, Environment Canada
- Dr. T. R. Bridle - Environmental Protection Service, Environment Canada
- S. A. Black - Laboratory Services and Applied Research Branch, Ontario Ministry of the Environment
- F. J. Iliffe - Waste Management Branch, Ontario Ministry of the Environment
- G. N. Woodburn - Works Department, Region of Halton
- V. Lesnicki - Works Department, Region of Halton
- A. Shames - Works Department, Region of Halton
- H. J. Stanley - Halton Agricultural Representative, OMAF
- R. Sovereign - Halton Agricultural Community Representative
- Dr. T. E. Bates - University of Guelph

1.4 Past and Current Practices

Based upon the authors' experience relating to sewage sludge utilization in the Region of Halton and other municipalities in the Province of Ontario, the proper management of such systems has

been manpower intensive. For instance, in the Region of Halton, 6 staff are directly involved on at least a part-time basis, with an estimated manpower requirement of 3 man years per year.

Many municipalities, in an attempt to minimize manpower requirements, have delegated more and more responsibilities to haulage contractors. Sludge haulage in Ontario is now most commonly undertaken by contractors. Besides haulage, responsibilities for selecting the spreading fields, finding and applying for approval of new fields, finding storage sites and constructing sludge storage facilities have often been assigned to the contractor.

This type of management of sludge utilization programs tends to be on a short term basis with only limited long term planning; for instance, fields for spreading have typically been selected on a day-to-day basis rather than being selected in advance based upon croppage plans, soil types, weather trends, etc. New fields have been sought for approval only when needed rather than as forecast to be needed. Additional storage has only been developed when problems have occurred due to inadequate land for sludge utilization being available.

In Ontario, record keeping systems pertaining to sludge spreading prior to the introduction of the 'Guidelines For Sewage Sludge Utilization on Agricultural Lands' were largely non-existent. After the introduction of the guidelines, records were required to be kept of such statistics as location of fields, volumes of sludge applied and dates of sludge application, but such records have all been manually maintained.

In the past, sludge spreading on fields was typically carried out using on-road vehicles. Most vehicles were gravity discharge tank trucks. Sludge spreading with such vehicles often caused damage to fields, especially to clay type fields due to rutting or soil compaction, and where the land was tile drained, damage to tiles often resulted. Gravity discharge also resulted in uneven sludge application to the fields causing poor crop response and uneven maturation. To solve these spreading problems, particularly for large scale sludge utilization programs, municipalities have recently begun to specify in sludge haulage contracts that vehicles with flotation-type tires and pressure discharges be used for spreading operations.

In the past, the common municipal practice to contract sludge haulage on an annual basis resulted in extra management due to the need for frequent tendering, contract evaluation and contract execution. As contractors were given the responsibility for finding fields and storage sites, building storage facilities, and providing expensive spreading equipment, one year contracts became unacceptable in that the contractors could not recover the cost of the extra services over the one year duration of the contract. Municipalities are now finding it necessary to go to longer term contracts. For instance, the current Region of Halton contract is for a duration of 4 years. This was necessary in that contract requirements, which included spreading with a flotation tire vehicle, would have forced the price to be considerably higher per unit volume of sludge if the contractor could only look to a one year secure contract.

1.5 Need for More Advanced
Sludge Management Systems

With the introduction of Ontario's "Guidelines for Sewage Sludge Utilization on Agricultural Lands" (1978), the management of sludge utilization programs became more complex. These guidelines introduced new requirements:

- for the sampling and analysis of sludges;
- for the acceptability of sludges (nitrogen to metal ratios);
- for the acceptability of farmland;
- for spreading frequency and rates;
- for compatibility of land use to sludge utilization;
- for the timing of sludge application in relation to land use;
- for record keeping.

The guidelines have imposed additional regulatory requirements on sludge utilization programs. The regulations have restricted the use of some fields, which has tended to reduce the area of farmland available for sludge utilization. In some cases, municipalities now have less agricultural land available. This, in turn, dictates that better management techniques be utilized to ensure that sludge is spread whenever conditions are suitable.

The current trend in agriculture to cash crops, with an emphasis on row crop production, also complicates sludge management programs since less fallow or pasture land is now available. This imposes additional constraints, including land access problems during the summer season when cropland is not available.

The storage of sludge is an important component in any sludge management program. When insufficient storage is available, sludge must be spread whenever possible. With traditional lagoon storage systems becoming less acceptable due to public and enforcement agency concerns which include odours, nutrient losses, and

possible groundwater pollution, storage is becoming more difficult and more costly to provide. To operate a sludge utilization system with a minimum of storage, operating authorities must have efficient procedures for recording, filing and sorting data related to field use.

In the case of the Region of Halton, all of these factors have come to influence the sludge utilization program. A decision was taken to support the development of a computer-assisted system to ensure that land use is optimized.

As farmers recognize the potential damage that can occur to their land from pollutants or soil compaction, pressure is placed on the municipalities to provide better service to keep farms in a sludge utilization program. For instance, farmers are demanding that municipalities provide a sludge with a consistent nutrient blend that will benefit their crops and that the sludge be applied at specific times to minimize nutrient loss, soil compaction and disruption to their farming activities. Detailed reporting on the benefits of the sludge, the nutrient content of the sludge applied, and the spreading rates used is necessary to ensure that the preceding can be achieved.

As previously mentioned, the trend, at least with large scale sludge utilization programs, is towards using vehicles equipped with flotation-type tires for sludge spreading. Such vehicles are quite expensive compared with on-road vehicles and as a result must be used effectively to keep sludge haulage contract costs at a reasonable level. This can dictate that the vehicle be used for long periods each day (in the order of 16 hours), spreading sludge volumes

management systems due to the need to:

- schedule the operating locations for the spreading vehicle to minimize its on-road travelling;
- schedule sludge transportation to the spreading sites from the various sewage treatment plants;
- calculate nutrient application rates and metal burdens considering the sludge quality of the various plants.

As discussed in the following sections of this report, a computer system can be used as a tool to assist managers to operate a sludge utilization program and to minimize the associated manpower requirements of the program. Not only can all of the previously mentioned management requirements be simplified by using a computer, but additional data analysis can be undertaken and reports prepared for farmers, sludge haulers, and management. The computer assisted system can help the municipality to minimize the costs of haulage contracts; and to improve the accuracy of forecasts of future sludge utilization requirements.

FIGURE 1
SCHEMATIC FLOW DIAGRAM

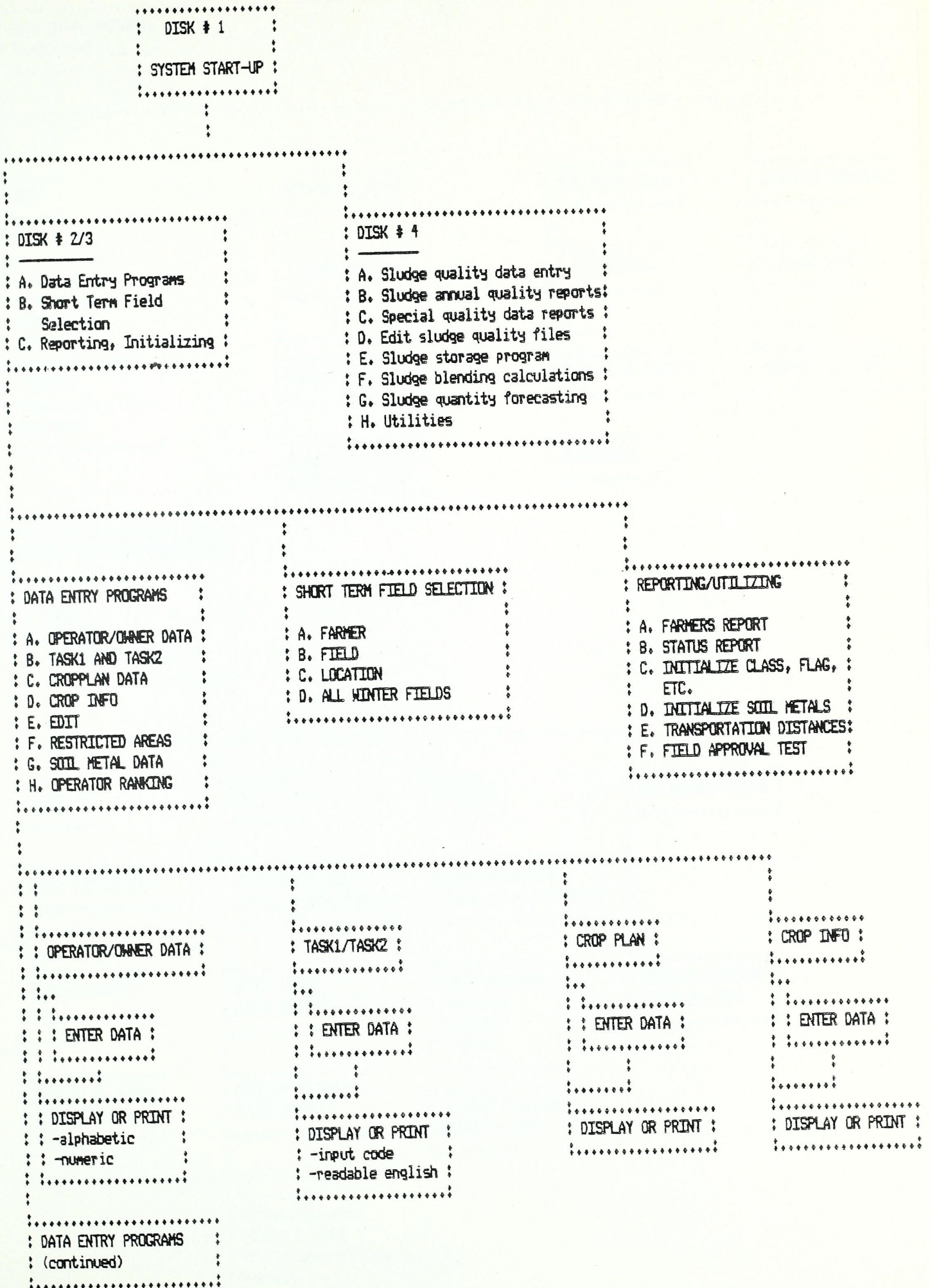
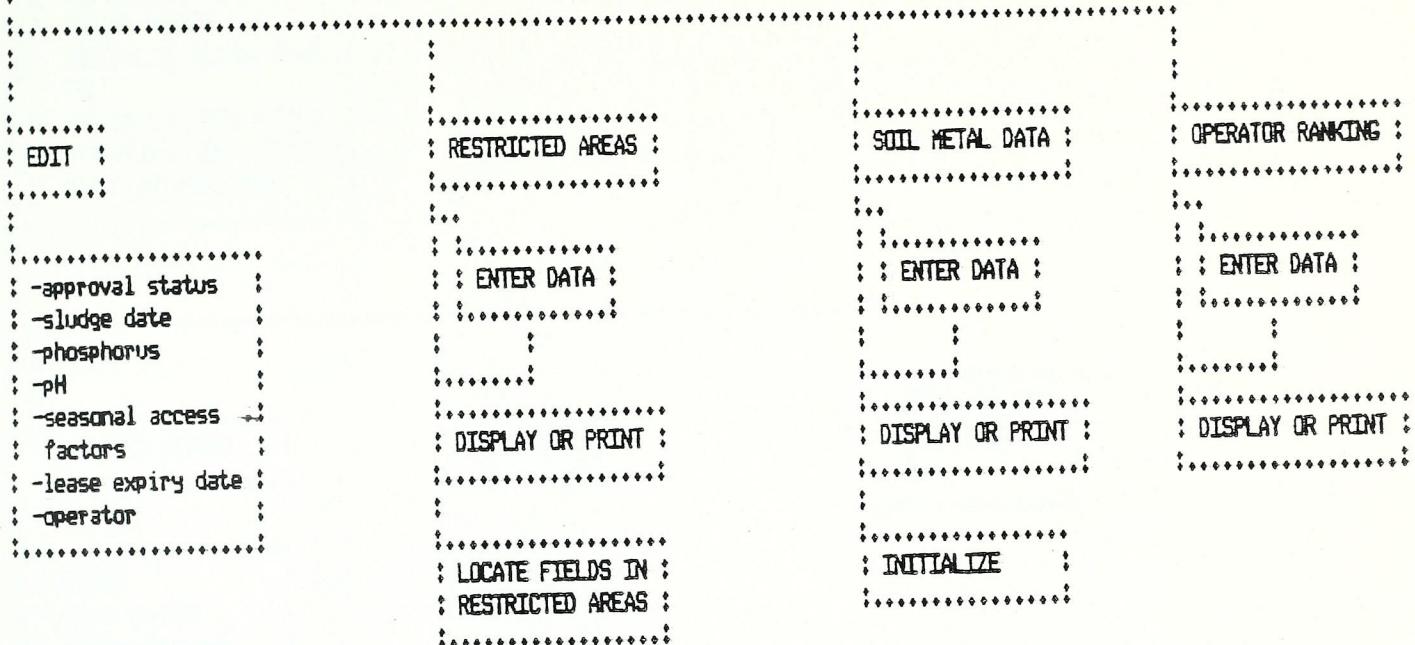


FIGURE 1 (cont'd)

```

:.....:
: DATA ENTRY PROGRAMS :
: (continued)         :
:.....:
    
```



```

:.....:
: SHORT TERM FIELD SELECTION :
:.....:
: A. FARMER                 :
: B. FIELD                  :
: C. LOCATION               :
: D. ALL WINTER FIELDS     :
:.....:
    
```

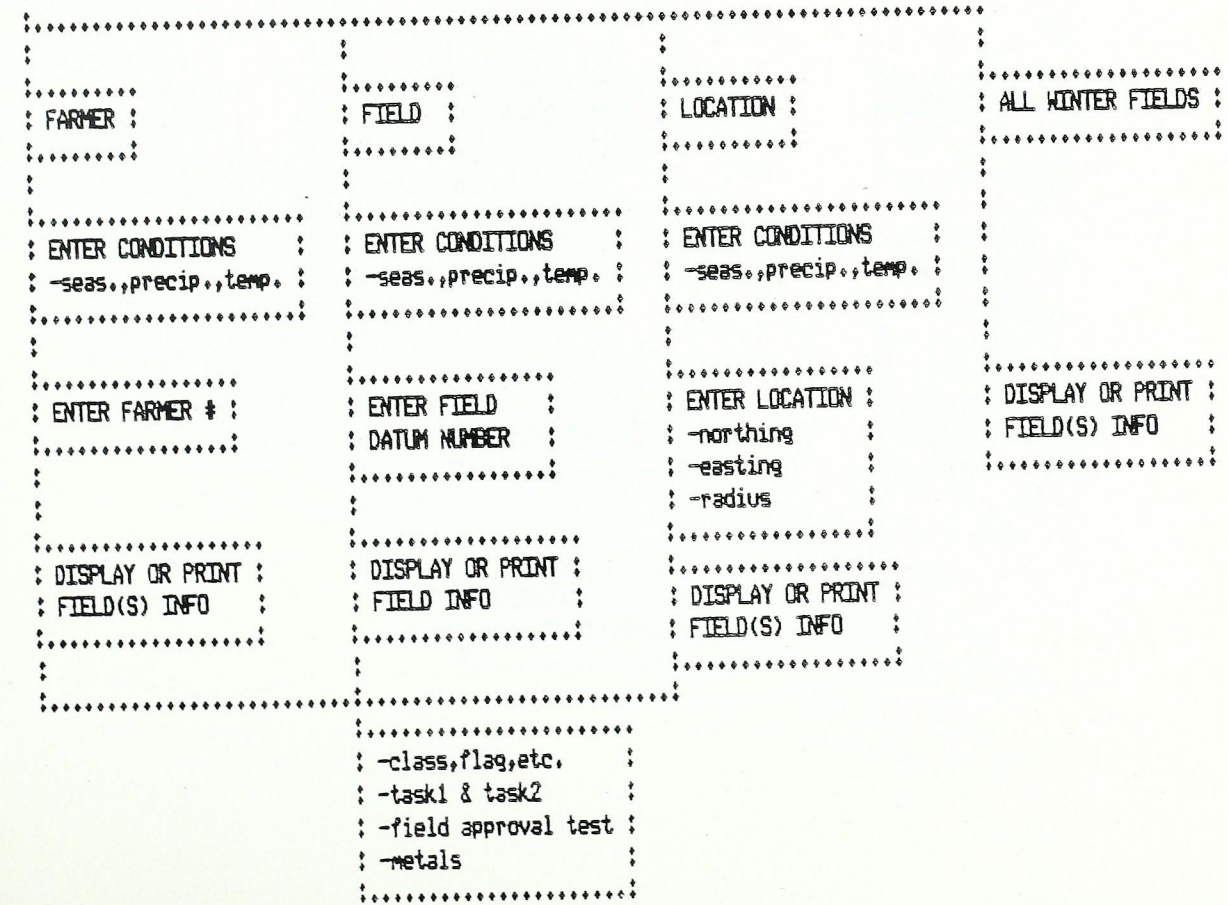


FIGURE 1 (cont'd)

REPORTING/UTILIZING

- A. FARMERS REPORT
- B. STATUS REPORT
- C. INITIALIZE CLASS, FLAG, ETC.
- D. INITIALIZE SOIL METALS
- E. TRANSPORTATION DISTANCES
- F. FIELD APPROVAL TEST

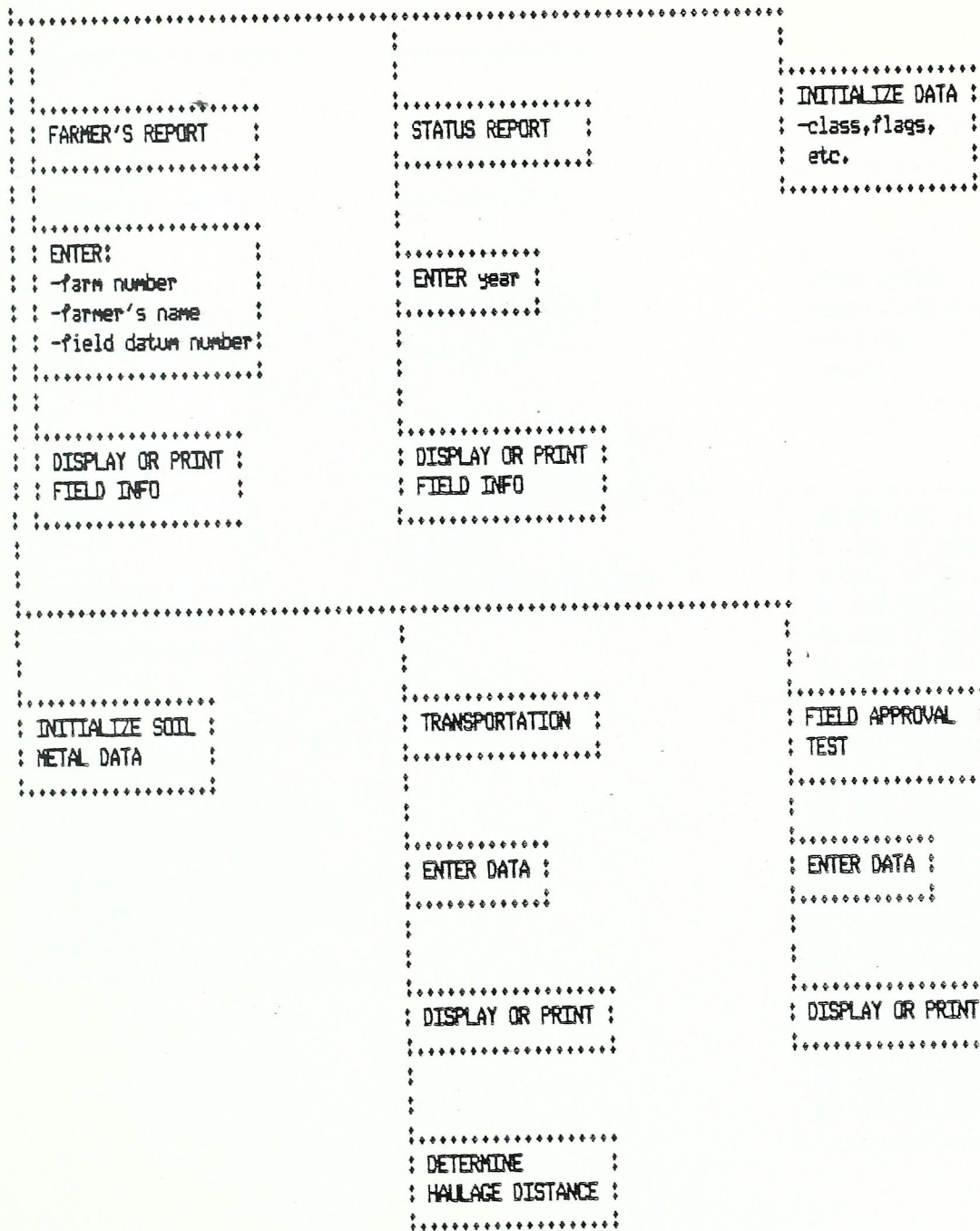


FIGURE 1 (cont'd)

```

:.....:
: DISK # 4 :
:-----:
: A. Sludge quality data entry :
: B. Sludge annual quality reports:
: C. Special quality data reports :
: D. Edit sludge quality files :
: E. Sludge storage program :
: F. Sludge blending calculations :
: G. Sludge quantity forecasting :
: H. Utilities :
:.....:

```

```

:.....:
: SLUDGE QUALITY : SLUDGE ANNUAL : SPECIAL QUALITY DATA REPORTS :
: DATA ENTRY : QUALITY REPORTS : :
:.....: :.....: :.....:
: PLANT SELECTION : PLANT SELECTION : CHOOSE OPTION :
: : : -general characteristics :
: : : -nutrients :
: : : -metals :
:.....: :.....: :.....:
: DATA ENTRY : DISPLAY OR PRINT : SELECT TYPE OF REPORT :
: : : -general characteristics : 1. ave. of data entered 1 mo. ago :
: : : -nutrients : 2. ave. of data entered 2 mo. ago :
: : : -metals : 3. ave. of data entered 3 mo. ago :
: : : -ammonia/metals ratios : 4. ave. of data entered 4 mo. ago :
: : : : 5. ave. of data entered 5 mo. ago :
: : : : 6. ave. of data entered 6 mo. ago :
: : : : 7. ave. of data entered 7 mo. ago :
: : : : 8. ave. of data entered 8 mo. ago :
: : : : 9. ave. of data entered 9 mo. ago :
: : : : 10. ave. of data entered 10 mo. ago :
: : : : 11. ave. of data entered 11 mo. ago :
: : : : 12. ave. of data entered 12 mo. ago :
: : : : 13. running average of all data :
: : : : 14. # entries to calculate run ave. :
: : : : 15. limiting value (high) :
: : : : 16. limiting value (low) :
: : : : 17. interim data file # 1 :
: : : : 18. interim data file # 2 :
: : : : 19. interim data file # 3 :
: : : : 20. interim data file # 4 :
:.....: :.....: :.....:
: DISK # 4 (continued) : : :
:-----: : : :
: D. Edit sludge quality files : : :
: E. Sludge storage program : : :
: F. Sludge blending calculations : : :
: G. Sludge quantity forecasting : : :
: H. Utilities : : :
:.....: :.....: :.....:

```


FIGURE 1 (cont'd)

DISK # 4 (continued)

- D. Edit sludge quality files
- E. Sludge storage program
- F. Sludge blending calculations
- G. Sludge quantity forecasting
- H. Utilities

EDIT SLUDGE QUALITY FILES :

SELECT TREATMENT PLANT :

SELECT DATA TO EDIT

- 1. ave. of data entered 1 mo. ago
- 2. ave. of data entered 2 mo. ago
- 3. ave. of data entered 3 mo. ago
- 4. ave. of data entered 4 mo. ago
- 5. ave. of data entered 5 mo. ago
- 6. ave. of data entered 6 mo. ago
- 7. ave. of data entered 7 mo. ago
- 8. ave. of data entered 8 mo. ago
- 9. ave. of data entered 9 mo. ago
- 10. ave. of data entered 10 mo. ago
- 11. ave. of data entered 11 mo. ago
- 12. ave. of data entered 12 mo. ago
- 13. running average of all data
- 14. # entries to calculate run ave.
- 15. limiting value (high)
- 16. limiting value (low)
- 17. interim data file # 1
- 18. interim data file # 2
- 19. interim data file # 3
- 20. interim data file # 4

CHOOSE OPTION

- general characteristics
- nutrients
- metals

EDIT DATA :

SLUDGE STORAGE PROGRAM :

CHOOSE OPTION

- update records
- edit records
- display or print

CHOOSE DATA FILE

- daily ave. sludge input
- total available storage capacity
- available sludge quant.
- truck size

SLUDGE PRODUCTION :
FORECASTING

CHOOSE OPTION

- forecasting
- edit records
- display or print

SELECT

- plant
- sludge product'n in cu. m./day/1000 people
- population projection

SLUDGE BLENDING :

SLUDGE BLEND :
CALCULATIONS :

CHOOSE PLANT :

CHOOSE DATA :

OUTPUT BLEND :
QUALITY :

DILUTION BLEND :
CALCULATIONS :

SELECT SLUDGE :
-to be diluted :
-to dilute with :

OUTPUT QUALITY :
OF BLEND & :
QUANTITY FROM :
EACH SOURCE :

UTILITIES :

SLUDGE DATA :
ENTRY STATUS :

PREPARE :
DATA ENTRY :
SHEETS :

2.0 CURRENT APPROACH TO SLUDGE MANAGEMENT

The Regional Municipality of Halton operates six water pollution control plants. Acton, Georgetown and Milton in the north of Halton are each serviced by individual plants. The largest plant in the system is the Burlington Skyway Plant. Oakville is serviced by the Southeast and the Southwest water pollution control plants. The Region also operates sludge storage lagoons in the Town of Oakville. These lagoons are used to store sewage sludge during periods of inclement weather when access to farm fields is not practical.

The plants each operate independently of others in the system. During adverse weather conditions, sludge from all plants is hauled to the lagoons in Oakville. The various components of the Halton system provide a cross-section of the types of installations typically encountered in the operation of sewage sludge utilization programs elsewhere.

The Region of Halton has a sludge haulage contract which requires that the contractor hauls sludge from the sewage treatment plants and lagoons to suitable fields in the Region as directed. The Region is responsible for finding fields and obtaining approval for their use. The Region specifies fields to be used and rates of application for sludge. The hauler, in turn, is responsible for providing and maintaining the equipment for hauling the sludge from the water pollution control plants and the lagoons. This responsibility includes the operation of an on-field spreading system. In the Halton situation, a flotation-tired vehicle and a travelling-type irrigation system are both operated.

Currently, the Region staff maintain records of approved fields from which fields for sludge utilization are selected using a screening process. Farmers who have expressed a willingness to receive sewage sludge are then contacted and fields in the area in which the equipment is to work are selected. This involves locating suitable fields and determining when they are ready to use. If fields are available and ready to use, a general area is chosen for the operation of the spreading equipment and the contractor is instructed to haul sludge directly from the sewage treatment plants to the farm fields for spreading with the flotation-tired vehicle or irrigation system.

The treatment plant operators advise personnel in the sewage sludge utilization program when digesters must be drawn down and the hauler, in turn, is instructed to take the appropriate steps to remove the sewage sludge.

When it is not practical to locate fields for spreading, instructions are issued to the hauler to transfer sludge to the storage lagoons. Generally the plants grant access to the hauler to haul sludge from 8 a.m. to 5 p.m., five days per week. If the hauler wishes to spread sewage sludge over a longer day, he is usually required to haul the sludge from the lagoon facilities following the plants closing.

All records for the system, including the water pollution control plant sludge quantity and quality and field use histories are maintained manually. Farmers are advised verbally of the rate of sludge application, including the quantity of phosphorus and nitrogen

applied to the fields. The hauler submits monthly claims for payment under the contract.

Generally, this type of contract arrangement is common Ontario practice. Some differences arise from municipality to municipality as a reflection of contract clauses, particularly the use of specialized equipment or the need for contractors to locate spreading fields. The Halton sludge utilization program was deemed to be a suitable prototype for the development and testing of software for a computer-assisted sludge management system.

3.0 PROPOSED COMPUTER-ASSISTED APPROACH
TO SEWAGE SLUDGE MANAGEMENT

3.1 Advantage of Using Micro-Computers

The use of a micro-computer in the sewage sludge management program facilitates the analysis of a broader data base. Sludge quality can be monitored and compared to preselected standards (eg. Ontario Ministry of Agriculture and Food and the Ontario Ministry of Environment Guidelines for Sewage Sludge Utilization on Agricultural Lands). Specific operating parameters for the system can be defined and incorporated in the testing program. These parameters can include variables related to the operation of the sewage treatment plant, crop production, transportation and/or spreading of the sludge. The improved record management using a computing system permits the maintenance of seasonal and long term trends for several parameters. This improves the operator's ability to plan and develop a comprehensive system.

With the more comprehensive computerized operation, it is possible to program the system such that fields are not overlooked when they are ready for receiving sludge. This becomes particularly important in operations where the reservoir of fields is relatively small compared to the quantity of sludge produced.

The computer-assisted sludge management system provides detailed information for farmers regarding the nutrient value of the sludge in terms of fertilizer equivalents. The farmer can then choose any supplementary fertilizers that he may require for the crop.

The computing system maintains records indicating the volumes and distances that sludge is hauled. This provides the necessary input to develop sludge hauling contracts on a volume-distance basis. The report system which will be developed in phase 2 will include reports to the hauler providing concise instructions as to the location of the field and the application rates of the sludge.

The system is designed to permit frequent updating of the records.

Options are available in the computer system to simulate conditions that could lead to problems in maintaining the sludge utilization system. These conditions could include wet weather, loss of fields, poor quality sludge and a number of other factors. Through simulating these conditions, the system users can determine what the effect will be on the overall system. Contingency plans can then be prepared to deal with such problems.

3.2 Factors Affecting Field Selection

The computer system is capable of preselecting fields for final selection by the system user. The preselection of fields can be undertaken based upon farmer priority, field location or random field selection based upon field availability.

The farmer priority phase of the program permits the selection of a portion of the fields to be committed for sludge spreading at a future date from a list of fields of selected farmers. In this way, the operating authority can make commitments of sewage sludge to specific farmers in advance of the actual spreading dates.

Fields can be chosen from specific areas of the operating authority's jurisdiction such that a geographic plan can be developed for the movement of equipment and the spreading of sludge throughout a region.

Fields can also be chosen at random over the entire area of the system.

These three alternatives provide a variety of ways in which fields can be selected for sludge utilization.

In any of the preceding modes of selection through the use of the computer system, the field is checked for a number of conditions. Initially, the field is tested to verify whether it has been previously approved or whether it is approvable for sludge utilization purposes. Determinations are then made as to when the field was last sludged and when it will be next usable for sludge utilization. Once it is determined that a field can be utilized for sewage sludge, tests are made to determine whether there are any seasonal restrictions applicable to the field. This is done by implementing a series of tests for each season of the year. These tests include determining:

- whether the ground slope is suitable;
- whether the ground is frozen or not frozen;
- the permeability of the soil;
- the setback distance from any watercourse;

- the possibility of soil loading capacity limitations;
- the location of the field relative to the nearest well;
- distance of the soil surface from groundwater;
- the distance of the soil surface from bedrock;

- distance to any house or residential area;
- the possibility of having tile drainage installed in the field; and
- the characteristics of runoff from the field.

In addition, a coding system has been developed to determine whether the field is in specified areas where there are constraints due to environmental or other considerations. These areas are spotted by specific restricted area designations and include such conditions as the possibility of high-yield wells, persons likely to complain if sludge spreading is undertaken near them, the existence of built-up areas and a number of other factors that could affect the viability of sewage sludge spreading on agricultural land.

Tests are included to determine which crops are most suitable in a cropping plan for utilizing sewage sludge. In this block of tests, priority goes to farmers who have recorded and filed a crop plan with the operating authority. Tests are also included to determine whether there are likely to be metal problems due to the accumulation of heavy metals in the soils of the fields.

Answers from these tests help the system user to make decisions relating to the utilization of sludge including choosing field locations and the timing of sludge application without having specific expertise in farming, trucking and sewage treatment plant operation.

3.3 Field Data Input Requirements

Specific information is required to describe the area to be considered for sewage sludge utilization. This includes a general description of the road system, a weather monitoring network to describe weather patterns and the location of: restricted areas, sewage treatment plants, sludge storage facilities and other specific information relating to the sludge utilization program.

Data is entered for each field in one of two tasks. The first task enters the location and farmer information relating to the field and the second task enters the physical environmental information relating to the field. In the first task, the location of the field, including township, lot, concession and northing and easting points (a north-south, east-west grid system developed for the area in question) are entered. The field size is determined and entered and then a number of factors relating to the suitability of the field are entered, including the accessibility of the field to vehicles during different seasons, the farmer lease expiry date, the status of the approval and the last date the field was sludged. The farm owner and operator are identified. The task 2 data includes information relating to the location of the nearest well, depth to groundwater, distance to surface water, depth to bedrock, location of houses in the nearby area, residential development adjacent to the fields, agricultural soil capability of the field, soil type, permeability of the soil, surface slope, phosphorus concentration in the soil, pH, probability of runoff, tile drainage, workability date, likelihood of flooding and location of the nearest weather station. This information is utilized by the computer system to assist in making decisions relating to the suitability of any specific field for spreading sludge during various times of the year.

4.0 CONCEPTUAL CHANGES

During the development of the computer-assisted sludge management system, it was necessary to make a number of modifications to the conceptual plan presented in the original unsolicited proposal. Three of the sub-routines involving the transportation of sludge, the blending of sludges and the maintenance of weather records now utilize different logic from the original proposal. In addition, the original plans to install remote sensing equipment could not be carried out due to technical difficulties leading to more expensive equipment requirements. As a result, the remote sensing phase of the project was abandoned.

4.1 Sludge Transportation

In lieu of the originally proposed transportation models, Halton staff established a haulage route network. The distance from each sewage treatment plant and sewage sludge storage site to a number of grid points throughout the Region were determined. Specific roads were identified as the desirable haulage roads. In the future, contractors would be expected to utilize these roads for hauling sludge. The computer program calculates the haulage distance from any water pollution control plant or sludge storage site to a final destination via the predetermined grid points found to be closest to the final field destination.

4.2 Sludge Blending

The original proposal suggested an automated blending procedure to determine which sludges should be hauled, and from what location, to meet an optimum blend suited to the field in question. Currently, there are inadequate facilities available in Halton to

facilitate proper blending. In addition, this would require hauling sludges from any area of the Region to specific fields which would considerably increase the sludge haulage costs. Checks were done and it was found that the sludges would meet the provincial criteria if the northern plant sludges were blended and the southern plant sludges were blended. It was then determined that an alternative to the original automated blending procedure should be implemented, namely, to offer a computer-assisted blending option to the system user. This program provides the operator with an opportunity to specify the sludges that he wishes to utilize and the proportion in which he wishes to mix them. The computer provides the operator with the specification of the blend and gives him the opportunity to revise that specification if he so desires. Thus, any blending decisions are made under the control of the system users.

4.3 Daily Weather Data

The original concept to have a weather-related program that would take into account soil moisture and the crop drying index as well as daily weather data was found to require extensive supporting data. It was concluded that to use this approach, the operating authority would be required to establish a major weather grid and spend considerable monies in instrumentation if all the required atmospheric and soil moisture data were to be collected. It was concluded that it would be better to maintain a record of the daily weather data and produce comparisons of this data to long term trends to make the Region aware of whether they were experiencing periods of abnormal weather that could require alterations in their sludge utilization program.

4.4 Remote Sensing

As part of the original proposal, automatic sensing equipment was to be installed at one of the Region of Halton's water pollution control plants to measure the volume of sludge generated, its density and the quantity in storage. The remote sensing equipment was to be of the ultrasonic type and this equipment was to be controlled by a remote terminal unit (a pre-programmed process controller) which would be utilized to transmit data to the computing system supporting the sludge management program. The budget for the installed cost of this equipment was \$46 000, exclusive of engineering.

4.4.1 Assessment of Water Pollution Control Plants

In the early stages of this project, Simcoe Engineering Group Limited carried out investigations to determine which plant would be most suitable to equip with this remote sensing equipment. All six of the existing plants were reviewed, considering the following factors:

- a) was the plant's sludge likely to remain suitable for utilization on farmland for the foreseeable future;
- b) were there three points on existing piping where all raw sludge, supernatant and digested sludge pumpage and/or flows and densities could be measured (i.e. using no more than three flow measuring heads and three density measuring heads to measure all three flow rates and densities);
- c) were the above-mentioned measuring points accessible (i.e. within a building, pipe gallery, etc. where a new structure would not be required to house the equipment);

- d) were the measuring points sufficiently isolated from pumps to avoid interference with the sensing head operation due to pump noise;
- e) were the measuring points in non-hazardous areas.

Only the Town of Georgetown Water Pollution Control Plant satisfied all of the above requirements such that the equipment could be installed within the budget allowance.

4.4.2 Field Trial at Georgetown Water Pollution Control Plant

As a final check on the suitability of this plant for the equipment installation, raw and digested sludge samples were tested with ultrasonic equipment to determine if a sufficiently strong signal for flow measurement and density measurement could be obtained. From this testing it was determined that the raw sludge contained far too many gas bubbles to allow an ultrasonic signal to pass through the sludge for purposes of density measurement. The digested sludge contained some bubbles, but the situation was not as severe as with the raw sludge.

The Region of Halton Operations staff and the Technical Committee were advised of the gas bubble problem with the raw sludge and it was decided to modify the plant operation in an attempt to reduce the concentration of the bubbles. The sludge blanket depth in the primary clarifier was reduced to a minimum to attempt to avoid denitrification. This visibly reduced the concentration of bubbles in the raw sludge, but not sufficiently to allow an adequate strength ultrasonic signal to pass through the sludge.

4.4.3 Use of Compresssion Cycle to
Allow Measurement of Sludge Density

Since the gas bubble problem could not be solved sufficiently by operational modifications, Simcoe Engineering Group Limited investigated the possibility of using compression to drive the gas bubbles back into solution. This could be accomplished by installing by-pass piping in the existing raw and digested sludge lines along with isolating valves and compression equipment. The Technical Committee asked that a preliminary cost estimate be prepared to assess what the additional equipment cost would be to solve the problem in this manner. The additional installed cost, exclusive of engineering, was estimated to be \$25 000.

The Technical Committee sought funding approval for this additional equipment, but unfortunately the request was not approved. As a result, the installation of remote sensing equipment was dropped from the project. Instead, it was decided to rely upon the data collected by the Region of Halton Operations staff using the conventional sludge flow measurement equipment at each plant, the currently used analytical methods for sludge density measurement, and the conveyance of this data to the computing system by telephone or hand delivery.

5.0 SLUDGE UTILIZATION

The micro-computer accesses several data files to obtain information to utilize in selecting suitable fields for use during specific periods of time. This information is entered via one of the data entry programs associated with the sludge utilization portion of the system. The data input includes:

- a) a farm owner/operator list;
- b) field information: a description of field size, location and accessibility;
- c) field characteristics information: a description of the field characteristics and its proximity to groundwater, surface water and residential development;
- d) keyword file: words and phrases used by the computer to prepare reports (provided with system disks);
- e) crop plan information: description of individual farmer's crop plans for specific fields;
- f) crop information: typical crops grown in Halton including planting and harvesting dates and nutrient requirements;
- g) restricted areas: locations and descriptions of restricted areas, complaints are entered using a separate data entry;
- h) weather data: daily rainfall and temperature records;
- i) soil metals: metal levels in soil for each grid component.

The principle computer sub-routine# in choosing fields suitable for sewage sludge utilization include:

- Field approval sub-routine,
- Sludge suitability sub-routine,
- Sludge history sub-routine,
- Transportation sub-routine,
- System reporting sub-routine.

5.1 Data Input

Table 5.1 lists typical data input to the computer system. These data are input in bulk from data entry sheets or one item at a time in response to computer generated prompts. Where possible, the

data are tested by the computer sub-routine to determine whether values are within normal ranges.

5.2 Data Storage

Data is retained as entered with modifications being made as circumstances dictate. In the case of weather data, the daily data is summarized in 7-day blocks beginning the first day of the year. At the end of each year, the 7-day block averages are added to the 10-year running average records and the 10-year old data is deleted.

5.3 Operating Sub-Routine

A series of operating sub-routines are utilized to determine when fields are suitable for sludge utilization, the timing for application of sludge, the history of sludge utilization, the determination of transportation logistics for the sludge and the reporting of the system status to operating staff and users.

5.3.1 Field Approval Sub-Routine.

This sub-routine tests each spreading site to determine whether the site meets specific requirements of the Ontario Guidelines For Sewage Sludge Utilization on Agricultural Lands. Potential problems relating to the use of the site are identified for the user's information.

The micro-computer system tests each field against the following criteria:

- a) WELL - The sub-routine indicates that the distance from the field to the nearest well is:
 - unknown,
 - 0-90 metres,
 - equal or greater than 90 metres.

The sub-routine specifies whether or not the separation distance is adequate.

b) PERMEABILITY - The sub-routine reports the soil permeability as:

- unknown,
- rapid to moderate,
- moderate to slow.

c) GROUNDWATER - The sub-routine indicates that the depth from the soil surface to groundwater is:

- unknown,
- less than 0.9 metres,
- 0.9 to 1.5 metres,
- greater than 1.5 metres.

The sub-routine uses the permeability information in determining whether or not there is an adequate depth of soil for sludge utilization.

d) SLOPE - The sub-routine indicates that the field surface slope is:

- unknown,
- 0 to 3%,
- 3 to 6%,
- 6 to 9%,
- greater than 9%.

e) SURFACE WATER - The sub-routine indicates that the distance of the field from the nearest surface water is:

- unknown,
- 0 to 60 metres,
- 61 to 120 metres,
- 121 to 180 metres,
- 181 to 240 metres,
- 241 to 260 metres,
- greater than 360 metres.

f) BEDROCK - The sub-routine indicates that the depth from the soil surface to bedrock is:

- unknown,
- 0 to 1.5 metres,
- greater than 1.5 metres.

The sub-routine reports whether or not the depth of soil cover is adequate.

- g) HOUSE - The sub-routine indicates that the distance from the field to the nearest house is:

- unknown,
- 0 to 90 metres,
- greater than 90 metres.

The sub-routine indicates whether or not the separation distance is adequate for surface spreading of sludge.

- h) RESIDENTIAL AREA - The sub-routine indicates that the distance from the field to a residential development is:

- unknown,
- 0 to 450 metres,
- greater than 450 metres.

The sub-routine indicates whether or not the separation distance is adequate for surface spreading of sludge.

- i) FLOODED - The sub-routine indicates the probability of the field being flooded as:

- unknown,
- no flooding,
- spring flooding,
- summer flooding,
- fall flooding,
- winter flooding,
- more than one season flooding.

- j) APPROVAL STATUS - The sub-routine indicates the status of approval of a field as:

- unlikely to ever be approved,
- likely to be approved when submitted but farmer is not interested,
- likely to be approved when submitted and farmer is interested,
- likely to be approved when submitted but farmers identity is unknown,
- field fully approved, farmer interested,
- field approved, farmer not interested,
- field approved, owner not interested.

5.3.2 Sludge Suitability Program.

This sub-routine determines whether the field is ready for spreading sludge and under what conditions the sludge can be spread. Tests determine whether it has been 5 years since the last use for

sludge utilization. Tests are included to determine in which season and under what conditions the field can be used. Conditions tested include the temperature and rainfall trends, probability of damage due to soil compaction and the pH and phosphorus levels of the soil. Possible problems relating to field separation distances to houses and wells, plus depths of soil cover to ground water or bedrock, are flagged. The sub-routine utilizes crop data to determine preferred fields for sludge spreading. Soil metal levels are checked in areas in which suitable fields are located.

5.3.3 Sludge History Sub-Routine.

This sub-routine maintains a record of all uses of fields for sludge utilization, including the quantity of sludge applied, the date of application and an estimate of the metal load to the field.

5.3.4 Transportation Sub-Routine.

This sub-routine determines the distance from the sludge source to the field using precalculated haulage routes. Records are kept of the volume-distance haulage totals for purposes of contract administration.

5.3.5 System Reporting Sub-Routine.

This sub-routine consolidates information from the other programs to provide the municipality with updated statistical information relating to the sludge utilization program.

TABLE 5.1

DATA INPUT OPTIONS

ITEM	INPUT
a) owner/operator list	- name, address, telephone
b) field information	- township, lot, concession, - field number, - northing, easting, - field area (hectare), - field accessibility: - spring - summer - fall - winter - lease expiry date, - status of field approval for sludge utilization, - date when last sludged, - Halton grid number in which field located, - Operator, - Owner.
c) field characteristics information	- distance from field to: - well, - house, - residential area, - stream; - depth to: - groundwater, - bedrock; - soil: - capability for agriculture, - type, - slope, - permeability, - phosphorus, - pH, - probability of flooding, - spring working date; - runoff characteristics; - tile drainage status; - weather data source.
d) keywords	- description words and phrases used in report preparation.
e) crop plan	- five-year crop plan with priority years for sludge utilization.

TABLE 5.1 (cont'd)

DATA INPUT OPTIONS

ITEM	INPUT
f) crop information	<ul style="list-style-type: none">- specific crop,- planting date,- harvesting date,- yield,- nitrogen requirements,- phosphorus requirements.
g) restricted areas	<ul style="list-style-type: none">- location of restriction,- description of location,- location and description of complaints.
h) weather data	<ul style="list-style-type: none">- daily rainfall,- daily mean temperature.
i) soil metals	<ul style="list-style-type: none">- metal levels in soil for each grid component.

6.0 SLUDGE QUALITY DATA

Sludge quality information must be input to, and manipulated by, the computer to permit the following functions to be carried out:

- a) assessment of the accuracy of the data itself before accepting the data for use;
- b) assessment of the operation of the water pollution control plant processes;
- c) evaluation of the sludge quality to ensure that it is acceptable for utilization on agricultural land;
- d) calculation of the sludge nutrient content and the recommended spreading rates for various crops.
- e) Calculation of the sludge quality resulting from blending operations.

6.1 Data Input

Table 6.1 shows the typical sludge quality analytical data which would be input to the program. This data, from each water pollution control plant and each off-site sludge storage facility, would be input by the computer operator as received. The data would be checked automatically to ensure that it fell within normal ranges before it would be accepted by the computer. If data fell outside normal ranges, the computer operator would be advised to check the accuracy of the data before re-entering.

For the Region of Halton situation, the data which will be input to the computer program will be the data from in-plant testing and the data from the Regional Laboratory. To comply with MOE

requirements, the Region routinely submits samples to the MOE Laboratory, but due to the lengthy time period between sample submission and the receipt of analytical results, the MOE data is received too late to be of value in the day-to-day sludge management program. The MOE data will, however, be used as a check on the accuracy of the Region's analytical procedures.

6.2 Data Storage

When all data for samples taken in a particular month are received and entered, the computer will calculate the averages for the most recent month's data. The average data for each of the previous 12 months will also be retained along with the running average of all previous data.

6.3 Use of Sludge Quality Data for Evaluation of Operations

Sludge quality data can be used to check the efficiency of the water pollution control plants' operations.

Once the data is checked for accuracy and input to the computer, the program automatically assesses the data, comparing them to normal ranges and past averages for the particular plant, and provides the computer operator with a report on each plant. This report points out possible operational problems such as the following:

- a) if raw sludge total solids fall significantly below normal values, the report would recommend that the raw sludge pumping operation be checked to determine if excessive liquid is being pumped to the digester;

- b) similarly, if digested sludge total solids fall significantly below normal values, the report would recommend that the raw sludge pumping and supernating operations be checked for either excessive pumpage of liquid into the digester or insufficient supernating of liquid from the digester;
- c) if digested sludge total solids remain normal, but ammonium nitrogen levels drop below normal, the report would recommend that digester operations be checked for excessive supernating;
- d) if volatile solids destruction in anaerobic digesters falls below normal values, or pH, volatile acids or alkalinity fall outside normal ranges, the report would recommend that the digester operation be checked;

6.4 Suitability of Sludge Quality for Utilization on Farmland

The computer program which was developed during this study incorporates the Ontario criteria for the acceptability of liquid digested sludge for utilization on agricultural land. If necessary, the program could be changed to include different sludge criteria as stipulated by other regulatory agencies.

The Ontario requirements for liquid digested sewage sludge quality are outlined in "Guidelines for Sewage Sludge Utilization on Agricultural Lands" [1981]. Acceptability is judged by the sludge's nitrogen to metal ratios. Nitrogen is measured as ammonium plus nitrate nitrogen in mg/L as N. The minimum ratio requirements are as shown in Table 6.2.

6.5 Sludge Nutrient Content

The sludge quality parameters of interest from a nutrient standpoint are total phosphorus, total Kjeldahl nitrogen, ammonium nitrogen, nitrate nitrogen and potassium. Generally, potassium levels in sewage sludge are insignificant relative to agricultural requirements. The programs, while reporting potassium application rates, do not impose any tests for potassium acceptability.

The computer program accepts data for the above-mentioned parameters in the units shown in Table 6.1. For reporting to farmers, the units of expression are changed by the computer program to correspond to those with which the farm community is most familiar - phosphorus as P_2O_5 , nitrogen as N and potassium as K_2O .

The computer program also calculates the recommended sludge spreading rates for the various crops taking into consideration the nutrient content of the sludges, the crop requirements and the soil analysis of the fields. The recommended spreading rates are contained in the computer reports to the sludge haulers and farmers.

6.6 Sludge Blending

Within the Region of Halton and elsewhere, sludge blending takes place in a more or less uncontrolled fashion through the use of road-side transfer tanks. With the use of flotation-tired spreading vehicles, the normal practice is to position the spreading vehicle at a favourable sludge utilization site and haul the sludge to this site from the various water pollution control plants using tanker vehicles. To speed the unloading of the tankers and the loading of the spreading vehicle, a road-side transfer tank is used. This tank has sufficient capacity to allow the tankers to discharge when they

arrive, without having to wait for the spreading vehicle, and conversely it allows the spreading vehicle to load while the tankers are returning to the plants for more sludge.

The above method of sludge blending is relatively inefficient due to the limited size of the currently used road-side tank and the lack of positive sludge mixing. More efficient sludge blending systems could be designed and used to provide improved product uniformity. Sludge blending could also take place within on-site digesters. Sludge blending could be used to improve sludge quality. For instance, aerobic sludge low in ammonium nitrogen could be blended with anaerobic sludge high in ammonium nitrogen to improve its fertilizer value. Similarly, sludges unable to satisfy the OMAF-MOE guideline ratios could be blended with sludges with desirable characteristics (e.g. high ammonium nitrogen and/or low metal levels) to render the combined sludge suitable for use on agricultural land.

If the municipality wishes to blend sludges from various plants to arrive at improved sludge quality, the computer program allows the user to input data on the proposed blending proportions for specific desirable sludges to be blended with a problem sludge. The computer obtains the most recent sludge quality data from the data files and then calculates the resulting quality of the sludge blend including the required proportion of each sludge. This permits the user to select the necessary blending proportions to arrive at an acceptable sludge quality.

An alternative blending equation permits the system operator to determine the blended quality of specific sludges in

specified proportions. This is useful to determine what the quality of the sludge being spread will be when more than one source is utilized.

TABLE 6.1

SLUDGE QUALITY DATA

Parameter	Sample Type	Frequency of Sampling	Units	Range of Acceptable Data Concentrations for Input	1.
Total Solids	Anaerobic or aerobic, raw and digested	Weekly to twice monthly	mg/L	20,000 to 100,000 for anaerobic (raw or digested) 3,000 to 20,000 for aerobic (raw) 20,000 to 60,000 for aerobic (digested)	
Volatile Solids	Anaerobic or aerobic, raw and digested	Weekly to twice monthly	% of total solids	45 to 80 for raw anaerobic 40 to 55 for digested anaerobic 50 to 80 for raw aerobic 40 to 60 for digested aerobic	
Volatile Acids	Anaerobic digested	Weekly to twice monthly	mg/L as acetic acid	200 to 1,000	
pH	Anaerobic digested	Weekly to twice monthly	none	6.0 to 8.0	
Alkalinity	Anaerobic digested	Weekly to twice monthly	mg/L as Ca CO ₃	2,000 to 3,000	
Total Phosphorus	Anaerobic or aerobic, digested	Twice monthly	mg/L as P	1,000 to 5,000	
Total Kjeldahl Nitrogen	Anaerobic or aerobic, raw and digested	Twice monthly	mg/L as N	2,000 to 5,000	

Sludge Quality Data (cont'd)

Parameter	Sample Type	Frequency of Sampling	Units	Range of Acceptable Data Concentrations for Input
Ammonium Nitrogen	Anaerobic or aerobic, raw and digested	Twice monthly	mg/L as N	500 to 1,200 for anaerobic 5 to 100 for aerobic
Nitrate Nitrogen	Anaerobic or aerobic digested	Twice monthly	mg/L as N	0 - 25
Potassium	Anaerobic or aerobic digested	Twice monthly	mg/L as K	50 - 150
Metals (see Table 6.2)	Anaerobic or aerobic digested	Twice monthly	mg/L as As, Cd, etc.	Arsenic 0.01 - 0.99 Cadmium 0.01 - 1.99 Cobalt 0.01 - 4.99 Chromium 2 - 100 Copper 10 - 100 Mercury 50 - 300 Nickel 0.10 - 9.99 Lead 4.0 - 150 Selenium 0.10 - 0.50

Notes: 1. If accuracy of data confirmed by operator, data with concentrations outside these ranges will be accepted by the computer program

TABLE 6.2
LIQUID DIGESTED SEWAGE
SLUDGE - ONTARIO REQUIREMENTS

Metal	Minimum Ammonium Plus Nitrate Nitrogen to Metal Ratios in Sewage Sludge
ARSENIC	100
CADMIUM	500
COBALT	50
CHROMIUM	6
COPPER	10
MERCURY	1,500
MOLYBDENUM	180
NICKEL	40
LEAD	15
SELENIUM	500
ZINC	4

7.0 SLUDGE QUANTITY DATA

Sludge quantity information must be input to, and manipulated by, the computer to permit the following functions to be carried out:

- a) assessment of the accuracy of the data itself before accepting the data for use;
- b) calculation of the digested sludge volumes in storage at the plant site and in storage off-site which must eventually be spread on agricultural land;
- c) calculation of storage capacity remaining on-site and off-site and when haulage must take place;
- d) forecasting of future sludge quantities, agricultural land requirements, and sludge storage requirements.

7.1 Data Input

Procedures are established with the plant operators whereby regular measurements are made of the quantity of sludge being pumped to and from the digester. This information is entered into the program to provide relationships on the sludge production rates.

For each water pollution control plant and each off-site sludge storage facility, the program user must initially enter data pertaining to the maximum usable digested sludge storage capacity. For digestion facilities, the usable storage capacity will depend upon the design of the digesters. Usually, the capacity of the primary digesters is not considered as being available for digested sludge storage. With the secondary digesters, the total volume may be available as usable storage if fixed covers and compressed gas storage is used. If the secondaries have floating covers, the usable

storage will consist of the volume between the gas seal elevation and the maximum liquid level in the tank(s).

After the maximum usable storage volumes have been input, the computer operator must enter the pumpages to and withdrawals from the digesters and sludge storage facilities. This entry of data should preferably be on a daily basis for the small capacity storage systems. For large capacity systems, such as sludge lagoons, the data can be entered less frequently. Where plants are not manned on a 7-day/week basis the sludge inventory changes during unmanned periods should be forecast based upon the known method of operation of the plant during such times. Table 7.1 shows the typical data which should be provided to the computer operator for input. The data in the last two rows of Table 7.1 can be calculated using the other data. As a check, however, the "digested sludge in storage" and "storage capacity remaining" should be subject to periodic field measurement to avoid accumulating errors due to inaccurate sludge and supernatant volume measurements.

To allow the computer system to prepare future forecasts of digested sludge volumes, land area requirements, and storage requirements, the user must also input data on current serviced populations for each water pollution control plant along with the population forecasts for each service area.

7.2 Data Storage

To provide an historical data base the previous 12 months' raw sludge and digested sludge production, data should be checked for accuracy then entered into the computer storage. This data can then

be used to automatically assess the accuracy of new data as it is being entered.

The computer will store the monthly average raw sludge, supernatant and digested sludge data for each of the previous 12 months. As each new month's data is added, the oldest month's data will be dropped from computer storage. The computer will also calculate, retain and update on a monthly basis the overall averages for the data for the previous 12-month period.

7.3 Status of Sludge Inventory

For the proper management of a program of sludge application to farmland, it is necessary to carefully monitor both the availability of farmland for spreading and the capacity remaining for digested sludge storage, either on-site or off-site. The factors to monitor with respect to farmland availability are discussed elsewhere in this report.

The computer system which has been developed allows the computer operator to assess the amount of digested sludge in storage at each plant and at each off-site storage facility which must eventually be spread; the amount of digested sludge storage capacity which remains, either on-site or off-site, in terms of volume and days until haulage must take place; the volume of digested sludge in storage and the number of vehicle loads which this volume represents. This information coupled with information on whether fields are accessible, where the accessible fields are, and where the sludge spreading equipment is located, provides the operator with the data necessary to permit him to decide where the digested sludge should be routed.

7.4 Sludge Quantity Forecasts

Periodically it is necessary for agencies managing sludge utilization programs to forecast sludge quantities, sludge storage requirements and field requirements. The software which has been developed permits these forecasts to be automatically made provided that the operator has entered data on population forecasts for the various water pollution control plants' service areas plus other information as discussed elsewhere in this report.

The computer system utilizes past average digested sludge production rates, and sludge quality (phosphorus and nitrogen), then factors this data according to the expected population growth rates to arrive at future forecasts.

To calculate the field areas needed, the computer system considers also the types of crops typically grown and the nutrient requirements for such crops.

Similarly, for forecasting sludge storage requirements, the computer system considers the past experience with sludge spreading in the area of consideration and the number of days when spreading typically cannot be carried out in a satisfactory manner.

Based upon the results of these forecasts, the program user can assess the adequacy of existing sludge storage and field inventory and, if necessary, initiate projects to increase storage capacity and/or intensify efforts to bring more agricultural land into the sludge utilization program.

TABLE 7.1

SLUDGE PRODUCTION AND DIGESTED SLUDGE

STORAGE STATUS

- DATA REQUIRED

DATE OF
DATA ENTRY

PLANT OR
STORAGE SITE

DIGESTED SLUDGE IN
STORAGE AS OF
PREVIOUS DATA INPUT
(m³)

RAW SLUDGE INPUT
SINCE PREVIOUS
DATA ENTRY
(m³)

VOLUME SUPERNATED
SINCE PREVIOUS
DATA ENTRY
(m³)

DIGESTED SLUDGE
HAULAGE SINCE
PREVIOUS DATA
ENTRY
(m³) (Loads)

DIGESTED SLUDGE
IN STORAGE
(m³) (Loads)

DIGESTED SLUDGE
STORAGE CAPACITY
REMAINING ON-SITE
(m³) (Days)

8.0 OFF-SITE STORAGE

The current sludge storage system in Halton involves the use of a lagoon storage system to provide storage during periods of the year when inclement weather prevents access to farm fields. The lagoons are supernatant to a separate cell. The supernatant is irrigated onto adjoining farmland. Each summer, the lagoons are emptied in preparation for the wet weather and winter conditions likely to prevent access to fields.

The Region of Halton is currently investigating alternative sludge storage facilities that could be utilized. The concepts under consideration include both centralized and decentralized storage facilities. Storage techniques being considered include lagoon systems, covered lagoons, and tanks. The storage options considered in the computer program have been kept general to facilitate use of any of the foregoing alternatives.

The computer system leaves the decisions as to field spreading or storing sludge up to the system user. Information is provided to the user describing the most probable fields for spreading sludge during specific time periods. The user then decides whether the fields can be used or whether sludge should be stored.

The computer-assisted sludge management system utilizes input from the water pollution control plants to determine when the in-plant digester storage is nearing a critical level. When this occurs, the system signals a need to move sludge out of the plant to off-site storage or fields.

The user specifies the quantity of sludge, the plant from which the sludge is to be hauled and the storage site to be used. The computer system calculates the changes in holding capacity in the plant and the designated storage. Predetermined haulage distance tables are utilized in the computer system to calculate the distance the sludge is to be moved.

The system calculates the impact of the sludge added to storage using a mass balance blending formula. The sludge quality in storage is re-checked and any anomalies are flagged.

A blending sub-routine is built into the sludge storage program to give the user the opportunity to choose sludge from several sources in a prescribed ratio. A calculation reports the quality of the proposed blend and gives the opportunity to revise the blend ratio if required. The blending sub-routine also offers the opportunity to blend one or more specific sludges with a problem sludge to achieve an overall blend within the limits of specified guidelines.

9.0 TRANSPORTATION AND SPREADING

The haulage phase of the computer system has been developed around a predetermined major road network. Provincial highways and major region and local roads were chosen between the sludge sources (including storage sites and treatment plants) and the farm fields. The distance between the source and a major road co-ordinate near the farm field is determined. Then a local distance is added to the haulage distance to determine the source-to-field distance.

The computer system calculates the volume and distance that sludge is hauled. This is also accumulated to provide a total volume-distance tally for haulage contract payment purposes.

10.0 REPORTING

The computer-assisted sludge management system includes a number of sub-routines to provide status reports to the users. These reports include descriptions of fields, summaries of data, and warnings of anomalies in the data and in the operation of the sewage facilities.

Specific report sub-routines summarize information for system users to provide management with reports for policing agencies such as the Ministry of the Environment, the preparation of budgets, executive summaries to present to council and user reports for farmers.

A P P E N D I X

PROGRAM LISTINGS


```

5 GOTO 1000
10 HOME:VTAB 3:PRINT STRING$(80,42)
20 HTAB 27:PRINT"SLUDGE MANAGEMENT SYSTEM":PRINT STRING$(80,42):PRINT:PRINT
30 HTAB 27:PRINT"THIS IS THE STARTING SYSTEM":PRINT:PRINT
40 HTAB 27:HTAB 3:PRINT"PRESS ";:INVERSE:PRINT"<A>";:NORMAL:PRINT" FOR 'SLUDGE AND PLANT INFORMATION DISK':PRINT
50 HTAB 10:PRINT"OR ";:INVERSE:PRINT"<B>";:NORMAL:PRINT" FOR 'AGRICULTURAL UTILIZATION DISK':PRINT
60 HTAB 10:PRINT"WHICH OPTION ";
70 GET A$:IF A$="A" THEN 100
80 IF A$="B" THEN 300 ELSE 70
100 PRINT A$:HOME:VTAB 12:HTAB 27
110 PRINT"INSERT DISK #4 IN DRIVE A":PRINT
120 HTAB 27:PRINT CHR$(7):PRINT"AND PRESS ";:INVERSE:PRINT"<RETURN>";:NORMAL:PRINT" TO CONTINUE";:INPUT" ",R$
130 RESET
140 OPEN"R",#1,"DISKNUM",2:FIELD#1,2 AS D$
145 GET#1,1
150 IF CVI(D$)=4 THEN 200
160 FOR I=1 TO 5:PRINT CHR$(7):NEXT:GOSUB 500
170 GOTO 100
200 CLOSE:HOME:VTAB 12:HTAB 10
210 PRINT"STAND BY >>>>>";:
220 LOAD"SLDGMENU.BAS",R
300 PRINT A$:HOME:VTAB 12:HTAB 27
310 PRINT"INSERT DISK #2 IN DRIVE A":HTAB 30
320 PRINT"AND DISK #3 IN DRIVE B":PRINT:PRINT
330 HTAB 10:PRINT CHR$(7):PRINT"PRESS ";:INVERSE:PRINT"RETURN";:NORMAL:PRINT" TO CONTINUE";:INPUT" ",R$
340 RESET
350 OPEN"R",#1,"DISKNUM",2:FIELD#1,2 AS D$
355 GET#1,1
360 IF CVI(D$)=2 THEN 400
370 FOR I=1 TO 5:PRINT CHR$(7):NEXT:GOSUB 500
380 GOTO 300
390 ON ERROR GOTO 370
400 OPEN"R",#2,"B:DISKNUM",2:FIELD#2,2 AS D$
405 GET#2,1
410 IF CVI(D$)=3 THEN 450 ELSE 370
450 CLOSE:HOME:VTAB 12:HTAB 30
460 PRINT"STAND BY >>>>>";:
470 LOAD"START.#01".R
500 IF GB=2 THEN HOME:VTAB 12:HTAB 24:FOR I=1 TO 10:BEEP 250-(20*I),50:BEEP 50,50
503 IF GB=0 THEN 510
504 NEXT:PRINT"YOU DID IT AGAIN NOW I QUIT !! ";:END
510 HTAB 10:PRINT"WRONG DISK # YOU HAVE ONE MORE CHANCE !! ";:
520 FOR I=1 TO 10:BEEP 50,50:BEEP 120,50:BEEP 50,50:NEXT
530 PRINT:HTAB 30:PRINT"TRY AGAIN":FOR I=1 TO 2000:NEXT:
540 GB=2: RETURN
1000 REM
1040 HOME:VTAB 2:HTAB 25
1050 INVERSE:PRINT" * * * * *":NORMAL:PRINT
1060 HTAB 25:PRINT"SLUDGE MANAGEMENT SYSTEM":PRINT:HTAB 25:INVERSE:PRINT" * * * * *":NORMAL:PRINT:
1070 PRINT:HTAB 35:PRINT"for":PRINT

```



```
1080 HTAB 23:PRINT"SUPPLY AND SERVICES CANADA":PRINT
1090 HTAB 28:PRINT"ENVIRONMENT CANADA":PRINT
1100 HTAB 19:PRINT"ONTARIO MINISTRY OF THE ENVIRONMENT":PRINT
1110 HTAB 35:PRINT"and":PRINT
1120 HTAB 29:PRINT"REGION OF HALTON":PRINT:PRINT:
1130 PRINT"prepared by:"
1140 INVERSE:PRINT"SIMCOE ENGINEERING GROUP LIMITED":NORMAL
1150 INVERSE:PRINT"ENVIROSEARCH LIMITED";:NORMAL:
1200 FOR I=1 TO 2
1210 BEEP 50,50
1220 NEXT
1250 FOR I =1 TO 8000:NEXT :GOTO 10
1010 ST$=STRING$(80,42)
1020 HOME:PRINT ST$+ST$:INVERSE
1030 HTAB 28:PRINT"SLUDGE INFORMATION DISK"
1040 NORMAL:PRINT:PRINT ST$+ST$
1050 PRINT:PRINT TAB(20)"PRESS ";:INVERSE:PRINT"(ESC)":;:NORMAL
1060 PRINT" FOR MAIN SYSTEM MENU OR SELECT":PRINT:PRINT
1070 PRINT TAB(28)"A. SLUDGE QUALITY DATA ENTRY"
1080 PRINT TAB(28)"B. SLUDGE ANNUAL QUALITY REPORTS"
1090 PRINT TAB(28)"C. SPECIAL QUALITY DATA REPORTS"
1100 PRINT TAB(28)"D. EDIT SLUDGE QUALITY FILES"
1110 PRINT TAB(28)"E. SLUDGE STORAGE PROGRAM"
1120 PRINT TAB(28)"F. SLUDGE BLENDING CALCULATION"
1130 PRINT TAB(28)"G. SLUDGE QUANTITY FORECASTING"
1140 PRINT TAB(28)"H. UTILITIES":PRINT CHR$(7)
1150 FF=FRE("):REM GARBAGE COLLECTION
1160 IF ARDONE<>1 THEN GOSUB 1320
1170 PRINT TAB(28)" WHICH OPTION ";:HTAB 28
1180 GET A$:IF A$=CHR$(27) THEN 1420
1190 A=ASC(A$)-64:IF A<1 OR A>8 THEN 1180
1200 PRINT A$:HOME:VTAB 12:HTAB 30
1210 PRINT"STAND BY >>>>>"
1220 COMMON PLN$( ),PAR$( ),ARDONE
1230 ON A GOTO 1240,1250,1260,1270,1280,1290,1300,1310
1240 CHAIN"SQINPUT",1000
1250 CHAIN"SQOUTPUT",1000
1260 CHAIN"SLDGSPEC",1000
1270 CHAIN"FILEFIX",1000
1280 CHAIN"STORPROG",1000
1290 CHAIN"SLDGLEN",1000
1300 CHAIN"SLDGCAST",1000
1310 CHAIN"UTILITY",1000
1320 OPEN"R",#1,"NAMES",22
1330 FIELD #1,2 AS N$,20 AS W$
1340 DIM PLN$(26),PAR$(27)
1350 FOR X=1 TO 26
1360 GET #1,X:PLN$(X)=W$
1370 NEXT
1380 FOR X=31 TO 57
```



```

1390 GET #1,X:PAR$(X-30)=4$
1400 NEXT
1410 ARDONE=1:CLOSE:RETURN
1420 HOME:VTAB 8
1430 HTAB 24:PRINT"PRESS Q TO QUIT THE SYSTEM NOW OR":PRINT
1440 HTAB 18:PRINT"INSERT DISK #2 (AGRICULTURAL UTILIZATION DISK) IN DRIVE A"
1445 HTAB 18:PRINT"AND DISK #3 IN DRIVE 4":PRINT
1450 HTAB 32:PRINT"AND PRESS RETURN ";
1460 GET R$:IF R$="Q" THEN HOME:END
1470 IF R$(1)CHR$(13) THEN 1460
1480 RESET
1490 OPEN"R",#1,"DISKNUM",2:FIELD#1,2 AS D$
1500 GET#1,1
1510 IF CVI(D$)=2 THEN 1530
1520 GOSUB 1600:GOTO 1420
1530 CLOSE :HOME:VTAB 12:HTAB 24:PRINT"STAND BY >>>>>";:LOAD"START.#01",R
1540 FOR T=1 TO 5:PRINT CHR$(7):NEXT
1550 RESUME 1420
1600 IF GB=2 THEN HOME:INVERSE:FOR I=1 TO 10:BEEP 250-(20*I),40:BEEP 50,50:NORMAL:NEXT
1620 IF GB=0 THEN 1640
1630 VTAB 12:HTAB 24:PRINT"YOU DID IT AGAIN NOW I QUIT ! ! !":END
1640 HTAB 10:PRINT"WRONG DISK # YOU HAVE ONE MORE CHANCE ! !"
1645 FOR I=1 TO 10: BEEP 50,50:BEEP 120,40:NEXT:PRINT
1650 HTAB 30:PRINT"TRY AGAIN":FOR I=1 TO 2000:NEXT
1660 GB=2:RETURN
1010 GOTO 1130
1020 INVERSE:BEEP 50,20:PRINT"-Y/N";:NORMAL
1030 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1030
1040 OPEN"R",#1,"SLUDGE.MET",52
1050 FIELD #1,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
1060 RETURN
1070 OPEN"R",#1,"SLUDGE.GEN",28
1080 FIELD #1,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
1090 RETURN
1100 OPEN"R",#1,"SLUDGE.NUT",28
1110 FIELD #1,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
1120 RETURN
1130 DIM V(13),DAT$(22),A$(13)
1140 F$(1)="SLUDGE.MET":F$(2)="SLUDGE.GEN":F$(3)="SLUDGE.NUT"
1160 OPEN"R",#1,"NAMES",22:FIELD #1,2 AS N$,20 AS W$
1170 FOR X=1 TO 22
1180 GET #1,X+60
1190 DAT$(X)=W$
1200 NEXT:CLOSE #1
1210 HOME
1220 INVERSE:PRINT"SLUDGE QUALITY DATA FILE EDITOR":NORMAL:PRINT
1230 PRINT"PRESS *":INVERSE:PRINT"<ESC>":NORMAL
1240 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1250 PRINT"A. METALS DATA FILE":PRINT
1260 PRINT"B. GENERAL CHARACTERISTICS DATA FILE":PRINT
1270 PRINT"C. NUTRIENTS DATA FILE":PRINT CHR$(7)

```



```

1280 PRINT" WHICH OPTION ";:HTAB 1
1290 GET A$:IF A$=CHR$(27) THEN 1860
1300 A=ASC(A$)-64:IF A<1 OR A>3 THEN 1290

1310 ON A GOSUB 1040,1070,1100:REM OPEN RIGHT FILE!
1320 HOME:INVERSE:PRINT"MODIFY SLUDGE DATA FILE:";F$(A):NORMAL
1330 PRINT:PRINT"PRESS ";:INVERSE:PRINT"<ESC>";:NORMAL
1340 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1350 FOR X=1 TO 26
1360 IF LEFT$(PLN$(X),5)="SPARE" THEN 1380
1370 PRINT CHR$(X+64);". ";PLN$(X):L=L+1
1380 NEXT
1390 PRINT:PRINT" WHICH PLANT ";:HTAB 1
1400 GET P$:IF P$=CHR$(27) THEN CLOSE:GOTO 1210
1410 P=ASC(P$)-64:IF P<1 OR P>L THEN 1400 ELSE L=0
1420 RECO=22*(P-1):REM ZEROth RECORD FOR PLANT #P
1430 HOME:INVERSE:PRINT"MODIFY SLUDGE DATA FILE ";F$(A);" FOR ";PLN$(P):NORMAL:PRINT
1440 FOR X=1 TO 22 STEP 2
1450 PRINT CHR$(X+64)+". "+DAT$(X)+" ";
1460 PRINT CHR$(X+65)+". "+DAT$(X+1)
1470 NEXT:PRINT
1480 PRINT" WHICH RECORD ";:HTAB 1
1490 GET R$:REC=ASC(R$)-64:IF REC=21 THEN 1490
1500 IF REC<1 OR REC>22 THEN 1490
1510 HOME:INVERSE:PRINT"MODIFY SLUDGE DATA FILE:";F$(A);" FOR ";PLN$(P):NORMAL
1520 PRINT"FILE DATA FOR ";DAT$(REC):PRINT"PRESS ";
1530 INVERSE:PRINT"RETURN FOR NO CHANGE";:NORMAL:PRINT" OR ENTER NEW VALUE"
1540 PLACE=RECO+REC
1550 GET #1.PLACE:VTAB 6
1560 ON A GOTO 1570,1610,1650
1570 FOR X=1 TO 13
1580 V(X)=CVS(A$(X))
1590 PRINT PAR$(X);:PRINT USING"#####.##";V(X)
1600 NEXT:GOTO 1700
1610 FOR X=1 TO 7
1620 V(X)=CVS(B$(X))
1630 PRINT PAR$(X+13);:PRINT USING"#####.##";V(X)
1640 NEXT:GOTO 1700
1650 FOR X=1 TO 7
1660 V(X)=CVS(C$(X))
1670 PRINT PAR$(X+20);:PRINT USING"#####.##";V(X)
1680 NEXT
1700 VTAB 6
1710 FOR Z=1 TO X-1
1720 HTAB 32:INPUT"NEW VALUE ";NV$
1730 IF LEN(NV$)=0 THEN 1750
1740 V(Z)=VAL(NV$)
1750 NEXT
1760 VTAB 22:PRINT"WRITE NEW VALUES TO FILE";:GOSUB 1020
1770 IF Z$="N" THEN 1850
1780 FOR Z=1 TO X-1
1790 ON A GOTO 1800,1810,1820

```



```

1800 LSET A$(Z)=MKS$(V(Z)):GOTO 1830
1810 LSET B$(Z)=MKS$(V(Z)):GOTO 1830
1820 LSET C$(Z)=MKS$(V(Z))
1830 NEXT
1840 PUT #1,PLACE
1850 CLOSE:GOTO 1210
1860 HOME:VTAB 12:HTAB 30
1870 PRINT"STAND BY >>>> "
1880 COMMON PLN$( ),PAR$( ),ARDONE
1890 CHAIN"SLDGMENU",1000
1010 GOTO 1250
1020 INVERSE:BEEP 50,20:PRINT"-Y/N";:NORMAL
1030 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1030
1040 HOME:PRINT LAN$
1050 INVERSE:PRINT"BLENDING CALCULATION RESULTS:"+X$:NORMAL
1060 PRINT LAN$:PRINT
1070 PRINT"QUALITY DATA--"+O$:PRINT
1080 PRINT"SOURCE:          PERCENT"
1090 FOR X=1 TO 26
1100 IF PLANT(X)=0 THEN 1130
1110 PRINT PLN$(X);
1120 PRINT USING"   ##.##";BLPCT(X)*100
1130 NEXT
1140 PRINT:PRINT LAN$
1150 PRINT:IF AM=0 THEN 1180
1160 AM=0:RETURN
1170 PRINT"BLENDED QUALITY":PRINT
1180 FOR P=Z1 TO Z2
1190 IF LEFT$(PAR$(P),5)="SPARE" THEN 1220
1200 PRINT PAR$(P);
1210 PRINT USING" #####.##";BL(P)
1220 NEXT
1230 PRINT:INVERSE:PRINT"PRESS RETURN TO CONTINUE ";:NORMAL
1240 GET R$:IF R$(<)CHR$(13) THEN 1240 ELSE PRINT:RETURN
1250 DIM BL(27),PLANT(26),BLPCT(26),AMRAT(13),A$(13)
1260 LIN$=STRING$(80,61):LAN$=STRING$(52,61)
1270 PR$="ADJUST THE PRINTER AND "
1280 RET$="PRESS ANY KEY TO CONTINUE "
1290 FOR X=1 TO 13:READ AMRAT(X):NEXT
1300 DATA 100,500,50,6,10,1.5
1310 DATA 180,40,15,500,4,0,0
1320 HOME
1330 INVERSE:PRINT"SLUDGE BLENDING PROGRAM":NORMAL:PRINT
1340 PRINT"PRESS ";:INVERSE:PRINT"<ESC>";:NORMAL
1350 PRINT" FOR PREVIOUS MENU OR RETURN TO CONTINUE ";
1360 GET R$:IF R$=CHR$(27) THEN 2570
1370 IF R$(<)CHR$(13) THEN 1360
1380 HOME:INVERSE:PRINT"SLUDGE BLENDING PROGRAM - SOURCE SELECTION":NORMAL:VTAB 5
1390 FOR X=1 TO 26
1400 IF LEFT$(PLN$(X),5)="SPARE" THEN 1420
1410 PRINT CHR$(X+64);". ";PLN$(X)
1420 NEXT :VTAB 5

```



```

1430 FOR X=1 TO 26
1440   IF LEFT$(PLN$(X),5)="SPARE" THEN 1480
1450   HTAB 30: PRINT"THIS ONE ";:GOSUB 1020
1460   IF Z#="N" THEN PLANT(X)=0: GOTO 1480
1470   PLANT(X)=X: LAST=LAST+1
1480 NEXT
1490 IF LAST<2 THEN 1330
1500 HOME:INVERSE:PRINT"BLEND SELECTION":NORMAL:PRINT
1510 FOR X=1 TO 26
1520   IF PLANT(X)=0 THEN 1570
1530   PRINT PLN$(X);
1540   INPUT "ENTER % ";P$
1550   P=VAL(P$):IF P=>100 THEN PRINT "0-100%":GOTO 1530
1560   PT=PT+P:BLPCT(X)=P*.01
1570 NEXT
1580 IF PT=100 THEN PT=0:GOTO 1630 ELSE PT=0
1590 FOR P=1 TO 5: PRINT CHR$(7);:NEXT
1600 PRINT"BLEND TOTAL MUST BE 100% !!"
1610 PRINT CHR$(7);"PRESS <ESC> TO QUIT OR ";RET$;
1620 GET R$:IF R#=CHR$(27) THEN 1330 ELSE 1500
1630 HOME:VTAB 5
1640 PRINT"THE SLUDGE QUALITY DATA USED FOR THE FOLLOWING CALCULATION MAY BE EITHER"
1650 PRINT:PRINT"A. HISTORICAL, I.E. LAST MONTHS DATA":PRINT
1660 PRINT"B. THE CALCULATED QUALITY FOR THE LOCATION (WHICH MAY NOT BE ACCURATE)"
1670 PRINT:PRINT"  WHICH DO YOU WANT ";:HTAB 1
1680 GET R$:IF R#="A" THEN R=1 ELSE IF R#="B" THEN R=22 ELSE 1680
1690 IF R=1 THEN D$="HISTORICAL" ELSE D$="CALCULATED"
1700 PRINT:PRINT:PRINT"CALCULATING...."
1720 OPEN"R",#4,"SLUDGE.MET",52
1730 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
1740 OPEN"R",#5,"SLUDGE.GEN",28
1750 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
1760 OPEN"R",#6,"SLUDGE.NUT",28
1770 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
1790 FOR X=1 TO 26
1800   IF PLANT(X)=0 THEN 1940
1810   RECN=22*(X-1)+R:REM SELECTED QUALITY
1820   GET #4,RECN
1830   FOR Z=1 TO 13
1840     BL(Z)=BL(Z)+BLPCT(X)*CVS(A$(Z))
1850   NEXT
1860   GET #5,RECN
1870   FOR Z=1 TO 7
1880     BL(13+Z)=BL(13+Z)+BLPCT(X)*CVS(B$(Z))
1890   NEXT
1900   GET #6,RECN
1910   FOR Z=1 TO 7
1920     BL(20+Z)=BL(20+Z)+BLPCT(X)*CVS(C$(Z))
1930   NEXT
1940 NEXT

```



```
1950 AMTOT=BL(23)+BL(24)
1960 HOME:PRINT"BLEND CALCULATIONS COMPLETE":PRINT
1970 PRINT"DO YOU WANT A PRINTED OUTPUT";:GOSUB 1020
1980 IF Z$="N" THEN 2020
1990 PRINT:PRINT PR$+RET$
2000 PRINT"OR PRESS (ESC) TO ABORT PRINT";
2010 GET R$:IF R$(<)<CHR$(27) THEN 2230
2020 X$="METALS QUALITY"
2030 Z1=1:Z2=13:GOSUB 1040
2040 X$="GENERAL CHARACTERISTICS"
2050 Z1=14:Z2=20:GOSUB 1040
2060 X$="NUTRIENT QUALITY"
2070 Z1=21:Z2=27:GOSUB 1040
2080 X$="AMMONIA/METALS RATIOS"
2090 AM=1:GOSUB 1040
2100 FOR Z=1 TO 13
2110 IF LEFT$(PAR$(Z),5)="SPARE" THEN 2190
2120 PRINT PAR$(Z);
2130 IF BL(Z)=<0 THEN PRINT" * NO DATA *":GOTO 2190
2140 IF AMTOT/BL(Z)>10000 THEN PRINT">10000":GOTO 2190
2150 IF AMTOT/BL(Z)<AMRAT(Z) THEN INVERSE
2160 PRINT USING " #####.##" ;AMTOT/BL(Z);:NORMAL
2170 IF AMTOT/BL(Z)>AMRAT(Z) THEN PRINT:GOTO 2190
2180 PRINT" -BELOW LIMIT VALUE OF";AMRAT(Z)
2190 NEXT
2200 PRINT:PRINT"DO YOU WANT A PRINTED COPY OF THESE RESULTS ";:GOSUB 1020
2210 IF Z$="Y" THEN 1990 ELSE 2530
2230 LPRINT:LPRINT LAN$
2240 LPRINT"BLENDING CALCULATION RESULTS";
2250 LPRINT" : QUALITY DATA--"+0$
2260 LPRINT LAN$:LPRINT
2270 LPRINT"SOURCE:                PERCENT"
2280 FOR X=1 TO 26
2290 IF PLANT(X)=0 THEN 2320
2300 LPRINT PLN$(X);
2310 LPRINT USING "   ##.##" ;BLPCT(X)*100
2320 NEXT
2330 LPRINT LAN$
2340 LPRINT:LPRINT"BLENDED QUALITY":LPRINT
2350 FOR Z=1 TO 27
2360 IF LEFT$(PAR$(Z),5)="SPARE" THEN 2390
2370 LPRINT PAR$(Z);
2380 LPRINT USING " #####.##" ;BL(Z)
2390 NEXT
2400 LPRINT LAN$
2410 LPRINT :LPRINT"AMMONIA/METALS RATIOS":LPRINT
2420 FOR Z=1 TO 13
2430 IF LEFT$(PAR$(Z),5)="SPARE" THEN 2500
2440 LPRINT PAR$(Z)+ " ";
2450 IF BL(Z)=<0 THEN LPRINT"* NO DATA *":GOTO 2500
2460 IF AMTOT/BL(Z)>10000 THEN LPRINT">10000":GOTO 2500
2470 LPRINT USING " #####.##" ;AMTOT/BL(Z);
```



```

2480 IF AHTOT/BL(Z)*AMRAT(Z) THEN LPRINT:GOTO 2500
2490 LPRINT " -BELOW LIMIT VALUE OF";AMRAT(Z)
2500 NEXT
2510 FOR P=1 TO 10 :LPRINT:NEXT
2520 FOR P=1 TO 5:PRINT CHR$(7):NEXT
2530 FOR Z=1 TO 27:BL(Z)=0:NEXT
2540 HOME:VTAB 5
2550 PRINT"DO YOU WANT TO TRY ANOTHER BLEND";
2560 GOSUB 1020:IF Z$="Y" THEN CLOSE:GOTO 1380
2570 CLOSE
2580 COMMON PLN$( ),PAR$( ),ARDONE
2590 HOME:VTAB 12:HTAB 30
2600 PRINT"STAND BY...)))))"
2610 CHAIN "SLDGMENU",1000
1010 GOTO 1170
1020 OPEN"R",#2,"POPMPROD",32
1030 FIELD #2,4 AS PROD$,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7)
1040 RETURN
1050 BEEP 50,20:PRINT"-Y/N ";
1060 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1060
1070 HOME:PRINT NAM$:PRINT
1080 FOR X=1 TO 26
1090 IF LEFT$(PLN$(X),5)="SPARE" THEN 1120
1100 LAST=LAST+1
1110 PRINT CHR$(X+64);" ";PLN$(X)
1120 NEXT
1130 PRINT:PRINT"WHICH LOCATION ";
1140 GET A$:A=ASC(A$)-64
1150 IF A<1 OR A>LAST THEN 1140
1160 LAST=0:PRINT A$:RETURN
1170 ST$=STRING$(80,42):LNS$=STRING$(80,45)
1180 FOR X=1 TO 7:READ TIM(X):NEXT
1190 DATA 1,2,3,4,5,10,20
1200 RET$="PRESS RETURN TO CONTINUE":PR$="ADJUST THE PRINTER AND "
1210 DIM PROD(26)
1220 T1$=" M3/D/1000 PROJECTED POPULATION-1000'S"
1230 T2$="LOCATION PEOPLE YEAR 1 YEAR 2 YEAR 3 YEAR 4 YEAR 5 YEAR 10 YEAR 20"
1240 T3$=" M3/D/1000 DAILY SLUDGE PRODUCTION-CU.M"
1250 HOME:PRINT ST$:HTAB 27
1260 PRINT"SLUDGE FORECASTING PROGRAM":PRINT ST$:PRINT
1270 PRINT"PRESS (ESC) FOR PREVIOUS MENU OR SELECT":PRINT
1280 PRINT"A. FORECAST SLUDGE PRODUCTION":PRINT
1290 PRINT"B. EDIT PRODUCTION/POPULATION FILE":PRINT
1300 PRINT"C. DISPLAY/PRINT PRODUCTION/POPULATION FILE":PRINT CHR$(7)
1310 PRINT" WHICH OPTION ";
1320 GET A$:IF A$=CHR$(27) THEN 2590
1330 A=ASC(A$)-64:IF A<1 OR A>3 THEN 1320
1340 PRINT A$:ON A GOTO 1360,1980,2210
1360 HOME:PRINT"SLUDGE PRODUCTION FORECAST":PRINT
1370 PRINT"PRESS (ESC) FOR PREVIOUS MENU OR SELECT":PRINT
1380 PRINT"A. MULTI-YEAR ALL LOCATIONS":PRINT
1390 PRINT"B. SINGLE LOCATION":PRINT

```



```

1400 PRINT " WHICH OPTION ";
1410 GET Z$:Z=ASC(Z$)-64
1420 IF Z#=CHR$(27) THEN 1250
1430 IF Z<1 OR Z>2 THEN 1410 ELSE PRINT Z$
1440 GOSUB 1020:IF Z=1 THEN 1590
1450 NAM$="SLUDGE FORECAST":GOSUB 1070
1460 HOME:PRINT NAM$+" "+PLN$(A):PRINT
1470 GET #2,A:PROD=CVS(PROD$)
1480 PRINT USING"PROD.RATE=#####.## M3/DAY/1000 PEOPLE";PROD
1490 PRINT:PRINT"YEAR          M3/DAY":PRINT
1500 FOR YR=1 TO 7
1510 PRINT USING" ##          #####.##";TIM(YR),PROD*CVS(A$(YR))
1520 NEXT
1530 PRINT:INPUT"POPULATION FOR FORECAST ";PP$:PP=VAL(PP$)
1540 PRINT:PRINT"FORECAST QUANTITY"
1550 PRINT USING"M3/DAY          =#####.##";PROD*PP*.001
1560 PRINT USING"M3/YEAR          =#####";PROD*PP*.365
1570 PRINT:PRINT"ANOTHER FORECAST";GOSUB 1050
1580 IF Z$="Y" THEN 1460 ELSE CLOSE:GOTO 1360
1590 PRINT:PRINT"DO YOU WANT PRINTED OUTPUT ";GOSUB 1050
1600 IF Z$="N" THEN PR=0:GOTO 1650 ELSE PR=1
1610 PRINT:PRINT PR$+RET$
1620 PRINT"OR PRESS (ESC) TO ABORT PRINT";
1630 GET R$:IF R#=CHR$(27) THEN 1650
1640 IF R$(<)CHR$(13) THEN 1630
1650 PRINT:HOME
1660 IF PR=1 THEN LPRINT T3$:LPRINT T2$ ELSE PRINT T3$:PRINT T2$
1670 IF PR=1 THEN LPRINT LIN$:LPRINT ELSE PRINT LIN$:PRINT
1680 FOR X=1 TO 26
1690 IF LEFT$(PLN$(X),5)="SPARE" THEN 1800
1700 GET #2,X:PROD=CVS(PROD$)
1710 IF PR=1 THEN LPRINT PLN$(X);:LPRINT USING"###.## ";PROD;:GOTO 1730
1720 PRINT PLN$(X);:PRINT USING"###.## ";PROD;
1730 FOR YR=1 TO 7
1740 PP(YR)=CVS(A$(YR))
1750 TS(YR)=TS(YR)+PROD*PP(YR)
1760 IF PR=1 THEN LPRINT USING"###.## ";PROD*PP(YR);:GOTO 1780
1770 PRINT USING"###.## ";PROD*PP(YR);
1780 NEXT
1790 IF PR=1 THEN LPRINT ELSE PRINT
1800 NEXT
1810 IF PR=1 THEN LPRINT ELSE PRINT:GOTO 1890
1820 LPRINT LIN$:LPRINT"REGIONAL TOTALS ";
1830 FOR YR=1 TO 7
1840 LPRINT USING"##### ";TS(YR);
1850 TS(YR)=0
1860 NEXT
1870 LPRINT LIN$:FOR P=1 TO 10:LPRINT:NEXT
1880 FOR P=1 TO 5:PRINT CHR$(7);:NEXT:GOTO 1960
1890 PRINT LIN$:PRINT"REGIONAL TOTALS ";
1900 FOR YR=1 TO 7
1910 PRINT USING"##### ";TS(YR);

```



```

1920 TS(YR)=0
1930 NEXT
1940 PRINT:PRINT RET$:
1950 GET R$:IF R$(>)CHR$(13) THEN 1950
1960 PRINT:CLOSE:GOTO 1250
1980 GOSUB 1020
1990 NAME="FILE EDIT ROUTINE":GOSUB 1070
2000 HOME:PRINT NAME+" "+PLN$(A):PRINT
2010 PRINT"CURRENT FILE INFORMATION:"
2020 PRINT"PRESS RETURN IF NO CHANGE TO VALUE":PRINT
2030 GET #2,A:PROD=CVS(PROD$)
2040 FOR YR=1 TO 7:PP(YR)=CVS(A$(YR)):NEXT
2050 PRINT USING"PROD\N RATE = #####.## M3/DAY/1000 PEOPLE";PROD;
2060 INPUT" NEW VALUE ";X$
2070 IF LEN(X$)=0 THEN 2080 ELSE PROD=VAL(X$)
2080 PRINT:PRINT
2090 FOR YR=1 TO 7
2100 PRINT USING"YEAR ##";TIM(YR);
2110 PRINT USING" #####.## THOUSAND PEOPLE";PP(YR);
2120 INPUT" NEW VALUE ";X$
2130 IF LEN(X$)=0 THEN 2140 ELSE PP(YR)=VAL(X$)
2140 NEXT:PRINT
2150 LSET PROD$=MKS$(PROD)
2160 FOR YR=1 TO 7:LSET A$(YR)=MKS$(PP(YR)):NEXT
2170 PUT #2,A
2180 PRINT:PRINT"ANY MORE CHANGES ";:GOSUB 1050
2190 CLOSE:IF Z$="N" THEN 1250 ELSE 1980
2210 HOME:PRINT"POPULATION/PRODUCTION FILE":PRINT
2220 GOSUB 1020
2230 PRINT"DO YOU WANT PRINTED COPY";:GOSUB 1050
2240 IF Z$="N" THEN 2440
2250 PRINT PR$+RET$
2260 PRINT"OR PRESS <ESC> TO ABORT PRINT";
2270 GET R$:IF R$=CHR$(27) THEN 2440
2280 HOME:LPRINT T1$:LPRINT T2$:LPRINT LIN$:LPRINT
2290 FOR X=1 TO 26
2300 IF LEFT$(PLN$(X),5)="SPARE" THEN 2410
2310 GET #2,X:PROD(X)=CVS(PROD$)
2320 FOR YR=1 TO 7
2330 PP(YR)=CVS(A$(YR))
2340 NEXT
2350 LPRINT PLN$(X);
2360 LPRINT USING"###.## ";PROD(X);
2370 FOR YR=1 TO 7
2380 LPRINT USING" ###.##";PP(YR);
2390 NEXT
2400 LPRINT
2410 NEXT:LPRINT:LPRINT LIN$
2420 FOR P=1 TO 10:LPRINT:NEXT
2430 FOR P=1 TO 5:PRINT CHR$(7);:NEXT:GOTO 2580
2440 HOME:PRINT T1$:PRINT T2$:PRINT LIN$:PRINT
2450 FOR X=1 TO 26

```



```

2460 IF LEFT$(PLN$(X),5)="SPARE" THEN 2560
2470 GET #2,X:PROD(X)=CVS(PROD%)
2480 FOR YR=1 TO 7
2490   PP(YR)=CVS(A$(YR))
2500 NEXT
2510 PRINT PLN$(X);
2520 PRINT USING"###.## ";PROD(X);
2530 FOR YR=1 TO 7
2540   PRINT USING"###.##";PP(YR);
2550 NEXT:PRINT
2560 NEXT:PRINT:PRINT RET%;
2570 GET R$:IF R$(1)CHR$(13) THEN 2570
2580 CLOSE:GOTO 1250
2590 HOME:VTAB 12:HTAB 30
2600 PRINT"STAND BY>>>>"
2610 COMMON PLN$( ),PAR$( ),ARDONE
2620 FF=FRE("")
2630 CHAIN"SLDGMENU",1000
1010 DIM A$(13),DAT$(22),PD(26),PL$(26)
1020 GOTO 1050
1030 INVERSE:BEEP 50,20:PRINT"-Y/N";:NORMAL
1040 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1040
1050 OPEN"R",#4,"SLUDGE.MET",52
1060 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
1070 OPEN"R",#5,"SLUDGE.GEN",28
1080 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
1090 OPEN"R",#6,"SLUDGE.NUT",28
1100 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
1110 LIN$=STRING$(80,61)
1120 BL$="-----";V$="#####.## "
1130 ZER=.0001
1140 PR$="ADJUST THE PRINTER AND "
1150 RET$="PRESS ANY KEY TO CONTINUE "
1160 OPEN"R",#1,"NAMES",22:FIELD #1,2 AS N$,20 AS W$
1170 FOR X=1 TO 22
1180   GET #1,X+60
1190   DAT$(X)=W$
1200 NEXT:CLOSE #1
1210 FOR X=1 TO 26
1220   PL$(X)=LEFT$(PLN$(X),12)+ "
1230   IF LEFT$(PLN$(X),5)="SPARE" THEN PD(X)=1 ELSE PD(X)=0
1240 NEXT
1250 HOME:INVERSE
1260 PRINT"SLUDGE QUALITY DATA - SPECIAL REPORTS":NORMAL
1270 PRINT:PRINT"PRESS ";:INVERSE
1280 PRINT"<ESC>";:NORMAL:PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1290 PRINT"A. GENERAL CHARACTERISTICS":PRINT
1300 PRINT"B. SLUDGE NUTRIENTS":PRINT
1310 PRINT"C. SLUDGE METALS":PRINT CHR$(7)
1320 PRINT" WHICH OPTION ";:HTAB 1
1330 GET A$:IF A$=CHR$(27) THEN 2420

```



```

1340 A=ASC(A$)-64:IF A<1 OR A>3 THEN 1330
1350 IF A=1 THEN REP$="SLUDGE GENERAL INFORMATION":GOTO 1380
1360 IF A=2 THEN REP$="SLUDGE NUTRIENTS INFORMATION":GOTO 1380
1370 REP$="SLUDGE METALS INFORMATION"
1380 HOME:INVERSE:PRINT"SPECIAL REPORT--"+REP$:NORMAL:PRINT
1390 FOR X=1 TO 22 STEP 2
1400   PRINT CHR$(X+64)+". "+DAT$(X)+" ";
1410   PRINT CHR$(X+65)+". "+DAT$(X+1)
1420 NEXT:PRINT
1430 PRINT" WHICH RECORD ";HTAB 1
1440 GET R$:R=ASC(R$)-64:IF R=21 THEN 1440
1450 IF R<1 OR R>22 THEN 1440
1460 PRINT:PRINT DAT$(R)+" SELECTED"
1470 PRINT"IS THIS THE ONE":GOSUB 1030
1480 IF Z$="N" THEN 1380
1490 PRINT:PRINT"DO YOU WANT PRINTED COPY":GOSUB 1030
1500 IF Z$="Y" THEN 1970
1510 HOME:INVERSE:PRINT REP$:NORMAL
1520 PRINT"SPECIAL REPORT-";DAT$(R)
1530 PRINT LIN$:PRINT:HTAB 15
1540 ON A GOTO 1560,1650,1740
1560 FOR Z=14 TO 20:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1570 FOR X=1 TO 26
1580   IF PD(X) THEN 1630 ELSE PRINT PL$(X);
1590   RR=R+22*(X-1):GET #5,RR
1600   FOR Z=1 TO 7
1610     IF CVS(B$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING V$;CVS(B$(Z));
1620   NEXT:PRINT
1630 NEXT:GOTO 1930
1650 FOR Z=21 TO 27:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1660 FOR X=1 TO 26
1670   IF PD(X) THEN 1720 ELSE PRINT PL$(X);
1680   RR=R+22*(X-1):GET #6,RR
1690   FOR Z=1 TO 7
1700     IF CVS(C$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING V$;CVS(C$(Z));
1710   NEXT:PRINT
1720 NEXT:GOTO 1930
1740 FOR Z=1 TO 7:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1750 FOR X=1 TO 26
1760   IF PD(X) THEN 1810 ELSE PRINT PL$(X);
1770   RR=R+22*(X-1):GET #4,RR
1780   FOR Z=1 TO 7
1790     IF CVS(A$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING V$;CVS(A$(Z));
1800   NEXT:PRINT
1810 NEXT
1820 PRINT:PRINT RET$;:GET R$:PRINT:HOME
1830 PRINT REP$:PRINT"SPECIAL REPORT-RECORD ";R;DAT$(R)
1840 PRINT LIN$:PRINT:HTAB 15
1850 FOR Z=8 TO 13:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1860 FOR X=1 TO 26
1870   IF PD(X) THEN 1920 ELSE PRINT PL$(X);
1880   RR=R+22*(X-1):GET #4,RR

```



```

1890   FOR Z=8 TO 13
1900     IF CVS(A$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING U$;CVS(A$(Z));
1910   NEXT:PRINT
1920 NEXT
1930 PRINT:INVERSE:PRINT'PRESS RETURN TO CONTINUE ';;NORMAL
1940 GET R$;IF R$(CHR$(13)) THEN 1940
1950 PRINT:GOTO 1250
1970 PRINT CHR$(7):PRINT PR$+RET$
1980 PRINT"OR PRESS <ESC> TO ABORT PRINTING";
1990 GET R$;PRINT:HOME:IF R$=CHR$(27) THEN 1510
2000 LPRINT:LPRINT REPS+" ";
2010 LPRINT"SPECIAL REPORT-";DAT$(R)
2020 LPRINT LIN$:LPRINT:LPRINT" ";
2030 ON A GOTO 2050,2140,2230
2050 FOR Z=14 TO 20:LPRINT" "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2060 FOR X=1 TO 26
2070   IF PD(X) THEN 2120 ELSE LPRINT PL$(X);
2080   RR=R+22*(X-1):GET #5,RR
2090   FOR Z=1 TO 7
2100     IF CVS(B$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING U$;CVS(B$(Z));
2110   NEXT:LPRINT
2120 NEXT:GOTO 2390
2140 FOR Z=21 TO 27:LPRINT" "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2150 FOR X=1 TO 26
2160   IF PD(X) THEN 2210 ELSE LPRINT PL$(X);
2170   RR=R+22*(X-1):GET #6,RR
2180   FOR Z=1 TO 7
2190     IF CVS(C$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING U$;CVS(C$(Z));
2200   NEXT:LPRINT
2210 NEXT:GOTO 2390
2230 FOR Z=1 TO 7:LPRINT" "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2240 FOR X=1 TO 26
2250   IF PD(X) THEN 2300 ELSE LPRINT PL$(X);
2260   RR=R+22*(X-1):GET #4,RR
2270   FOR Z=1 TO 7
2280     IF CVS(A$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING U$;CVS(A$(Z));
2290   NEXT:LPRINT
2300 NEXT:LPRINT:LPRINT:LPRINT" ";
2310 FOR Z=8 TO 13:LPRINT" "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2320 FOR X=1 TO 26
2330   IF PD(X) THEN 2380 ELSE LPRINT PL$(X);
2340   RR=R+22*(X-1):GET #4,RR
2350   FOR Z=8 TO 13
2360     IF CVS(A$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING U$;CVS(A$(Z));
2370   NEXT:LPRINT
2380 NEXT
2390 LPRINT LIN$:FOR P=1 TO 10:LPRINT:NEXT
2400 FOR P=1 TO 5:PRINT CHR$(7)::NEXT
2410 GOTO 1250
2420 HOME:VTAB 12:HTAB 30
2430 PRINT"STAND BY >>>> "
2440 COMMON PL$( ),PAR$( ),ARDONE

```



```

2450 CLOSE
2460 CHAIN"SLDGMENU",1000
1010 DIM A$(13),VL(27),OV(13),LM(27),PN(27),ADD(27)
1020 DIM SUMVAL(27),NUMVAL(27),AVVAL(27),RVAL(27),NVAL(27),NETTOT(27)
1030 GOSUB 3310:GOTO 1070
1040 INVERSE:BEEP 50,20:PRINT"-Y/N ";:NORMAL
1050 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1050
1070 HOME:INVERSE
1080 PRINT "SLUDGE QUALITY DATA ENTRY":NORMAL
1090 PRINT:PRINT:PRINT"PRESS ";
1100 INVERSE:PRINT"<ESC>":NORMAL
1110 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1120 FOR REC=1 TO 26
1130 IF LEFT$(PLN$(REC),5)="SPARE" THEN 1150
1140 PRINT CHR$(REC+64);". ";:PRINT PLN$(REC):LAST=LAST+1
1150 NEXT
1160 PRINT:PRINT" WHICH LOCATION ";:HTAB 1
1170 GET A$:A=ASC(A$)-64
1180 IF A$=CHR$(27) THEN 3530
1190 IF A<1 OR A>LAST THEN 1170
1200 LAST=0:PLN=A:PRINT A$
1210 RECO=22*(PLN-1):REM ZEROTH RECORD
1220 GOSUB 3460
1230 DIM HIL(27),LOL(27)
1240 REC=RECO+15:REM HILIM ARRAY
1250 GET #4,REC:FOR Z=1 TO 13:HIL(Z)=CVS(A$(Z)):NEXT
1260 GET #5,REC:FOR Z=1 TO 7:HIL(Z+13)=CVS(B$(Z)):NEXT
1270 GET #6,REC:FOR Z=1 TO 7:HIL(Z+20)=CVS(C$(Z)):NEXT
1280 REC=RECO+16:REM LOLIM ARRAY
1290 GET #4,REC:FOR Z=1 TO 13:LOL(Z)=CVS(A$(Z)):NEXT
1300 GET #5,REC:FOR Z=1 TO 7:LOL(Z+13)=CVS(B$(Z)):NEXT
1310 GET #6,REC:FOR Z=1 TO 7:LOL(Z+20)=CVS(C$(Z)):NEXT
1330 HOME:PRINT"SLUDGE DATA FOR ";PLN$(A)
1340 FOR Z=1 TO 27
1350 IF PN(Z)=0 THEN 1410
1360 PRINT PAR$(Z)::INPUT" VALUE ";VL(Z)
1370 IF VL(Z)>HIL(Z) THEN PRINT HIVAL$:HIL(Z) ELSE 1390
1380 PRINT OK$:GOSUB 1040:IF Z$="N" THEN 1360
1390 IF VL(Z)<LOL(Z) THEN PRINT LOVAL$:LOL(Z) ELSE 1410
1400 PRINT OK$:GOSUB 1040:IF Z$="N" THEN 1360
1410 NEXT
1420 HOME:PRINT"DATA VERIFICATION"
1430 REC=RECO+1:REM LAST MONTHS VALUES ARRAY
1440 GET #4,REC:FOR Z=1 TO 13:LM(Z)=CVS(A$(Z)):NEXT
1450 GET #5,REC:FOR Z=1 TO 7:LM(Z+13)=CVS(B$(Z)):NEXT
1460 GET #6,REC:FOR Z=1 TO 7:LM(Z+20)=CVS(C$(Z)):NEXT
1470 FOR Z=1 TO 27
1480 IF PN(Z)=0 THEN 1640
1490 IF LM(Z)<ZER THEN 1640
1500 IF VL(Z)<2*LM(Z) THEN 1570
1510 PRINT GT$:PRINT PAR$(Z);" LAST MONTH ";LM(Z);" THIS MONTH ";VL(Z)
1520 PRINT CH$:GOSUB 1040:IF Z$="N" THEN 1570

```



```

1530 PRINT PAR$(Z);:INPUT" REVISED VALUE ";VL(Z)
1540 IF VL(Z)>HIL(Z) THEN PRINT HIVAL$;HIL(Z):GOTO 1520
1550 IF VL(Z)<LOL(Z) THEN PRINT LOVAL$;LOL(Z):GOTO 1520
1560 GOTO 1500
1570 IF VL(Z)>.5* LM(Z) THEN 1640
1580 PRINT LT$;PRINT PAR$(Z);" LAST MONTH ";LM(Z);" THIS MONTH ";VL(Z)
1590 PRINT CH$;:GOSUB 1040:IF Z$="N" THEN 1640
1600 PRINT PAR$(Z);:INPUT" REVISED VALUE";VL(Z)
1610 IF VL(Z)>HIL(Z) THEN PRINT HIVAL$;HIL(Z):GOTO 1590
1620 IF VL(Z)<LOL(Z) THEN PRINT LOVAL$;LOL(Z):GOTO 1590
1630 GOTO 1570
1640 NEXT
1650 ERASE HIL,LOL:DIM RA(27)
1660 HOME:VTAB 5
1670 PRINT"DO YOU WANT A PROCESS REVIEW";:GOSUB 1040
1680 IF Z$="N" THEN ERASE RA:GOTO 2280
1700 HOME:INVERSE:VTAB 5
1710 PRINT"PERFORMANCE REVIEW FOR ";PLN$(A):NORMAL
1720 VTAB 20:INVERSE:PRINT"CAUTION";:NORMAL
1730 PRINT" PROGRAM WILL SCMB IF PRINTER IS NOT ON"
1740 R=RECO+13:REM RUNNING AVERAGES
1750 GET #4,R:FOR Z=1 TO 13:RA(Z)=CVS(A$(Z)):NEXT
1760 GET #5,R:FOR Z=1 TO 7:RA(Z+13)=CVS(B$(Z)):NEXT
1770 GET #6,R:FOR Z=1 TO 7:RA(Z+20)=CVS(C$(Z)):NEXT
1780 VTAB 12:PRINT"ADJUST THE PRINTER "+RET$;:GET R$
1790 LPRINT LIN$:LPRINT"PROCESS REVIEW "+PLN$(A):LPRINT
1800 LPRINT"COMPARISON WITH HISTORICAL DATA":LPRINT
1810 LPRINT"PARAMETER          VS.HISTORICAL  VS.LAST  CHANGE"
1820 LPRINT"                   AVERAGE      MONTH"
1830 FOR Z=1 TO 27
1840   IF PN(Z)=0 THEN 1950
1850   IF RA(Z)<ZER OR VL(Z)<ZER THEN DLTA=0:GOTO 1870
1860   DLTA=100*(VL(Z)-RA(Z))/RA(Z)
1870   IF VL(Z)<ZER OR LM(Z)<ZER THEN DLTM=0:GOTO 1890
1880   DLTM=100*(VL(Z)-LM(Z))/LM(Z)
1890   IF (DLTA=0)*(DLTM=0) THEN 1950 ELSE LPRINT PAR$(Z);" ";
1900   IF DLTA=0 THEN LPRINT"          "; ELSE LPRINT USING"##### %" ";DLTA;
1910   LPRINT USING"##### %" ";DLTM;
1920   DLTM=ABS(DLTM)
1930   IF DLTM>200 THEN LPRINT"EXTREME CHANGE":GOTO 1950
1940   IF DLTM<10 THEN LPRINT ELSE LPRINT LEFT$(ST$,DLTM/10)
1950 NEXT:ERASE RA
1960 LPRINT LIN$:LPRINT
1970 OPEN"R",#2,"NAMES",22
1980 FIELD #2,2 AS N$,20 AS W$
1990 GET #2,PLN:TYP=CVI(N$):CLOSE #2
2000 IF TYP=1 THEN 2190:REM NO AEROBIC CHECKS
2010 IF VL(18)<500 THEN 2030
2020 LPRINT INDIG$;"VOLATILE ACIDS>500 IS TOO HIGH"
2030 IF VL(19)<7.5 AND VL(19)>6.5 THEN 2050
2040 LPRINT INDIG$;"PH OUTSIDE 6.5-7.5 RANGE"
2050 IF VL(20)<1800 THEN 2070

```



```

2060 LPRINT INDIG#;'ALKALINITY>2500 IS TOO HIGH'
2070 IF VL(23)>800 THEN 2100
2080 LPRINT'AMMONIA NITROGEN TOO LOW; REDUCE QUANTITY SUPERNATED OR'
2090 LPRINT'CHECK SLUDGE PUMPS NOT DRAWING TOO MUCH LIQUID'
2100 IF VL(16)=0 OR VL(16)>100 OR VL(17)>100 THEN 2190
2110 VSD1=(100-VL(16))/VL(16)
2120 VSD2=VL(17)/(100-VL(17))
2130 USD=100*(1-VSD1#VSD2)
2140 NVSD=1.97*VL(16)-74.4;REM EXPECTED VALUE
2150 PERF=VSD/VSD
2160 IF PERF>.8 AND PERF<1.25 THEN 2190
2170 LPRINT USING'###.## % VOLATILE SOLIDS DESTRUCTION OBTAINED';VSD
2180 LPRINT USING'###.## % VOLATILE SOLIDS DESTRUCTION NORMAL';NVSD
2190 IF (TYP=1)*(VL(14)>.3) OR (TYP=0)*(VL(14)>.2) THEN 2220
2200 LPRINT'RAW SLUDGE VERY DILUTE'
2210 LPRINT'--CHECK SLUDGE PUMPING CYCLES'
2220 IF VL(15)>4 THEN 2260
2230 LPRINT'DIGESTED SLUDGE VERY DILUTE'
2240 LPRINT'--CHECK EXTENT OF SUPERNATING'
2250 LPRINT'--CHECK SLUDGE PUMPING CYCLES'
2260 LPRINT:LPRINT'REVIEW COMPLETE';LPRINT LIN#
2270 FOR P=1 TO 10:LPRINT:NEXT:HOME
2280 PRINT:PRINT'DO YOU WANT A COPY OF THE DATA ENTERED?';
2290 GOSUB 1040:IF Z#='N' THEN 2500
2300 PRINT:PRINT'ADJUST THE PRINTER '+RET#;;GET R#;PRINT
2310 LPRINT:LPRINT'DATA ENTERED FOR ';PLN#(A):LPRINT
2320 LPRINT'METALS'
2330 FOR X=1 TO 13
2340 IF FN(X)=0 THEN 2360 ELSE LPRINT PAR$(X);
2350 LPRINT USING'#####.##';VL(X)
2360 NEXT:LPRINT
2370 LPRINT'GENERAL DATA'
2380 FOR X=14 TO 20
2390 IF FN(X)=0 THEN 2410 ELSE LPRINT PAR$(X);
2400 LPRINT USING'#####.##';VL(X)
2410 NEXT:LPRINT
2420 LPRINT'NUTRIENTS'
2430 FOR X=21 TO 27
2440 IF FN(X)=0 THEN 2460 ELSE LPRINT PAR$(X);
2450 LPRINT USING'#####.##';VL(X)
2460 NEXT:LPRINT
2470 LPRINT'ENTERED ON ..... BY .....'
2480 FOR P=1 TO 10:LPRINT:NEXT
2500 FOR REC=RECO+17 TO RECO+21
2510 GET #4,REC:FOR Z=1 TO 13:Q=Q+CVS(A$(Z)):NEXT
2520 GET #5,REC:FOR Z=1 TO 7:Q=Q+CVS(B$(Z)):NEXT
2530 GET #6,REC:FOR Z=1 TO 7:Q=Q+CVS(C$(Z)):NEXT
2540 IF Q=0 THEN REC=RECO+21 ELSE Q=0
2550 FR=FR+1
2560 NEXT
2570 RR=16+FR:FR=0
2580 FOR Z=1 TO 13:LSET A$(Z)=MKS$(VL(Z)):NEXT:PUT #4,RECO+RR

```



```

2590 PUT #4,RECO+22
2600 FOR Z=1 TO 7:LSET B$(Z)=MKS$(VL(Z+13)):NEXT:PUT #5,RECO+RR
2610 PUT #4,RECO+22
2620 FOR Z=1 TO 7:LSET C$(Z)=MKS$(VL(Z+20)):NEXT:PUT #6,RECO+RR
2630 PUT #4,RECO+22
2640 IF RR=21 THEN 2680
2650 PRINT"ARE THESE THE FINAL DATA FOR THE MONTH";:GOSUB 1040
2660 IF Z$="N" THEN 3250
2680 PRINT:PRINT"TRANSFERRING DATA & UPDATING...PLEASE WAIT"
2700 FOR REC=RECO+17 TO RECO+21
2710 GET #4,REC:FOR Z=1 TO 13:VL(Z)=CVS(A$(Z)):NEXT
2720 GET #5,REC:FOR Z=1 TO 7:VL(Z+13)=CVS(B$(Z)):NEXT
2730 GET #6,REC:FOR Z=1 TO 7:VL(Z+20)=CVS(C$(Z)):NEXT
2740 FOR Z=1 TO 27
2750 SUMVAL(Z)=SUMVAL(Z)+VL(Z)
2760 IF VL(Z)=0 THEN 2780
2770 NUMVAL(Z)=NUMVAL(Z)+1
2780 NEXT
2790 NEXT
2800 FOR Z=1 TO 27:ADD(Z)=1
2810 IF NUMVAL(Z)=0 THEN AVAL(Z)=0:ADD=0:GOTO 2830
2820 AVAL(Z)=SUMVAL(Z)/NUMVAL(Z)
2830 NEXT
2850 REC=RECO+14:REM RUNNING # OF VALUES
2860 GET #4,REC:FOR Z=1 TO 13:NVAL(Z)=CVS(A$(Z)):NEXT
2870 GET #5,REC:FOR Z=1 TO 7:NVAL(Z+13)=CVS(B$(Z)):NEXT
2880 GET #6,REC:FOR Z=1 TO 7:NVAL(Z+20)=CVS(C$(Z)):NEXT
2890 REC=RECO+13:REM ACTUAL RUNNING AVERAGES
2900 GET #4,REC:FOR Z=1 TO 13:RVAL(Z)=CVS(A$(Z)):NEXT
2910 GET #5,REC:FOR Z=1 TO 7:RVAL(Z+13)=CVS(B$(Z)):NEXT
2920 GET #6,REC:FOR Z=1 TO 7:RVAL(Z+20)=CVS(C$(Z)):NEXT
2930 FOR Z=1 TO 27
2940 NEWTOT(Z)=RVAL(Z)
2950 IF NUMVAL(Z)=0 THEN 2970
2960 NEWTOT(Z)=(RVAL(Z)*NVAL(Z)+AVAL(Z))/(NVAL(Z)+1)
2970 NEXT
2980 REC=RECO+14:REM RUNNING # OF VALUES
2990 FOR Z=1 TO 13:LSET A$(Z)=MKS$(NVAL(Z)+ADD(Z)):NEXT:PUT #4,REC
3000 FOR Z=14 TO 20:LSET B$(Z-13)=MKS$(NVAL(Z)+ADD(Z)):NEXT:PUT #5,REC
3010 FOR Z=21 TO 27:LSET C$(Z-20)=MKS$(NVAL(Z)+ADD(Z)):NEXT:PUT #6,REC
3020 REC=RECO+13:REM RUNNING AVERAGES
3030 FOR Z=1 TO 13:LSET A$(Z)=MKS$(NEWTOT(Z)):NEXT:PUT #4,REC
3040 FOR Z=14 TO 20:LSET B$(Z-13)=MKS$(NEWTOT(Z)):NEXT:PUT #5,REC
3050 FOR Z=21 TO 27:LSET C$(Z-20)=MKS$(NEWTOT(Z)):NEXT:PUT #6,REC
3070 FOR REC=RECO+17 TO RECO+21
3080 FOR Z=1 TO 13:LSET A$(Z)=MKS$(0):NEXT:PUT #4,REC
3090 FOR Z=1 TO 7:LSET B$(Z)=MKS$(0):NEXT:PUT #5,REC
3100 FOR Z=1 TO 7:LSET C$(Z)=MKS$(0):NEXT:PUT #6,REC
3110 NEXT
3130 FOR REC=RECO+11 TO RECO+1 STEP -1
3140 GET #4,REC:FOR Z=1 TO 13:OV(Z)=CVS(A$(Z)):NEXT
3150 FOR Z=1 TO 13:LSET A$(Z)=MKS$(OV(Z)):NEXT:PUT #4,REC+1

```



```

3160 GET #5,REC:FOR Z=1 TO 7:OV(Z)=CVS(B*(Z)):NEXT
3170 FOR Z=1 TO 7:LSET B*(Z)=MKS*(OV(Z)):NEXT:PUT #5,REC+1
3180 GET #6,REC:FOR Z=1 TO 7:OV(Z)=CVS(C*(Z)):NEXT
3190 FOR Z=1 TO 7:LSET C*(Z)=MKS*(OV(Z)):NEXT:PUT #6,REC+1
3200 NEXT
3220 FOR Z=1 TO 13:LSET A*(Z)=MKS*(AVVAL(Z)):NEXT:PUT #4,REC0+1
3230 FOR Z=1 TO 7:LSET B*(Z)=MKS*(AVVAL(Z+13)):NEXT:PUT #5,REC0+1
3240 FOR Z=1 TO 7:LSET C*(Z)=MKS*(AVVAL(Z+20)):NEXT:PUT #6,REC0+1
3250 FOR X=1 TO 27
3260 SUMVAL(X)=0
3270 NUMVAL(X)=0
3280 NEXT
3290 CLOSE:GOTO 1030
3310 RET$="PRESS ANY KEY TO CONTINUE"
3320 LIN$=STRING$(80,61):ST$=STRING$(20,42)
3330 HIVAL$="THIS VALUE IS GREATER THAN THE HIGH LIMIT: "
3340 LOVAL$="THIS VALUE IS LESS THAN THE LOW LIMIT: "
3350 OK$="DO YOU WISH TO ENTER THIS VALUE TO FILE"
3360 GT$="VALUE EXCEEDS 200% OF PREVIOUS MONTH'S VALUE"
3370 LT$="VALUE IS LESS THAN 50% OF PREVIOUS MONTH'S VALUE"
3380 CH$="DO YOU WANT TO REVISE NEW VALUE"
3390 INDIG$="POSSIBLE DIGESTER UPSET:"
3400 FOR X=1 TO 27
3410 PN(X)=1
3420 IF LEFT$(PAR$(X),5)="SPARE" THEN PN(X)=0
3430 NEXT
3440 ZER=.0001:RETURN
3460 OPEN"R",#4,"SLUDGE.MET",52
3470 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
3480 OPEN"R",#5,"SLUDGE.GEN",28
3490 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
3500 OPEN"R",#6,"SLUDGE.NUT",28
3510 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
3520 RETURN
3530 CLOSE
3540 HOME:VTAB 12:HTAB 30
3550 PRINT"STAND BY >>>>>"
3560 COMMON PLN$( ),PAR$( ),ARDONE
3570 CHAIN"SLDGMENU",1000
1010 DIM A$(13),AMRAT(13),AMTOT(13),MN$(24)
1020 DATA 100,500,50,6,10,1.5
1030 DATA 180,40,15,500,4,0,0
1040 FOR X=1 TO 13:READ AMRAT(X):NEXT
1050 BL$=" ---- ":V$="#####.## ":ZER=.0001
1060 GOSUB 3110:GOTO 1100
1070 INVERSE:BEEP 50,20:PRINT" Y/N ":NORMAL
1080 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1080
1100 HOME:INVERSE:PRINT"YEARLY SLUDGE QUALITY REPORTS":NORMAL
1110 PRINT:PRINT"PRESS ";INVERSE:PRINT"<ESC>":NORMAL
1120 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1130 PRINT"A. SLUDGE GENERAL CHARACTERISTICS":PRINT

```



```

1140 PRINT"B. SLUDGE NUTRIENTS":PRINT
1150 PRINT"C. SLUDGE METALS":PRINT
1160 PRINT"D. AMMONIA/METALS RATIOS":PRINT CHR$(7)
1170 PRINT" WHICH OPTION ";:HTAB 1
1180 GET A$:IF A$=CHR$(27) THEN CLOSE:GOTO 3280
1190 A=ASC(A$)-64:IF A<1 OR A>4 THEN 1180 ELSE PRINT A$
1200 LAST=0:HOME:INVERSE:PRINT"SLUDGE REPORTS":NORMAL:PRINT
1210 FOR X=1 TO 26
1220 IF LEFT$(PLN$(X),5)="SPARE" THEN 1240
1230 PRINT CHR$(X+64)+". "+PLN$(X):LAST=LAST+1
1240 NEXT
1250 PRINT:PRINT" WHICH LOCATION ";:HTAB 1
1260 GET P$:PLN=ASC(P$)-64:IF PLN<1 OR PLN>LAST THEN 1260
1270 RECO=22*(PLN-1):REM ZEROTH RECORD
1280 PRINT PLN$(PLN):PRINT:PRINT:W$=PLN$(PLN)
1290 IF MND=1 THEN 1410
1300 HOME:INVERSE:PRINT"YEARLY REPORT:"+W$:NORMAL:PRINT
1310 FOR X=1 TO 12
1320 PRINT CHR$(X+64)+". ";
1330 PRINT MID$(MON$,3*X-2,3)
1340 NEXT
1350 PRINT:PRINT" WHICH WAS LAST MONTH ";
1360 HTAB 1:GET M$:M=ASC(M$)-64
1370 IF M<1 OR M>12 THEN 1360
1380 FOR X=1 TO 12
1390 M$(X)=MID$(MGN$,3*(13-X+M)-2,3)+" "
1400 NEXT:MND=1
1410 PRINT"DO YOU WANT PRINTED OUTPUT?";GOSUB 1070
1420 IF ?$="Y" THEN 2280
1430 HOME:INVERSE:PRINT W$+REP$(A):NORMAL:PRINT:PRINT " ";
1440 FOR Z=14 TO 20:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1470 FOR REC=RECO+1 TO RECO+12:GET #5,REC
1480 PRINT M$(REC-RECO);
1490 FOR Z=1 TO 7
1500 IF CVS(B$(Z))<ZER THEN PRINT BL$: ELSE PRINT USING U$;CVS(B$(Z));
1510 NEXT:PRINT
1520 NEXT:PRINT:PRINT
1530 REC=RECO+13:GET #5,REC:PRINT RA$:PRINT " ";
1540 FOR Z=1 TO 7:PRINT USING"#####.## ";CVS(B$(Z));:NEXT
1550 GOTO 2240
1570 FOR Z=21 TO 27:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1580 FOR REC=RECO+1 TO RECO+12:GET #6,REC
1590 PRINT M$(REC-RECO);
1600 FOR Z=1 TO 7
1610 IF CVS(C$(Z))<ZER THEN PRINT BL$: ELSE PRINT USING U$;CVS(C$(Z));
1620 NEXT:PRINT
1630 NEXT:PRINT:PRINT
1640 REC=RECO+13:GET #6,REC:PRINT RA$:PRINT " ";
1650 FOR Z=1 TO 7:PRINT USING"#####.## ";CVS(C$(Z));:NEXT
1680 FOR Z=1 TO 7:PRINT" "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1690 FOR REC=RECO+1 TO RECO+12:GET #4,REC
1700 PRINT M$(REC-RECO);

```



```

1710 FOR Z=1 TO 7
1720 IF CVS(A$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING V$;CVS(A$(Z));
1730 NEXT:PRINT
1740 NEXT:PRINT:PRINT
1750 REC=RECO+13:GET #4,REC:PRINT RA$:PRINT " ";
1760 FOR Z=1 TO 7:PRINT USING "#####.## ";CVS(A$(Z));:NEXT:PRINT
1770 PRINT RET$::GET R$:PRINT:HOME
1780 INVERSE:PRINT W$+REP$(A):NORMAL:PRINT:PRINT " ";
1790 FOR Z=8 TO 13:PRINT " "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1800 FOR REC=RECO+1 TO RECO+12:GET #4,REC
1810 PRINT MN$(REC-RECO);
1820 FOR Z=8 TO 13
1830 IF CVS(A$(Z))<ZER THEN PRINT BL$; ELSE PRINT USING V$;CVS(A$(Z));
1840 NEXT:PRINT
1850 NEXT:PRINT:PRINT
1860 REC=RECO+13:GET #4,REC:PRINT RA$:PRINT " ";
1870 FOR Z=8 TO 13:PRINT USING "#####.## ";CVS(A$(Z));:NEXT
1900 FOR REC=RECO+1 TO RECO+12
1910 GET #6,REC
1920 AMTOT(REC-RECO)=CVS(C$(3))+CVS(C$(4))
1930 NEXT
1940 FOR Z=1 TO 7:PRINT " "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
1950 FOR REC=RECO+1 TO RECO+12
1960 GET #4,REC
1970 PRINT MN$(REC-RECO);
1980 FOR Z=1 TO 7
1990 IF CVS(A$(Z))<ZER THEN PRINT " ---- ";:GOTO 2050
2000 AM=AMTOT(REC-RECO)/CVS(A$(Z))
2010 IF AM>10000 THEN PRINT "> 10000 ";:GOTO 2050
2020 IF AMRAT(Z)>AM THEN INVERSE
2030 PRINT USING "#####.##";AM;
2040 IF AMRAT(Z)>AM THEN PRINT "* ";:NORMAL ELSE PRINT " ";
2050 NEXT:PRINT
2060 NEXT
2070 PRINT:INVERSE:PRINT"* RATIO IS BELOW LIMIT":NORMAL
2080 PRINT:INVERSE:PRINT RET$::NORMAL:GET R$
2090 HOME:INVERSE:PRINT W$+REP$(A):NORMAL:PRINT:PRINT " ";
2100 FOR Z=8 TO 13:PRINT " "+LEFT$(PAR$(Z),8);:NEXT:PRINT:PRINT
2110 FOR REC=RECO+1 TO RECO+12
2120 GET #4,REC
2130 PRINT MN$(REC-RECO);
2140 FOR Z=8 TO 13
2150 IF CVS(A$(Z))<ZER THEN PRINT " ---- ";:GOTO 2210
2160 AM=AMTOT(REC-RECO)/CVS(A$(Z))
2170 IF AM>10000 THEN PRINT "> 10000 ";:GOTO 2210
2180 IF AMRAT(Z)>AM THEN INVERSE
2190 PRINT USING "#####.##";AM;
2200 IF AMRAT(Z)>AM THEN PRINT"* ";:NORMAL ELSE PRINT " ";
2210 NEXT:PRINT
2220 NEXT
2230 PRINT:INVERSE:PRINT"** RATIO IS BELOW LIMIT"
2240 PRINT:INVERSE:PRINT"PRESS RETURN TO CONTINUE ";:NORMAL

```



```

2250 GET R$:IF R$(CHR$(13)) THEN 2250
2280 PRINT CHR$(7):PRINT PR$+RET$
2290 PRINT " OR PRESS (ESC) TO ABORT PRINTING";
2300 GET R$:PRINT:HOME:IF R$=CHR$(27) THEN 1430
2310 LPRINT:LPRINT REP$(A)+W$:LPRINT
2320 LPRINT LIN$:LPRINT " ";
2350 FOR Z=14 TO 20:LPRINT " "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2360 FOR REC=REC0+1 TO REC0+12:GET #5,REC
2370   LPRINT M$(REC-REC0);
2380   FOR Z=1 TO 7
2390     IF CVS(B$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING V$;CVS(B$(Z));
2400   NEXT:LPRINT
2410 NEXT:LPRINT:LPRINT
2420 REC=REC0+13:GET #5,REC:LPRINT RA$:LPRINT " ";
2430 FOR Z=1 TO 7:LPRINT USING"#####.## " ;CVS(B$(Z));:NEXT
2460 FOR Z=21 TO 27:LPRINT " "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2470 FOR REC=REC0+1 TO REC0+12:GET #6,REC
2480   LPRINT M$(REC-REC0);
2490   FOR Z=1 TO 7
2500     IF CVS(C$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING V$;CVS(C$(Z));
2510   NEXT:LPRINT
2520 NEXT:LPRINT:LPRINT
2530 REC=REC0+13:GET #6,REC:LPRINT RA$:LPRINT " ";
2540 FOR Z=1 TO 7:LPRINT USING"#####.## " ;CVS(C$(Z));:NEXT
2570 FOR Z=1 TO 7:LPRINT " "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2580 FOR REC=REC0+1 TO REC0+12:GET #4,REC
2590   LPRINT M$(REC-REC0);
2600   FOR Z=1 TO 7
2610     IF CVS(A$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING V$;CVS(A$(Z));
2620   NEXT:LPRINT
2630 NEXT:LPRINT:LPRINT
2640 REC=REC0+13:GET #4,REC:LPRINT RA$:LPRINT " ";
2650 FOR Z=1 TO 7:LPRINT USING"#####.## " ;CVS(A$(Z));:NEXT:LPRINT
2660 LPRINT LIN$:LPRINT:LPRINT " ";
2670 FOR Z=8 TO 13:LPRINT " "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2680 FOR REC=REC0+1 TO REC0+12:GET #4,REC
2690   LPRINT M$(REC-REC0);
2700   FOR Z=8 TO 13
2710     IF CVS(A$(Z))<ZER THEN LPRINT BL$; ELSE LPRINT USING V$;CVS(A$(Z));
2720   NEXT:LPRINT
2730 NEXT:LPRINT:LPRINT
2740 REC=REC0+13:GET #4,REC:LPRINT RA$:LPRINT " ";
2750 FOR Z=8 TO 13:LPRINT USING"#####.## " ;CVS(A$(Z));:NEXT
2780 FOR REC=REC0+1 TO REC0+12
2790   GET #6,REC
2800   AMTOT(REC-REC0)=CVS(C$(3))+CVS(C$(4))
2810 NEXT
2820 FOR Z=1 TO 7:LPRINT " "+LEFT$(PAR$(Z),8);:NEXT:LPRINT:LPRINT
2830 FOR REC=REC0+1 TO REC0+12
2840   GET #4,REC
2850   LPRINT M$(REC-REC0);
2860   FOR Z=1 TO 7

```



```

2870     IF CVS(A*(Z))<ZER THEN LPRINT" ---- ";GOTO 2920
2880     AM=AMTOT(REC-RECO)/CVS(A*(Z))
2890     IF AM>10000 THEN LPRINT"> 10000 ";GOTO 2920
2900     LPRINT USING"#####.#":AM;
2910     IF AMRAT(Z)>AM THEN LPRINT"* "; ELSE LPRINT" ";
2920     NEXT:LPRINT
2930 NEXT
2940 LPRINT:LPRINT" ";
2950 FOR Z=8 TO 13:LPRINT" "+LEFT$(PAR$(Z),8);NEXT:LPRINT:LPRINT
2960 FOR REC=RECO+1 TO RECO+12
2970     GET #4,REC
2980     LPRINT M$(REC-RECO);
2990     FOR Z=8 TO 13
3000         IF CVS(A*(Z))<ZER THEN LPRINT" ---- ";GOTO 3050
3010         AM=AMTOT(REC-RECO)/CVS(A*(Z))
3020         IF AM>10000 THEN LPRINT"> 10000 ";GOTO 3050
3030         LPRINT USING"#####.#":AM;
3040         IF AMRAT(Z)>AM THEN LPRINT"* "; ELSE LPRINT" ";
3050     NEXT:LPRINT
3060 NEXT
3070 LPRINT:LPRINT" * INDICATES RATIO IS BELOW LIMIT"
3080 LPRINT LIN$:FOR P=1 TO 10:LPRINT:NEXT
3110 RET$="PRESS ANY KEY TO CONTINUE"
3120 LIN$=STRING$(80,61):ST$=STRING$(80,42)
3130 PR$="ADJUST THE PRINTER AND "
3140 REP$(1)="SLUDGE GENERAL DATA REPORT "
3150 REP$(2)="SLUDGE NUTRIENTS REPORT "
3160 REP$(3)="SLUDGE METALS REPORT "
3170 REP$(4)="SLUDGE AMMONIA/METAL RATIOS "
3180 RA$=" HISTORICAL AVERAGES"
3190 MON$=" JANFEBMARAPR MAYJUNJUL AUGSEPTNOVDEC":MON$=MON$+MON$
3210 OPEN"R",#4,"SLUDGE.MET",52
3220 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
3230 OPEN"R",#5,"SLUDGE.GEN",28
3240 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
3250 OPEN"R",#6,"SLUDGE.NUT",28
3260 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
3270 ZER=.0001:RETURN
3280 HOME:VTAB 12:HTAB 30
3290 PRINT"STAND BY >>>>)"
3300 COMMON PLN$( ),PAR$( ),ARDONE
3310 CHAIN"SLDGMENU",1000
1010 LIN$=STRING$(80,61):SP$=STRING$(17,32)
1020 UD$="UPDATE QUANTITY FOR "
1030 QU$="PRESS RETURN FOR ZERO QUANTITY OR ENTER QUANTITY IN CUBIC METRES "
1040 PR$="ADJUST THE PRINTER AND "
1050 RET$="PRESS ANY KEY TO CONTINUE":ZER=.0001
1060 DIM A$(13),B$(26),SLPCT(26),PD(26),M(12),AMRAT(13)
1070 DATA 31,29,31,30,31,30
1080 DATA 31,31,30,31,30,31
1090 FOR Z=1 TO 12:READ M(Z):NEXT

```



```

1100 DATA 100,500,50,6,10,1.5
1110 DATA 180,40,15,500,4,0,0
1120 FOR Z=1 TO 13:READ AMRAT(Z):NEXT
1130 Q$="ENTER QUANTITY OF SLUDGE (CUBIC METRES)"
1140 GOTO 1340
1150 BEEP 50,20:PRINT"-Y/N ";
1160 GET Z$:IF Z$="Y" OR Z$="N" THEN PRINT Z$:RETURN ELSE 1160
1170 OPEN "R",#4,"SLUDGE.MET",52
1180 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
1190 OPEN "R",#5,"SLUDGE.GEN",28
1200 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
1210 OPEN "R",#6,"SLUDGE.NUT",28
1220 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
1230 RETURN
1240 LINE INPUT"Today's DATE (YY/MM/DD) IS ";D$
1250 IF LEN(D$)<>8 THEN PRINT"WRONG FORMAT !! ";GOTO 1240
1260 Y$=MID$(D$,1,2):M$=MID$(D$,4,2):DAY$=MID$(D$,7,2)
1270 YR=VAL(Y$):M=VAL(M$):D=VAL(DAY$)
1280 IF YR<80 OR YR>99 THEN 1320
1290 IF M<1 OR M>12 THEN 1320
1300 IF D<1 OR D>M(M) THEN 1320
1310 GOTO 1330
1320 PRINT CHR$(7)+"PLEASE CHECK YOUR CALENDAR!! ";GOTO 1240
1330 D$=Y$+" "+M$+" "+DAY$:RETURN
1340 FOR X=1 TO 26
1350 PD(X)=0
1360 IF LEFT$(PLN$(X),5)<>"SPARE" THEN PD(X)=1
1370 NEXT
1380 HOME:INVERSE
1390 PRINT"SLUDGE STORAGE PROGRAM":NORMAL:PRINT:PRINT"PRESS ";
1400 INVERSE:PRINT"<ESC>";NORMAL:PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1410 PRINT"A. DAILY UPDATE OF QUANTITIES":PRINT
1420 PRINT"B. ADJUST FILE DATA":PRINT
1430 PRINT"C. DISPLAY/PRINT FILE DATA":PRINT CHR$(7)
1440 PRINT" WHICH OPTION ";:HTAB 1
1450 GET A$:IF A$=CHR$(27) THEN 3130
1460 A=ASC(A$)-64:IF A<1 OR A>3 THEN 1450
1470 PRINT A$:ON A GOTO 1490,2300,2680
1490 OPEN "R",#2,"SLDGSTOR",30
1500 FIELD #2,8 AS TSU$,8 AS INS$,4 AS PROD$,2 AS TR$,8 AS DAT$
1510 GOSUB 1170
1520 DIM INP(26)
1530 FOR Y=1 TO 26
1540 IF PD(Y)=0 THEN 2250
1550 HOME:INVERSE:PRINT UD$+PLN$(Y):NORMAL
1560 VTAB 5:PRINT"ANY DATA TO ENTER ";
1570 GOSUB 1150:IF Z$="N" THEN 2250 ELSE INP(Y)=1
1580 GOSUB 1240:REM WHAT DAY IS IT ???...IT'S D$
1590 GET #2,Y:TSU=CVD(TSU$):INS=CVD(INS$):PROD=CVD(PROD$):TR=CVI(TR$):LD$=DAT$
1600 HOME:INVERSE:PRINT UD$+PLN$(Y):NORMAL
1610 PRINT QU$:PRINT

```



```

1620 PRINT"QUANTITY TRUCKED OUT SINCE ";LD$;:INPUT Q$:QOUT=VAL(Q$)
1630 PRINT"# DAYS SINCE ";LD$;" IS ";:INPUT ND$
1640 D=INT(VAL(ND$)):FLUSH=D*PROD
1650 FOR PL=1 TO 26
1660     IF PD(PL)=0 OR PL=Y THEN 1710
1670     HOME:PRINT UD$+PLN$(Y)
1680     PRINT QU$:PRINT"TRUCKED IN FROM "+PLN$(PL);
1690     INPUT " ";Q$:Q(PL)=VAL(Q$)
1700     TOT=TOT+Q(PL)
1710 NEXT
1720 QNOW=INS+FLUSH+TOT-QOUT:TOT=0
1730 IF QNOW<TSV THEN 1770
1740 PRINT"THE TOTAL IN STORAGE AT THIS LOCATION IS CALCULATED AS GREATER THAN THE CAPACITY"
1750 PRINT"DO YOU WISH TO RE-ENTER DATA ";
1760 GOSUB 1150:IF Z$="Y" THEN 1600
1770 IF QNOW>0 THEN 1890
1780 PRINT"THE TOTAL IN STORAGE AT THIS LOCATION IS CALCULATED AS LESS THAN ZERO"
1790 PRINT:PRINT"THIS CALCULATION CANNOT BE COMPLETED--YOU MAY EITHER RE-ENTER THE DATA OR QUIT"
1800 FOR P=1 TO 5:PRINT CHR$(7);:NEXT
1810 PRINT"DO YOU WANT TO RE-ENTER DATA";
1820 GOSUB 1150:IF Z$="Y" THEN 1600
1830 HOME:PRINT"DATA INPUT ABORTED. THE FOLLOWING WERE ENTERED":PRINT
1840 FOR Z=1 TO 26
1850     IF PD(Z)=0 OR INP(Z)=0 THEN 1860 ELSE PRINT PLN$(Z)
1860 NEXT:PRINT
1870 PRINT"PLEASE NOTE THIS INFORMATION THEN ";RET$;
1880 GET R$:ERASE BL:GOTO 2260
1890 FOR PL=1 TO 26
1900     BLPCT(PL)=Q(PL)/QNOW
1910 NEXT
1920 HOME:PRINT"CALCULATING FINAL QUALITY AT "+PLN$(Y)
1930 DIM BL(27)
1940 FOR X=1 TO 26
1950     IF BLPCT(X)=0 THEN 2090
1960     RECN=22*(X-1)+22:REM RECN=LAST CALC DATA
1970     GET #4,RECN
1980     FOR Z=1 TO 13
1990         BL(Z)=BL(Z)+BLPCT(X)*CVS(A$(Z))
2000     NEXT
2010     GET #5,RECN
2020     FOR Z=1 TO 7
2030         BL(13+Z)=BL(13+Z)+BLPCT(X)*CVS(B$(Z))
2040     NEXT
2050     GET #6,RECN
2060     FOR Z=1 TO 7
2070         BL(20+Z)=BL(20+Z)+BLPCT(X)*CVS(C$(Z))
2080     NEXT
2090 NEXT
2100 PRINT:PRINT"BLEND CALCULATIONS COMPLETE FOR ";:PRINT PLN$(Y)
2110 AMTOT=BL(23)+BL(24)
2120 FOR Z=1 TO 13
2130     IF BL(Z)<ZER THEN 2170

```



```

2140   AMR=AMTOT/BL(Z)
2150   IF AMR>AMRAT(Z) THEN 2170
2160   PRINT PAR$(Z);"BELOW AMMONIA/METAL RATIO OF";AMRAT(Z)
2170   NEXT
2180   RECO=22*(X-1):REC=RECO+22
2190   FOR A=1 TO 13:LSET A$(A)=MKS$(BL(A)):NEXT:PUT #4,REC
2200   FOR A=14 TO 20:LSET B$(A-13)=MKS$(BL(A)):NEXT:PUT #5,REC
2210   FOR A=21 TO 27:LSET C$(A-20)=MKS$(BL(A)):NEXT:PUT #6,REC
2220   INS=GNOW:GNOW=0
2230   LSET TSV$=MKD$(TSV):LSET INS$=MKD$(INS):LSET PROD$=MKS$(PROD):LSET TR$=MKI$(TR):LSET DAT$=D$
2240   PUT #2,Y:ERASE BL
2250   NEXT
2260   ERASE Q:DIM Q(26)
2270   ERASE INP
2280   CLOSE:GOTO 1380
2300   OPEN "R",#2,"SLDGSTOR",30
2310   FIELD #2,8 AS TSV$,8 AS INS$,4 AS PROD$,2 AS TR$,8 AS DAT$
2320   HOME:INVERSE:PRINT"ADJUST FILE DATA FOR SLUDGE STORAGE":NORMAL
2330   PRINT:PRINT"PRESS ";:INVERSE:PRINT"<ESC>":NORMAL
2340   PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
2350   FOR X=1 TO 26
2360     IF PD(X)=0 THEN 2390
2370     PRINT CHR$(X+64)+". "+PLN$(X)
2380     LAST=LAST+1
2390   NEXT
2400   PRINT:PRINT" WHICH LOCATION ";
2410   GET R$:IF R$=CHR$(27) THEN CLOSE:GOTO 1380
2420   PLN=ASC(R$)-64:IF PLN<1 OR PLN>LAST THEN 2410 ELSE LAST=0
2430   HOME:INVERSE:PRINT"STORAGE INFO: ";PLN$(PLN):NORMAL:PRINT
2440   GET #2,PLN
2450   TSV=CVD(TSV$):INS=CVD(INS$):PROD=CVS(PROD$):TR=CVI(TR$):D$=DAT$
2460   PRINT USING"USABLE STORAGE CAPACITY = ##### CU.M";TSV
2470   PRINT USING"AVAILABLE SLUDGE = ##### CU.M";INS
2480   PRINT USING"CURRENT PRODUCTION RATE = ##### CU.M/DAY";PROD
2490   PRINT USING"TRUCK SIZE (HAUL AWAY) = ### CU.M";TR
2500   PRINT:PRINT"IS THIS THE ONE";:GOSUB 1150
2510   IF Z$="N" THEN 2320
2520   PRINT:PRINT"CHANGE USABLE STORAGE CAPACITY";:GOSUB 1150
2530   IF Z$="Y" THEN INPUT"NEW VALUE ";NV$:TSV=VAL(NV$)
2540   PRINT:PRINT"CHANGE AVAILABLE SLUDGE";:GOSUB 1150
2550   IF Z$="Y" THEN INPUT"NEW VALUE ";NV$:INS=VAL(NV$) ELSE 2570
2560   GOSUB 1240:REM GET UPDATE DATE
2570   PRINT:PRINT"CHANGE CURRENT PRODUCTION";:GOSUB 1150
2580   IF Z$="Y" THEN INPUT"NEW RATE ";NV$:PROD=VAL(NV$)
2590   PRINT:PRINT"CHANGE HAUL AWAY TRUCK SIZE";:GOSUB 1150
2600   IF Z$="Y" THEN INPUT"NEW SIZE (CU.M) ";NV$ ELSE 2620
2610   TR=INT(VAL(NV$)):IF TR<1 THEN OR TR>200 THEN 2590
2620   LSET TSV$=MKD$(TSV):LSET INS$=MKD$(INS)
2630   LSET PROD$=MKS$(PROD):LSET TR$=MKI$(TR):LSET DAT$=D$
2640   PUT #2,PLN:CLOSE
2650   PRINT"DO YOU WANT TO EDIT MORE";:GOSUB 1150
2660   IF Z$="Y" THEN 2300 ELSE 1380

```



```

2680 T1$='LOCATION      % FULL DAYS  PRODUCTION  AVAILABLE SLUDGE:  LAST'
2690 T2$='              LEFT    M3/DAY    CAP. M3    TRUCKLOADS    UPDATE'
2700 OPEN'R',#2,'SLOGSTOR',30:FIELD #2,3 AS TSV$,3 AS INS$,4 AS PROD$,2 AS TR$,3 AS DAT$
2710 HOME:INVERSE:PRINT'SLUDGE STORAGE LOCATIONS DATA':NORMAL:PRINT
2720 PRINT'DO YOU WANT PRINTED OUTPUT ':GOSUB 1150
2730 IF Z$='Y' THEN 2940
2740 HOME:PRINT T1$:PRINT T2$:PRINT LIN$
2750 FOR X=1 TO 26
2760   IF PD(X)=0 THEN 2890
2770   GET #2,X:TSV=CVD(TSV$):INS=CVD(INS$):PROD=CVS(PROD$):TR=CVI(TR$)
2780   PRINT LEFT$(PLN$(X),15);
2790   PRINT USING '###.# %',100*INS/TSV;
2800   IF PROD<1 THEN PRINT SP$;GOTO 2830
2810   PRINT USING '→####';(TSV-INS)/PROD;
2820   PRINT USING '#####.##';PROD;
2830   PRINT USING '#####';INS;
2840   PRINT USING '### ? ## CUM      ';INS/TR,TR;
2850   PRINT DAT$
2860   IF VPOS(0)<20 THEN 2890
2870   PRINT:PRINT RET$:GET R$:PRINT
2880   HOME:PRINT T1$:PRINT T2$:PRINT LIN$
2890 NEXT
2900 PRINT:INVERSE:PRINT'END OF DATA - PRESS RETURN TO CONTINUE ':NORMAL
2910 GET R$:IF R$<>CHR$(13) THEN 2910
2920 CLOSE:GOTO 1380
2940 PRINT:PRINT PR$+RET$
2950 PRINT'OR PRESS <ESC> TO ABORT PRINT';
2960 GET R$:IF R$=CHR$(27) THEN 2740 ELSE PRINT
2970 LPRINT:LPRINT T1$:LPRINT T2$:LPRINT LIN$:LPRINT
2980 FOR X=1 TO 26
2990   IF PD(X)=0 THEN 3090
3000   GET #2,X:TSV=CVD(TSV$):INS=CVD(INS$):PROD=CVS(PROD$):TR=CVI(TR$)
3010 LPRINT LEFT$(PLN$(X),15);
3020 LPRINT USING '###.# %',100*INS/TSV;
3030 IF PROD<1 THEN LPRINT SP$;GOTO 3060
3040 LPRINT USING '####';(TSV-INS)/PROD;
3050 LPRINT USING '#####.##';PROD;
3060 LPRINT USING '#####';INS;
3070 LPRINT USING '### ? ## CUM      ';INS/TR,TR;
3080 LPRINT DAT$
3090 NEXT
3100 LPRINT:LPRINT LIN$:FOR P=1 TO 10:LPRINT:NEXT
3110 FOR P=1 TO 5:PRINT CHR$(7);:NEXT
3120 CLOSE:GOTO 1380
3130 CLOSE:HOME:VTAB 12
3140 HTAB 30:PRINT'STAND BY >>>>'
3150 COMMON PLN$(),PAR$(),ARGNE
3160 CHAIN'SLOGMENU',1000
1010 DIM HIL(27),LOL(27),A$(13),PN(27)
1020 GOSUB 1960:GOTO 1060
1030 INVERSE:BEEP 50,20:PRINT'Y/N ':NORMAL
1040 GET Z$:IF Z$='Y' OR Z$='N' THEN PRINT Z$:RETURN ELSE 1040

```



```

1060 HOME:INVERSE
1070 PRINT"SLUDGE SYSTEM UTILITIES":NORMAL
1080 PRINT:PRINT"PRESS ";
1090 INVERSE:PRINT"(ESC)":NORMAL
1100 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1110 PRINT"A, PREPARE DATA ENTRY BLANKS":PRINT
1120 PRINT"B, SLUDGE QUALITY DATA ENTRY STATUS":PRINT CHR$(7)
1130 PRINT" WHICH OPTION ";:HTAB 1
1140 GET A$:IF A$=CHR$(27) THEN CLOSE:GOTO 2090
1150 A=ASC(A$)-64:IF A<1 OR A>2 THEN 1140
1160 PRINT A:ON A GOTO 1170,1630
1170 HOME:INVERSE:PRINT"BLANK DATA FORM PREPARATION":NORMAL:PRINT
1180 PRINT"PRESS ";:INVERSE:PRINT"(ESC)":NORMAL
1190 PRINT" FOR PREVIOUS MENU OR SELECT":PRINT
1200 FOR REC=1 TO 26
1210 IF LEFT$(PLN$(REC),5)=""SPARE" THEN 1230
1220 PRINT CHR$(REC+64);". ";:PRINT PLN$(REC):LAST=LAST+1
1230 NEXT
1240 PRINT:PRINT" WHICH LOCATION ";:HTAB 1
1250 GET A$:A=ASC(A$)-64
1260 IF A$=CHR$(27) THEN 1060
1270 IF A<1 OR A>LAST THEN 1250
1280 LAST=0:PLN=A:PRINT A$
1290 RECO=22*(PLN-1):REM ZEROTH RECORD
1300 REC=RECO+15:REM HILIM ARRAY
1310 GET #4,REC:FOR Z=1 TO 13:HIL(Z)=CVS(A$(Z)):NEXT
1320 GET #5,REC:FOR Z=1 TO 7:HIL(Z+13)=CVS(B$(Z)):NEXT
1330 GET #6,REC:FOR Z=1 TO 7:HIL(Z+20)=CVS(C$(Z)):NEXT
1340 REC=RECO+16:REM LOLIM ARRAY
1350 GET #4,REC:FOR Z=1 TO 13:LOL(Z)=CVS(A$(Z)):NEXT
1360 GET #5,REC:FOR Z=1 TO 7:LOL(Z+13)=CVS(B$(Z)):NEXT
1370 GET #6,REC:FOR Z=1 TO 7:LOL(Z+20)=CVS(C$(Z)):NEXT
1380 PRINT:PRINT"ADJUST THE PRINTER AND ";RET$:GET R$:PRINT
1390 LPRINT L$:LPRINT"DATA ENTRY":PLN$(A):LPRINT L$
1400 LPRINT:LPRINT"METALS":LPRINT T$
1410 FOR X=1 TO 13
1420 IF PNC(X)=0 THEN 1450 ELSE LPRINT PAR$(X);
1430 LPRINT USING"#####.## #####.##";LOL(X),HIL(X);
1440 LPRINT X$
1450 NEXT:LPRINT
1460 LPRINT L$:LPRINT"GENERAL CHARACTERISTICS":LPRINT T$
1470 FOR X=14 TO 20
1480 IF PNC(X)=0 THEN 1510 ELSE LPRINT PAR$(X);
1490 LPRINT USING"#####.## #####.##";LOL(X),HIL(X);
1500 LPRINT X$
1510 NEXT:LPRINT
1520 LPRINT L$:LPRINT"NUTRIENTS":LPRINT T$
1530 FOR X=21 TO 27
1540 IF PNC(X)=0 THEN 1570 ELSE LPRINT PAR$(X);
1550 LPRINT USING"#####.## #####.##";LOL(X),HIL(X);
1560 LPRINT X$
1570 NEXT:LPRINT:LPRINT L$

```



```

1580 LPRINT'PREP BY ..... ENTERED ON ..... BY .....':LPRINT L#
1590 LPRINT'COMMENTS:'
1600 FOR P=1 TO 4:LPRINT:NEXT:LPRINT L#
1610 FOR P=1 TO 10:LPRINT:NEXT:GOTO 1060
1630 HOME:VTAB 5:PRINT'FILE STATUS CHECK-':
1640 PRINT'DO YOU WANT PRINTED OUTPUT':GOSUB 1030
1650 IF Z#='Y' THEN PR=1 ELSE 1710
1660 PRINT:PRINT'ADJUST THE PRINTER AND ':
1670 PRINT RET$:GET R$:PRINT:GOTO 1740
1680 IF Z#='N' THEN PR=0:GOTO 1710 ELSE PR=1
1690 PRINT:PRINT'ADJUST THE PRINTER AND ':RET$
1700 GET R$:PRINT:GOTO 1740
1710 HOME:INVERSE:PRINT'FILE STATUS:CHECK FOR REMAINING RECORDS' NORMAL
1720 PRINT:PRINT'INDICATES # OF DATA ENTRIES REMAINING THIS MONTH FOR EACH LOCATION'
1730 PRINT:PRINT'LOCATION RECS':GOTO 1780
1740 LPRINT'FILE STATUS:CHECK FOR REMAINING RECORDS'
1750 LPRINT'INDICATES # OF DATA ENTRIES REMAINING'
1760 LPRINT'THIS MONTH FOR EACH LOCATION'
1770 LPRINT:LPRINT'LOCATION RECS':LPRINT
1780 FOR X=1 TO 26
1790 IF LEFT$(PLN$(X),5)='SPARE' THEN 1900
1800 RECO=22*(X-1):REM ZEROTH RECORD
1810 FOR REC=RECO+17 TO RECO+21
1820 GET #4,REC:FOR Z=1 TO 13:Q=0+CVS(A$(Z)):NEXT
1830 GET #5,REC:FOR Z=1 TO 7:Q=0+CVS(B$(Z)):NEXT
1840 GET #6,REC:FOR Z=1 TO 7:Q=0+CVS(C$(Z)):NEXT
1850 IF Q=0 THEN REC=RECO+21 ELSE Q=0
1860 FR=FR+1
1870 NEXT
1880 IF PR=1 THEN LPRINT PLN$(X):' ;6-FR:GOTO 1900
1890 PRINT PLN$(X):;HTAB 30:PRINT 6-FR:FR=0
1900 NEXT
1910 IF PR=1 THEN 1940
1920 PRINT:INVERSE:PRINT'PRESS RETURN TO CONTINUE ':NORMAL
1930 GET R$:IF R$(1)CHR$(13) THEN 1930 ELSE 1060
1940 FOR P=1 TO 10:LPRINT:NEXT:GOTO 1060
1960 OPEN'R',#4,'SLUDGE.MET',52
1970 FIELD #4,4 AS A$(1),4 AS A$(2),4 AS A$(3),4 AS A$(4),4 AS A$(5),4 AS A$(6),4 AS A$(7),4 AS A$(8),4 AS A$(9),4 AS A$(10),4 AS A$(11),4 AS A$(12),4 AS A$(13)
1980 OPEN'R',#5,'SLUDGE.GEN',28
1990 FIELD #5,4 AS B$(1),4 AS B$(2),4 AS B$(3),4 AS B$(4),4 AS B$(5),4 AS B$(6),4 AS B$(7)
2000 OPEN'R',#6,'SLUDGE.NUT',28
2010 FIELD #6,4 AS C$(1),4 AS C$(2),4 AS C$(3),4 AS C$(4),4 AS C$(5),4 AS C$(6),4 AS C$(7)
2020 FOR X=1 TO 27
2030 PN(X)=1
2040 IF LEFT$(PAR$(X),5)='SPARE' THEN PN(X)=0
2050 NEXT
2060 RET#='PRESS ANY KEY TO CONTINUE'
2070 T#=STRING$(20,32)+'LOW LIMIT HIGH LIMIT DATA'
2080 L#=STRING$(52,45):X#=' .....':RETURN
2090 HOME:VTAB 12:HTAB 30
2100 PRINT'STAND BY >>>>>'

```



```

2110 CLOSE
2120 COMMON PLN$( ),PAR$( ),ARDONE
2130 CHAIN"SLOGMENU",1000
110 ST$=STRING$(80,42):HOME:PRINT ST$+ST$:HTAB 30
120 PRINT "HALTON SLUDGE MANAGEMENT SYSTEM DISK 1":PRINT ST$+ST$
130 PRINT:PRINT"PRESS ";:INVERSE:PRINT"<ESC>";:NORMAL:PRINT" TO EXIT":PRINT
140 HTAB 27:PRINT" A. DATA ENTRY PROGRAMS":PRINT
150 HTAB 27:PRINT" B. SHORT TERM FIELD SELECTION":PRINT
160 HTAB 27:PRINT" C. REPORTING,INITIALIZING":PRINT
250 HTAB 27:PRINT" WHICH OPTION ";
260 GET A$:IF A$=CHR$(27) THEN 1200
270 A=ASC(A$)-64:IF A<1 OR A>3 THEN 260
280 PRINT A$:HOME:VTAB 12:HTAB 30:PRINT"STAND BY >>>>>"
290 ON A GOTO 410,420,900
410 GOTO 500
420 RUN"SB"
500 HOME:PRINT ST$:HTAB 30 :PRINT"DATA ENTRY PROGRAMS":PRINT ST$:PRINT
510 PRINT"PRESS ";:INVERSE:PRINT"<ESC>";:NORMAL:PRINT" TO EXIT"
520 HTAB 27:PRINT"A. OPERATOR/OWNER DATA":PRINT
530 HTAB 27:PRINT"B. TASK 1 AND/OR TASK 2":PRINT
550 HTAB 27:PRINT"C. CROPPLAN DATA":PRINT
560 HTAB 27:PRINT"D. CROP INFORMATION":PRINT
570 HTAB 27:PRINT"E. EDIT PROGRAM":PRINT
580 HTAB 27:PRINT"F. RESTRICTED AREAS":PRINT
590 HTAB 27:PRINT"G. SOIL METAL DATA":PRINT
600 HTAB 27:PRINT"H. OPERATOR RANKING":PRINT
700 HTAB 27:PRINT" WHICH OPTION ";
710 GET B$:IF B$=CHR$(27) THEN GOTO 100
720 B=ASC(B$)-64:IF B<1 OR B>8 THEN 710
730 PRINT B$:HOME:VTAB 12:HTAB 30:PRINT"STAND BY >>>>>"
740 ON B GOTO 300,310,830,840,850,860,870,880
800 RUN"OP/OW"
810 RUN"ENGL"
830 RUN"CROPPLAN"
840 RUN"CINFO"
850 RUN"ED"
860 RUN"RA"
870 RUN"METALS"
880 RUN"RANK"
900 HOME:PRINT ST$:HTAB 30:PRINT"REPORTING":PRINT ST$:PRINT
910 PRINT"PRESS ";:INVERSE:PRINT"<ESC>";:NORMAL:PRINT" TO EXIT":PRINT
920 HTAB 27:PRINT"A. FARMERS REPORT":PRINT
930 HTAB 27:PRINT"B. STATUS REPORT":PRINT
940 HTAB 27:PRINT"C. INITIALIZE SEASONAL SUITABILITY,PH,PHOSPHORUS ETC.":PRINT
950 HTAB 27:PRINT"D. INITIALIZE SOIL METALS":PRINT
960 HTAB 27:PRINT"E. TRANSPORTATION DISTANCES":PRINT
970 HTAB 27:PRINT"F. FIELD APPROVAL TEST":PRINT
1000 HTAB 27:PRINT" WHICH OPTION ";
1010 GET A$:IF A$=CHR$(27) THEN GOTO 100
1020 A=ASC(A$)-64: IF A<1 OR A>6 THEN 1000
1030 PRINT A$:HOME:VTAB 12:HTAB 30:PRINT"STAND BY >>>>>"
1040 ON A GOTO 1060,1070,1080,1090,1100,1110

```



```

1060 RUN"FR"
1070 RUN"GRAP"
1080 RUN"FINAL"
1090 RUN"METALS"
1100 RUN"TRAN"
1110 RUN"ATEST"
1200 HOME:VTAB 8:HTAB 24
1210 PRINT"PRESS ";:INVERSE:PRINT"Q";:NORMAL:PRINT" TO QUIT THE SYSTEM NOW OR ";:PRINT
1220 HTAB 18:PRINT"INSERT DISK #4 ( SLUDGE AND PLANT INFO DISK ) IN DRIVE A"
1230 HTAB 18:PRINT"AND PRESS ";:INVERSE:PRINT"RETURN";:NORMAL:
1240 GET R$:IF R$="Q" THEN HOME:END
1250 IF R$(1)CHR$(13) THEN 1240
1260 RESET
1270 OPEN"R",#1,"DISKNUM",2:FIELD#1,2 AS D$
1280 GET #1,1
1290 IF CUI(D$)=4 THEN 1310
1300 GOSUB 1400:GOTO 1200
1310 CLOSE:HOME:VTAB 12:HTAB 24
1320 PRINT"STAND BY >>>>";:LOAD"SLDGMENU.BAS",R
1400 IF GB=2 THEN HOME:FOR I=1 TO 10:BEEP 250-(20*I),40:BEEP 50,50:NEXT
1410 IF GB=0 THEN 1430
1420 VTAB 12:HTAB 24:PRINT"YOU DID IT AGAIN NOW I QUIT !! ";:END
1430 HTAB 10:PRINT:PRINT:PRINT"WRONG DISK # YOU HAVE ONE MORE CHANCE !! "
1440 FOR I= 1 TO 10:BEEP 50,50:BEEP 120,50:BEEP 50,50:NEXT
1450 PRINT:HTAB 30:PRINT"TRY AGAIN":FOR I=1 TO 2000:NEXT
1460 GB=2 :RETURN
110 ON ERROR GOTO 130
120 GOTO 200
130 BEEP 50,50:BEEP 50,50
140 PRINT:PRINT"OPERATOR ERROR..."
145 FOR T =1 TO 1000:NEXT:GOTO 2030
150 PRINT ST$:PRINT
160 POKE 3,150:RETURN
200 ST$=STRING$(80,42)
210 NP$="NO PROBLEMS"
220 GOSUB 400
230 HOME:PRINT ST$:PRINT
240 PRINT TAB(25) "FIELD APPROVAL TEST":PRINT
250 PRINT ST$:PRINT
260 PRINT SPC(22)"1. DISPLAY DATA ON SCREEN":PRINT
270 PRINT SPC(22)"2. PRINT DATA":PRINT
280 PRINT SPC(22)"3. EXIT THE PROGRAM":PRINT
290 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
300 FOR I=1 TO 4000
310 A$=INKEY$:IF LEN(A$)=0 THEN 330 ELSE OPT=ASC(A$)-48
320 IF (OPT>0)*(OPT<4) THEN 350
330 NEXT:GOTO 2030
350 ON OPT GOTO 360,360,2030
360 GOTO 490
400 OPEN"R",#3,"9:FDATA2",12:FIELD #3,2 AS DWA$,2 AS DOTH$,2 AS SOIL$,2 AS CTP$,
2 AS WET$,2 AS WSTA$

```



```

410 OPEN "R",#1,"B:KEYS",22:FIELD#1,2 AS NUM$,20 AS WORD$
420 OPEN "R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS
    ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS DP$,2 AS DW$:RETURN
490 GOTO 800
500 DWA=CVI(DWA$):DOTH=CVI(DOTH$):SOIL=CVI(SOIL$):CTP=CVI(CTP$)
510 WET=CVI(WET$):WSTA=CVI(WSTA$)
520 WELL=INT(.01*DWA):GW=INT((DWA-100*WELL)*.1):SW=DWA-(100*WELL+10*GW)
530 ROCK=INT(.01*DOTH):HO=INT((DOTH-100*ROCK)*.1):RA=DOTH-(100*ROCK+10*HO)
540 SC=INT(.001*SOIL):ST=INT((SOIL-1000*SC)*.1):PER=SOIL-(1000*SC+10*ST)
550 SLP=INT(.001*CTP):POH=INT((CTP-1000*SLP)*.1):PH=CTP-(1000*SLP+10*POH)
560 ROF=INT(.001*WET):TD=INT((WET-1000*ROF)*.01)
570 OLS=INT((WET-1000*ROF)-100*TD)*.1)
580 FLD=WET-(1000*ROF+100*TD+10*OLS):RETURN
800 HOME:PRINT
810 INPUT"WHICH FIELD NO.":TN:PRINT
820 IF OPT=2 THEN PRINT"ADJUST PRINTER AND PRESS RETURN TO CONTINUE";:INPUT" ",
    R$:GOSUB 160
900 HOME:PRINT ST$:PRINT
910 PRINT TAB(25)"FIELD APPROVAL TEST":PRINT
920 PRINT ST$:PRINT
930 PRINT TAB(25)"TEST RESULTS OF FIELD NO.":TN
940 PRINT:GET#3,TN
950 GOSUB 500
960 PRINT"WELL";
970 GET #1,290+WELL:PRINT TAB(22) WORD$;
980 IF WELL=0 THEN PRINT TAB(73)"????":GOTO 1010
990 IF WELL=2 THEN PRINT TAB(44)"ADEQUATE DISTANCE":GOTO 1010
1000 PRINT TAB(73)"****"
1010 PRINT:PRINT"PERMEABILITY";
1020 GET #1,380+PER:PRINT TAB(22) WORD$;
1025 IF PER=0 THEN PRINT TAB(73)"????" ELSE PRINT:GOTO 1030
1030 PRINT:PRINT"GROUND WATER";
1040 GET #1,300+GW:PRINT TAB(22) WORD$;
1050 IF GW=0 THEN PRINT TAB(73) "????":GOTO 1100
1060 IF GW =3 THEN GOTO 1090
1065 IF PER=0 THEN TAB(73)"????":GOTO 1100
1070 IF GW=2 AND PER=2 THEN 1090
1080 PRINT TAB(73)"****":GOTO 1100
1090 PRINT TAB(44)"ADEQUATE DEPTH"
1100 PRINT:PRINT"SLOPE";
1110 GET #1,390+SLP:PRINT TAB(22) WORD$;
1120 IF SLP=4 THEN PRINT TAB(44)"UNACCEPTABLE" TAB(73)"****":GOTO 1150
1130 IF SLP=0 THEN PRINT TAB(73)"????" ELSE PRINT:GOTO 1150
1150 PRINT:PRINT"SURFACE WATER";
1160 GET#1,310+SW:PRINT TAB(22) WORD$;
1170 IF SLP=4 THEN PRINT TAB(44)"UNACCEPTABLE-(SLOPE)":GOTO 1550
1180 IF SW=0 OR SLP=0 THEN PRINT TAB(73)"????":GOTO 1550
1190 IF SW=6 THEN GOTO 1500
1200 IF PER=0 THEN PRINT TAB(73)"????":GOTO 1550
1210 IF SW=1 THEN 1510
1215 IF PER=2 THEN GOTO 1270
1220 IF SLP=1 AND SW! THEN 1500

```



```

1230 IF SLP=2 AND SW<3 THEN 1510
1240 IF SLP=2 AND SW>2 THEN 1500
1250 IF SLP=3 AND SW<4 THEN 1510
1260 IF SLP=3 AND SW>3 THEN 1500
1270 IF SLP=1 AND SW<3 THEN 1510
1280 IF SLP=1 AND SW>2 THEN 1500
1290 IF SLP=2 AND SW<5 THEN 1510
1300 IF SLP=2 AND SW>4 THEN 1500
1310 IF SLP=3 AND SW<6 THEN 1510
1500 PRINT TAB(44)"ADEQUATE DISTANCE":GOTO 1550
1510 PRINT TAB(73)"****"
1550 PRINT:PRINT"BEDROCK";
1560 GET #1,320+ROCK:PRINT TAB(22) WORD$;
1570 IF ROCK=0 THEN PRINT TAB(73)"????":GOTO 1600
1580 IF ROCK =2 THEN PRINT TAB(44)"ADEQUATE DEPTH":GOTO 1600
1590 PRINT TAB(73)"****"
1600 IF OPT=2 THEN 1609
1602 PRINT:PRINT"PRESS RETURN TO CONTINUE";:INPUT " ";R$
1604 HOME:PRINT ST$:PRINT:PRINT"-----CONTINUE-----" FIELD NO.:";TN:PRINT
1609 PRINT:PRINT"HOUSE";
1610 GET #1,330+HO:PRINT TAB(22) WORD$;
1620 IF HO=0 THEN PRINT TAB(73)"????":GOTO 1650
1630 IF HO=1 THEN PRINT TAB(73)"????":GOTO 1650
1640 PRINT TAB(44)"ADEQUATE DISTANCE"
1650 PRINT:PRINT"RESIDENTIAL AREA";
1660 GET#1,340+RA:PRINT TAB(22) WORD$;
1670 IF RA=0 THEN PRINT TAB(73)"????":GOTO 1700
1680 IF RA=1 THEN PRINT TAB(73)"****":GOTO 1700
1690 PRINT TAB(44)"ADEQUATE DISTANCE"
1700 PRINT:PRINT"PHOSPHORUS LEVEL";
1710 IF POH=99 THEN PRINT TAB(22)"UNKNOWN" TAB(73)"????":GOTO 1750
1720 PRINT TAB(22) POH;
1730 IF POH<41 THEN PRINT TAB(44)"ACCEPTABLE LEVEL":GOTO 1750
1735 IF POH<61 THEN PRINT TAB(73)"****":GOTO 1750
1740 PRINT TAB(44)"UNACCEPTABLE" TAB(73)"****"
1750 PRINT:PRINT"PH";
1760 GET #1,400+PH:PRINT TAB(22) WORD$;
1770 IF PH=0 THEN PRINT TAB(73)"????":GOTO 1800
1790 IF PH=1 THEN PRINT TAB(73)"****":GOTO 1800
1790 PRINT TAB(44)"ACCEPTABLE"
1800 PRINT:PRINT:GET#2,TN
1810 PRINT "APPROVAL STATUS: ";
1820 IF CVI(APP$)=4 THEN PRINT "APPROVED":GOTO 1950
1825 APP=CVI(APP$)
1830 IF APP<4 THEN PRINT "NOT APPROVED: ";
1840 GET#1,250+APP:PRINT WORD$
1850 PRINT:PRINT ST$
2000 IF OPT=2 THEN POKE 3,149:FOR B=1 TO 5:BEEP 10*B,10:PRINT:NEXT
2010 IF OPT =1 THEN PRINT:PRINT" PRESS RETURN TO CONTINUE";:INPUT " ";R$
2020 GOTO 230
2030 CLEAR:HOME:UTAB 12
2040 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"

```



```

100 ON ERROR GOTO 120
110 GOTO 400
120 BEEP 50,50:BEEP 50.50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000: NEXT: GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";
320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 OPEN"R",#1,"B:CROPINFO",22:FIELD#1,2 AS PB$,2 AS PE$,2 AS PV$,2 AS PL$,
    2 AS HB$,2 AS HE$,2 AS HV$,2 AS HL$,2 AS YLD$,2 AS NR$,2 AS PH$
500 ST$=STRING$(80,42)
510 NN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH "
520 RET$=" PRESS RETURN TO CONTINUE"
530 TITLE1$=" CROP      PLANTING DAYS      HARVESTING DAYS      NIT. PHO. # DAYS # DAYS"
540 HELP$="###---###---###---###---###.#---###"
560 INC$="INCORRECT NUMBERS-TRY AGAIN"
570 TITLE2$=" #  BEG  END  EARLY  LATE  BEG  END  EARLY  LATE  YIELD  REQ  REQ  PLANT.  GROWING"
1000 HOME:PRINT ST$:PRINT
1010 PRINT SPC(30)"CROP INFORMATION PROGRAM":PRINT
1020 PRINT ST$:PRINT
1030 PRINT SPC(27)"1. ENTER OR CHANGE DATA":PRINT
1040 PRINT SPC(27)"2. DISPLAY FILE ON SCREEN":PRINT
1050 PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1060 PRINT SPC(27)"4. EXIT THE PROGRAM":PRINT
1070 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1080 FOR I=1 TO 5000
1090 A$=INKEY$:IF LEN(A$)=0 THEN 1110 ELSE OPT =ASC(A$)-48
1100 IF (OPT>0)*(OPT<5) THEN 1120
1110 NEXT:GOTO 4000
1120 HOME:ON OPT GOTO 2000,3000,3000,4000
2000 HOME: REM ENTER DATA FROM FIELDSHEET
2010 PRINT:INPUT "DATA FOR CROP #:",CN
2020 IF CN>20 THEN PRINT"WRONG NUMBER":GOTO 2010
2030 PRINT:PRINT HELP$
2040 INPUT",FF$
2050 IF LEN(FF$)<>33 THEN PRINT"WRONG LENGTH":GOTO 2010
2060 IF MID$(FF$,27,1)<> "." THEN PRINT "MISSING DECIMAL":GOTO 2010
2070 FOR LL=1 TO 26:L1=ASC(MID$(FF$,LL,1))
2080 IF L1<48 OR L1>57 THEN 2140
2090 NEXT
2100 FOR LL=28 TO 33:L1=ASC(MID$(FF$,LL,1))
2110 IF L1<48 OR L1>57 THEN 2140
2120 NEXT:GOTO 2200
2140 PRINT "CHARACTER";LL;"IS NOT A NUMBER":GOTO 2030
2200 PB=VAL(MID$(FF$,1,3)):PE=VAL(MID$(FF$,4,3)):PV=VAL(MID$(FF$,7,3))
2210 PL=VAL(MID$(FF$,10,3)):HB=VAL(MID$(FF$,13,3)):HE=VAL(MID$(FF$,16,3))
2220 HV=VAL(MID$(FF$,19,3)):HL=VAL(MID$(FF$,22,3)):YL=VAL(MID$(FF$,25,4))
2230 NR=VAL(MID$(FF$,29,3)):PH=VAL(MID$(FF$,32,2))
2250 LSET PB$=MKI$(PB):LSET PE$=MKI$(PE):LSET PV$=MKI$(PV):
2260 LSET PL$=MKI$(PL):LSET HB$=MKI$(HB):LSET HE$=MKI$(HE)
2270 LSET HV$=MKI$(HV):LSET HE$=MKI$(HE):LSET HL$=MKI$(HL):LSET YLD$=MKI$(10*YL)

```



```

2280 LSET NR$=MKI$(NR):LSET PH$=MKI$(PH)
2300 PUT #1,CN
2350 PRINT:PRINT"ANY MORE DATA TO ENTER?":GOSUB 300
2360 IF Z$="Y" THEN GOTO 2000
2370 HOME:GOTO 1000
2400 P=CVI(P$):H=CVI(H$):N=CVI(N$):PH=CVI(PH$):RETURN
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",REC1:INPUT"END RECORD NUMBER ",REC2
3030 IF (REC1/0)*(REC2/REC1) THEN 3050
3040 PRINT"TRY AGAIN ";:GOTO 3000
3050 RECL=REC2-REC1+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS?";RECL
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(NR$,4*I-3,4):INPUT " ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I);" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170
3160 PRINT CHR$(7):PRINT" ADJUST THE PRINTER AND ";RET$:INPUT " ",R$:POKE 3,150
3170 PRINT ST$:PRINT TITLE1$:PRINT TITLE2$:PRINT ST$
3180 FOR I =1 TO RECL:PRINT USING" ### ";X(I);
3190 GET#1,X(I)
3200 IF CVI(PB$)=0 OR CVI(PH$)=0 THEN PRINT"NO DATA":GOTO 3450
3210 PRINT USING"### ### ### ### ### ###";CVI(PB$),CVI(PE$),CVI(PV$),CVI(PL$),CVI(HB$),CVI(HE$);
3220 PRINT USING" ### ### ##.# ";CVI(HV$),CVI(HL$),.1*CVI(YLD$);
3230 PRINT USING"### ## ";CVI(NR$),CVI(PH$);
3280 AA=CVI(PL$)-CVI(PV$)
3290 IF CVI(PB$)> CVI(HB$) THEN 3310
3300 BB=CVI(HB$)-CVI(PB$):GOTO 3330
3310 BB=CVI(HB$)+(365-CVI(PB$))
3330 PRINT USING"## ### ";AA,BB
3450 IF OPT=3 THEN 3490
3460 IF VPOS(0)<20 THEN 3490
3470 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 3530
3480 HOME:PRINT ST$:PRINT TITLE1$:PRINT TITLE2$:PRINT
3490 NEXT
3500 IF OPT=2 THEN PRINT:PRINT RET$;:INPUT " ",R$:PRINT:GOTO 3530
3510 PRINT:PRINT LIN$:FOR P=1 TO 10:PRINT:NEXT
3520 POKE 3,149:FOR B=1 TO 5:BEEP 10*B,10:NEXT
3530 ERASE X:GOTO 1000
4000 CLEAR:HOME:VTAB 12
4010 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
100 ON ERROR GOTO 120
110 GOTO 400
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000:NEXT:GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";

```



```

320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 OPEN "R",#1,"B:CDATA",10:FIELD#1,2 AS TWO$,2 AS TAF$,2 AS FAF$,2 AS FAS$,2 AS SIX$
500 ST$=STRING$(80,42)
510 NN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH "
520 RET$=" PRESS RETURN TO CONTINUE"
530 HELP$=" "+STRING$(15,45)
540 LIN$=STRING$(79,42)
550 TITLE1$="                1982                1983                1984                1985                1986 "
560 INC$="INCORRECT NUMBERS - TRY AGAIN "
570 TITTLE2$="FIELDNO.  PREF. CROP  PREF. CROP  PREF. CROP  PREF. CROP  PREF. CROP "
1000 HOME:PRINT ST$:PRINT
1010 PRINT SPC(30)"CROPPLAN DATA ACCESS PROGRAM": PRINT
1020 PRINT ST$:PRINT
1030 PRINT SPC(27)"1. ENTER DATA FROM FIELDSHEET":PRINT
1040 PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1050 PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1060 PRINT SPC(27)"4. EXIT THE PROGRAM":PRINT
1070 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1080 FOR I=1 TO 5000
1090 A$=INKEY$:IF LEN (A$)=0 THEN 1110 ELSE OPT=ASC(A$)-48
1100 IF (OPT>0)*(OPT<5) THEN 1120
1110 NEXT:GOTO 4000
1120 HOME:ON OPT GOTO 2000,3000,3000,4000
2000 HOME:REM ENTER DATA FROM FIELDSHEET
2010 PRINT:INPUT"CROPPLAN DATA STRING FOR FIELDIDENTIFICATION NO.":Z$
2012 IF Z$>9999 THEN PRINT:PRINT"WRONG NUMBER - TRY AGAIN":GOTO 2010
2015 PRINT
2020 PRINT HELP$
2030 INPUT " ",SF$:IF LEN (SF$)<>15 THEN PRINT:PRINT"WRONG LENGTH":GOTO 2010
2040 FOR LL=1 TO 15:L1=ASC(MID$(SF$,LL,1))
2050 IF L1<48 OR L1>57 THEN 2070
2060 NEXT:GOTO 2080
2070 PRINT"CHARACTER" ;LL;"IS NOT A NUMBER-TRY AGAIN":GOTO 2020
2080 TWO=VAL(MID$(SF$,1,3)):TAF=VAL(MID$(SF$,4,4))
2090 FAF=VAL(MID$(SF$,8,3)):FAS=VAL(MID$(SF$,11,3))
2100 SIX=VAL(MID$(SF$,14,2))
2110 LSET TWO$=MKI$(TWO):LSET TAF$=MKI$(TAF)
2120 LSET FAF$=MKI$(FAF):LSET FAS$=MKI$(FAS)
2130 LSET SIX$=MKI$(SIX)
2200 PUT #1,Z$
2210 PRINT:PRINT"ANY MORE DATA TO ENTER ?":GOSUB 300
2220 IF Z$="Y" THEN 2010
2230 HOME :GOTO 1000
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",RECL:INPUT"END RECORD NUMBER ",REC2
3030 IF (RECL>0)*(REC2>RECL) THEN 3050
3040 PRINT"TRY AGAIN ";:GOTO 3000
3050 RECL=REC2-RECL+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=RECL:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS (20 IS MAXIMUM)":RECL

```



```

3080 IF (RECL>0)*(RECL<21) THEN 3090 ELSE 3070
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(N$,4*I-3,4)::INPUT " ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I);" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170
3160 PRINT CHR(7):PRINT " ADJUST THE PRINTER AND ";RET$:INPUT " ",R$:POKE 3,150
3170 PRINT LIN$:PRINT TITLE1$:PRINT TITLE2$:PRINT LIN$
3180 FOR I =1 TO RECL:PRINT USING"#### ";X(I);
3190 GET # 1,X(I)
3200 IF CVI(TWO$)>0 OR CVI(TAF$)>0 OR CVI(FAF$)>0 OR CVI(FAS$)>0 OR CVI(SIX$)>0 THEN GOTO 3210
3205 PRINT " NO DATA":GOTO 3450
3210 TWO=CVI(TWO$):PTW=INT(.01*TWO):CTW=( TWO-100*PTW)
3220 TAF=CVI(TAF$):PTH=INT(.001*TAF):CTH=INT((TAF-1000*PTH)*.1)
3230 PFO=(TAF-1000*PTH)-10*CTH
3240 FAF=CVI(FAF$):CFO=INT(.1*FAF):PFI=(FAF-10*CFO)
3250 FAS=CVI(FAS$):CFI=INT(.1*FAS):PSI=(FAS-10*CFI)
3260 SIX=CVI(SIX$):CSI=SIX
3400 PRINT USING" # ## # ## # ";PTW,CTW,PTH,CTH,PFO;
3410 PRINT USING" ## # ## # ##";CFO,PFI,CFI,PSI,CSI
3450 IF OPT=3 THEN 3490
3460 IF UPOS(0)<20 THEN 3490
3470 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 3530
3480 HOME:PRINT LIN$:PRINT TITLE1$:PRINT TITLE2$:PRINT LIN$
3490 NEXT
3500 IF OPT=2 THEN PRINT:PRINT RET$::INPUT " ",R$:PRINT:GOTO 3530
3510 PRINT:PRINT LIN$:FOR P=1 TO 10:PRINT:NEXT
3520 POKE 3,149: FOR B=1 TO 5:BEEP 10*B,10:NEXT
3530 ERASE X:GOTO 1000
4000 CLEAR:HOME:VTAB 12
4010 PRINT SPC(33)"STAND BY>>>>>>";:RUN "START.#01"
1010 ON ERROR GOTO 1030
1020 GOTO 1060
1030 BEEP 50,50:BEEP 50,50
1040 PRINT:PRINT"OPERATOR ERROR..."
1050 FOR T=1 TO 1000:NEXT:GOTO 5000
1060 GOSUB 3380:GOTO 1160
1070 BEEP 50,10
1080 PRINT" Y/N ";
1090 GET Z$:IF Z$="Y" OR Z$="N" THEN 1100 ELSE 1090
1100 PRINT Z$:PRINT:RETURN
1110 OPEN"R",#2,"B:FDATA1",22:FIELD #2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS
OP$,2 AS QAN$:RETURN
1120 OPEN "R",#1,"B:OP/QAN",71:FIELD#1,20 AS NAM$,20 AS ADD$,13 AS CIT$,7 AS COD$,11 AS TEL$:RETURN
1160 GOSUB 1110:GOSUB 1120
1180 HOME:PRINT ST$:PRINT
1190 PRINT SPC(30)"TASK 1 DATA ACCESS PROGRAM":PRINT
1200 PRINT ST$:PRINT
1210 PRINT SPC(27)"1. ENTER DATA FROM FIELD SHEETS":PRINT:PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1220 PRINT SPC(27)"3. PRINT FILE DATA":PRINT:PRINT SPC(27)"4. EXIT THE PROGRAM"

```



```

1240 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION  ";
1250 FOR T=1 TO 5000
1260   A$=INKEY$:IF LEN(A$)=0 THEN 1280 ELSE OPT=ASC(A$)-48
1270   IF (OPT>0)*(OPT<5) THEN 1290
1280 NEXT:GOTO 5000
1290 HOME:ON OPT GOTO 1350 ,3000,3000,5000
1350 PRINT:PRINT INNAM$:INPUT"OPERATOR";NA$
1355 INPUT" NUMBER:";LC:GET#1,LC:IF LEFT$(NA$,4)=LEFT$(NAM$,4)THEN GOTO 1360
1358 PRINT"WRONG NAME OR NUMBER RECORDNO. ";LC;" BELONGS TO ";NAM$:GOTO 1350
1360 PRINT:PRINT USING"FIELD DATA STRING FOR FIELD ##";FF+1
1365 PRINT HELP$
1370 INPUT" ",FF$:
1400 IF LEN (FF$)>45 THEN PRINT"WRONG LENGHT":GOTO 1365
1410 IF MID$(FF$,19,1)(">". THEN PRINT"MISSING DECIMAL":GOTO 1365
1420 FOR LL=1 TO 18:L1 =ASC(MID$(FF$,LL,1))
1430 IF L1<48 OR L1>57 THEN 1480
1440 NEXT
1450 FOR LL=20 TO 45: L1 =ASC(MID$(FF$,LL,1))
1460 IF L1<48 OR L1 >57 THEN GOTO 1480
1470 NEXT:GOTO 1500
1480 PRINT"CHARACTER";LL;" IS NOT A NUMBER":GOTO 1365
1500 FIL=VAL(MID$(FF$,1,4));TL=VAL(MID$(FF$,5,4))
1510 CF=VAL(MID$(FF$,9,4));NE=VAL(MID$(FF$,13,4))
1520 HA=VAL(MID$(FF$,17,4));ACC=VAL(MID$(FF$,21,4))
1530 LEASE=VAL(MID$(FF$,25,4));APP=VAL(MID$(FF$,29,2))
1540 SLD=VAL(MID$(FF$,31,4));GRID=VAL(MID$(FF$,35,3))
1550 OP=VAL(MID$(FF$,38,4));OWN=VAL(MID$(FF$,42,4))
1600 TWP=INT(.01*TL):LOT=TL-(100*TWP)
1610 CON=INT(.01*CF):FLO=CF-(100*CON)
1620 ER=0
1700 IF TWP>4 THEN PRINT"WRONG TOWNSHIP #":ER=1
1710 IF LOT >50 THEN PRINT"WRONG LOT #":ER=1
1720 IF CON >15 THEN PRINT"WRONG CON. #":ER=1
1730 IF LEASE >1300 THEN PRINT"WRONG LEASE DATE":ER=1
1740 IF SLD>1300 THEN PRINT"WRONG SLUDGE DATE":ER=1
1750 IF GRID >450 THEN PRINT"WRONG GRID #":ER=1
1760 IF OP<>LC THEN PRINT"WRONG OPERATOR #": ER=1
1770 IF OP<>OWN THEN GOTO 1780
1775 IF LEASE>0 THEN PRINT"OPERATOR IS OWNER-NO LEASE !!!":ER=1
1780 IF ER=0 THEN GOTO 2000
1790 PRINT:PRINT" FF$
1800 IF TWP>4 THEN HTAB 6:PRINT"--";
1810 IF LOT >50 THEN HTAB 8:PRINT"##";
1820 IF CON>15 THEN HTAB 10:PRINT"---";
1830 IF LEASE>1300 THEN HTAB 26:PRINT"####";
1840 IF SLD>1300 THEN HTAB 32:PRINT"####";
1850 IF GRID>450 THEN HTAB 36:PRINT"----";
1860 IF OP<>LC THEN HTAB 39:PRINT"####"
1870 HTAB 1:INPUT" ",NEWFF$:PRINT" ";
1880 FOR GB= 1 TO LEN(FF$)
1890 IF MID$(FF$,GB,1)=MID$(NEWFF$,GB,1) THEN PRINT" ":GOTO 1910
1900 PRINT"*";

```



```

1910 NEXT
1920 PRINT:PRINT"ARE THE RIGHT CHANGES MADE Y/N?":GOSUB 1070
1930 IF Z$="N" THEN GOTO 1790
1940 PRINT:FF$=NEWFF$:PRINT:GOTO 1400
2000 LSET TL$=MKI$(TL):LSET CF$=MKI$(CF):LSET NE$=MKI$(NE):LSET HA$=MKI$(10*HA)
2010 LSET ACC$=MKI$(ACC):LSET LEASE$=MKI$(LEASE):LSET APP$=MKI$(APP)
2020 LSET SLD$=MKI$(SLD):LSET GRID$=MKI$(GRID)
2030 LSET OP$=MKI$(OP):LSET OWN$=MKI$(OWN)
2100 PUT#2,FIL:FF=FF+1
2110 GOTO 2260
2260 PRINT"ANY MORE DATA THIS SHEET";:GOSUB 1070:IF Z$="Y" THEN 1360 ELSE FF=0
2270 PRINT"ANY MORE DATA TO ENTER";:GOSUB 1070:IF Z$="Y" THEN HOME:GOTO 1350
2280 GOTO 1180
2300 TL=CVI(TL$):TWP=INT(.01*TL):LOT=TL-(100*TWP)
2310 CF=CVI(CF$):CON=INT(.01*CF):FLD=CF-(100*CON)
2320 NE=CVI(NE$):KMN=INT(.01*NE):KME=NE-(100*KMN)
2330 RETURN
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",REC1:INPUT"END RECORD NUMBER ",REC2
3030 IF (REC1>0)*(REC2>REC1) THEN 3050
3040 PRINT"TRY AGAIN ";:GOTO 3000
3050 RECL=REC2-REC1+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS (20 IS MAXIMUM)":RECL
3080 IF (RECL>0)*(RECL<21) THEN 3090 ELSE 3070
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(NN$,4*I-3,4):INPUT " ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I);" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170
3160 PRINT CHR$(7):PRINT ADJ$+RET$:INPUT " ",R$:POKE 3,150
3170 PRINT HD$:PRINT:PRINT:PRINT TITLE1$:PRINT TITLE2$:PRINT LIN$
3180 FOR I=1 TO RECL:PRINT USING"#### " ;X(I);
3190 GET #2,X(I)
3200 IF CVI(TL$)<1 THEN PRINT NODAT$:GOTO 3290
3210 GOSUB 2300
3220 PRINT USING" ## ## ## ## ## ## " ;TWP,LOT,CON,FLD,KMN,KME;
3240 PRINT USING"##.# #### ##.# ## " ;CVI(HA$)*.1,CVI(ACC$),CVI(LEASE$)*.01,CVI(APP$);
3250 PRINT USING"##.# ## #### ####" ;CVI(SLD$)*.01,CVI(GRID$),CVI(OP$),CVI(OWN$)
3290 IF OPT=3 THEN 3330
3300 IF VPOS(0)<20 THEN 3330
3310 PRINT:PRINT CON$:GOSUB 1070:IF Z$="N" THEN 3370
3320 HOME:PRINT TITLE2$:PRINT LIN$
3330 NEXT
3340 IF OPT=2 THEN PRINT RET$:INPUT " ",R$:GOTO 3370
3350 PRINT:PRINT LIN$:FOR P=1 TO 10:PRINT:NEXT
3360 POKE 3,149:FOR B=1 TO 5:BEEP 10*8,10:NEXT
3370 ERASE X :GOTO 1180
3380 CON$="DO YOU WANT TO CONTINUE":RET$="PRESS RETURN TO CONTINUE"

```



```

3390 ADJ$="ADJUST THE PRINTER AND "INOCAT$="NO DATA IN FILE"
3400 OF$=" OUTSIDE FILE LIMITS-TRY AGAIN"
3410 LIN$=STRING$(80,45);ST$=STRING$(80,42)
3420 HD$="      TASK 1:FIELD LOCATION AND DESCRIPTION"
3430 INNAM$="ENTER LASTNAME FIRST THEN INITIALS - NO PERIODS OR COMMAS"
3440 HELP$=" ####---##---##---##.#####-----"
3460 TITLE2$="FILE TWP LOT CON FLD KMN KME AREA ACCESS LEASE APP SLUDGE GRID OP# CLN#"
3470 NN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH 2"
3480 RETURN
5000 CLEAR:HOME:VTAB 12
5010 PRINT SPC(33)"STAND BY))))))":RUN "START.#01"
100 ON ERROR GOTO 120
110 GOTO 400
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000: NEXT: GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";
320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 OPEN"R",#3,"B:FDATA2",12:FIELD#3,2 AS CWA$,2 AS DOTH$,2 AS SOIL$,2 AS CTP$,2 AS WET$,2 AS WSTA$
500 ST$=STRING$(80,42)
510 NN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH "
520 RET$=" PRESS RETURN TO CONTINUE"
530 HELP$=" -#-#-#-#-#-#-#-#"
540 LIN$=STRING$(79,42)
545 HD$="      TASK 2:FIELD CHARACTERISTICS"
550 TITLE1$="FLD WELL GW SW ROC HOU RA CAB TYP PER SL PHO PH RO TO LSP FLO WSTA"
560 INC$="INCORRECT NUMBERS-TRY AGAIN"
1000 HOME:PRINT ST$:PRINT
1010 PRINT SPC(30)"TASK 2 SOIL DATA ACCESS PROGRAM":PRINT
1020 PRINT ST$:PRINT
1030 PRINT SPC(27)"1. ENTER DATA FROM FIELDSHEET":PRINT
1040 PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1050 PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1060 PRINT SPC(27)"4. EXIT THE PROGRAM":PRINT
1070 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1090 FOR I=1 TO 5000
1090 A$=INKEY$:IF LEN(A$)=0 THEN 1110 ELSE OPT =ASC(A$)-48
1100 IF (OPT>0)*(OPT<5) THEN 1120
1110 NEXT:GOTO 4000
1120 HOME:ON OPT GOTO 2000,3000,3000,4000
2000 HOME: REM ENTER DATA FROM FIELDSHEET
2010 PRINT:INPUT"SOIL DATA STRING FOR FIELDNO.":ZN
2012 IF ZN>9999 THEN PRINT:PRINT"WRONG NUMBER":GOTO 2010
2015 PRINT
2020 PRINT HELP$
2030 INPUT" ",SF$
2040 IF LEN(SF$)<>19 THEN PRINT"WRONG LENGTH": GOTO 2010
2045 FOR LL=1 TO 19:L1=ASC(MID$(SF$,LL,1))
2050 IF L1<48 OR L1>57 THEN 2070
2060 NEXT: GOTO 2080

```



```

2070 PRINT"CHARACTER" ;LL" IS NOT A NUMBER" ;GOTO 2020
2080 DWA=VAL(MID$(SF$,1,3));DOTH=VAL(MID$(SF$,4,3))
2090 SOIL=VAL(MID$(SF$,7,4));CTP=VAL(MID$(SF$,11,4))
2100 WET=VAL(MID$(SF$,15,4));WSTA=VAL(MID$(SF$,19,1))
2110 GOSUB 2200
2180 GOTO 2400
2200 WELL=INT(.01*DWA);GW=INT((DWA-100*WELL)*.1);SW=DWA-(100*WELL+10*GW)
2210 ROCK=INT(.01*DOTH);HO=INT((DOTH-100*ROCK)*.1);RA=DOTH-(100*ROCK+10*HO)
2220 SC=INT(.001*SOIL);ST=INT((SOIL-1000*SC)*.1);PER=SOIL-(1000*SC+10*ST)
2230 SLP=INT(.001*CTP);POH=INT((CTP-1000*SLP)*.1);PH=CTP-(1000*SLP+10*POH)
2240 ROF=INT(.001*WET);TD=INT((WET-1000*ROF)*.01)
2250 OLS=INT(((WET-1000*ROF)-100*TD)*.1)
2260 FLO=WET-(1000*ROF+100*TD+10*OLS);RETURN
2300 DWA=CVI(DWA$);DOTH=CVI(DOTH$);SOIL=CVI(SOIL$);CTP=CVI(CTP$)
2310 WET=CVI(WET$);WSTA=CVI(WSTA$);RETURN
2400 ER=0;IF WELL>2 THEN PRINT"WRONG WELL-DISTANCE";ER=1
2410 IF GW>3 THEN PRINT"WRONG GR.WATER-DISTANCE";ER=1
2420 IF SW>6 THEN PRINT"WRONG SURF.WATER-DISTANCE";ER=1
2430 IF ROCK>2 THEN PRINT"WRONG BEDROCK-DISTANCE";ER=1
2440 IF HO>2 THEN PRINT"WRONG HOUSE-DISTANCE";ER=1
2450 IF RA>2 THEN PRINT"WRONG RES.AREA-DISTANCE";ER=1
2460 IF SC>6 THEN PRINT"WRONG SOIL CAPABILITY";ER=1
2470 IF ST>11 THEN PRINT"WRONG SOIL TYPE";ER=1
2480 IF PER>2 THEN PRINT"WRONG PERMEABILITY";ER=1
2490 IF PH>2 THEN PRINT"WRONG PH";ER=1
2500 IF SLP>4 THEN PRINT"WRONG SLOPE";ER=1
2510 IF ROF>6 THEN PRINT"WRONG RUN OFF";ER=1
2520 IF TD>2 THEN PRINT"WRONG TILE DRAIN.";ER=1
2530 IF OLS>3 THEN PRINT"WRONG SPRING DATE";ER =1
2540 IF FLO>6 THEN PRINT"WRONG FLOOD #";ER=1
2550 IF WSTA>6 THEN PRINT"WRONG WSTA #";ER=1
2560 IF ER=0 THEN GOTO 2900
2570 PRINT:PRINT" *SF$
2580 IF WELL>2 THEN HTAB 2:PRINT"-";
2590 IF GW>3 THEN HTAB 3:PRINT"#";
2600 IF SW>6 THEN HTAB 4:PRINT"#";
2610 IF ROCK>2 THEN HTAB 5:PRINT"-";
2620 IF HO>2 THEN HTAB 6:PRINT"#";
2630 IF RA >2 THEN HTAB 7:PRINT"-";
2640 IF SC>6 THEN HTAB 8:PRINT"-";
2650 IF ST>11 THEN HTAB 9:PRINT"##";
2660 IF PER>2 THEN HTAB 11:PRINT"-";
2670 IF SLP>4 THEN HTAB 12:PRINT"#";
2680 IF PH>2 THEN HTAB 15:PRINT"#";
2690 IF ROF>6 THEN HTAB 16:PRINT"-";
2700 IF TD>2 THEN HTAB 17:PRINT"#";
2710 IF OLS>3 THEN HTAB 18:PRINT"-";
2720 IF WSTA>6 THEN HTAB 20:PRINT"-";
2730 IF FLO>6 THEN HTAB 19:PRINT"#";
2750 HTAB 1:INPUT" *.NEW$SF$;PRINT" ";
2760 FOR KB=1 TO LEN(SF$)
2770 IF MID$(SF$,KB,1)=MID$(NEW$SF$,KB,1) THEN PRINT" ";GOTO 2790

```



```

2780 PRINT"*";
2790 NEXT
2800 PRINT:PRINT"ARE THE RIGHT CHANGES MADE Y/N?":GOSUB 300
2810 IF Z$="N" THEN GOTO 2570
2820 PRINT:SF$=NEWSF$:PRINT:GOTO 2040
2900 LSET DWA$=MKI$(DWA):LSET DOTH$=MKI$(DOTH):LSET SOIL$=MKI$(SOIL)
2910 LSET CTP$=MKI$(CTP):LSET WET$=MKI$(WET):LSET WSTA$=MKI$(WSTA)
2950 PUT#3,ZN
2960 PRINT:PRINT"ANY MORE DATA TO ENTER Y/N?":GOSUB 300
2970 IF Z$="Y" THEN GOTO 2010
2980 HOME:GOTO 1000
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",REC1:INPUT"END RECORD NUMBER ",REC2
3030 IF (REC1>0)*(REC2>REC1) THEN 3050
3040 PRINT"TRY AGAIN ";:GOTO 3000
3050 RECL=REC2-REC1+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS (20 IS MAXIMUM)";RECL
3080 IF (RECL>0)*(RECL<21) THEN 3090 ELSE 3070
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(NV$,4*I-3,4):INPUT" ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I);" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170
3160 PRINT CHR$(7):PRINT" ADJUST THE PRINTER AND ";RET$:INPUT" ",R$:POKE 3,150
3165 PRINT HD$:PRINT:PRINT
3170 PRINT LIN$:PRINT TITLE1$:PRINT LIN$
3180 FOR I =1 TO RECL:PRINT USING"#### ";X(I);
3190 GET # 3,X(I)
3200 IF CVI(WET$)>0 OR CVI(WSTA$)>0 THEN GOTO 3300
3210 PRINT"NO DATA":GOTO 3450
3300 GOSUB 2300:GOSUB 2200
3400 PRINT USING" # # # # " ;WELL,GW,SW,ROCK;
3410 PRINT USING" # # # # # # " ;HO,RA,SC,ST,PER,SLP;
3420 PRINT USING" ## # # # # # # " ;POH,PH,ROF,TD,CLS,FLO,WSTA
3450 IF OPT=3 THEN 3490
3460 IF VPOS(0)<20 THEN 3490
3470 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 3530
3480 HOME:PRINT LIN$:PRINT TITLE1$:PRINT LIN$
3490 NEXT
3500 IF OPT=2 THEN PRINT:PRINT RET$;:INPUT" ",R$:PRINT:GOTO 3530
3510 PRINT:PRINT LIN$:FOR P=1 TO 10:PRINT:NEXT
3520 POKE 3,149:FOR B=1 TO 5:BEEP 10*8,10:NEXT
3530 ERASE X:GOTO 1000
4000 CLEAR:HOME:VTAB 12
4010 PRINT GPC(33)"STAND BY >>>>>":RUN"START.#01"

```



```

110 ON ERROR GOTO 130
120 GOTO 160
130 BEEP 50,50:BEEP 50,50
140 PRINT:PRINT"OPERATOR ERROR..."
150 FOR T=1 TO 1000:NEXT:GOTO 2000
160 OPEN "R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS
    ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS OP$,2 AS CLN$
170 OPEN "R",#3,"B:FDATA2",12:FIELD #3,2 AS DW$,2 AS DOTH$,2 AS SOIL$, 2 AS CTP$,
    2 AS WET$,2 AS WSTA$
200 ST$=STRING$(80,42)
290 GOTO 500
300 BEEP 50,10:BEEP 50,10:PRINT"Y/N";
310 GET Z$:IF Z$="Y" OR Z$="N" THEN 320 ELSE 310
320 PRINT Z$:RETURN
350 PRINT:PRINT" DO YOU WANT TO CHANGE THIS ";GOSUB 300:IF Z$="N" THEN 500
360 RETURN
500 HOME:PRINT ST$:PRINT
510 PRINT SPC(20)" THIS PROGRAM CHANGES THE FOLLOWING FIELD DATA":PRINT
520 PRINT ST$:PRINT
530 PRINT SPC(27)"1. APP (APPROVAL STATUS)":PRINT
540 PRINT SPC(27)"2. SLD (SLUDGE DATE)":PRINT
550 PRINT SPC(27)"3. PHO (PHOSPHORUS)":PRINT
560 PRINT SPC(27)"4. PH":PRINT
570 PRINT SPC(27)"5. SEASONAL ACCESS FACTORS":PRINT
580 PRINT SPC(27)"6. LEASE EXPIRY DATE":PRINT
582 PRINT SPC(27)"7. OPERATOR (FIELD)":PRINT
599 PRINT SPC(27)"8. EXIT THE PROGRAM":PRINT
600 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
610 FOR T=1 TO 5000
620 A$=INKEY$:IF LEN(A$)=0 THEN 640 ELSE OPT=ASC(A$)-48
630 IF (OPT>0)*(OPT<9) THEN 950
640 NEXT: GOTO 2000
700 HOME:
705 INPUT "FOR WHICH FIELD THE DATA HAS TO BE CHANGED:";YY
710 IF YY>9999 THEN GOTO 700
720 PRINT:PRINT"ARE YOU SURE ?";GOSUB 300
730 IF Z$="N" THEN GOTO 700
740 RETURN
950 HOME:ON OPT GOTO 1000,1100,1200,1200,1400,1500,1600,2000
1000 GOSUB 700:HOME :PRINT
1005 GET #2,YY:APPO=CVI(APP$)
1010 PRINT"FOR FIELD ";YY;" THE APP IS:";APPO
1012 GOSUB 350
1015 PRINT:PRINT"THIS HAS TO BE CHANGED TO:";INPUT APP
1020 IF APP>9 THEN PRINT"WRONG NUMBER":GOTO 1010
1030 PRINT:PRINT"ARE YOU SURE ?":GOSUB 300
1040 IF Z$="N" THEN GOTO 1010
1050 LSET APP$=MKI$(APP):PUT #2,YY
1060 GOTO 500
1100 GOSUB 700:HOME:PRINT
1105 GET #2,YY:SLDO=CVI(SLD$)
1110 PRINT"FOR FIELD";YY;"THE SLD IS:";SLDO*.01

```



```
1112 GOSUB 350
1115 PRINT:PRINT"THIS HAS TO BE CHANGED TO (##.##):";INPUT SLD
1120 IF SLD >13 THEN PRINT"WRONG DATA":GOTO 1110
1130 PRINT:PRINT"ARE YOU SURE ?":GOSUB 300
1140 IF Z$="N" THEN GOTO 1110
1150 LSET SLD$=MKI$(SLD*100):PUT#2,YY
1160 GOTO 500
1200 GOSUB 700:HOME:PRINT
1210 GET#3,YY:CTP=CVI(CTP$)
1220 SLP=INT(.001*CTP):PHOP=INT((CTP-1000*SLP)*.1):PHA=CTP-(1000*SLP+10*PHOP)
1225 IF OPT=4 THEN GOTO 1300
1230 PRINT"FOR FIELD";YY;" THE PHO IS:";PHOP
1235 GOSUB 350
1240 PRINT:PRINT"THIS HAS TO BE CHANGED TO:":INPUT POH
1250 IF POH>99 THEN PRINT"WRONG NUMBER":GOTO 1240
1260 PRINT:PRINT"ARE YOU SURE ?":GOSUB 300:IF Z$="N" THEN 1230
1270 CTP=PHA+1000*SLP+10*POH
1280 LSET CTP$=MKI$(CTP):PUT#3,YY
1290 GOTO 500
1300 PRINT"FOR FIELD";YY;"THE PH IS:";PHA
1305 GOSUB 350
1310 PRINT:PRINT"THIS HAS TO BE CHANGED TO:":INPUT PH
1320 IF PH >2 THEN PRINT"WRONG NUMBER":GOTO 1300
1330 PRINT:PRINT"ARE YOU SURE ":GOSUB 300
1340 IF Z$="N" THEN GOTO 1300
1350 CTP=1000*SLP+10*PHOP+PH
1360 LSET CTP$=MKI$(CTP):PUT#3,YY
1370 GOTO 500
1400 GOSUB 700:HOME:PRINT
1410 GET#2,YY:AC=CVI(ACC$)
1420 PRINT"FOR FIELD: ";YY;" THE ACCESS FACTORS ARE: "AC
1425 GOSUB 350
1430 PRINT:PRINT"THIS HAS TO BE CHANGED TO: ";INPUT ACC
1440 PRINT:PRINT"ARE YOU SURE ?":GOSUB 300
1450 IF Z$="N" THEN GOTO 1420
1460 LSET ACC$=MKI$(ACC):PUT#2,YY
1470 GOTO 500
1500 GOSUB 700:HOME:PRINT
1510 GET #2,YY:LEA=CVI(LEASE$)
1520 PRINT"FOR FIELD ";YY;" THE LEASE EXPIRY DATE IS: ";LEA*.01
1525 GOSUB 300
1530 PRINT:PRINT"THIS HAS TO BE CHANGED TO(##.##): ";INPUT LEASE
1540 IF LEASE>13 THEN PRINT"WRONG DATE":GOTO 1520
1550 PRINT:PRINT"ARE YOU SURE ?":GOSUB 300
1560 IF Z$="N" THEN 1520
1570 LSET LEASE$=MKI$(LEASE*100):PUT #2,YY
1580 GOTO 500
1600 GOSUB 700:HOME:PRINT
1610 GET#2,YY:OPN=CVI(OP$)
1620 PRINT"FOR FIELD";YY;"THE OPERATOR NUMBER IS:";OPN
1625 GOSUB 350
1630 PRINT:PRINT"THIS HAS TO BE CHANGED TO:":INPUT OP
```



```

1640 IF OP>150 THEN PRINT"WRONG NUMBER":GOTO 1620
1650 PRINT:PRINT" ARE YOU SURE ";GOSUB 300
1660 IF Z$="N" THEN 1620
1670 LSET OP$=MKI$(OP):PUT#2,YY
1680 GOTO 500
2000 CLEAR:HOME:VTAB 12
2010 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
110 GOTO 150
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000:NEXT:GOTO 3050
150 OPEN"R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$, 2 AS NE$,2 AS HA$,2 AS
  ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS OP$, 2 AS QWN$
170 OPEN"R",#3,"B:FDATA2",12:FIELD#3,2 AS DWA$,2 AS DOTH$,2 AS SOIL$,2 AS CTP$,2
  AS WET$,2 AS WSTA$
180 OPEN"R",#1,"B:KEYS",22:FIELD#1,2 AS NUM$,20 AS WORD$
200 OPEN"R",#4,"B:OP/QWN",71:FIELD#4,20 AS NAM$,20 AS ADD$,13 AS CIT$,7 AS COD$,
  11 AS TEL$
290 GOTO 600
300 BEEP 50,10
310 PRINT"Y/N":GET Z$:IF Z$="N" OR Z$="Y" THEN 320 ELSE 310
320 PRINT Z$:PRINT: RETURN
400 TL=CVI(TL$):TWP=INT(.01*TL):LOT=TL-(100*TWP):CF=CVI(CF$):CGN=INT(.01*CF)
410 FLD=CF-(100*CGN):ACC=CVI(ACC$):HA=CVI(HA$)*.1:LEASE=CVI(LEASE$)*.01
420 SLD=CVI(SLD$)*.01:SPRI=INT(.001*ACC):SUMM=INT((ACC-1000*SPRI)*.01)
430 FALL=INT((ACC-1000*SPRI)-100*SUMM)*.1)
440 WINT=ACC-(1000*SPRI+100*SUMM+10*FALL):GRID=CVI(GRID$):OP=CVI(OP$)
450 QWN=CVI(QWN$):RETURN
500 DWA=CVI(DWA$):DOTH=CVI(DOTH$):SOIL=CVI(SOIL$):CTP=CVI(CTP$):WET=CVI(WET$)
505 OP=CVI(OP$):QWN=CVI(QWN$)
510 WSTA=CVI(WSTA$):WELL=INT(.01*DWA):GW=INT((DWA-100*WELL)*.1)
520 SW=DWA-(100*WELL+10*GW):ROCK=INT(.01*DOTH):HO=INT((DOTH-100*ROCK)*.1)
530 RA=DOTH-(100*ROCK+10*HO):SC=INT(.001*SOIL):ST=INT((SOIL-1000*SC)*.1):
540 PER=SOIL-(1000*SC+10*ST):SLP=INT(.001*CTP):POH=INT((CTP-1000*SLP)*.1)
550 PH=CTP-(1000*SLP+10*POH):ROF=INT(.001*WET):TD=INT((WET-1000*ROF)*.01)
560 OLS=INT((WET-1000*ROF)-100*TD)*.1):FLO=WET-(1000*ROF+100*TD+10*OLS):RETURN
600 RET$=" PRESS RETURN TO CONTINUE "
610 QWC$="DO YOU WANT TO CONTINUE ? "
620 ST$=STRING$(30,42)
900 HOME:PRINT"DO YOU WANT A READABLE 'ENGLISH'-REPORT ";GOSUB 300
910 IF Z$="Y" THEN 1000
920 HOME:PRINT:PRINT
930 INPUT"ENTER (1) FOR TASK1 OR (2) FOR TASK 2: ",N$
940 IF N$="1" OR N$="2" THEN 950 ELSE 930
950 IF N$="1" THEN RUN"DATA1.#01"
960 RUN"DATA2.#01"
1000 HOME:PRINT"THIS PROGRAM PRINTS THE DATA FROM TASK 1 AND TASK 2 IN READABLE ENGLISH"
1010 PRINT:PRINT:INPUT" ENTER 1 FOR TASK 1 OR 2 FOR TASK 2: ",N$
1020 IF N$="1" OR N$="2" THEN 1030 ELSE 1010
1030 PRINT:PRINT:INPUT"DO YOU WANT TO (D)DISPLAY OR (P)PRINT THE DATA ?",W$
1040 IF W$="D" OR W$="P" THEN 1050 ELSE 1030
1050 HOME:PRINT:INPUT"FOR WHICH FIELD NO.:",XX

```



```

1060 IF W$="D" THEN 1080
1070 PRINT:PRINT CHR$(7):PRINT " ADJUST THE PRINTER AND ";RET$:INPUT " ",R$:POKE 3,150
1080 IF N$="2" THEN 2000
1210 HOME:GET#2,XX:GOSUB 400
1215 IF TL<1 THEN PRINT"NO DATA":GOTO 3010
1220 PRINT ST$:PRINT TAB(33)"TASK 1":PRINT ST$:PRINT
1230 GET#4,OP:PRINT "OPERATOR: ";OP;NAM$ TAB(48) "FIELD NO.:";XX
1240 PRINT TAB(11) ADD$ TAB(35) CIT$
1250 PRINT TAB(11)"POSTAL CODE: ";COD$ TAB(35)"PHONE: ";TEL$
1300 PRINT:PRINT "OWNER: ";
1305 IF OWN=OP THEN PRINT"SAME AS OPERATOR":GOTO 1330
1310 IF OWN=0 THEN PRINT"UNKNOWN" :GOTO 1330
1320 GET#4,OWN:PRINT NAM$
1340 GET#1,200+TWP:PRINT:PRINT"LOCATION"
1350 PRINT"TOWNSHIP: ";WORD$ TAB(32)"LOT";LOT TAB(45) "CONC.: ";
1360 IF TWP=2 OR TWP=3 THEN 1380
1370 PRINT CON:GOTO 1400
1380 IF CON<11 THEN 1370 ELSE GET#1,210+CON
1390 PRINT WORD$
1400 PRINT:PRINT"GRID NUMBER: ";
1410 IF TWP=2 OR TWP=3 THEN 1430
1420 PRINT GRID:GOTO 1500
1430 AA=GRID-(INT(GRID*.1)*10)
1440 IF AA=4 OR AA=5 THEN 1445 ELSE PRINT GRID:GOTO 1500
1445 FOR I=260 TO 289:GET#1,I
1450 IF CVI(NUM$)=GRID THEN PRINT WORD$:GOTO 1500
1460 NEXT
1500 PRINT:PRINT"FARMER'S FIELDNO.: ";FLD TAB(30) "TOTAL AREA OF FIELD: ";HA;"HA"
1505 IF W$="P" THEN 1510 ELSE PRINT:PRINT RET$;;INPUT " ",R$
1510 PRINT:PRINT TAB(20)"SEASONAL ACCESS FACTORS"
1520 GET#1,230+SPRI:PRINT"SPRING: ";WORD$ TAB(35)
1530 GET#1,230+SUMM:PRINT"SUMMER: ";WORD$
1540 GET#1,230+FALL:PRINT"FALL: ";WORD$ TAB(35)
1550 GET#1,230+WINT:PRINT"WINTER: ";WORD$:PRINT
1600 IF LEASE<1 THEN PRINT:GOTO 1620
1610 PRINT TAB(25) "LEASE EXPIRY DATE: ";:PRINT USING"##.##";LEASE
1620 IF SLD<1 THEN 1650
1630 PRINT:PRINT TAB(25)"LAST SLUDGE DATE: ";:PRINT USING"##.##";SLD
1650 GOTO 2600
2010 HOME:GET#2,XX:OP=CVI(OP$):OWN=CVI(OWN$)
2020 PRINT ST$:PRINT TAB(33) "TASK 2":PRINT ST$:PRINT
2030 GET #4,OP:PRINT"OPERATOR: ";OP;NAM$
2040 PRINT TAB(11) ADD$ TAB(35) CIT$
2050 PRINT TAB(11)"POSTAL CODE: ";COD$ TAB(35) "PHONE: ";TEL$
2100 PRINT:PRINT"OWNER: ";
2110 IF OWN=OP THEN PRINT"SAME AS OPERATOR":GOTO 2140
2120 IF OWN=0 THEN PRINT"UNKNOWN":GOTO 2140
2130 GET#4,OWN:PRINT NAM$
2140 GET#3,XX:GOSUB 500
2150 PRINT:PRINT TAB(20) "DISTANCE TO: "
2160 GET#1,290+WELL:PRINT"WELL: ";WORD$ TAB(38) "GROUND WATER: ";
2170 GET#1,300+GW:PRINT WORD$:GET#1,310+SW:PRINT"SURFACE WATER: ";WORD$ TAB(38)

```



```

2180 GET#1,320+ROCK:PRINT "BEDROCK: ";WORD$:GET#1,330+HO:PRINT"HOUSE: ";WORD$ TAB(38)
2210 IF W$="P" THEN 2300
2220 PRINT CHR$(7):PRINT CHR$(7)
2230 PRINT:PRINT RET$;:INPUT " ",R$
2240 HOME
2300 PRINT:PRINT"SOIL CAPABILITY: CLASS":SC TAB(38)
2310 GET#1,390+SLP:PRINT"SLOPE: ";WORD$:GET#1,360+ST:PRINT:PRINT"SOIL TYPE: ";WORD$ TAB(38)
2320 GET#1,380+PER:PRINT"PERMEABILITY: ";WORD$
2340 IF POH=99 THEN PRINT"PHOSPHORUS LEVEL: UNKNOWN" TAB(38);:GOTO 2360
2350 PRINT"PHOSPHORUS LEVEL: ";POH TAB(38)
2360 GET#1,400+PH:PRINT"PH: ";WORD$:GET#1+TD:PRINT
2370 PRINT"TILE DRAINED: ";WORD$ TAB(38)
2380 GET#1,430+OLS:PRINT"ON LAND IN SPRING: ";WORD$
2400 GET#1,440+FLO:PRINT:PRINT"FLOOD PROBLEMS: ";WORD$
2410 GET#1,410+ROF:PRINT:PRINT"EROSION INTO WATERCOURSE: ";WORD$
2420 GET#1,450+WSTA:PRINT:PRINT"WEATHER STA.: ";WORD$
2400 PRINT:PRINT ST$:PRINT
3000 IF W$="D" THEN 3030
3010 FOR P=1 TO 10:PRINT:NEXT
3020 POKE 3,149:FOR P=1 TO 5:SEEP 10*P,10:NEXT
3030 PRINT "DO YOU WANT TO CONTINUE?";:GOSUB 300:IF Z$="Y" THEN 1000
3050 CLEAR:HOME:VTAB 12
3060 PRINT SPC(33)"STAND BY >>>>>":RUN"START.#01"
100 GOTO 600
300 SEEP 50,50:PRINT" Y/N":GET Z$:IF Z$="N" OR Z$="Y" THEN 320 ELSE 310
310 GOTO 300
320 PRINT Z$:PRINT:RETURN
400 OPEN "R",#3,"B:FDATA2",12:FIELD #3,2 AS DWA$,2 AS DOTH$, 2 AS SOIL$,
    2 AS CTP$, 2 AS WET$, 2 AS WSTA$
410 OPEN "R",#2, "B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,
    2 AS HA$,2 AS ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,
    2 AS OP$,2 AS CLN$
430 OPEN "R",#1,"B:ISSUIT",8:FIELD#1,2 AS XYZ$,2 AS PPR$,2 AS FLAG$,2 AS MT$
440 OPEN"R",#4,"B:ADATA",8:FIELD#4,2 AS KN$,2 AS KE$,2 AS D$,2 AS RTC$
450 RETURN
500 CTP=CVI(CTP$):SLP=INT(.001*CTP):DWA=CVI(DWA$)
510 WELL=INT(.01*DWA):GW=INT((DWA-100*WELL)*.1):SW=DWA-(100*WELL+10*GW)
520 SOIL=CVI(SOIL$):SC=INT(.001*SOIL):ST=INT((SOIL-1000*SC)*.1)
530 PER=SOIL-(1000*SC+10*ST)
550 RETURN
560 SP=INT(.001*ACC):SUM=INT((ACC-1000*SP)*.01)
570 FALL=INT(((ACC-1000*SP)-100*SUM)*.1)
580 WIN=ACC-(1000*SP+100*SUM+10*FALL):RETURN
600 HOME:PRINT"THIS PROGRAM INITIALIZES THE FILES FOR SEASONAL SUITABILITY":PRINT
610 PRINT"THIS SHOULD ONLY BE DONE WHEN NEW ENTRIES HAVE BEEN MADE":
620 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300
630 IF Z$="N" THEN 9500
640 HOME:VTAB 12
650 PRINT" ARE YOU SURE, THIS TEST TAKES ABOUT 45 MINUTES.":PRINT
660 PRINT"You can go for a long coffee-break."
670 PRINT:PRINT"Do you want to continue ";:GOSUB 300
680 IF Z$="N" THEN 9500

```



```
1000 GOSUB 400
1100 HOME
1205 V=1
1210 GET # 2,V:HA=CVI(HA#)*.1:ACC=CVI(ACC#):GOSUB 560
1212 VTAB 12:PRINT INT((800-V)/10);:PRINT" PLEASE WAIT FOR DATA SORTING (APPROX. 16 MIN.) PHASE 1
1215 IF EOF(2) THEN 5000
1220 IF HA=0 THEN XYZ=9999:GOTO 3750
1222 GET#1,V:FLAG=CVI(FLAG#)
1225 GET#3,V:IF CVI(CTP#)=0 THEN XYZ=9999:GOTO 3750
1227 GOSUB 500
1235 SUS=0:FS=0:XYZ=0:SS=0:SFLAG=0:FLAG=0
1240 IF WIN=9 THEN 1270
1250 IF WIN=0 OR WIN=6 THEN WS=9:GOTO 2200 '(OUT) FILE
1260 SFLAG=3
1270 IF SLP>2 THEN WS=9: GOTO 2200 '(OUT) FILE
1350 IF SW>65 THEN WS=3:GOTO 1800 'FROZEN
1370 IF SW<2 THEN 1380 ELSE 1400
1380 IF HA<20.2 THEN WS=9:GOTO 2200 '(OUT) FILE
1390 WS=6:GOTO 1800
1400 IF SW=2 THEN 1410 ELSE 1430
1410 IF HA<16 THEN WS=9:GOTO 2200 '(OUT) FILE
1420 WS=6:GOTO 1800 'FROZEN
1430 IF SW=3 THEN 1440 ELSE 1460
1440 IF HA<12.5 THEN WS=9: GOTO 2200 '(OUT) FILE
1450 WS=6:GOTO 1800 'FROZEN
1460 IF SW=4 THEN 1470 ELSE 1440
1470 IF HA<9.6 THEN WS=9:GOTO 2200 '(OUT) FILE
1480 WS=6:GOTO 1800 'FROZEN
1490 IF SW=5 THEN 1500 ELSE 1520
1500 IF HA<7.3 THEN WS=9:GOTO 2200 '(OUT) FILE
1510 WS=6:GOTO 1800 'FROZEN
1520 PRINT:PRINT "SOMETHING WENT WRONG":STOP
1620 IF SW>3 THEN WS=3:GOTO 1800
1650 IF SW<2 THEN 1660 ELSE 1680
1660 IF HA<9.6 THEN WS=9:GOTO 2200 '(OUT) FILE
1670 WS=6:GOTO 1800 'FROZEN
1680 IF SW=2 THEN 1690 ELSE 1710
1690 IF HA<7.3 THEN WS=9:GOTO 2200 '(OUT) FILE
1700 WS=6:GOTO 1800 'FROZEN
1710 IF WS=3 THEN 1720 ELSE 1740
1720 IF HA<5.4 THEN WS=9:GOTO 2200 '(OUT) FILE
1730 WS=6:GOTO 1800 'FROZEN
1740 PRINT:PRINT"SOMETHING WENT WRONG":STOP
1890 IF SW<2 THEN 1900 ELSE 1920
1900 IF HA<20.2 THEN GOTO 2100 'SOIL T
1910 WS=2:GOTO 2100 'SOIL T
1920 IF SW=2 THEN 1930 ELSE 1950
1930 IF HA<16 THEN GOTO 2100 'SOIL T
1940 WS=2:GOTO 2100 'SOIL T
1950 IF SW=3 THEN 1960 ELSE 1980
1960 IF HA<12.5 THEN GOTO 2100 'SOIL T
1970 WS=2:GOTO 2100 'SOIL T
```



```
1980 IF SW=4 THEN 1990 ELSE 2010
1990 IF HA<9.6 THEN GOTO 2100 'SOIL T
2010 IF SW=5 THEN 2020 ELSE 2040
2020 IF HA<7.3 THEN GOTO 2100 'SOIL T
2030 WS=2:GOTO 2100 'SOIL T
2040 PRINT:PRINT"SOMETHING WRONG AGAIN?":STOP
2110 IF ST=7 OR ST=8 THEN GOTO 2200
2120 IF WS=1 THEN WS=5:GOTO 2200
2130 IF WS=2 THEN WS=7:GOTO 2200
2140 IF WS=3 THEN WS=4:GOTO 2200
2150 IF WS=6 THEN WS=8:GOTO 2200
2160 PRINT:PRINT"SOMETHING WENT WRONG AGAIN?":STOP
2200 WS=1000*WS
2320 IF SP=9 THEN 2350
2330 IF SP=0 OR SP=6 THEN SS=9:GOTO 2900 '(OUT) FILE
2340 SFLAG=3
2350 IF SLP=1 OR SLP=2 THEN 2400
2360 SS=9:GOTO 2900 '(OUT) FILE
2410 IF PER=1 THEN 2650
2430 IF SW>5 THEN SS=3:GOTO 2800
2450 IF SW<2 THEN 2460 ELSE 2480
2460 IF HA<20.2 THEN SS=9:GOTO 2900
2470 SS=6:GOTO 2800
2480 IF SW=2 THEN 2490 ELSE 2510
2490 IF HA<6 THEN SS=9:GOTO 2900 '(OUT) FILE
2500 SS=6:GOTO 2800
2510 IF SW=3 THEN 2520 ELSE 2540
2520 IF HA<12.5 THEN SS=9:GOTO 2900 '(OUT) FILE
2530 SS=6:GOTO 2800
2540 IF SW=4 THEN 2550 ELSE 2570
2550 IF HA<9.6 THEN SS=9:GOTO 2900 '(OUT) FILE
2560 SS=6:GOTO 2800
2570 IF SW=5 THEN 2580 ELSE 2600
2580 IF HA<7.3 THEN SS=9:GOTO 2900
2600 PRINT:PRINT"SOMETHING WENT WRONG?":STOP
2670 IF SW>3 THEN SS=3:GOTO 2800
2690 IF SW<2 THEN 2700 ELSE 2720
2700 IF HA<9.6 THEN SS=9:GOTO 2900
2710 SS=6:GOTO 2800
2720 IF SW=2 THEN 2730 ELSE 2750
2730 IF HA<7.3 THEN SS=9:GOTO 2900
2740 SS=6:GOTO 2800
2750 IF SW=3 THEN 2760 ELSE 2780
2760 IF HA<5.4 THEN SS=9:GOTO 2900
2770 SS=6:GOTO 2800
2790 PRINT:PRINT"WRONG AGAIN?":STOP
2810 IF ST=7 OR ST=8 THEN GOTO 2900
2820 IF SS=3 THEN SS=4:GOTO 2900
2830 IF SS=6 THEN SS=8:GOTO 2900
2900 SS=100*SS
3020 IF SUM=9 THEN GOTO 3050
3030 IF SUM=0 OR SUM=6 THEN SUS=9:GOTO 3050
```



```

3040 SFLAG=3
3060 IF FALL=9 THEN GOTO 3100
3070 IF FALL=0 OR FALL=6 THEN FS=9:GOTO 3450
3080 SFLAG=3
3110 IF SLP=1 THEN 3120 ELSE 3200
3120 IF SW>1 THEN SFS=1:GOTO 3500
3130 IF HA<5.4 THEN SFS=0:GOTO 3500
3140 SFS=2:GOTO 3500
3200 IF SLP=2 THEN 3210 ELSE 3300
3210 IF SW>2 THEN SFS=1:GOTO 3500
3215 IF SW=2 THEN GOTO 3250
3220 IF HA<7.3 THEN SFS=0:GOTO 3500
3230 SFS=2:GOTO 3500
3250 IF HA<5.4 THEN SFS=0:GOTO 3500
3260 SFS=2:GOTO 3500
3300 IF SLP=3 THEN 3310 ELSE SFS=0:GOTO 3500
3310 IF SW>3 THEN SFS=1:GOTO 3500
3320 IF SW=3 THEN 3330 ELSE GOTO 3350
3330 IF HA<9.6 THEN SFS=0:GOTO 3500
3340 SFS=2:GOTO 3500
3350 IF SW=2 THEN 3360 ELSE GOTO 3380
3360 IF HA<7.3 THEN SFS=0:GOTO 3500
3370 SFS=2:GOTO 3500
3390 SFS=2:GOTO 3500
3450 IF SUS=9 AND FS=9 THEN GOTO 3600 'FILE
3460 GOTO 3100
3500 IF SUS=9 THEN FS=SFS:GOTO 3600 'FILE
3510 IF FS=9 THEN SUS=SFS:GOTO 3600 'FILE
3520 FS=SFS:SUS=SFS:GOTO 3600 'FILE
3600 SUS=10*SUS
3610 IF SFLAG=3 THEN 3620 ELSE 3700
3620 IF FLAG=0 THEN FLAG=3:GOTO 3650
3630 IF FLAG=2 THEN FLAG=5:GOTO 3650
3640 PRINT"WRONG IN 3640":STOP
3650 LSET FLAG$=MKI$(FLAG)
3700 XYZ=WS+SS+SUS+FS
3750 LSET XYZ$=MKI$(XYZ)
3760 PUT#1,V
3770 V=V+1
3780 GOTO 1210
5000 CLEAR
6010 GOSUB 400
6330 HOME
6400 REM      PHOSPHORUS TEST
6410 V=1
6420 GET #3,V
6421 GET#1,V
6425 IF EOF(3) THEN 7000
6426 UTAB 12:PRINT INT((300-V)/10)::PRINT*   PLEASE WAIT FOR DATA SORTING (APPROX. 5 MIN.) PHASE 2*
6428 IF CVI(DWA$)=0 THEN PPR=9 :GOTO 6700
6430 CTP=CVI(CTP$):SLP=INT(.001*CTP):POH=INT((CTP-1000*SLP)*.1)
6440 PH=CTP-(1000*SLP+10*POH)

```



```

6500 IF POH=99 OR PH=0 THEN PPR=0:GOTO 6700 'FILE
6510 IF POH>60 THEN PPR=9:GOTO 6700 'FILE
6520 IF POH<=30 THEN PR=1:GOTO 6600 'PH TEST
6530 PR=2:GOTO 6600
6540 PRINT 'SOMETHING WENT WRONG'
6600 REM      PH TEST
6610 IF PH=1 THEN GOTO 6620 ELSE 6650
6620 IF PR=1 THEN PPR=3:GOTO 6700 'FILE
6630 IF PR=2 THEN PPR=4:GOTO 6700 'FILE
6640 PRINT "WRONG???"
6660 IF PR=1 THEN PPR=1:GOTO 6700 'FILE
6670 IF PR=2 THEN PPR=2:GOTO 6700 'FILE
6680 PRINT "WRONG???"
6700 LSET PPR$=MKI$(PPR)
6710 PUT #1,V
6720 V=V+1
6730 GOTO 6420
7000 CLEAR
7820 GOSUB 400
7830 HOME
7840 UTAB 12:PRINT INT((800-V)/10):PRINT" PLEASE WAIT FOR DATA SORTING (APPROX. 18 MIN.) PHASE 3 "
7850 V=1
7860 GET #3,V:IF EOF(3) THEN 9500
7870 IF CVI(DWA$)=0 THEN GOTO 8820
7900 DWA=CVI(DWA$):DOH=CVI(DOH$):SOIL=CVI(SOIL$):CTP=CVI(CTP$)
7910 WET=CVI(WET$):WSTA=CVI(WSTA$)
7920 WELL=INT(.01*DWA):GW=INT((DWA-100*WELL)*.1):SW=DWA-(100*WELL+10*GW)
7930 ROCK=INT(.01*DOH):HO=INT((DOH-100*ROCK)*.1):RA=DOH-(100*ROCK+10*HO)
7940 SC=INT(.001*SOIL):ST=INT((SOIL-1000*SC)*.1):PER=SOIL-(1000*SC+10*ST)
7950 ROF=INT(.001*WET):TD=INT((WET-1000*ROF)*.01)
7960 OLS=INT(((WET-1000*ROF)-100*TD)*.1)
7970 FLO=WET-(1000*ROF+100*TD+10*OLS)
7980 GET #1,V:FLAG=CVI(FLAG$)
8010 IF WELL=2 THEN 8030 'GW TEST
8020 GOTO 8250 'OUT FLAG 4
8040 IF GW=3 THEN 8100 'BEDROCK TEST
8050 IF PER=2 AND GW=2 THEN 8100 'BEDROCK TEST
8060 GOTO 8250 'OUT FLAG 4
8110 IF ROCK=2 THEN 8150 'HOUSE TEST
8120 GOTO 8250 'OUT FLAG 4
8160 IF HO=2 THEN 8180 'RESO.AREA TEST
8170 GOTO 8250 'OUT FLAG 4
8190 IF RA=2 THEN 8400 'NEXT TESTING
8200 GOTO 8250 'OUT FLAG 4
8250 GOTO 8260
8260 IF FLAG=0 THEN FLAG=4:GOTO 8400
8270 IF FLAG=3 THEN FLAG=7:GOTO 8400
8280 IF FLAG=5 THEN FLAG=8:GOTO 8400
8290 IF FLAG=2 THEN FLAG=6:GOTO 8400
8420 IF TD=2 THEN 8450 'NEXT TEST
8430 GOTO 8700 'FLAG 1
8460 IF ROF=1 OR ROF=3 THEN 8480 'NEXT TEST

```



```

3470 GOTO 3700 'OUT FLAG 1
3490 IF OLS=1 OR OLS=2 THEN 3600
3500 GOTO 3700 'OUT FLAG 1
3600 GET #2,V:NE=CVI(NE$):KN=INT(.01*NE):KME=NE-100*KN
3610 IF CVI(HA$)=0 THEN 3820
3620 T=1
3630 GET #4,T:KN=CVI(KN$):KE=CVI(KE$):O=CVI(O$)
3635 IF KN=0 THEN 3800
3640 IF EOF(4) THEN 3800
3650 ND1=KN+O:ND2=KN-O
3660 ED1=KE+O:ED2=KE-O
3670 IF (KN<ND1)*(KN<ND2) THEN 3680 ELSE 3690 'OUT
3680 IF (KME<ED1)*(KME<ED2) THEN GOTO 3700 ELSE 3690
3690 T=T+1:GOTO 3630
3700 IF FLAG=0 THEN FLAG=1:GOTO 3800
3710 IF FLAG=2 THEN FLAG=9:GOTO 3800
3720 IF FLAG=3 THEN FLAG=13:GOTO 3800
3730 IF FLAG=4 THEN FLAG=15:GOTO 3800
3740 IF FLAG=5 THEN FLAG=10:GOTO 3800
3750 IF FLAG=6 THEN FLAG=11:GOTO 3800
3760 IF FLAG=7 THEN FLAG=14:GOTO 3800
3770 IF FLAG=8 THEN FLAG=12:GOTO 3800
3800 LSET FLAG$=MKI$(FLAG)
3810 PUT #1,V
3820 V=V+1:GOTO 7860
9500 HOME:FOR I=1 TO 10:BEEP 10*I,50:BEEP 25*I,20:NEXT
9510 CLEAR:HOME:VTAB 12
9560 PRINT SPC(33)*"STAND BY >>>>>";:RUN"START.#01"
50 ON ERROR GOTO 70
60 GOTO 100
70 BEEP 50,50:BEEP 50,50
80 PRINT:PRINT"OPERATOR ERROR..."
90 FOR T=1 TO 1000:NEXT:GOTO 1630
100 REM THIS IS A SHORT VERSION OF THE "FARMER REPORT"--PROGRAM
110 OPEN "R",#4,"B:OP/OWN",71:FIELD #4,20 AS NAM$,20 AS ADD$,13 AS CIT$,7 AS COD$,
11 AS TEL$
130 OPEN "R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS
S OP$,2 AS OWN$
140 OPEN "R",#3,"B:FDATA2",12:FIELD #3,2 AS DWA$,2 AS DOTH$,2 AS SOIL$,2 AS CTP$,2 AS WET$,2 AS WSTA$
150 OPEN"R",#1,"B:KEYS",22:FIELD#1,2 AS NUM$,20 AS WORD$
155 HOME
160 GOTO 1000
200 TL=CVI(TL$):TWP=INT(.01*TL):LOT=TL-(100*TWP):
205 CF=CVI(CF$):ACC=CVI(ACC$):HA=CVI(HA$)*.1
210 CGN=INT(.01*CF):FLD=CF-(100*CGN):ACC=CVI(ACC$):
215 HA=CVI(HA$)*.1:LEASE=CVI(LEASE$)*.01:SLD=CVI(SLD$)*.01
220 SPRI=INT(.001*ACC):SUMM=INT((ACC-1000*SPRI)*.01)
225 GRID=CVI(GRID$):OP=CVI(OP$):OWN=CVI(OWN$)
230 FALL=INT(((ACC-1000*SPRI)-100*SUMM)*.1)
240 WINT=ACC-(1000*SPRI+100*SUMM+10*FALL):RETURN
250 DWA=CVI(DWA$):DOTH=CVI(DOTH$):SOIL=CVI(SOIL$):CTP=CVI(CTP$)
260 WET=CVI(WET$):WSTA=CVI(WSTA$)

```



```

270 WELL=INT(.01*DWA):GW=INT((DWA-100*WELL)*.1):SW=DWA-(100*WELL+10*GW)
280 ROCK=INT(.01*DOTH):HO=INT((DOTH-100*ROCK)*.1):RA=DOTH-(100*ROCK+10*HO)
290 SC=INT(.001*SOIL):ST=INT((SOIL-1000*SC)*.1):PER=SOIL-(1000*SC+10*ST)
300 SLP=INT(.001*CTP):POH=INT((CTP-1000*SLP)*.1):PH=CTP-(1000*SLP+10*POH)
310 ROF=INT(.001*WET):TD=INT((WET-1000*ROF)*.01)
320 OLS=INT((WET-1000*ROF)-100*TD)*.1)
330 FLO=WET-(1000*ROF+100*TD+10*OLS):RETURN
400 HOME
1000 INPUT "FARMER NAME";XX$
1010 INPUT "NUMBER";XX
1020 PRINT:INPUT "WHICH FIELD NO.";FA
1025 PRINT:PRINT "ADJUST PRINTER"
1030 GET #4,XX
1035 POKE 3,150
1038 PRINT " FARMER'S REPORT":PRINT:PRINT
1040 PRINT NAM$
1050 PRINT ADD$ TAB(25) CIT$:
1060 PRINT "POSTAL CODE: ";COD$ TAB(25) "PHONE: ";TEL$:
1070 PRINT:PRINT:
1100 GET #2,FA:GOSUB 200
1120 GET#1,200+TWP
1130 PRINT:PRINT "FIELDNO.:";FLD TAB(20) "(FILE NO.;"FA;")":
1140 PRINT:PRINT "LOCATION"
1150 PRINT "TOWNSHIP:";WORD$ TAB(30) "LOT:";LOT TAB(45) "CONC.:";
1160 IF TWP=2 OR TWP=3 THEN GOTO 1180
1170 PRINT CON:GOTO 1200
1180 IF CON<11 THEN GOTO 1170 ELSE GET#1,210+CON
1190 PRINT WORD$
1200 PRINT:PRINT "TOTAL AREA OF FIELD:";HA;"HA"
1210 PRINT:PRINT "SEASONAL ACCESS FACTORS"
1220 GET#1,230+SPRI
1230 PRINT:PRINT "SPRING:";WORD$ TAB(35)
1240 GET#1,230+SUMM
1250 PRINT "SUMMER:";WORD$
1260 GET#1,230+FALL
1270 PRINT "FALL:";WORD$ TAB(35)
1280 GET#1,230+WINT
1290 PRINT "WINTER:";WORD$:PRINT
1300 IF LEASE < 1 THEN PRINT :GOTO 1335
1310 PRINT "LEASE EXPIRY DATE: ";:PRINT USING"##.##";LEASE;
1315 IF OWN=0 THEN PRINT TAB(35) "OWNER: UNKNOWN":GOTO 1335
1320 GET#4,OWN
1330 PRINT TAB(35) "OWNER: ";NAM$
1335 IF SLD<1 THEN 1350
1340 PRINT "LAST SLUDGE DATE: ";:PRINT USING"##.##";SLD
1350 REM DISPLAY OF TASK 2
1400 GET#3,FA:GOSUB 250
1410 PRINT:PRINT "DISTANCES TO:"
1420 GET#1,290+WELL
1430 PRINT "WELL:";WORD$ TAB(35) "GROUND WATER:";
1440 GET#1,300+GW:PRINT WORD$

```



```

1450 GET#1,310+SW:PRINT"SURFACE WATER:";WORD$ TAB(35)
1460 GET#1,320+ROCK:PRINT"BEDROCK:";WORD$
1470 GET#1,330+HO:PRINT"HOUSE:";WORD$ TAB(35)
1480 GET#1,340+RA:PRINT"RESIDENTIAL AREA:";WORD$
1490 PRINT:PRINT"SOIL CAPABILITY: CLASS";SC TAB(35)
1500 GET#1,390+SLP:PRINT"SLOPE:";WORD$
1510 GET#1,360+ST:PRINT:PRINT"SOIL TYPE:";WORD$ TAB(35)
1520 GET#1,380+PER:PRINT"PERMEABILITY:";WORD$
1525 IF POH=99 THEN PRINT"PHOSPHORUS LEVEL: UNKNOWN" TAB(35);:GOTO 1540
1530 PRINT:PRINT"PHOSPHORUS LEVEL:";POH TAB(35)
1540 GET#1,400+PH:PRINT"PH:";WORD$
1560 GET#1,420+TD:PRINT:PRINT"PILE DRAINED:";WORD$ TAB(35)
1570 GET#1,430+OLS:PRINT"ON LAND IN SPRING:";WORD$
1580 GET#1,440+FLO:PRINT:PRINT"FLOOD PROBLEMS:";WORD$
1590 GET#1,410+ROF:PRINT"EROSION INTO WATER COURSE:";WORD$
1600 POKE 3,149
1610 INPUT"DO YOU WANT TO CONTINUE ? Y/N";Z$
1620 IF Z$="Y" THEN GOTO 1000
1630 CLEAR:HOME:VTAB 12
1640 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
1010 ON ERROR GOTO 1040
1020 GOTO 1200
1040 BEEP 50,50:BEEP 50,50
1050 PRINT:PRINT "OPERATOR ERROR . . ."
1060 FOR T=1 TO 1000:NEXT:GOTO 10450
1200 RET$="PRESS RETURN TO CONTINUE"
1210 ST$=STRING$(80,42)
1220 TITLE$="FIELD SEAS CLASS FLAG PH/PHOS METAL --- NA=NOT APPROVED"
1230 STF$=STRING$(80,45)
1240 STN$=STRING$(51,42):STN$=" --- R=CLASS NOT ACCEPTABLE"
1490 GOTO 6000
1500 OPEN "R",#1,"B:SSUIT",3:FIELD#1,2 AS XYZ$,2 AS PPR$,2 AS FLAG$,2 AS MT$:
RETURN
1510 OPEN "R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS
ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS OP$,2 AS OWN$:RETURN
1600 Y=CVI(XYZ$):WIN=INT(.001*Y):SP=INT((Y-1000*WIN)*.01)
1610 SUM=INT(((Y-1000*WIN)-100*SP)*.1):FALL=Y-(1000*WIN+100*SP+10*SUM):RETURN
1650 BEEP 50,50:PRINT "Y/N";
1660 GET Z$:IF Z$="N" OR Z$="Y" THEN 1670 ELSE 1660
1670 PRINT Z$:PRINT:RETURN
1710 F1$="STATUS WARNING, RESTRICTED AREAS"
1720 F2$="REDUCED RATE OF APPLICATION"
1730 F3$="SEASONAL ACCESS FACTOR"
1740 F4$="FIELD APPROVAL TEST"
1750 IF FLAG=0 THEN PRINT"NO PROBLEM":GOTO 1930
1760 IF FLAG=1 THEN PRINT F1$:GOTO 1930
1770 IF FLAG=2 THEN PRINT F2$:GOTO 1930
1780 IF FLAG=3 THEN PRINT F3$:GOTO 1930
1790 IF FLAG=4 THEN PRINT F4$:GOTO 1930
1800 IF FLAG=5 THEN PRINT F2$:PRINT F3$:GOTO 1930
1810 IF FLAG=6 THEN PRINT F2$:PRINT F4$:GOTO 1930
1820 IF FLAG=7 THEN PRINT F3$:PRINT F4$:GOTO 1930

```



```

1330 IF FLAG=8 THEN PRINT F2$:PRINT F3$:PRINT F4$:GOTO 1930
1340 IF FLAG=9 THEN PRINT F1$:PRINT F2$:GOTO 1930
1350 IF FLAG=10 THEN PRINT F1$:PRINT F2$:PRINT F3$:GOTO 1930
1360 IF FLAG=11 THEN PRINT F1$:PRINT F2$:PRINT F4$:GOTO 1930
1370 IF FLAG=12 THEN PRINT F1$:PRINT F2$:PRINT F3$:PRINT F4$:GOTO 1930
1380 IF FLAG=13 THEN PRINT F1$:PRINT F3$:GOTO 1950
1390 IF FLAG=14 THEN PRINT F1$:PRINT F3$:PRINT F4$:GOTO 1930
1400 IF FLAG=15 THEN PRINT F1$:PRINT F4$:GOTO 1930
1430 RETURN
1435 FLAG=CVI(FLAG$):PPR=CVI(PPR$):MT=CVI(MT$)
1436 IF SI=1 THEN W=WIN:GOTO 1940
1437 IF SI=2 THEN W=SP:GOTO 1940
1438 IF SI=3 THEN W=SUM ELSE W=FALL
1440 IF CUI(APP$)<4 THEN PRINT"NA";
1441 PRINT TAB(9)" ";;PRINT USING" #";W;;IF W=9 THEN PRINT"R";
1442 PRINT TAB(20)" ";;PRINT USING" ## # #";FLAG,PPR,MT
1443 W=0
1460 IF SI=1 THEN 1970 ELSE 2000
1470 IF WT=2 OR WT=3 THEN SS=1:GOTO 2150 'WINTER FROZEN
1480 IF WP=3 OR WP=2 THEN SS=2:GOTO 2150 'WINTER NOT FROZEN,WET
1490 SS=3:GOTO 2150 'WINTER NOT FROZEN,DRY
2000 IF SI=2 THEN 2010 ELSE 2050
2010 IF WT=3 THEN SS=4:GOTO 2150 'SPRING FROZEN
2020 IF WP=1 THEN SS=5:GOTO 2150 'SPRING NOT FROZEN,DRY
2030 SS=6:GOTO 2150 'SPRING NOT FROZEN,WET
2050 IF SI=3 THEN 2060 ELSE 2100 'FALL
2060 IF WP=3 THEN SS=7:GOTO 2150 'SUMMER WET
2070 SS=8:GOTO 2150 'SUMMER DRY
2100 IF WP=3 THEN SS=9:GOTO 2150 'FALL WET
2110 SS=10:GOTO 2150 'FALL WET
2150 RETURN
2250 IF SS=1 THEN 2260 ELSE 2290
2260 IF W=9 THEN 2550 'NOT ACCEPTABLE
2270 IF W=3 OR W=6 THEN 2550 'NOT ACCEPTABLE
2280 GOTO 2580
2290 IF SS=2 THEN 2300 ELSE 2330
2300 IF W=1 OR W=2 THEN 2280 'ACCEPTABLE
2310 IF W=3 OR W=6 THEN 2290 'ACCEPTABLE
2320 GOTO 2550 'NOT ACCEPTABLE
2330 IF SS=3 THEN 2350 ELSE 2380
2350 IF W=9 THEN 2550 'NOT ACCEPTABLE
2360 GOTO 2280 'ACCEPTABLE
2380 IF SS=4 THEN GOTO 2260
2390 IF SS=5 THEN 2400 ELSE 2430
2400 IF SP=9 THEN 2550 'NOT ACCEPTABLE
2410 GOTO 2280 'ACCEPTABLE
2430 IF SS=6 THEN 2440 ELSE 2480
2440 IF SP=3 OR SP=6 THEN 2280 'ACCEPTABLE
2450 GOTO 2550 'NOT ACCEPTABLE
2480 IF SS=7 OR SS=8 THEN 2490 ELSE 2510
2490 IF SUM=9 THEN 2550 'NOT ACCEPTABLE
2500 GOTO 2280 'ACCEPTABLE

```



```

2510 IF FALL=9 THEN 2550      'NOT ACCEPTABLE
2520 GOTO 2290                'ACCEPTABLE
2550 LN=9:GOTO 2580
2580 RETURN
2620 IF PPR=9 THEN PRINT 'FIELD IS REJECTED; PHOSPHORUS TEST IS TOO HIGH':
      GOTO 2680 'RETURN
2625 IF BSC=8 THEN 2630 ELSE 2680
2630 IF PPR=0 THEN PRINT 'PH AND PHOSPHORUS ARE UNKNOWN':GOTO 2670      'UNKNOWN
2640 IF PPR=1 THEN PRINT 'PH)=6 AND P<30 (ACCEPTABLE)':GOTO 2670      'RETURN
2650 IF PPR=3 THEN PRINT 'PH<6 AND P<30      PH IS TOO LOW, FIELD REQUIRES LIMING':
      GOSUB 2560:GOTO 2670      'RETURN
2660 IF PPR=4 THEN PRINT 'PH<6 AND P=30-60      PH IS TOO LOW, FIELD REQUIRES LIMING':
      GOTO 2670
2670 IF MT=1 THEN PRINT:PRINT 'THERE IS A METAL PROBLEM IN THE GRID NO.':
      CVI(GRID$)
2680 RETURN
2710 HOME:INVERSE:PRINT'ADDITIONAL INFORMATION':NORMAL
2720 PRINT STF$:PRINT:PRINT'PRESS (ESC) TO EXIT ':PRINT
2730 PRINT'A. DETAILED INFO ABOUT CLASS,FLAG,ETC.':PRINT
2740 PRINT'B. TASK1 AND/OR TASK2':PRINT
2750 PRINT'C. FIELD APPROVAL TEST':PRINT
2760 PRINT'D. RESTRICTED AREAS':PRINT
2780 PRINT'E. METALS':PRINT
2800 PRINT' WHICH OPTION ':
2810 GET A$:IF A$=CHR$(27) THEN RUN'START.#01'
2820 A=ASC(A$)-64:IF A<1 OR A>5 THEN 2800
2830 PRINT A$:HOME:VTAB 12:HTAB 30:PRINT'STAND BY >>>>>'
2840 ON A GOTO 4100,2860,2900,2910,2930
2860 RUN'ENGL'
2900 RUN'ATEST'
2910 RUN'RA'
2920 PRINT 'NOT READY'
2930 RUN'METALS'
2945 -2950
2946 REM
2947 REM
2948 REM
2950 REM      SLUGGED FIELD SUBROUTINE
2960 ISD=INT(DAY):OSD=INT(.01*ISD):MSD=INT(ISD-100*OSD):YSD=(DAY-ISD)*100
2970 SDF=YSD-5:SLD=CVI(SLD$):MSLD=INT(.01*SLD):YSLD=SLD-(100*MSLD)
3000 IF YSLD=>SDF THEN 3010 ELSE 3050 'NO PROBLEM
3010 IF YSLD=SDF THEN 3020 ELSE 3030 'NOT ACCEPTABLE
3020 IF MSD=>MSLD THEN 3050 ELSE 3030 'NOT ACCEPTABLE
3030 IF WFT<>9 THEN 3040
3035 STT=1 :GOTO 3050
3040 PRINT'      NOT ACCEPTABLE IT HAS BEEN SLUGGED IN: ',CVI(SLD$)*.01:LN=9:GOTO 3050
3050 RETURN
4000 IF CVI(SLD$)=0 THEN 4010 ELSE      GOSUB 2950:IF LN=9 THEN 4020
4010      GOSUB 1600:GOSUB 2250:GOSUB 1935:GOSUB 2600
4020      PRINT STF$
4025 IF GB=2 THEN 4060
4030      IF VPOS(0)<24 THEN 4060

```



```

4040 PRINT:PRINT RET$::INPUT " ",R$:PRINT
4050 HOME:PRINT ST$:PRINT TITLE$:PRINT STM$:STN$:PRINT
4060 W=0:RETURN
4100 HOME:INVERSE:PRINT"DETAILED INFO ABOUT CLASS,FLAG,ETC.":NORMAL
4110 PRINT STF$:PRINT
4120 INPUT"ENTER FIELDNUMBER: ",FLR$
4130 FLR=VAL(FLR$)
4135 PRINT:PRINT"DO YOU WANT A PRINT-OUT OF THIS DATA ? ";:GOSUB 1650
4136 IF Z$="N" THEN 4140
4138 PRINT:PRINT"ADJUST PRINTER AND ";RET$::INPUT " ",R$
4139 POKE 3, 150:GB=2
4140 GET#1,FLR
4150 HOME:PRINT ST$:PRINT TITLE$:PRINT STM$: STN$:PRINT
4170 PRINT FLR::SET#2,FLR
4180 GOSUB 4000
4190 PRINT:PRINT"SEASONAL CLASS: ";W;"="::GOSUB 5000:PRINT
4200 PRINT"FLAG: ";FLAG;"="::GOSUB 1700:PRINT
4210 BSC=8:GOSUB 2600:PRINT
4215 BSC=0
4220 IF MT=0 THEN PRINT"NO METAL PROBLEM"
4225 PRINT:PRINT STF$
4230 IF GB=2 THEN POKE 3,149:GB=0
4240 PRINT:PRINT RET$::INPUT " ",R$
4250 GOTO 2700
5010 IF W=0 THEN PRINT"SPECIAL CONDITIONS":GOTO 5110
5020 IF W=1 THEN PRINT"NO RESTRICTIONS,INCLUDES FROZEN":GOTO 5110
5030 IF W=2 THEN PRINT"SETBACK,INCLUDES FROZEN":GOTO 5110
5040 IF W=3 THEN PRINT"NO RESTRICTIONS,EXCLUDES FROZEN":GOTO 5110
5050 IF W=4 THEN PRINT"NO RESTRICTIONS,EXCLUDES FROZEN,SOIL LOADING":GOTO 5110
5060 IF W=5 THEN PRINT"FROZEN OK BUT SOIL LOADING":GOTO 5110
5070 IF W=6 THEN PRINT"SETBACK,EXCLUDES FROZEN":GOTO 5110
5080 IF W=7 THEN PRINT"SETBACK,FROZEN (ELSE SOIL LOADING)":GOTO 5110
5090 IF W=8 THEN PRINT"SETBACK,EXCLUDES FROZEN,SOIL LOADING":GOTO 5110
5100 IF W=9 THEN PRINT"REJECT"
5110 RETURN
6010 HOME:PRINT ST$:PRINT SPC(30)"SHORT TERM FIELD SELECTION":PRINT ST$:PRINT
6020 INPUT "ENTER DATE (AS IN DDMM.YY):",DAY$:DAY=VAL(DAY$)
6030 IF (DAY<100)OR(DAY>3112) THEN PRINT "ILLEGAL DATE":GOTO 6020
6145 GOTO 6400
6150 HOME:PRINT ST$:PRINT SPC(30)"IDENTIFY SEASON":PRINT ST$:PRINT
6160 PRINT SPC(27)"1. WINTER":PRINT
6170 PRINT SPC(27)"2. SPRING":PRINT
6180 PRINT SPC(27)"3. SUMMER":PRINT
6190 PRINT SPC(27)"4. FALL":PRINT
6200 PRINT SPC(30)"WHICH OPTION":INPUT SI
6210 IF (SI<4)OR(SI<1) THEN 6150
6250 HOME:PRINT ST$:PRINT SPC(23)"IDENTIFY WEATHER CONDITION -- PRECIPITATION --
":PRINT ST$:PRINT
6260 PRINT SPC(27)"1. DRY":PRINT
6270 PRINT SPC(27)"2. NORMAL":PRINT
6280 PRINT SPC(27)"3. WET":PRINT

```



```

6290 PRINT SPC(30)"WHICH OPTION";:INPUT WP
6300 IF (WP>3)OR(WP<1) THEN GOTO 6250
6310 HOME:PRINT ST$:PRINT SPC(23)"IDENTIFY WEATHER CONDITIONS -- TEMPERATURE ---"
      :PRINT ST$:PRINT
6320 PRINT SPC(27)"1. WARM":PRINT
6330 PRINT SPC(27)"2. NORMAL":PRINT
6340 PRINT SPC(27)"3. COLD":PRINT
6350 PRINT SPC(30)"WHICH OPTION";:INPUT WT
6360 IF (WT>3)OR(WT<1) THEN 6310
6370 GOTO 6470
6400 HOME:PRINT ST$:PRINT SPC(30)"SELECTION METHOD":PRINT ST$:PRINT
6405 PRINT"PRESS";:INVERSE:PRINT"<ESC>";:NORMAL:PRINT"TO EXIT"
6410 PRINT SPC(27)"1. FARMER":PRINT
6420 PRINT SPC(27)"2. FIELD":PRINT
6430 PRINT SPC(27)"3. LOCATION":PRINT
6440 PRINT SPC(27)"4. ALL WINTER FIELDS":PRINT
6450 PRINT SPC(30)"WHICH OPTION";:GET SM$
6455 IF SM$=CHR$(27)THEN 10450
6460 SM=VAL(SM$)
6465 IF SM<4 THEN 6150
6470 GOSUB 1950:GOSUB 1500:GOSUB 1510:GOSUB 1600
6500 IF SM=2 THEN 6600 'FIELD
6510 IF SM=1 THEN 8000'FARMER
6520 IF SM=3 THEN 9000 'LOCATION
6530 GOTO 10000 'ANY FIELDS
6640 HOME:INPUT "FIELDNO: ",FLR
6680 GET#2,FLR
6750 HOME:PRINT ST$:PRINT TITLE$:PRINT STM$:STN$:PRINT
6760 PRINT FLR;
6765 GET#1,FLR
6770 GOSUB 4000
6800 PRINT:PRINT RET$;:INPUT " ",R$:PRINT:HOME
6820 GOSUB 2700
8030 HOME:INPUT"OPERATOR NUMBER:",OPNR
8040 IF OPNR>150 THEN PRINT"WRONG NUMBER":GOTO 8030
8060 V=1:T=0
8070 HOME:VTAB 12:PRINT"PLEASE WAIT FOR DATA SORTING (APPROX. 2 MIN)"
9080 GET#2,V
8090 IF EOF(2) THEN 8150
8100 OP=CUI(OP$):APP=CUI(APP$)
8105 VTAB 12:PRINT"PLEASE WAIT FOR DATA SORTING (APPROX. 2 MIN.)"
8110 IF OP=OPNR THEN 8120 ELSE 8130 'NEXT
8120 T=T+1
8130 U=V+1:GOTO 8080
8150 AA=T-1
8170 DIM B(AA)
8200 V=1:I=1
8205 FOR I=1 TO AA
8210 GET#2,V:IF EOF(2) THEN STOP
8212 OP=CUI(OP$)
8215 UN=0
8220 IF OP=OPNR THEN 8250 ELSE 8280 'NEXT V

```



```

8250 B(I)=V
8270 LN=1
8280 V=V+1:IF LN=1 THEN 8290 ELSE 8210
8290 NEXT
8320 HOME:PRINT ST$:PRINT TITLE$:PRINT STM$:STN$:PRINT
8350 FOR I=1 TO AA
8400 GET#1,B(I):PRINT B(I);
8405 GET#2,B(I)
8410 GOSUB 4000
8460 NEXT
8470 IF GB=2 THEN 8520
8480 PRINT:PRINT"DO YOU WANT A PRINT-OUT OF THESE FIELDS ? ";GOSUB 1650
8490 IF Z$="N" THEN 8550
8495 PRINT:PRINT"ADJUST THE PRINTER AND ";RET$;:INPUT " ",R$
8500 POKE 3,150:GB=2
8510 GOTO 8200
8520 POKE 3,149:GB=0
8550 GOTO 2700
9030 HOME:INPUT"COORDINATE NORTH";CN
9040 PRINT:INPUT"COORDINATE EAST";CE
9050 PRINT:INPUT"RADIUS OF THE AREA TO BE SEARCHED (MAX. 5 KM)";RA
9060 PRINT:PRINT"THE RADIUS IS >5 KM ;THIS MEANS THAT YOU ARE SEARCHING IN A LARGE AREA !";
9070 PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 1650:IF Z$="N" THEN 9000
9100 RCN1=CN+RA:RCN2=CN-RA:RCE1=CE+RA:RCE2=CE-RA
9110 HOME:VTAB 12:PRINT"PLEASE WAIT FOR DATA SORTING (APPROX. 2 MIN.)"
9150 V=1:T=0
9160 GET#2,V:IF EOF(2) THEN 9280
9180 NE=CVI(NE$):KMN=INT(.01*NE):KME=NE-100*KMN
9190 IF (KMN<RCN2)*(KMN<RCN1) THEN 9200 ELSE 9250' OUT
9200 IF (KME>RCE2)*(KME>RCE1) THEN 9240 ELSE 9250' OUT
9240 T=T+1
9250 V=V+1:GOTO 9160
9280 AA=T-1
9290 IF AA<1 THEN PRINT"NO FIELDS IN THAT AREA":PRINT:PRINT:FOR I=1 TO 300:
NEXT:GOTO 9000
9300 DIM C(AA)
9320 V=1:I=1
9340 FOR I=1 TO AA
9360 GET#2,V:IF EOF(2) THEN 9500
9365 NE=CVI(NE$):KMN=INT(.01*NE):KME=NE-100*KMN
9370 LN=0
9380 IF (KMN<RCN2)*(KMN<RCN1) THEN 9390 ELSE 9420' OUT
9390 IF (KME>RCE2)*(KME>RCE1) THEN 9400 ELSE 9420' OUT
9400 C(I)=V
9410 LN=1
9420 V=V+1:IF LN=1 THEN 9450 ELSE 9360
9450 NEXT
9560 HOME:PRINT ST$:PRINT TITLE$:PRINT STM$:STN$:PRINT
9570 FOR I=1 TO AA
9600 GET#2,C(I)
9610 GET#1,C(I):PRINT C(I);
9620 GOSUB 4000

```



```

9700 NEXT
9710 IF GB=2 THEN 9770
9720 PRINT:PRINT"DO YOU WANT A PRINT-OUT OF THESE FIELDS ? ";GOSUB 1650
9730 IF Z$="N" THEN 9780
9740 PRINT:PRINT"ADJUST PRINTER AND ";RET$;:INPUT " ",R$
9750 POKE 3,150:GB=2
9760 GOTO 9320
9770 POKE 3,149:GB=0
9780 GOTO 2700
10010 HOME:PRINT ST$:HTAB 30:PRINT"ANY FIELDS":PRINT ST$:PRINT
10020 PRINT"THIS PROGRAM FINDS ALL FIELDS FOR WINTER SPREADING"
10030 FOR I=1 TO 2000:NEXT
10040 HOME
10050 PRINT STRING$(80,45):PRINT"FIELDS FOR WINTER SPREADING":PRINT STRING$(80,45)
10060 PRINT:PRINT" FLD SF HA FLD SF HA"
10070 PRINT
10080 V=1:WFT=9
10090 GET#1,V
10100 Y=CVI(XY2$):WIN=INT(.001*Y)
10110 IF EOF(1) THEN 10300
10120 IF WIN=9 THEN 10280
10125 IF Y=0 THEN 10280
10130 STT=0
10140 GET#2,V:HA=CVI(HA$)*.1
10150 APP=CVI(APP$)
10155 GOSUB 2950
10160 IF XX=1 THEN 10200
10170 PRINT USING"#### # ##.# ";V,WIN,HA;:IF APP=4 THEN PRINT"A";
10180 IF STT=1 THEN PRINT"S";
10190 XX=1:GOTO 10225
10200 PRINT TAB(35)" ";:PRINT USING"#### # ##.# ";V,WIN,HA;:IF APP=4 THEN PRINT"A";
10210 IF STT=1 THEN PRINT"S" ELSE PRINT
10220 XX=0
10225 IF WKRP=4 THEN 10280
10230 IF VPOS(0)<20 THEN 10280
10240 PRINT STF$:PRINT"A=APPROVED S=SLUDGED":PRINT
10250 PRINT RET$;:INPUT " ",R$
10260 HOME:PRINT" FLD SF HA FLD SF HA"
10270 PRINT STF$
10280 V=V+1:GOTO 10090
10300 IF WKRP=4 THEN 10400
10305 PRINT STF$:PRINT RET$;:INPUT " ",R$
10310 HOME:PRINT"DO YOU WANT A PRINT-OUT OF THIS DATA ";:GOSUB 1650
10320 IF Z$="N" THEN GOTO 10450
10350 POKE 3,150:WKRP=4:GOTO 10050
10400 PRINT STF$:PRINT"A=FLD HAS BEEN APPROVED"
10410 PRINT"S=FLD HAS BEEN SLUDGED IN LAST 5 YEARS"
10420 POKE 3,149:PRINT:PRINT RET$;:INPUT " ",R$
10450 CLEAR:HOME:VTAB 12
10460 PRINT SPC(33)"STAND BY >>>>";:RUN"START.#01"

```



```

100   ON ERROR GOTO 120
110   GOTO 400
120   BEEP 50,50:BEEP 50,50
130   PRINT:PRINT"OPERATOR ERROR . . ."
140   FOR T=1 TO 1000:NEXT:GOTO 2900
300   BEEP 50,10
310   PRINT "Y/N";
320   GET Z$:PRINT:RETURN
400   ST$=STRING$(80,42)
410   NN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH 10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH"
420   RET$=" PRESS RETURN TO CONTINUE"
430   B=1
440   TITLE$="GRID#  AS  CD  CO  CR  CU  HG  MO  NI  PB  SE  ZN"
445   OPEN"R",#2,"B:SSUIT",8:FIELD#2,2 AS XYZ$,2 AS PPR$,2 AS FLAG$,2 AS MT$
450   OPEN "R",#1,"B:METAL",12:FIELD#1,2 AS ASCD$, 2 AS COCR$, 2 AS CUHG$,2 AS
      ZNMO$,2 AS NIPB$,2 AS SE$
455   OPEN"R",#3,"B:FDATA1",22:FIELD#3,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS
      ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS OP$,2 AS
460   GOTO 1000
600   ASCD=CVI(ASCD$):COCR=CVI(COCR$):CUHG=CVI(CUHG$)
610   ZNMO=CVI(ZNMO$):NIPB=CVI(NIPB$):SE=CVI(SE$)
620   AS=INT(.01*ASCD)*.1:CO=(ASCD-1000*AS)*.1
630   CR=INT(.01*COCR):CO=COCR-100*CR
640   CU=INT(.01*CUHG):HG=(CUHG-100*CU)*.01
650   ZN=INT(.1*ZNMO):MO=ZNMO-10*ZN
660   NI=INT(.01*NIPB):PB=NIPB-100*NI
670   SE=SE*.1
680   RETURN
1000  HOME:PRINT ST$:PRINT
1010  PRINT SPC(30)"GRID METALS":PRINT
1020  PRINT ST$:PRINT
1030  PRINT SPC(27)"1. ENTER DATA":PRINT
1040  PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1050  PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1060  PRINT SPC(27)"4. INITIALIZE FILE":PRINT
1070  PRINT SPC(27)"5. EXIT THE PROGRAM":PRINT
1080  PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1090  FOR I=1 TO 5000
1100  A$=INKEY$:IF LEN(A$)=0 THEN 1120 ELSE OPT=ASC(A$)-48
1110  IF(OPT>0)*(OPT<6) THEN 1130
1120  NEXT:GOTO 2900
1130  HOME:ON OPT GOTO 1500,2000,2000,3000,2900
1500  HOME: REM      ENTER DATA
1510  PRINT:INPUT "GRID NUMBER:",GNO
1520  IF GNO<1000 OR GNO>4500 THEN PRINT "WRONG NUMBER":GOTO 1510
1530  PRINT:INPUT "AS, ARSENIC:",AS
1540  IF AS>32 THEN PRINT "WRONG NUMBER":GOTO 1530
1550  PRINT:INPUT "CD, CADMIUM:",CD
1560  IF CD>10 THEN PRINT "WRONG NUMBER":GOTO 1550
1570  PRINT:INPUT "CO, COBALT:",CO
1580  IF CO>99 THEN PRINT "WRONG NUMBER":GOTO 1570
1590  PRINT:INPUT "CR, CHROMIUM:",CR

```



```
1600 IF CR>500 THEN PRINT "WRONG NUMBER":GOTO 1590
1610 PRINT: INPUT "CU, COPPER:",CU
1620 IF CU>500 THEN PRINT "WRONG NUMBER":GOTO 1610
1630 PRINT:INPUT "HG, MERCURY:",HG
1640 IF HG>1 THEN PRINT "WRONG NUMBER":GOTO 1630
1650 PRINT:INPUT "MO, MOLYBDENUM:",MO
1660 IF MO>10 THEN PRINT "WRONG NUMBER":GOTO 1650
1670 PRINT:INPUT "NI, NICKEL:",NI
1680 IF NI>99 THEN PRINT "WRONG NUMBER":GOTO 1670
1690 PRINT:INPUT "PB, LEAD:",PB
1700 IF PB>99 THEN PRINT "WRONG NUMBER":GOTO 1690
1710 PRINT:INPUT "SE, SELENIUM:", SE
1720 IF SE>10 THEN PRINT "WRONG NUMBER":GOTO 1710
1730 PRINT:INPUT "ZN, ZINC:",ZN
1740 IF ZN>999 THEN PRINT "WRONG NUMBER":GOTO 1730
1750 ASCD=1000*AS+10*CD
1760 COCR=CO+CR*100
1770 CUHG=100*CU+100*HG
1780 ZNMO=10*ZN+MO
1790 NIPB=100*NI+PB:SE=10*SE
1800 LSET ASCD$=MKI$(ASCD)
1810 LSET COCR$=MKI$(COCR)
1820 LSET CUHG$=MKI$(CUHG)
1830 LSET ZNMO$=MKI$(ZNMO)
1840 LSET NIPB$=MKI$(NIPB):LSET SE$=MKI$(SE)
1850 PUT #1,GNO
1880 PRINT:PRINT "MORE DATA TO ENTER?";:GOSUB 300
1890 IF Z$="N" THEN GOTO 1000 'MENU
1900 HOME:GOTO 1500 'DATA ENTRY
2000 HOME: REM DATA OUTPUT
2010 PRINT:PRINT "DO YOU WANT CONSECUTIVE OR RANDOM RECORDS - C/R ";
2020 GET A$:IF A$="C" THEN 2030 ELSE IF A$="R" THEN 2100 ELSE 2020
2030 PRINT A$:INPUT "START RECORD NUMBER ",REC1:INPUT "END RECORD NUMBER ",REC2
2040 IF (REC1>0)*(REC2>REC1) THEN 2060
2050 PRINT "TRY AGAIN":GOTO 2000
2060 IF REC1<111 THEN PRINT"REC# HAS TO BE GREATER THAN 111":GOTO 2030
2070 RECL=REC2-REC1+1:DIM X(RECL)
2080 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 2180
2100 PRINT:PRINT:INPUT "HOW MANY RECORDS (20 IS MAXIMUM)":RECL
2110 IF (RECL>0)*(RECL<21) THEN 2120 ELSE 2100
2120 DIM X(RECL)
2130 FOR I=1 TO RECL
2140 PRINT MID$(GNN$,4*I-3,4);:INPUT " ",X(I)
2150 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 2165
2160 PRINT X(I);" IS REJECTED":GOTO 2140
2165 IF X(I)<111 THEN PRINT"REC# HAS TO BE GREATER THAN 111":GOTO 2140
2170 NEXT
2180 IF OPT=2 THEN HOME:GOTO 2200
2190 PRINT CHR$(7):PRINT "ADJUST THE PRINTER AND";RET$:INPUT " ",R$:POKE 3,150
2200 PRINT ST$:PRINT TITLE1$:PRINT ST$
2210 FOR I=1 TO RECL
```



```

2230 PRINT USING "####";10*X(I)+B;
2240 GET#1,10*X(I)+B
2250 IF CVI(ASCD$)>0 THEN GOTO 2270
2260 PRINT " NO DATA":GOTO 2900
2270 GOSUB 600
2300 IF AS>14 THEN INVERSE:PRINT USING "   ##.#";AS;:NORMAL:GOTO 2330
2310 PRINT USING "   ##.#";AS;
2330 IF CD>1.6 THEN INVERSE:PRINT USING "  ##.#";CD;:NORMAL:GOTO 2360
2340 PRINT USING "  ##.#";CD;
2360 IF CO>20 THEN INVERSE:PRINT USING " ###";CO;:NORMAL:GOTO 2390
2370 PRINT USING " ###";CO;
2390 IF CR>120 THEN INVERSE:PRINT USING " ####";CR;:NORMAL:GOTO 2420
2400 PRINT USING " ####";CR;
2420 IF CU>100 THEN INVERSE:PRINT USING " ####";CU;:NORMAL:GOTO 2450
2430 PRINT USING " ####";CU;
2450 IF HG>.5 THEN INVERSE:PRINT USING " *.##";HG;:NORMAL:GOTO 2480
2460 PRINT USING " *.##";HG;
2480 IF MO>4 THEN INVERSE:PRINT USING " *#";MO;:NORMAL:GOTO 2510
2490 PRINT USING " *#";MO;
2510 IF NI>32 THEN INVERSE:PRINT USING " ###";NI;:NORMAL:GOTO 2540
2520 PRINT USING " ###";NI;
2540 IF PB>60 THEN INVERSE:PRINT USING " ###";PB;:NORMAL:GOTO 2570
2550 PRINT USING " ###";PB;
2570 IF SE>1.6 THEN INVERSE:PRINT USING "  ##.#";SE;:NORMAL:GOTO 2600
2580 PRINT USING "  ##.#";SE;
2600 IF ZN>220 THEN INVERSE:PRINT USING " ####";ZN;:NORMAL:GOTO 2800
2610 PRINT USING " ####";ZN
2900 IF OPT=3 THEN 2840
2910 IF VPOS(0)<20 THEN 2840
2915 HTAB 40:INVERSE:PRINT " * ";:NORMAL:PRINT"-ABOVE RECOMMENDATION"
2920 PRINT "DO YOU WANT TO CONTINUE? ";:GOSUB 300:IF Z$="N" THEN 2890
2930 HOME:PRINT ST$:PRINT TITLE1$:PRINT ST$
2940 IF B=4 THEN 2945 ELSE B=B+1:GOTO 2230
2945 B=1
2950 NEXT
2960 IF OPT=2 THEN PRINT:PRINT RET$;:INPUT " ",R$;PRINT:GOTO 2890
2970 PRINT:PRINT ST$:FOR P=1 TO 10:PRINT:NEXT
2980 POKE 3, 149:FOR B=1 TO 5:BEEP 10*B,10:NEXT
2990 ERASE X:GOTO 1000
2900 CLEAR:HOME:VTAB 12
2910 PRINT SPC(33)"STAND BY >>>>":RUN"START.#0"
3002 HOME:PRINT:PRINT"ARE YOU SURE - THIS ONLY HAS TO BE DONE WHEN NEW ENTRIES HAVE BEEN MADE ";:
      GOSUB 300
3004 IF Z$="N" THEN 1000
3010 V=1
3020 GET#3,V:GRID=CVI(GRID$)
3030 IF EOF(3) THEN 1000
3040 GET#1,10*GRID+B
3045 GET #2,V
3050 IF CVI(ASCD$)>0 THEN 3070
3060 GOTO 3300
3070 GOSUB 600

```



```

3180 IF AS>14 THEN 3350
3200 IF CD>1.5 THEN 3350
3210 IF CO>20 THEN 3350
3220 IF CR>120 THEN 3350
3240 IF CU>100 THEN 3350
3250 IF HG>.5 THEN 3350
3255 IF MO>5 THEN 3350
3260 IF NI>32 THEN 3350
3270 IF P9>60 THEN 3350
3280 IF SE>1.6 THEN 3350
3290 IF ZN>220 THEN 3350
3300 IF B=4 THEN 3310 ELSE B=B+1:GOTO 3040
3310 B=1
3320 V=V+1:GOTO 3020
3350 MT=1:LSET MT$=MKI$(MT)
3360 PUT#2,V
3370 GOTO 3310
100 ON ERROR GOTO 120
110 GOTO 550
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR . . ."
140 FOR U =1 TO 1000:NEXT:GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";
320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 PRINT CHR$(7):PRINT "ADJUST PRINTER AND ";RET$:INPUT " ",R$:POKE 3,150
405 PRINT ST$:PRINT
410 PRINT SPC(30)"OPERATOR/OWNER-LIST":PRINT
420 PRINT ST$:PRINT:PRINT
430 PRINT HELP$:PRINT
440 PRINT:RETURN
550 OPEN "R",#1,"9:OP/OWN",71:FIELD #1,20 AS NAM$,20 AS ADD$,13 AS CIT$,7 AS COD$,11 AS TEL$
600 RET$="PRESS RETURN TO CONTINUE"
610 ST$=STRING$(80,42)
620 HELP$=" NO. NAME ADDRESS CITY P. CODE PHONE #"
700 HOME:PRINT ST$:PRINT
710 PRINT SPC(30)"OPERATOR/OWNER-LIST":PRINT
720 PRINT ST$:PRINT
730 PRINT SPC(27)"1. ENTER DATA":PRINT
740 PRINT SPC(27)"2. PRINT ALPHABETIZED LIST":PRINT
750 PRINT SPC(27)"3. PRINT SORTED NUMERIC LIST":PRINT
753 PRINT SPC(27)"4. DISPLAY ALPHABETIZED LIST":PRINT
756 PRINT SPC(27)"5. DISPLAY SORTED NUMERIC LIST":PRINT
760 PRINT SPC(27)"6. EXIT THE PROGRAM":PRINT
770 PRINT CHR$(7):PRINT SPC(30) "WHICH OPTION";
780 FOR I =1 TO 5000
790 A$=INKEY$:IF LEN(A$) =0 THEN 810 ELSE OPT=ASC(A$)-48
800 IF (OPT<0)*(OPT<7) THEN 820
810 NEXT: GOTO 4000
820 HOME:ON OPT GOTO 1000,2000,3000,2000,3000,4000

```



```

1010 INPUT"OPERATOR/OWNER NUMBER" IN
1020 PRINT:INPUT"ENTER LAST NAME FIRST THEN INITIALS- NO PERIODS OR COMMAS";X$
1030 V=1
1040 GET #1,V:IF EOF(1) THEN GOTO 1110
1050 L#=#LEN(X$)
1060 IF LEFT$(X$,L#)=LEFT$(NAM$,L#) THEN GOTO 1080
1070 V=V+1: GOTO 1040
1080 PRINT:PRINT"THIS NAME HAS BEEN ENTERED BEFORE UNDER NO.";V
1085 L#=#LEN(X$)
1090 PRINT:PRINT"DO YOU WANT TO FILE  ";X$;"  UNDER NO. "N;"  ANYWAY ?":GOSUB 300
1100 IF Z$="N" THEN GOTO 1000
1110 PRINT:INPUT"ADDRESS";Y$
1120 INPUT"CITY";W$
1130 INPUT"P. CODE";P$
1140 INPUT "PHONE #";Q$
1200 LSET NAM$=X$:LSET ADD$=Y$:LSET CIT$=W$:LSET COD$=P$:LSET TEL$=Q$
1210 PUT #1,N
1220 PRINT:PRINT"ANY MORE DATA TO ENTER ?":GOSUB 300
1230 IF Z$="Y" THEN GOTO 1000
1240 HOME: GOTO 700
2000 V=1
2010 GET #1,V:IF EOF(1) THEN GOTO 2030
2020 V=V+1:GOTO 2010
2030 Q#N=V-1
2050 IF Q#NARR<>1 THEN 2200
2100 IF OPT=2 THEN GOSUB 400 ELSE GOSUB 405
2110 GET #1,B(1)
2120 PRINT USING"####";B(1);:PRINT "NAM$;" "ADD$;" "CIT$;" "COD$;" "TEL$
2130 FOR X=2 TO Q#LIST:OLDNAM$=NAM$
2140 GET #1,B(X)
2150 IF LEFT$(OLDNAM$,1)<>LEFT$(NAM$,1) THEN PRINT
2160 PRINT USING"####";B(X);:PRINT "NAM$;" "ADD$;" "CIT$;" "COD$;" "TEL$
2165 IF OPT=2 THEN 2185
2170 IF VPOS(0)<24 THEN 2185
2175 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 700
2180 HOME:PRINT:PRINT HELP$:PRINT
2185 NEXT
2192 IF OPT=4 THEN PRINT RET$;:INPUT " ";R$:GOTO 700
2190 POKE 3,149:FOR M=1 TO 5:BEEP 10*M,10:NEXT:GOTO 700
2200 DIM A$(Q#N),B(Q#N):VTAB 5:HTAB 26
2210 PRINT"PLEASE WAIT FOR DATA SORTING";
2220 GET #1,1:A$(1)=NAM$
2230 B(1)=1
2240 FOR NODE=2 TO Q#N
2250 GET #1,NODE:A$(NODE)=NAM$
2260 B(NODE)=NODE
2270 SON=NODE:FATHER=SON\2
2280 WHILE FATHER>0
2290 IF A$(B(FATHER))<A$(B(SON)) THEN SWAP B(FATHER),B(SON):
SON=FATHER:FATHER=SON\2 ELSE FATHER=0
2300 WEND
2310 NEXT
2320 LAST=Q#N

```



```

2330 FOR I=1 TO LAST-1
2340 SWAP B(1),B(LAST)
2350 LAST=LAST-1
2360 FATHER=1 :SON=2
2370 WHILE SON<LAST
2380 IF A$(B(SON))>A$(B(SON+1)) THEN S=SON
                ELSE S=SON+1
2390 IF A$(B(S))>A$(B(FATHER)) THEN SWAP B(S),B(FATHER)
2400 FATHER=S:SON=FATHER*2
2410 WEND
2420 IF SON=LAST THEN SWAP B(SON),B(FATHER)
2430 NEXT
2440 POINT1=1
2450 FOR I=2 TO OWN
2460 IF A$(B(POINT1))=A$(B(I)) THEN B(I)=0 ELSE POINT1=1
2470 NEXT
2480 ERASE A$
2490 POINT1=2:POINT2=2
2500 WHILE POINT2<=OWN
2510 IF B(POINT2)=0 THEN POINT2=POINT2+1
                ELSE B(POINT1)=B(POINT2): POINT2=POINT2+1
                POINT1=POINT1+1
2520 WEND
2530 OWNARR=1:OWNLIST=POINT1-1
2540 BEEP 50,20:HOME:GOTO 2100
3000 REM SORTED NUMERIC LIST
3010 IF OPT=3 THEN GOSUB 400 ELSE GOSUB 405
3020 C=1
3100 GET #1,C
3110 IF EOF(1) THEN PRINT"END OF FILE":GOTO 3200
3120 PRINT USING"####";C;:PRINT "NAM$;" "ADD$;" "CIT$;" "COD$;" "TEL$
3130 IF OPT=3 THEN 3170
3140 IF VPOS(0)<24 THEN 3170
3150 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 700
3160 HOME:PRINT:PRINT HELP$:PRINT
3170 C=C+1:GOTO 3100
3180 IF OPT=5 THEN PRINT RET$;:INPUT " ",R$:GOTO 700
3200 POKE 3,149:FOR M=1 TO 5:BEEP 10*M,10:NEXT:GOTO 700
4000 CLEAR:HOME:VTAB 12
4010 PRINT SPC(33)"STAND BY>>>>>":RUN"START.#01"
110 GOTO 400
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000: NEXT: GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";
320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 OPEN"R",#1,"B:RADATA",3:FIELD#1,2 AS KN$,2 AS KE$,2 AS DS,2 AS RTC$
500 ST$=STRING$(80,42)
510 N$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH "

```



```

520 RET$=" PRESS RETURN TO CONTINUE"
530 HELP$=" ##--4--"
540 INC$="INCORRECT NUMBERS-TRY AGAIN"
570 TITLE1$="RESTRICTION COORDINATES RESTRICTION RESTRICTION"
580 TITLE2$=" NO. KN KM DISTANCE CLASS"
1000 HOME:PRINT ST$:PRINT
1010 PRINT SPC(30)"RESTRICTED AREAS":PRINT
1020 PRINT ST$:PRINT
1030 PRINT SPC(27)"1. ENTER DATA":PRINT
1040 PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1050 PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1055 PRINT SPC(27)"4. FIELDS IN RESTRICTED AREAS":PRINT
1060 PRINT SPC(27)"5. EXIT THE PROGRAM":PRINT
1070 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1080 FOR I=1 TO 5000
1090 A$=INKEY$:IF LEN(A$)=0 THEN 1110 ELSE OPT =ASC(A$)-48
1100 IF (OPT>0)*(OPT<6) THEN 1120
1110 NEXT:GOTO 4000
1120 HOME:ON OPT GOTO 2000,3000,3000,5000,4000
2000 HOME:REM ENTER DATA
2010 PRINT:INPUT"RESTRICTION NO. ";RNO$:RNO=VAL(RNO$)
2020 IF RNO>999 THEN PRINT:PRINT"WRONG NUMBER":GOTO 2010
2030 PRINT:PRINT HELP$
2040 INPUT " ",DSF$
2050 IF LEN(DSF$)<>6 THEN PRINT"WRONG LENGTH":GOTO 2010
2060 FOR LL=1 TO 6:LI=ASC(MID$(DSF$,LL,1))
2070 IF LI<48 OR LI>57 THEN 2090
2080 NEXT:GOTO 2100
2090 PRINT"CHARACTER";LL" IS NOT A NUMBER":GOTO 2030
2100 KN=VAL(MID$(DSF$,1,2)):KE=VAL(MID$(DSF$,3,2)):D=VAL(MID$(DSF$,5,1))
2105 RTC=VAL(MID$(DSF$,6,1))
2110 LSET KN$=MKI$(KN):LSET KE$=MKI$(KE):LSET D$=MKI$(D):LSET RTC$=MKI$(RTC)
2120 PUT #1,RNO
2130 PRINT"ANY MORE DATA TO ENTER ?":GOSUB 300
2140 IF Z$="Y" THEN GOTO 2000
2150 HOME:GOTO 1000
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",REC1:INPUT"END RECORD NUMBER ",REC2
3030 IF (REC1>0)*(REC2>REC1) THEN 3050
3040 PRINT"TRY AGAIN ";GOTO 3000
3050 RECL=REC2-REC1+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS (20 IS MAXIMUM)";RECL
3080 IF (RECL>0)*(RECL<21) THEN 3090 ELSE 3070
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(NN$,4*I-3,4):INPUT " ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I):" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170

```



```

3160 PRINT CHR$(7):PRINT " ADJUST THE PRINTER AND ";RET$:INPUT " ",R$:POKE 3,150
3170 PRINT ST$:PRINT TITLE1$:PRINT TITLE2$:PRINT ST$
3180 FOR I =1 TO RECL:PRINT USING " ###          ";X(I):
3190 GET # 1,X(I)
3200 IF CUI(KN$)>0 OR CUI(KE$)>0 THEN GOTO 3300
3210 PRINT"NO DATA":GOTO 3450
3300 PRINT USING" ##      #          #";CUI(KN$),CUI(KE$),CUI(D$),CUI(RTC$)
3450 IF OPT=3 THEN 3490
3460 IF VPOS(0)<20 THEN 3490
3470 PRINT:PRINT"DO YOU WANT TO CONTINUE ";:GOSUB 300:IF Z$="N" THEN 3530
3480 HOME:PRINT ST$:PRINT TITLE1$:PRINT TITLE2$:PRINT ST$
3490 NEXT
3500 IF OPT=2 THEN PRINT:PRINT RET$::INPUT " ",R$:PRINT:GOTO 3530
3510 PRINT:PRINT ST$:FOR P=1 TO 10:PRINT:NEXT
3520 POKE 3,149: FOR B=1 TO 5:BEEP 10*B,10:NEXT
3530 ERASE X:GOTO 1000
4000 CLEAR:HOME:VTAB 12
4010 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
5000 OPEN"R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS
ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS GRID$,2 AS OP$,2 AS OWN$
5010 HOME:PRINT"WHICH FIELD DO YOU WANT TO CHECK : ";:INPUT FLD$:FLD=VAL(FLD$)
5020 GET#2,FLD:NE=CUI(NE$):KN=INT(.01*NE):KME=NE-100*KN
5025 HOME:PRINT"THE RESTRICTION NUMBER(S) ARE: ";
5030 V=1
5040 GET#1,V:KN=CUI(KN$):KE=CUI(KE$):D=CUI(D$)
5050 IF KN=0 THEN 5200
5060 ND1=KN+D:ND2=KN-D
5070 ED1=KE+D:ED2=KE-D
5080 IF (KN<ND1)*(KN<ND2) THEN 5100 ELSE 5150 'OUT
5100 IF (KN<ED1)*(KN<ED2) THEN 5110 ELSE 5150 'OUT
5110 HTAB 35: PRINT V
5150 V=V+1
5160 GOTO 5040
5200 PRINT:PRINT ST$
5210 CLOSE #2
5230 PRINT RET$::INPUT " ",R$:GOTO 1000
100 ON ERROR GOTO 120
110 GOTO 400
120 BEEP 50,50:BEEP 50,50
130 PRINT:PRINT"OPERATOR ERROR..."
140 FOR T=1 TO 1000: NEXT: GOTO 4000
300 BEEP 50,10
310 PRINT"Y/N";
320 GET Z$:IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$:PRINT:RETURN
400 OPEN"R",#2,"B:OPRANK",2:FIELD#2,2 AS R$
410 OPEN"R",#1,"B:OP/OWN",71:FIELD#1,20 AS NAM$,20 AS ADD$,13 AS CIT$,7 AS COD$,
11 AS TEL$
500 ST$=STRING$(90,42)
510 NAM$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH 10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH "
520 RET$=" PRESS RETURN TO CONTINUE"
530 HELP$="###-"

```



```

570 TITLE1$=" OP.#   RANK"
1000 HOME:PRINT ST$:PRINT
1010 PRINT SPC(30)"OPERATOR RANKING":PRINT
1020 PRINT ST$:PRINT
1030 PRINT SPC(27)"1. ENTER DATA":PRINT
1040 PRINT SPC(27)"2. DISPLAY FILE DATA ON SCREEN":PRINT
1050 PRINT SPC(27)"3. PRINT FILE DATA":PRINT
1060 PRINT SPC(27)"4. EXIT THE PROGRAM":PRINT
1070 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION";
1080 FOR I=1 TO 5000
1090 A$=INKEY$:IF LEN(A$)=0 THEN 1110 ELSE OPT =ASC(A$)-48
1100 IF (OPT>0)*(OPT<5) THEN 1120
1110 NEXT:GOTO 4000
1120 HOME:ON OPT GOTO 2000,3000,3000,4000
2000 HOME:REM ENTER DATA
2010 PRINT:PRINT:INPUT"OPERATOR NUMBER:",QNO
2020 IF QNO>150 THEN PRINT "WRONG NUMBER":GOTO 2000
2030 GET#1,QNO
2040 PRINT:PRINT "NO.": QNO;"BELONGS TO: "NAM$
2050 PRINT:PRINT"DO YOU WANT TO CONTINUE ?";:GOSUB 300
2060 IF Z$="N" THEN GOTO 1000
2070 HOME:PRINT:PRINT NAM$::INPUT"GETS RANKING NUMBER: ",RNO
2080 IF RNO>9 THEN PRINT"WRONG NUMBER":GOTO 2070
2090 LSET R$=MKI$(RNO)
2100 PUT #2,QNO
2110 PRINT:PRINT"MORE DATA TO ENTER ?";:GOSUB 300
2120 IF Z$="N" THEN GOTO 1000
2130 GOTO 2000
2140 IF Z$="Y" THEN GOTO 2000
2150 HOME:GOTO 1000
3000 PRINT:PRINT"DO YOU WANT CONSECUTIVE OR RANDOM RECORDS -C/R ";
3010 GET A$:IF A$="C" THEN 3020 ELSE IF A$="R" THEN 3070 ELSE 3010
3020 PRINT A$:INPUT"START RECORD NUMBER ",REC1:INPUT"END RECORD NUMBER ",REC2
3030 IF (REC1>0)*(REC2>REC1) THEN 3050
3040 PRINT"TRY AGAIN ";:GOTO 3000
3050 RECL=REC2-REC1+1:DIM X(RECL)
3060 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 3150
3070 PRINT:PRINT:INPUT"HOW MANY RECORDS (20 IS MAXIMUM)":RECL
3080 IF (RECL>0)*(RECL<21) THEN 3090 ELSE 3070
3090 DIM X(RECL)
3100 FOR I=1 TO RECL
3110 PRINT MID$(NN$,4*I-3,4)::INPUT" ",X(I)
3120 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 3140
3130 PRINT X(I);" IS REJECTED":GOTO 3110
3140 NEXT
3150 IF OPT=2 THEN HOME:GOTO 3170
3160 PRINT CHR$(7):PRINT" ADJUST THE PRINTER AND ";RET$:INPUT" ",R$:POKE 3,150
3170 PRINT ST$:PRINT TITLE1$:PRINT ST$
3180 FOR I =1 TO RECL:PRINT USING"###";X(I);
3190 GET # 2,X(I)
3200 IF CVI(R$)>0 THEN GOTO 3300
3210 PRINT" NO DATA":GOTO 3450

```



```

3300 PRINT USING "      #":CVI(R%)
3450 IF OPT=3 THEN 3490
3460 IF VPOS(0)<20 THEN 3490
3470 PRINT:PRINT"DO YOU WANT TO CONTINUE ";;GOSUB 300:IF Z%="N" THEN 3530
3480 HOME:PRINT ST%:PRINT TITLE%:PRINT ST%
3490 NEXT
3500 IF OPT=2 THEN PRINT:PRINT RET%;;INPUT " ",R%:PRINT:GOTO 3530
3510 PRINT:PRINT ST%:FOR P=1 TO 10:PRINT:NEXT
3520 POKE 3,149: FOR B=1 TO 5:BEEP 10*B,10:NEXT
3530 ERASE X:GOTO 1000
4000 CLEAR:HOME:VTAB 12
4010 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
100 REM *** STATUS REPORT PROGRAM**
110 ON ERROR GOTO 130
120 GOTO 160
130 BEEP 50,50:BEEP 50,50
140 PRINT:PRINT"OPERATOR ERROR..."
150 FOR T=1 TO 1000:NEXT:GOTO 2320
160 OPEN"R",#2,"B:FDATA1",22:FIELD#2,2 AS TL%,2 AS CF%,2 AS NE%,2 AS HA%,2 AS
    ACC%,2 AS LEASE%,2 AS APP%,2 AS SLD%,2 AS GRID%,2 AS OP%,2 AS OWN%
170 OPEN"R",#1,"B:SSUIT",8:FIELD#1,2 AS XYZ%,2 AS PPR%,2 AS FLAG%,2 AS MT%
200 ST%=STRING$(80,42)
550 HOME:PRINT:PRINT CHR$(7);
560 INPUT" TYP IN LAST TWO NUMBERS OF THE YEAR AS IN 19..":YN
570 IF YN>99 THEN PRINT"WRONG NUMBERS":GOTO 550
580 YMF=YN-5
590 HOME:VTAB 12:PRINT SPC(25)"PLEASE WAIT (APPROX. 1.5 MIN.)"
600 V=1:TAA=0:N=0:TAA=0:C=0:TSA=0:OT=0:XX=0
610 GET#2,V
615 IF EOF(2) THEN GOTO 1370
620 HA =CVI(HA%)*.1
630 IF CVI(TL%)<1 THEN GOTO 720
640 TA=TA+HA:XX=XX+1
700 APP=CVI(APP%)
710 IF APP=4 THEN GOSUB 800
720 V=V+1:GOTO 610
800 N=N+1:TAA=TAA+HA
810 SLD =CVI(SLD%)
820 YEAR=SLD-((INT(SLD*.01))*100)
830 IF YEAR=>YMF THEN C=C+1:TSA=TSA+HA
840 RETURN
1000 HOME:PRINT"DO YOU WANT A PRINT-OUT OF THIS DATA -Y/N";:GET Z%
1010 IF Z%="N" OR Z%="Y" THEN 1020 ELSE 1000
1020 IF Z%="N" THEN CCC=7:GOTO 1240
1200 HOME:FOR B=1 TO 8:BEEP 10*B,25:NEXT
1210 PRINT CHR$(7)
1220 PRINT" ADJUST THE PRINTER AND PRESS RETURN TO CONTINUE":INPUT " ",R%:
1230 POKE 3,150
1240 HOME:PRINT ST%:PRINT
1250 PRINT SPC(30)"STATUS REPORT":PRINT
1260 PRINT ST%:PRINT:PRINT

```



```

1300 PRINT"NUMBER OF FIELDS IN THE PROGRAM: ";XX TAB(50)
1310 PRINT"TOTAL AREA (HA): ";TA:PRINT:PRINT
1320 PRINT"NUMBER OF APPROVED FIELDS: ";N TAB(50)
1330 PRINT"TOTAL AREA (HA): ";TAA:PRINT:PRINT
1340 PRINT "NUMBER OF SLUDGED FIELDS (LAST 5 YEARS): ";C TAB(50)
1350 PRINT" TOTAL AREA (HA): ";TSA:PRINT:PRINT
1360 PRINT "NUMBER OF FIELDS AVAILABLE FOR SPREADING: ";N-C
1365 GOTO 1930
1370 V=1
1380 CW=0
1400 GOTO 1440
1410 Y=CUI(XYZ$):WIN=INT(.001*Y):SP=INT((Y-1000 *WIN)*.01)
1420 SUM=INT((Y-1000*WIN)-100*SP)*.1)
1430 FALL=Y-(1000*WIN+100*SP+10*SUM):RETURN
1440 GET#1,V
1450 IF EOF(1) THEN 1000
1460 GOSUB 1410
1470 GET #2,V:IF CUI(TL$)<1 THEN 1890
1500 IF WIN=1 THEN CW1=CW1+1:GOTO 1590
1510 IF WIN=2 THEN CW2=CW2+1:GOTO 1590
1520 IF WIN=3 THEN CW3=CW3+1:GOTO 1590
1530 IF WIN=4 THEN CW4=CW4+1:GOTO 1590
1540 IF WIN=5 THEN CW5=CW5+1:GOTO 1590
1550 IF WIN=6 THEN CW6=CW6+1:GOTO 1590
1560 IF WIN=7 THEN CW7=CW7+1:GOTO 1590
1570 IF WIN=8 THEN CW8=CW8+1:GOTO 1590
1580 IF WIN=9 THEN CW9=CW9+1:GOTO 1590
1590 GOTO 1600
1600 IF SP=1 THEN CS1=CS1+1:GOTO 1690
1610 IF SP=2 THEN CS2=CS2+1:GOTO 1690
1620 IF SP=3 THEN CS3=CS3+1:GOTO 1690
1630 IF SP=4 THEN CS4=CS4+1:GOTO 1690
1640 IF SP=5 THEN CS5=CS5+1:GOTO 1690
1650 IF SP=6 THEN CS6=CS6+1:GOTO 1690
1660 IF SP=7 THEN CS7=CS7+1:GOTO 1690
1670 IF SP=8 THEN CS8=CS8+1:GOTO 1690
1680 IF SP=9 THEN CS9=CS9+1:GOTO 1690
1685 STOP
1690 IF SUM=0 THEN SM=SM+1:GOTO 1790
1700 IF SUM=1 THEN SM1=SM1+1:GOTO 1790
1710 IF SUM=2 THEN SM2=SM2+1:GOTO 1790
1720 IF SUM=9 THEN SM9=SM9+1:GOTO 1790
1790 IF FALL=0 THEN CF=CF+1:GOTO 1890
1800 IF FALL=1 THEN CF1=CF1+1:GOTO 1890
1810 IF FALL=2 THEN CF2=CF2+1:GOTO 1890
1880 IF FALL=9 THEN CF9=CF9+1:GOTO 1890
1890 V=V+1
1900 GOTO 1440
1930 IF CCC=7 THEN PRINT:PRINT"PRESS RETURN TO CONTINUE";:INPUT " ";R$
1935 PRINT:PRINT
1940 PRINT STRING$(30,45)
1950 PRINT "CLASS      WINTER      SPRING      SUMMER      FALL"

```



```

1960 PRINT STRING$(80,45)
1970 PRINT
1980 PRINT " 0";
1990 PRINT " NA NA";:PRINT USING" #### ##";SM,CF
2000 PRINT " 1";
2010 PRINT USING" #### ##";CW1,CS1,SM1,CF1
2020 PRINT " 2";
2030 PRINT USING" #### ##";CW2,CS2,SM2,CF2
2040 PRINT " 3";
2050 PRINT USING" #### ##";CW3,CS3;:PRINT" NA NA"
2060 PRINT " 4";
2070 PRINT USING" #### ##";CW4,CS4;:PRINT" NA NA"
2080 PRINT " 5";
2090 PRINT USING" #### ##";CW5,CS5;:PRINT" NA NA"
2100 PRINT " 6";
2110 PRINT USING" #### ##";CW6,CS6;:PRINT" NA NA"
2120 PRINT " 7";
2130 PRINT USING" #### ##";CW7,CS7;:PRINT" NA NA"
2140 PRINT " 8";
2150 PRINT USING" #### ##";CW8,CS8;:PRINT" NA NA"
2160 PRINT " 9";
2170 PRINT USING" #### ##";CW9,CS9,SM9,CF9
2180 PRINT STRING$(80,45)
2200 IF CCC=7 THEN 2310
2300 POKE 3,149;FOR X=1 TO 10 :PRINT:NEXT:
2310 FOR B=1 TO 5:BEEP 5*B,10:NEXT
2320 PRINT:PRINT"PRESS RETURN TO CONTINUE";:INPUT " ",R$
2325 CLEAR:HOME:VTAB 12
2330 PRINT SPC(33)"STAND BY >>>>>";:RUN"START.#01"
110 ON ERROR GOTO 130
120 GOTO 400
130 BEEP 50,50:BEEP 50,50:PRINT:PRINT"OPERATOR ERROR . . ."
140 FOR U=1 TO 1000:NEXT:GOTO 4500
300 BEEP 50,10
310 PRINT "Y/N";
320 GET Z$;IF Z$="Y" OR Z$="N" THEN 330 ELSE 320
330 PRINT Z$;PRINT:RETURN
400 OPEN "R",#1,"B:TRANS",18:FIELD#1,2 AS KN$, 2 AS KE$, 2 AS SWO$, 2 AS SED$, 2 AS BU$, 2 AS MI$, 2 AS GE$, 2 AS
S AC$, 2 AS LA$
410 OPEN "R",#2,"B:FDATA1",22:FIELD#2,2 AS TL$,2 AS CF$,2 AS NE$,2 AS HA$,2 AS ACC$,2 AS LEASE$,2 AS APP$,2 AS SLD$,2 AS BRID$
500 RET$="PRESS RETURN TO CONTINUE"
510 ST$=STRING$(80,42)
520 DIS$="DISTANCE TO:"
530 LN$=" 1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH 9TH 10TH11TH12TH13TH14TH15TH16TH17TH18TH19TH20TH"
600 TITLE1$="RD COOR NORTH EAST SW OAK SE OAK BURL MILTON GEORGT ACTON LA600N"
700 HOME:PRINT ST$:PRINT
710 PRINT SPC(30)"TRANSPORTATION SYSTEM":PRINT
720 PRINT ST$:PRINT
730 PRINT SPC(27)"1. ENTER DATA":PRINT
740 PRINT SPC(27)"2. DISPLAY DATA ON SCREEN":PRINT
750 PRINT SPC(27)"3. PRINT DATA":PRINT
760 PRINT SPC(27)"4. DETERMINE HAULAGE DISTANCE":PRINT

```



```

770 PRINT SPC(27)*5. EXIT THE PROGRAM":PRINT
780 PRINT CHR$(7):PRINT SPC(30)"WHICH OPTION"
790 FOR U=1 TO 5000
800 A$=INKEY$:IF LEN(A$)=0 THEN 820 ELSE OPT=ASC(A$)-48
810 IF (OPT>0)*(OPT<6) THEN 830
820 NEXT:GOTO 100 'CHANGE
830 HOME:ON OPT GOTO 1000, 2000, 2000, 3000, 4500
1010 INPUT "ROAD COORDINATE NUMBER: ",RC
1020 IF RC>32 THEN PRINT "WRONG NUMBER":GOTO 1010
1030 PRINT:INPUT "NORTH KM: ",KN
1040 IF KN>65 THEN PRINT "WRONG NUMBER":GOTO 1030
1050 PRINT:INPUT "EAST KM: ",KE
1060 IF KE>60 THEN PRINT "WRONG NUMBER":GOTO 1050
1070 PRINT:PRINT DIS$
1080 INPUT "S.W. OAKVILLE: ",SWO
1090 IF SWO>65 THEN PRINT "WRONG NUMBER":GOTO 1070
1100 PRINT:PRINT DIS$
1110 INPUT "S.E. OAKVILLE: ",SEO
1120 IF SEO>80 THEN PRINT "WRONG NUMBER":GOTO 1100
1130 PRINT:PRINT DIS$
1140 INPUT "BURLINGTON: ",BU
1150 IF BU>75 THEN PRINT "WRONG NUMBER":GOTO 1130
1160 PRINT:PRINT DIS$
1170 INPUT "MILTON: ",MI
1180 IF MI>40 THEN PRINT "WRONG NUMBER":GOTO 1160
1190 PRINT:PRINT DIS$
1200 INPUT "GEORGETOWN: ",GE
1210 IF GE>65 THEN PRINT "WRONG NUMBER":GOTO 1190
1220 PRINT:PRINT DIS$
1230 INPUT "ACTON: ",AC
1240 IF AC>60 THEN PRINT "WRONG NUMBER":GOTO 1220
1250 PRINT:PRINT DIS$
1260 INPUT "LAGOON: ",LA
1270 IF LA>60 THEN PRINT "WRONG NUMBER":GOTO 1250
1400 LSET KN$=MKI$(KN*10):LSET KE$=MKI$(KE*10)
1410 LSET SWO$=MKI$(SWO*10):LSET SEO$=MKI$(SEO*10)
1420 LSET BU$=MKI$(BU*10):LSET MI$=MKI$(MI*10)
1430 LSET GE$=MKI$(GE*10):LSET AC$=MKI$(AC*10)
1440 LSET LA$=MKI$(LA*10)
1500 PUT #1,RC
1550 PRINT:PRINT "ANY MORE DATA TO ENTER ";:GOSUB 300
1560 IF Z$="Y" THEN GOTO 1000
1570 HOME:GOTO 700
2010 PRINT:PRINT "DO YOU WANT CONSECUTIVE OR RANDOM RECORDS - C/R";
2020 GET A$:IF A$="C" THEN 2030 ELSE IF A$="R" THEN 2100 ELSE 2020
2030 PRINT A$: INPUT "START RECORD NUMBER ",REC1:INPUT "END RECORD NUMBER ",REC2
2040 IF (REC1>0)*(REC2>REC1) THEN 2070
2050 PRINT "TRY AGAIN":GOTO 2000
2070 RECL=REC2-REC1+1:DIM X(RECL)
2080 FOR I=1 TO RECL:X(I)=REC1:REC1=REC1+1:NEXT:GOTO 2180
2100 PRINT:PRINT:INPUT "HOW MANY RECORDS (20 IS MAXIMUM)":RECL
2110 IF (RECL>0)*(RECL<21) THEN 2120 ELSE 2100

```



```

2120 DIM X(RECL)
2130 FOR I=1 TO RECL
2140 PRINT MID$(NN$,4*I-3,4);:INPUT " ",X(I)
2150 IF (X(I)>0)*(X(I)=INT(X(I))) THEN 2170
2160 PRINT X(I);"IS REJECTED";GOTO 2140
2170 NEXT
2180 IF OPT=2 THEN HOME:GOTO 2200
2190 PRINT CHR$(7):PRINT "ADJUST THE PRINTER AND";RET$:INPUT " ",R$:POKE 3,150
2200 PRINT ST$:PRINT TITLE1$:PRINT ST$
2210 FOR I=1 TO RECL
2220 PRINT USING "-----##";X(I);
2240 GET #1,X(I)
2250 IF CVI(KN$)>0 THEN 2270
2260 PRINT " NO DATA":GOTO 2500
2270 PRINT USING " ##.#";.1*CVI(KN$);
2280 PRINT USING " ##.# ##.# ##.#";.1*CVI(KE$),.1*CVI(SW0$),.1*CVI(SE0$);
2290 PRINT USING " ##.# ##.# ##.#";.1*CVI(BU$),.1*CVI(MI$),.1*CVI(GE$);
2300 PRINT USING " ##.# ##.#";.1*CVI(AC$),.1*CVI(LA$)
2500 IF OPT=3 THEN 2540
2510 IF VPOS(0)<20 THEN 2540
2520 PRINT:PRINT "DO YOU WANT TO CONTINUE";:GOSUB 300:IF Z$="N" THEN 2580
2530 HOME:PRINT ST$:PRINT TITLE1$:PRINT ST$
2540 NEXT
2550 IF OPT=2 THEN PRINT:PRINT RET$,:INPUT " ",R$:PRINT:GOTO 2580
2560 FOR T=1 TO 10:PRINT:NEXT
2570 POKE 3,149:FOR T=1 TO 5:BEEP 10*T,10:NEXT
2580 ERASE X:GOTO 700
3100 HOME:PRINT ST$:PRINT SPC(26)"TRANSPORTATION SYSTEM":PRINT ST$
3110 PRINT
3120 PRINT SPC(26)"*** SLUDGE SOURCE ***":PRINT
3130 PRINT SPC(27)"1. BURLINGTON":PRINT
3140 PRINT SPC(27)"2. SW OAKVILLE":PRINT
3150 PRINT SPC(27)"3. SE OAKVILLE":PRINT
3160 PRINT SPC(27)"4. MILTON":PRINT
3170 PRINT SPC(27)"5. GEORGETOWN":PRINT
3180 PRINT SPC(27)"6. ACTON":PRINT
3190 PRINT SPC(27)"7. LAGOON":PRINT
3200 PRINT CHR$(7):INPUT "WHICH OPTION ",W
3210 IF W>7 THEN PRINT "WRONG NUMBER":GOTO 3000
3220 PRINT:PRINT "ARE YOU SURE? ";:GOSUB 300
3230 IF Z$="N" THEN 3000
3300 IF W=1 THEN SN=7.5:SE=39.7:GOTO 3500
3310 IF W=2 THEN SN=19.1:SE=48.9:GOTO 3500
3320 IF W=3 THEN SN=26.7:SE=52.1:GOTO 3500
3330 IF W=4 THEN SN=29.9:SE=33.3:GOTO 3500
3340 IF W=5 THEN SN=44.3:SE=32.9:GOTO 3500
3350 IF W=6 THEN SN=43.9:SE=21.7:GOTO 3500
3360 IF W=7 THEN SN=21.5:SE=44.1:GOTO 3500
3370 GOTO 3000
3500 HOME:PRINT ST$:PRINT SPC(26)"TRANSPORTATION SYSTEM":PRINT ST$:PRINT
3510 PRINT SPC(26)"*** SLUDGE DESTINATION ***":PRINT
3520 INPUT "ENTER DATUM NUMBER OF FIELD: ", D

```



```

3550 HOME:VTAB 12:PRINT SPC(25)*"PLEASE WAIT FOR DATA SORTING"
3560 GET #2,D
3610 NE=CVI(NE$):IF NE>0 THEN 3650
3620 HOME:PRINT "COORDINATES OF FIELD ARE 0,0; DISTANCE CANNOT BE DETERMINED";GOTO 700
3650 DN=INT(.01*NE):DE=NE-100*DN
3700 DNA=DN+7:DNS=DN-7
3710 DEA=DE+7:DES=DE-7
3720 X=0
3750 FOR I=1 TO 32
3760 GET #1,I
3770 RCN=CVI(KN$)*.1:RCE=CVI(KE$)*.1
3780 IF RCN<DNA AND RCN>DNS THEN 3790 ELSE 3850      'NEXT
3790 IF RCE<DEA AND RCE>DES THEN 3800 ELSE 3850      'NEXT
3800 A=DN-RCN:B=DE-RCE
3810 C=(A*A)+(B*B):Y=SQR(C)
3820 IF X=0 THEN 3840
3830 IF Y<=X THEN 3840 ELSE 3850      'NEXT
3840 X=Y:Z=I
3850 NEXT
3905 GET #1,ZZ:RCN=CVI(KN$)*.1:RCE=CVI(KE$)*.1
3910 A1=SN-RCN:B1=SE-RCE
3920 C1=(A1*A1)+(B1*B1):Y1=SQR(C1)
3940 A2=SN-DN:B2=SE-DE
3950 C2=(A2*A2)+(B2*B2):Y2=SQR(C2)
3970 IF W=1 THEN HD=CVI(BU$):PP$="BURLINGTON":GOTO 4100
3980 IF W=2 THEN HD=CVI(SWO$):PP$="S.W. OAKVILLE":GOTO 4100
3990 IF W=3 THEN HD=CVI(SE$):PP$="S.E. OAKVILLE":GOTO 4100
4000 IF W=4 THEN HD=CVI(MI$):PP$="MILTON":GOTO 4100
4010 IF W=5 THEN HD=CVI(GE$):PP$="GEORGETOWN":GOTO 4100
4020 IF W=6 THEN HD=CVI(AC$):PP$="ACTON":GOTO 4100
4030 IF W=7 THEN HD=CVI(LA$):PP$="LAGOON":GOTO 4100
4100 IF Y1>Y2 THEN 4120
4110 AA=(HD*.1)+X:GOTO 4200
4120 AA=(HD*.1)-X
4130 AA=INT(AA)
4200 HOME:PRINT ST$:PRINT "TRANSPORTATION SYSTEM":PRINT ST$:PRINT
4210 PRINT "THE HAULAGE DISTANCE FROM THE SOURCE ";PP$;" TO FIELD: ";D;" IS: ";
4215 PRINT USING"###";AA;PRINT " KM."
4220 PRINT:PRINT "THE CLOSEST ROAD COORDINATE IS: ";ZZ
4230 PRINT:PRINT RET$;:INPUT " ",R$
4240 GOTO 700
4500 CLEAR:HOME:VTAB 12:HTAB 30
4510 PRINT"STAND BY >>>>";:LOAD"START.#01",R

```


PART 2

**USER GUIDE
TO
SLUDGE MANAGEMENT SYSTEM**

for:

SUPPLY AND SERVICES CANADA

ENVIRONMENT CANADA

ONTARIO MINISTRY OF ENVIRONMENT

and

THE REGIONAL MUNICIPALITY OF HALTON

prepared by:

SIMCOE ENGINEERING GROUP LIMITED
Consulting Engineers, Pickering, Ontario

and

ENVIROSEARCH LIMITED
Consulting Engineers and Environmental Specialists
Milton, Ontario

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE NO.</u>
1.0 INTRODUCTION	1
1.1 General Information -----	1
1.2 General System Operations -----	1
1.3 System Start-up -----	2
1.4 Agricultural Utilization Disk -----	3
2.0 DATA ENTRY PROGRAM	4
2.1 A. Operator/Owner Data -----	4
2.2 B. Task 1 and/or Task 2 -----	5
2.3 C. Crop Plan Data -----	8
2.4 D. Crop Information -----	8
2.5 E. Edit Program -----	9
2.6 F. Restricted Areas -----	9
2.7 G. Soil Metal Data -----	10
2.8 H. Operator Ranking -----	10
3.0 SHORT TERM FIELD SELECTION	12
4.0 REPORTING, INITIALIZING	14
4.1 Farmer's Report -----	14
4.2 Status Report -----	14
4.3 Initialize Seasonal Suitability pH, Phosphorus, etc. -----	15
4.4 Initialize Soil Metals -----	15
4.5 Transportation Distances -----	15
4.6 Field Approval Test -----	16
5.0 SLUDGE AND PLANT INFORMATION DISK - OPTION A	17
5.1 Sludge Quality Data Input -----	17
5.2 Sludge Annual Quality Reports -----	19
5.3 Special Quality Data Reports -----	19
5.4 Edit Sludge Quality Files -----	20
5.5 Sludge Storage Program -----	21
5.6 Sludge Blending Program -----	23
5.7 Sludge Forecasting -----	25
5.8 Utilities -----	26

TABLES

<u>Table</u>	<u>After</u>
3.1 Possible Weather Conditions -----	Section 3
5.1 Data Contained in Record -----	Section 5
5.2 Metals -----	Section 5
5.3 General Characteristics -----	Section 5
5.4 Nutrients -----	Section 5

APPENDICES

Appendix No.	Title
1	TASK 1 - DATA ENTRY SHEET AND NOTES
2	TASK 2 - DATA ENTRY SHEET AND NOTES
3	CROP PLAN - DATA ENTRY SHEET AND NOTES
4	CROP INFO - DATA ENTRY SHEET
5	RESTRICTED AREAS - DATA ENTRY SHEET AND NOTES
6	SOIL METAL DATA -- DATA ENTRY SHEET
7	SPECIFIC INFORMATION ABOUT FIELDS (SHORT TERM FIELD SELECTION)
8	WINTER FIELDS
9	FARMER'S REPORT
10	STATUS REPORT
11	FIELD APPROVAL TEST
12	PROCESS REVIEW
13	SLUDGE ANNUAL QUALITY REPORTS
14	SPECIAL QUALITY DATA REPORTS
15	PRINT FILE DATA FOR SLUDGE STORAGE
16	BLENDING CALCULATION RESULTS
17	FORECAST SLUDGE PRODUCTION
18	SLUDGE PRODUCTION/POPULATION FILE
19	SLUDGE QUALITY DATA ENTRY BLANKS

1.0 INTRODUCTION

1.1 General Information

The SLUDGE MANAGEMENT SYSTEM is a set of computer programs that maintain and sort data files to assist in the:

- a) process control in sewage treatment plants, and
- b) utilization of sewage sludge on agricultural lands.

The software is developed for an Apple II Plus, 48K computer with a CP/M operating system [system includes a 16K memory card (slot 0), two disk drives with controller card (slot 6) monitor (crt), printer with interface card (slot 1), and Z-80 softcard (slot 4)].

The system is supplied on four 5 1/4" floppy disks. DISK # 1 contains the program to start the system. DISK # 2 contains programs for sludge utilization. DISK # 3 contains all the data files used for the sludge utilization system and DISK # 4 handles sludge quantity and quality for all sludge storage locations in-plant and off-site. DISK # 4 contains both program files and data files.

1.2 General System Operations

- 1) Responses to all questions which offer a choice of two letters (eg. Y/N, etc, need only the necessary key to be depressed to execute).
- 2) Responses to all "which option?" questions displayed with program menus need only the necessary key to be depressed to execute.
- 3) All other requests for information or action require the response to be concluded by depressing the <RETURN> key to indicate the end of data entry.

- 4) Whenever possible, the programs provided on the disks contain rational checks to protect against reasonable errors. Appropriate messages accompany input rejection in these cases.
- 5) At certain key events in program execution, audio signals are provided to alert the system operator.
- 6) Prior to any output printing, the program provides an operator controlled pause for adjustment of the printer, paper, etc.

1.3 System Start-up

- 1) Insert DISK # 1 in upper disk drive (A: or 1). Make sure that the drive door is closed!
- 2) Boot the disk by turning on the computer, screen monitor and printer.
- 3) The system will automatically start up and load the disk control program.

After some introductory information, the following message will appear on the screen:

SLUDGE MANAGEMENT

THIS IS THE STARTING SYSTEM

PRESS <A> FOR 'SLUDGE AND PLANT INFORMATION DISK'

OR FOR 'AGRICULTURAL UTILIZATION DISK'

WHICH OPTION?

Depressing the <A> key will result in the following message:

INSERT DISK # 4 IN DRIVE A
AND PRESS <RETURN> TO CONTINUE

Option <A> (sludge and plant information disk) will be discussed in section 5.0.

Option will give the message:

INSERT DISK # 2 IN DRIVE A
AND DISK # 3 IN DRIVE B
PRESS <RETURN> TO CONTINUE.

The insertion of the wrong disks in the disk drives following the selection of A or B will cause the system to shut down, forcing the operator to re-boot the disk.

1.4 Agricultural Utilization Disk

DISK # 2 contains all the programs used for agricultural utilization.

DISK # 3 contains all the data files.

The main menu offers the following options.

- A. DATA ENTRY PROGRAMS. (section 2.0)
- B. SHORT TERM FIELD SELECTION. (section 3.0)
- C. REPORTING AND INITIALIZING. (section 4.0)

By depressing <ESC> the user is given two options:

- exit the system,
- return to DISK # 4.
(Sludge and plant information disk.)

2.0 DATA ENTRY PROGRAMS

Option A, data entry programs, offers a menu with the following programs:

- A. OPERATOR/OWNER DATA
- B. TASK 1 AND/OR TASK 2
- C. CROP PLAN DATA
- D. CROP INFORMATION
- E. EDIT PROGRAM
- F. RESTRICTED AREAS
- G. SOIL METAL DATA
- H. OPERATOR RANKING

OR <ESC> TO DISK # 2 MAIN MENU.

All the programs guide the user to the appropriate section of the program by the use of menus. From each menu, the user may select an option number by a single key-stroke (no return necessary).

Each program conclusion returns the user to the DISK # 2 main menu.

All programs, except E (Edit Program), have options to:

- ENTER DATA
- DISPLAY DATA ON SCREEN
- PRINT DATA
- EXIT THE PROGRAM

2.1 A. Operator/Owner Data

This program handles information about farm operators and landowners and includes their addresses, postal codes and phone numbers. The program places this information in a data file called "OP/OWN". Names or addresses cannot be longer than 20 letters (spaces included).

The program menu offers the following options:

- 1) ENTER DATA
- 2) PRINT ALPHABETIZED LIST
- 3) PRINT SORTED NUMERIC LIST
- 4) DISPLAY ALPHABETIZED LIST
- 5) DISPLAY SORTED NUMERIC LIST
- 6) EXIT THE PROGRAM

Each owner or farm operator involved in the program is assigned a specific number by the person entering the data. The data entry occurs through a question and answer procedure.

First an "OPERATOR/OWNER" number is requested. After this, the last name should be entered, followed by the initials (no periods or commas). A check is made to see if the name has been entered before. The address, city, postal code and phone number should be entered accordingly. After each data entry the <RETURN> key is required to be depressed.

The program is able to provide the system operator with an alphabetized listing by name or a sorted numeric listing of the data by operator/owner number.

This program will not be used frequently. After the first entries have been made, the program should only be used when new operators or owners are to be added, or previously entered data is to be changed.

2.2 B. Task 1 and/or Task 2

The program either directs the system operator to the menus of TASK 1 or TASK 2 or allows screen display or printed "readable English" reports of the data in TASK 1 or TASK 2.

TASK 1

TASK 1 has a data file called "FDATA1". The program stores general information such as field size, owner, operator, lot and concession number, etc. Each field is given a specific number (datum number) by the person entering the data. The program offers four options for handling the data entered from the data entry sheets.

Option 1 - Enter Data

Data should be entered according to the appropriate data entry sheet form (see Appendix 1). The program requests the name and number of the farm operator. After this number is entered, the screen will display a data entry line to assist in accurate entry of the data. The program has a built-in system to flag information outside of normally anticipated ranges. This gives the system operator the opportunity to correct obvious errors in the data during entry.

This section concludes with the option to enter additional data or revert to the program menu.

Options 2 & 3 - Data Output

The program outputs from the data entered from the data entry sheet forms by printing it on paper or by displaying it on the screen. The output can be provided in consecutively numbered records or randomly selected records (maximum 20). Column headings for data output are as follows:

FILE	- datum number
TWP	- township
LOT	- lot number
CON	- concession number
FLD	- field number (assigned)
KMN	- kilometers north
	> co-ordinates
KME	- kilometers east
AREA	- field area in hectares
ACCESS	- seasonal access factors
LEASE	- lease expiry date
APP	- approval status
SLUDGE	- date field was last sludged
GRID	- grid number
OP#	- operator number (farmer)
OWN#	- owner number

Option 4 - Exit the Program

Returns to main disk menu for further operations.

TASK 2

The program, TASK 2, is similar to the TASK 1 program. It has a data file called "FDATA2". The program stores information about each field's soil characteristics such as depth to bedrock, phosphorus content, pH, etc.

A specific number has already been given to each field in TASK 1. The program offers four options for handling data entered from the data entry sheet.

- 1) ENTER DATA
- 2) DISPLAY DATA ON SCREEN
- 3) PRINT DATA
- 4) EXIT THE SYSTEM

Option 1 - Enter Data

Data should be entered according to the appropriate data entry sheet (see Appendix 2). The program requests a datum number. After this number is entered, the screen will display a data entry line to assist in accurate entry of the data. This section of the program also contains a large number of checks to minimize incorrect data entry. The data can be corrected during data entry. This section concludes with the option to enter additional data or revert to the program menu.

Options 2, 3 and 4 are exactly the same as in TASK 1.

The column headings for the data output are as follows:

FLD	- datum number
WELL	- distance to well
GW	- depth to groundwater

SW	- distance to surface water
ROC	- distance to bedrock
HOU	- distance to house
RA	- distance to residential area
CAB	- soil capability
TYP	- soil type
PER	- permeability
SL	- slope
PHO	- phosphorus level in the soil
PH	- soil pH
RO	- runoff/erosion into watercourse
TD	- tile drained
LSP	- spring access date
FLO	- flooded in which part of the year
WSTA	- weather station

2.3 C. Crop Plan Data

The program has a data file called "CDATA". It stores information about what crop is grown each year on each field and indicates which year the farmer would like to have sludge applied.

The program setup is similar to TASK 1 and TASK 2 in that it offers the same options for the handling of data.

Data is entered according to the appropriate data entry sheet form (see Appendix 3). This data is only requested when a farmer has fields approved for sludge spreading.

2.4 D. Crop Information

This program has a data file called "CROPINFO". It stores information about crops, including:

- planting dates,
- harvesting dates,
- nutrient requirements, and
- yields.

The program setup is similar to TASK 1 and TASK 2 in that it offers the same options for handling data. Each crop is given a specific

number. Data is entered according to the data entry sheet form (see Appendix 4). The data is checked to minimize entry of incorrect data. The program gives the computer operator the opportunity to correct data during entry.

This file will be considerably smaller than most other files as there is a relatively small number of crops for which data will be stored.

2.5 E. Edit Program

The edit program has no data file. It does not store information. It assists the operator in updating previously entered data. The following items of TASK 1 and TASK 2 can be edited.

1. APP (approval status)
2. SLD (sludge date)
3. PHO (phosphorus)
4. pH (soil pH)
5. SEASONAL ACCESS FACTORS
6. LEASE EXPIRY DATE
7. OPERATOR NUMBER (farmer)

The system operator is requested to enter the field datum number for which the data is to be updated. After this, the screen displays the existing data for the selected field. The operator is asked to enter the new data. Before the new data is written to the appropriate file, the operator has the opportunity to cancel the action if necessary.

2.6 F. Restricted Areas

This program stores information about restricted areas. No sludge should be spread in restricted areas until consideration has been given to specific conditions that may have to be met. Restrictions may include:

- * Municipal bylaws
- * Residential or non-farm areas

- * Environmentally sensitive areas:
 - ecological constraints
 - wetlands
 - unsuitable overburden
 - high yield wells

- * Complaints

The program offers a menu that allows the system operator to enter data or to print the entered data.

Data should be entered according to the data entry sheet (see Appendix 5). The program requests the restriction number. Each restricted area has its own number. After the number is entered, the screen will display a data entry line to assist in accurate entry of the data. The data consists of co-ordinate, restriction distance and restriction classes.

The program also offers an option to determine in which restricted area(s) a certain field occurs.

2.7 G. Soil Metal Data

This program stores information about soil metal concentrations for eleven metals in each of the grid areas. Data can be entered and reviewed. The program will automatically determine if the metal content is above the value as recommended in the "Guidelines for Sewage Sludge Utilization on Agricultural Lands". Data should be entered according to the data entry sheet (see Appendix 6).

2.8 H. Operator Ranking

This program has the same options as the previous programs. It stores information about the ranking number of a farm operator. The ranking number indicates how often a farm operator is likely to be assured of

sludge on a future commitment. The ranking system is to be set up by the region (e.g. There might be farmers who will receive commitments for future sludge every year while others may receive the commitment for future sludge every other year, etc). The program offers a menu that allows the system operator to enter data or to print the entered data.

3.0 SHORT TERM FIELD SELECTION

This program determines acceptable fields for sludge application.

There are four different methods of field selection:

1. FARMER
2. FIELD
3. LOCATION
4. ALL WINTER FIELDS

The options 1, 2 and 3 follow a sub-routine whereby the system operator identifies the season and certain weather conditions (precipitation and rainfall). This is done to determine acceptable fields for these specific conditions.

The program checks whether the fields have been sludged before and provides information on seasonal class and possible constraints.

There are ten different seasonal suitability classes.

- 1- NO RESTRICTIONS, INCLUDES FROZEN GROUND
- 2- SETBACK*, INCLUDES FROZEN
- 3- NO RESTRICTIONS, EXCLUDES FROZEN
- 4- NO RESTRICTIONS, EXCLUDES FROZEN, SOIL LOADING
- 5- FROZEN OK, BUT SOIL LOADING
- 6- SETBACK, EXCLUDES FROZEN
- 7- SETBACK, FROZEN (ELSE SOIL LOADING)
- 8- SETBACK, EXCLUDES FROZEN, SOIL LOADING
- 9- REJECT
- 0- SPECIAL CONDITIONS (sludge has to be injected.)

* SETBACK: Total area of field is not suitable for sludge application because of separation distance from a stream.

Possible weather conditions for each season are shown in Table 3.1.

The system operator is asked if more explanatory information about seasonal class and possible constraints are required (see Appendix 7).

Method 1 - FARMER

After the system operator enters the farm operator/owner number, the program produces all of the datum numbers for fields

operated by the requested farmer, with additional information describing the acceptability of the fields for sludge application. The system operator can continue or request more information on specific fields (as shown in Appendix 7).

Method 2 - FIELD

By entering the datum number for the field, the program produces all the above information for this field. The system operator can continue or request more information.

Method 3 - LOCATION

This method is used when spreading fields are required in a certain area (e.g. where the terragator is spreading). The northing and easting co-ordinates at the desired location and a radius must be entered to determine the fields located within the circumscribing square.

Method 4 - ALL WINTER FIELDS

This program automatically provides all the suitable winter fields. It also provides information about the seasonal class, size, approval status and indicates whether the field has already been sludged (see Appendix 8).

TABLE 3.1

POSSIBLE WEATHER CONDITIONS

PART A

SEASON	TEMPERATURE	PRECIPITATION	WEATHER CONDITIONS
WINTER	warm	dry	A
		wet/normal	B
	cold/normal		C
SPRING	cold		C
	warm/normal	dry	D
		wet/normal	E
SUMMER/FALL			F

PART B

For each weather condition, the following seasonal suitability classes are acceptable.

SEASON	WEATHER CONDITION	ACCEPTABLE	UNACCEPT- ABLE	
WINTER	A	1,2,3,4 5,6,7,8	9	0 not applicable.
	B	1,2,3,6	4,5,7,8,9	0 not applicable.
	C	1,2,4,5,7	3,6,9	0 not applicable.
SPRING	C	1,2,4,5,7,8	3,6,9	0 not applicable.
	D	3,4,6,8	9	0,1,2,5,7 not applicable.
	E	3,6	4,8,9	0,1,2,5,7 not applicable.
SUMMER/FALL	F	0,1,2	9	3,4,5,6,7,8 not applicable.

4.0 REPORTING, INITIALIZING

This option offers the following menu:

- A. FARMERS REPORT
- B. STATUS REPORT
- C. INITIALIZE SEASONAL SUITABILITY, PH, PHOSPHORUS, ETC.
- D. INITIALIZE SOIL METALS
- E. TRANSPORTATION DISTANCES
- F. FIELD APPROVAL TEST

4.1 Farmer's Report

This program does not have a data file. It does not store information. It interprets numerical data, entered through Task 1 and Task 2 into words, and prints a readable report (see Appendix 9).

This report can be sent to the farmer to confirm that the entered information is correct. Not all the data contained in Task 1 and Task 2 need be reported for this purpose as some of it is not known to the farmer:

- e.g.- weather station,
- grid number,
- co-ordinates, etc.

By entering the datum number of a field, the farmer's report is automatically printed. After execution, an option for more data output occurs; 'Y' permits further data output; 'N' reverts to the main disk menu.

4.2 Status Report

This program produces a report for the system operator. It provides information about:

- a) Number of fields in the program and their total area;
- b) Number of approved fields and their total area;
- c) Number of sludged fields (last 5 years) and their total area;
- d) Number of fields available for spreading and their total area;
- e) Number of fields in each seasonal class.

This program does not write data to a file. It uses previously filed data. When the program is called up, it automatically prints all the statistics (see Appendix 10). The system operator does not need to choose from a 'program menu' as with some of the previous programs.

4.3 Initialize Seasonal Suitability pH, Phosphorus, etc.

This program determines the seasonal suitability for each field. It registers problems that might occur due to soil pH, phosphorus content of soil, etc. It also determines whether or not the fields are in a restricted area.

This program only has to be executed when fields have been added to the system or changes have been made. All the data is stored in files which will be used when the program "Short Term Field Selection" is accessed. The total initializing time of this program is approximately 45 minutes.

4.4 Initialize Soil Metals

This program determines if a field's soil metals are within the recommended "Guidelines for Sewage Sludge Utilization on Agricultural Lands". The initializing of this program only needs to be done when fields have been added or significant changes have been made.

4.5 Transportation Distances

The program offers the following menu:

1. ENTER DATA
2. DISPLAY DATA ON SCREEN
3. PRINT DATA
4. DETERMINE HAULAGE DISTANCE
5. EXIT THE PROGRAM

A haulage route network with major road co-ordinates is established. The distances between the sludge sources (including storage sites and treatment plants) and the major road co-ordinates are determined. OPTION 1 enters this data.

OPTION 4 determines the haulage distance from the source to the field. The system operator is asked to enter the sludge source and the field datum number.

4.6 Field Approval Test

This program tests spreading sites according to Ministry guidelines for the possibility of approval. It identifies the potential problems on these sites.

The following criteria are tested:

- well
- groundwater
- permeability
- slope
- surface water
- bedrock
- distance to nearest house
- distance to residential areas
- phosphorus level
- soil pH

The program checks each item separately. It prints the actual value and determines if problems might occur. The program requires the input of a field datum number to execute. The system operator can display the output on the screen or print it on paper. Appendix 11 gives an example of such output.

5.0 SLUDGE AND PLANT INFORMATION DISK
 - OPTION A

INTRODUCTION

This disk contains data files with information on current and historical sludge quality for all sludge storage locations (both plants and lagoons/tanks), and information on the storage capacities and current volumes in storage for all locations.

The disk also contains a number of program files which can access these data files and produce the typical reports shown at the end of this section.

OPERATION

When first accessed, the disk # 4 main menu is displayed from which the following selections may be made:

- A. Sludge quality data entry
- B. Sludge annual quality reports
- C. Special quality data reports
- D. Edit sludge quality files
- E. Sludge storage program
- F. Sludge blending calculation
- G. Sludge quantity forecasting
- H. Utilities

or the user may <ESC> either to go back to the main system menu (disk # 1), go to disk # 2/3, or to quit entirely.

5.1 Sludge Quality Data Entry

This program permits entry of analytical data for each sludge storage location of all parameters for which analysis is done. Disk Option H - prepare blank data entry forms may save the user time in entering data through this routine.

It provides significant hints to the user if sludge quality diverges from the norm, or indicates potential abnormalities within the

process. It is able to provide a comparison of the data entered with both historical averages and previous data entered.

CAUTION: This program assumes that a maximum of five data entries will be made in any one month for each location. Therefore, the user should assemble analytical results for all 27 parameters and enter them all at the same time.

The user is prompted to select a location for which data are to be entered. Each parameter name is displayed and the user responds by entering the data value.

If this value is greater than the high acceptable limit or less than the low acceptable limit for this parameter, the user is advised, and requested to confirm the data be entered or enter a new value in its place.

After all data are entered, each is compared with the previous month values and the user advised if new values are more than twice or less than half last month's values. If so, the user has the option of entering a new value in its place.

After data entry is complete for a location, the program performs a 'process review'. A printed output (see Appendix 12) is provided which indicates:

- a: the % change in each parameter compared with values on file for the previous month, and historical averages.
- b: check of certain parameters indicative of digester upset conditions.
- c: check volatile solids destruction.
- d: check of certain parameters indicative of excess supernating.

At the conclusion of this report, the user signifies whether these data are the final entries for this location for the month. Note that while a maximum of five entries per month is permitted, a lesser number is acceptable.

5.2 Sludge Annual Quality Reports

Allows either screen display or printed reports on various sludge quality information for any individual location (see Appendix 13).

The program options are:

- A. Sludge general characteristics
- B. Sludge nutrients
- C. Sludge metals
- D. Ammonia/metal ratios

or <ESC> to the disk 4 main menu.

After selecting a report type, the user selects the location for which this report is required.

Report formats are all identical and show the values for the preceding twelve months and running averages for each parameter.

5.3 Special Quality Data Reports

Allows either screen display or printed (see Appendix 14) reports on various sludge quality information for all locations. This program is complementary to option 5.2.

The program options are:

- A. general characteristics
- B. sludge nutrients
- C. sludge metals

or <ESC> to the disk 4 main menu.

After selecting a report type, the user then selects the record

within a block (see Table 5.1) and this information is produced for each sludge storage location.

5.4 Edit Sludge Quality Files

This permits the user to correct wrong data or adjust the various bits of information in the file to reflect process changes, etc.

The program options are:

- A. Metals data file
- B. General characteristics data file
- C. Nutrients data file

or <ESC> to the disk 4 main menu.

Three separate data files are maintained on this disk for these types of data. Each file is identically constructed in blocks of 22 records, i.e. plant # 1 had data from record 1 to 22, plant # 2 from 23 to 44, etc.

The internal construction within a block is shown in the Table 5.1. This construction should be thoroughly understood before any alterations are made to the sludge quality files. It is not practical to 'user-proof' this program against every conceivable way of distorting the information.

Options A, B, C all function in virtually identical manner. Only a typical operation is described.

ADJUST FILE DATA - CAUTION!

The sludge storage locations are displayed and the user selects one site for adjustment. The user then selects the record within a block (A-V equivalent to 1-22) to be modified. NOTE Record U (21) cannot be altered.

The values for data within a record are then displayed with the parameter names associated with them. Tables 5.2 - 5.4 indicate the specific internal construction of each individual record.

The user is then prompted for each value displayed to enter a new value.

When all data within that record have been entered the user is requested to confirm that they be written to the data file.

NOTE: THIS PROGRAM SHOULD ONLY BE USED WHEN ITS SIGNIFICANCE IS FULLY APPRECIATED.

Normally the only changes that will need to be made are to records O & P [15 and 16] which represent the high and low values for each parameter used to verify acceptable input.

5.5 Sludge Storage Program

This permits the user to update edit (correct), or display data maintained on the quantity of sludge in storage at the various locations.

NOTE: THIS PROGRAM SHOULD BE USED DAILY, IF POSSIBLE.

The program options are:

- A. Update of quantities
- B. Adjust file data
- C. Display/print file data

or <ESC> to the disk 4 main menu.

A. Update of Quantities

The name of each storage location is displayed and the user responds to the questions 'how much sludge was trucked in from each location';

how much sludge was trucked out'; how many days (sludge production) since the previous update; and the current date. If there are no data for a particular location, it may be bypassed.

The 'available sludge', i.e. the quantity which could be removed from the digester without upsetting the process, is then adjusted by adding the average daily sludge production, the quantity available previously in storage and the net difference in quantity trucked in. A check is made to ensure that the calculated quantity in storage is neither greater than 100% of the total storage capacity, nor less than 0% of that capacity. (Note that this is possible since the inflow of sludge to the digester is an assumed quantity - see option B for correction). In either case, the user is advised, and offered the opportunity of correcting his input.

Based on the quality of sludge at each storage location, a mass balance is performed to determine the new quality of sludge at each particular location, and this new quality is used in future calculations.

This process repeats for all sludge storage locations, then returns the user to the program menu.

B. Adjust File Data

The user may access the sludge storage file to modify any of the four values maintained for each location:-

1. Daily average sludge input from process
2. Total available storage capacity
3. Available sludge quantity
4. Truck size

It is recommended that item 1 - daily sludge from process - be adjusted seasonally to reflect process changes, and that item 3 be adjusted monthly by actual measurement of the available sludge quantity.

C. Display/Print File Data

Either a printed output (see Appendix 15) or screen display is available which shows (for all locations individually):

- storage site location
- date of last data entry
- percent full of available
- average daily site production
- no. of days remaining for storage
- available storage capacity
- no. of truckloads in storage

5.6 Sludge Blending Program

This permits the user to calculate the quality of blends of sludge from the various storage locations. It also permits the user to determine the quantity of a sludge to dilute with a blend of sludges to obtain a given quality. The program options are:

- A. Sludge blend calculations
- B. Dilution blend to meet ammonia to metals ratios

A. Sludge Blend Calculations

The list of storage sites is displayed and the user enters those sites from which sludge is to be used in the blend.

The user then selects the % of sludge to be taken from any of these locations to produce the composite sludge. Total % must be 100%.

The blending calculation may be conducted using either of two sludge quality data sets. One could use the average quality data for 'last month' which is based exclusively on laboratory data, or the

calculated quality in storage for each location which has been adjusted to reflect sludge trucked in from other locations. (This information is updated to the most recent lab data whenever lab data is entered for that location).

Based on the sludge quality selected, the composite quality and ammonia/metal ratios are calculated. Ammonia/metal ratios exceeding the guideline limits are flagged in the calculation output.

When the calculation is completed, either hard copy output (see Appendix 16) or screen display of the results is offered. If screen display is selected, the user is offered the option of printed output later.

B. Dilution Blend to Meet Ammonia Ratios

The list of storage sites is displayed and the user enters the source sludge to be diluted. The user then selects the diluting sludge(s). The total must be 100%. Blending calculations may be conducted using the blending option in A when more than one sludge quality data set is used.

The quality of the blend of diluting sludges is calculated and displayed. A printed output of the data is also offered.

After this, the blend quality and ammonia/metal ratios are calculated (uses dilution ratio of diluted sludge to diluting sludges of 1:1). If required, the calculation can be repeated with further dilutions of 1:2, 1:3, etc.

5.7 Sludge Forecasting

This permits the user to project sludge quantities for each location for the next five years, and for ten and twenty years.

The program options are:

- A. Forecast sludge production
- B. Edit production/population file
- C. Display/print production/population file

or <ESC> to the disk 4 main menu.

A. Forecast Sludge Production

Either a printed output (see Appendix 17) or screen display is available which shows (for all locations individually):

storage site location
average sludge production in m^3/day per 1000 people
sludge production in m^3/day for years 1 - 5, 10, and 20

and summarizes the Region totals for sludge production.

A second forecast option is available for any selected location.

The location is selected and the projected population data displayed. The user is prompted to enter a population value and the sludge production (daily and yearly) is displayed with an option for another forecast.

B. Edit Production/Population File

The user may access the population/production file to modify either the average daily sludge production per 1000 people for each site, or the projected population served by each site in future years.

This file should be edited at least annually to adjust the sludge production rate based on past history, and to update the population projections.

C. Display/Print Production/Population File

Allows either a printed output (see Appendix 18) or screen display of the file data.

5.8 Utilities

This program has miscellaneous utility routines which support the other programs on disk. The options are:

- A. Prepare sludge quality data entry blanks
- B. Assess sludge quality data entry status

or <ESC> back to the disk 4 main menu

A. Prepare Sludge Quality Data Entry Blanks

To assist the system operator in preparing for data entry, this routine provides a printed form for any (see Appendix 19) of the storage locations showing the parameter names and the low and high acceptable values for each, with a blank for the data to be entered.

This allows the system operator to note any data abnormalities prior to attempting actual data entry. The form can also serve as a hard copy record of the data entered (the actual data entry program also allows a hard copy to be obtained).

B. Sludge Quality Data Entry Status

As noted in section 5.1, a maximum of five data set entries per month is permitted. This routine allows the system operator to check the status of each plant data to determine the number of data sets which can be entered for each location in this month.

SLUDGE QUALITY DATA ENTRY LOGIC

1. Read high/low acceptable limits and previous month's data for comparison purposes.
2. Enter all data and verify correct or adjust values.
3. Search records 17 - 21 within appropriate block to locate first empty transient.
4. Write data to transient. Copy data to record 22 (current quality data).
5. If not last data for month and data not written to last transient (21) then exit data entry.
6. Move old data 'down' one month, i.e. overwrite 12 months ago with eleven months ago, 11 with 10, etc.
7. Summate transients and write averages of transients to record 1 (last months data).
8. Clear all transient records ready for 'next month'.
9. Read historical averages and # of values in historical average. Using these and average of transients, recalculate historical averages and # of values. Write these data back to records 13 and 14 in block.
10. Exit data entry routine.

TABLE 5.1

RECORD #
IN BLOCK

DATA CONTAINED IN RECORD

1. Average of data entered one month ago
2. Average of data entered two months ago
3. Average of data entered three months ago
4. Average of data entered four months ago
5. Average of data entered five months ago
6. Average of data entered six months ago
7. Average of data entered seven months ago
8. Average of data entered eight months ago
9. Average of data entered nine months ago
10. Average of data entered ten months ago
11. Average of data entered eleven months ago
12. Average of data entered twelve months ago
13. Running average of all data
14. # of entries used to calculate running average.
15. Limiting value (HIGH) for acceptable data
16. Limiting value (LOW) for acceptable data
17. Transient # 1)
18. Transient # 2) Use for data entry during any month.
19. Transient # 3) Averaged and written to record # 1 in
20. Transient # 4) block when all five used or at 'end of
21. Transient # 5) month'
22. Temporary quality (used by storage program)

TABLE 5.2

METALS

PARAMETER NAME/UNITS	LOCATION IN RECORD
Arsenic mg/L	1
Cadmium mg/L	2
Cobalt mg/L	3
Chromium mg/L	4
Copper mg/L	5
Mercury mg/L	6
Molybdenum mg/L	7
Nickel mg/L	8
Lead mg/L	9
Selenium mg/L	10
Zinc mg/L	11
SPARE	12
SPARE	13

TABLE 5.3

GENERAL CHARACTERISTICS

PARAMETER NAME/UNITS	LOCATION IN RECORD
Total Solids - raw sludge %	1
Total Solids - digested sludge %	2
Volatile Solids - raw sludge %	3
Volatile Solids - digested sludge %	4
Volatile Acids mg/L	5
pH	6
Alkalinity mg/L	7

TABLE 5.4

NUTRIENTS

PARAMETER NAME/UNITS	LOCATION IN RECORD
Total Phosphorus	1
Total Kjeldahl nitrogen	2
Ammonium nitrogen	3
Nitrate nitrogen	4
Potassium	5
SPARE	6
SPARE	7

APPENDICES

APPENDIX 1 (cont'd)

Notes on Completion of Task 1 Data Sheet

1. Datum Number: Four-digit consecutive numbers entered by person completing data sheet.
2. Township: Two-digit number for each township in Halton Region.
01 = Esquesing
02 = Trafalgar
03 = Nelson
04 = Nassagaweya
3. Lot: Two digits.
4. Conc.: Two digits except for Nelson and Trafalgar.
11 = II NDS
12 = I NDS
13 = I SDS
14 = II SDS
15 = III SDS
5. Field: Two digits assigned by "5"'s on the concession maps of fields. For each lot and concession, numbers are assigned starting from 05.
(eg. 05, 10, 15, 20 95).
6. Kilometres N/E: Two-digit distance in kilometers north and kilometers east from a specific (0,0) point. All distances must be greater than 0.
7. Field Area: Actual field size in hectares, three digits including tenths of a hectare (include decimal - e.g. 33.3 ha).
8. Seasonal Access Factors: Four digits in order of spring, summer, fall and winter where:-
0 = No practical access
1 = Restricted access on roads
2 = Main laneway unsuitable
3 = Laneway subject to flooding
4 = No place to turn around for tank trucks
5 = No field access from laneway: resolvable
6 = No field access from laneway: unresolvable
7 = Storage tank restrictions
8 = Other constraints
9 = No constraints (minimal problems)
9. Lease Expiry Date: Four-digit number in the form MONTH/YEAR indicating the date of lease expiry (e.g. Jan 1986 = 0186; if land is farmer owned, enter = 0000).

10. Approval: One digit.

0 = unlikely to ever be approved

1 = likely to be approved when submitted, but farmer is not interested

2 = likely to be approved when submitted and farmer is interested

3 = likely to be approved when submitted, but farmer's identity is unknown

4 = field fully approved, farmer interested

5 = field approved, farmer not interested

6 = field approved, owner not interested

7 = field approved, farmer's identity is unknown

11. Last
Sludge
Date:

Four digit number in the form MONTH/YEAR,
(e.g. Jan 1986 = 0186)

If a field never has been sludged, it will be represented by 0000.

12. Grid
Number:

Three digits assigned by Grid Number as per map, except for Nelson and Trafalgar.

NELSON	TRAFALGAR
-----	-----
314 = 31A1	215 = 21B1
315 = 31B1	224 = 21A2
324 = 31A2	225 = 21B2
325 = 31B2	234 = 21A3
334 = 31A3	235 = 21B3
335 = 31B3	244 = 21A4
344 = 31A4	245 = 21B4
345 = 31B4	254 = 21A5
354 = 21A5	255 = 21B5
355 = 31B5	264 = 21A6
	265 = 21B6
	274 = 21A7
	275 = 21B7

13. Operator/
Owner
List:

Four digits from operator/owner list. If operator is owner, then enter same number in both columns.

If owner is unknown, enter: 0000

10. Slope
- 0 = unknown
 - 1 = 0 - 3%
 - 2 = > 3 - 6%
 - 3 = > 6 - 9%
 - 4 = > 9%
11. Phosphorus Level in Soil
- Actual Value: 2 digits
99 = unknown
12. Soil pH
- 0 = unknown
 - 1 = pH < 6
 - 2 = pH => 6
13. Runoff/Erosion Into Watercourse
(T/A = ton/acre)
- 0 = unknown
 - 1 = no
 - 2 = yes
 - 3 = minimum 3 T/A
 - 4 = medium 3 - 10 T/A
 - 5 = severe > 10 T/A
14. Tile Drained
- 0 = unknown
 - 1 = yes
 - 2 = no
15. When on Land in Spring
- 0 = unknown
 - 1 = early (March 21)
 - 2 = midway (April 15)
 - 3 = late (May 1)
16. Flooded in which Part of the Year
- 0 = unknown
 - 1 = no flooding
 - 2 = spring
 - 3 = summer
 - 4 = fall
 - 5 = winter
 - 6 = more than one season
 - 7 = localize spring < 25%
 - 8 = local flood
17. Weather Station
- 0 = unknown
 - 1 = Acton
 - 2 = Georgetown
 - 3 = Milton
 - 4 = Oakville Southeast
 - 5 = Oakville Southwest
 - 6 = Burlington

APPENDIX 3

Crop Plan - Data Entry Sheet

REGION OF HALTON
AUTOMATED SLUDGE MANAGEMENT SYSTEM

CROP PLAN

OPERATOR: _____

NUMBER: _____

FIELD NO.				82		83		84		85		86				
				P	C	P	C	P	C	P	C	P	C			
#	#	#	#	-	#	#	-	#	#	-	#	#	-	#	#	
A																A
B																B
C																C
				-	#	#	-	#	#	-	#	#	-	#	#	
D																D
E																E
F																F
				-	#	#	-	#	#	-	#	#	-	#	#	
G																G
H																H
I																I
				-	#	#	-	#	#	-	#	#	-	#	#	
J																J
K																K
L																L
				-	#	#	-	#	#	-	#	#	-	#	#	
M																M
N																N
O																O

P - PREFERABLE CROP
C - CROP GROWN

APPENDIX 3 (cont'd)

Notes on Completion of Crop Plan Data Sheet

PREFERABLE CROP (P)

0 = unknown
1 = first
2 = second
3 = third
4 = fourth
5 = fifth
9 = no sludge

CROP GROWN (C)

00 = unknown
01 = corn (grain)
02 = corn (silage)
03 = grass
04 = winter cereals
05 = spring cereals
06 = legumes
07 = beans (soy, white, peas)
08 = fallow
09 = others (usable for sludge)
10 = others (not usable for
sludge)

APPENDIX 5

Restricted Areas - Data Entry Sheet

REGION OF HALTON
 AUTOMATED SLUDGE MANAGEMENT SYSTEM
 RESTRICTED AREAS

RESTRICTION NO.			COORDINATES		RESTRICTION DISTANCE	RESTRICTION CLASS
-	-	-	#	#	-	-
A						
B						
C						
	-	-	#	#	-	-
D						
E						
F						
	-	-	#	#	-	-
G						
H						
I						
	-	-	#	#	-	-
J						
K						
L						
	-	-	#	#	-	-
M						
N						
O						

APPENDIX 5 (cont'd)

Notes on Completion of Restricted Areas Data Sheet

RESTRICTION NO.

Each restriction has its own number. Numbers are from 0 to 999.

CO-ORDINATES

Kilometers North (KMN) and Kilometers East (KME).
Numbers from 0 to 9999.

RESTRICTION DISTANCE

The radius distance (in kilometers) of the restricted use zone from the co-ordinate.

RESTRICTION CLASS

Numbers from 0 - 9.

AUTOMATED SLUDGE MANAGEMENT SYSTEM
SOIL METALS

APPENDIX 6

Soil Metals - Data Entry Sheet

GRID NO.	As		Cd		Co		Cr		Cu		Hg		Mo		Ni		Pb		Se		Zn			
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	C	
	#	#	<	-	#	#	-	-	#	#	-	-	<	#	-	-	#	#	-	-	-	-	#	#
	#	#	;	;							;	;									;	;		
	#	#	;	;	#	#	-	-	#	#	;	;			#	#	-	-	#	#	;	;		
	#	#	;	;							;	;	;	;							;	;		
	#	#	;	;	#	#	-	-	#	#	;	;	;	;	#	#	-	-	#	#	;	;		
	#	#	;	;							;	;	;	;							;	;		
	#	#	;	;	#	#	-	-	#	#	;	;	;	;	#	#	-	-	#	#	;	;		
	#	#	;	;							;	;	;	;							;	;		
	#	#	;	;	#	#	-	-	#	#	;	;	;	;	#	#	-	-	#	#	;	;		
	#	#	;	;							;	;	;	;							;	;		
	#	#	;	;	#	#	-	-	#	#	;	;	;	;	#	#	-	-	#	#	;	;		
	#	#	;	;							;	;	;	;							;	;		

APPENDIX 7

Specific Field Information

```
*****  
FIELD SEAS CLASS FLAG PH/PHOS METAL --- NA=NOT APPROVED  
***** --- R=CLASS NOT ACCEPTABLE  
90 2 4 0 1
```

SEASONAL CLASS: 2 =SETBACK, INCLUDES FROZEN

FLAG: 4 =FIELD APPROVAL TEST

PH AND PHOSPHORUS ARE UNKNOWN

THERE IS A METAL PROBLEM IN THE GRID NO. 153

APPENDIX 7 (cont'd)

SPECIFIC FIELD INFORMATION

Possible constraints that can restrict the sludging of fields are referred to as flags in the program and include the following:

- A. STATUS WARNING*, RESTRICTED AREAS (section 2.6)
- B. REDUCED RATE OF APPLICATION
- C. SEASONAL ACCESS FACTOR (section 2.2)
- D. FIELD APPROVAL TEST (section 4.6)

- * STATUS WARNING includes information about fields:
- if they are tile drained,
 - if there are runoff or erosion problems, and
 - the spring access date.

The FLAGS contain the following constraints:

<u>FLAG #</u>	<u>CONSTRAINT</u>	<u>FLAG #</u>	<u>CONSTRAINT</u>
0	no problem	8	B,C,D
1	A	9	A,B
2	B	10	A,B,C
3	C	11	A,B,D
4	D	12	A,B,C,D
5	B,C	13	A,C
6	B,D	14	A,C,D
7	C,D	15	A,D

OTHER FACTORS that affect the acceptability of a field to be sludged are the pH and phosphorus values of the fields and the metal contents of the grids.

The results found in the "PH/PHOS"-column refer to:

- 0 - pH and phosphorus are unknown
- 1 - pH => 6 and P < 30 (acceptable)
- 3 - pH < 6 and P < 30: pH is too low, field requires 'Buffer pH' test to determine amount of liming required.
- 4 - pH < 6 and P=30-60: pH is too low, field requires 'Buffer pH'test to determine amount of liming required.
- 9 - Field is rejected: phosphorus level is too high (>60).

The results in the "METAL"-column refer to:

0 - no metal problem

1 - there is a metal problem in grid no. ____.

APPENDIX 8

Winter Fields

FIELDS FOR WINTER SPREADING

FLD	SF	HA	FLD	SF	HA
1	7	23.8 A	25	7	16.0 A
100	7	29.7 AS	145	8	14.1 AS
320	7	19.6 S	344	7	30.3
366	8	30.5 AS	378	8	17.5
420	7	19.3 AS	465	8	31.5
466	8	29.1	470	8	51.5
474	8	46.3	475	8	30.5 S
476	8	33.1	477	8	19.4
480	8	37.3	499	8	36.2
505	8	16.9	506	7	28.3
517	8	39.6	519	8	16.8
520	7	28.9	524	7	34.9
531	7	25.3	533	7	27.7
542	7	24.7 AS	543	7	27.3 A
544	7	24.6 A	605	7	21.3
606	7	21.2	608	7	20.2
668	7	23.5	670	7	12.5
676	7	25.0	678	7	18.1
701	7	20.2 AS	713	7	21.3 AS
719	2	41.0 AS	721	7	20.1 A
739	8	33.7 A	740	7	31.0 A

A=FLD HAS BEEN APPROVED

S=FLD HAS BEEN SLUDGED IN LAST 5 YEARS

APPENDIX 9

Farmer's Report

FARMER'S REPORT

STADLER S
RR#4
POSTAL CODE: L9T 2X8

MILTON
PHONE: 878 2528

DATUM NO.: 3 FIELD NO.: 15

LOCATION
TOWNSHIP: TRAFALGAR LOT: 6 CONC.: 5

TOTAL AREA OF FIELD: 12.5 HA

SEASONAL ACCESS FACTORS

SPRING:NO CONSTRAINTS
FALL:NO CONSTRAINTS

SUMMER:NO CONSTRAINTS
WINTER:NO CONSTRAINTS

LEASE EXPIRY DATE: 12.82

OWNER: UNKNOWN

DISTANCES TO:

WELL: => 90 METER
SURFACE WATER: 0-60 METER
HOUSE: => 90 METER

GROUND WATER: > 1.5 METER
BEDROCK: > 1.5 METER
RESIDENTIAL AREA: > 450 METER

SOIL CAPABILITY: CLASS 1

SLOPE: 0-3%

SOIL TYPE: CLAY LOAM
PHOSPHORUS LEVEL: UNKNOWN

PERMEABILITY: MODERATE TO SLOW
PH: UNKNOWN

TILE DRAINED: NO

ON LAND IN SPRING: MIDWAY (APRIL 15)

FLOOD PROBLEMS: UNKNOWN
EROSION INTO WATER COURSE: NO

APPENDIX 10

Status Report

STATUS REPORT

NUMBER OF FIELDS IN THE PROGRAM: 773 TOTAL AREA (HA): 5448.6
NUMBER OF APPROVED FIELDS: 437 TOTAL AREA (HA): 2851.2
NUMBER OF SLUDGED FIELDS (LAST 5 YEARS): 213 TOTAL AREA (HA): 1477.6
NUMBER OF FIELDS AVAILABLE FOR SPREADING: 224

CLASS	WINTER	SPRING	SUMMER	FALL
0	NA.	NA	220	220
1	0	0	358	358
2	1	0	158	158
3	0	0	NA	NA
4	0	15	NA	NA
5	0	0	NA	NA
6	0	1	NA	NA
7	25	0	NA	NA
8	16	345	NA	NA
9	731	412	37	37

APPENDIX 11

Field Approval Test

FIELD APPROVAL TEST

TEST RESULTS FOR DATUM NO. 3

WELL	=> 90 METER	ADEQUATE DISTANCE	
PERMEABILITY	MODERATE TO SLOW		
GROUND WATER	> 1.5 METER	ADEQUATE DEPTH	
SLOPE	0-3%		
SURFACE WATER	0-60 METER		XXXX
BEDROCK	>1.5 METER	ADEQUATE DEPTH	
HOUSE	=>90 METER	ADEQUATE DISTANCE	
RESIDENTIAL AREA	>450 METER	ADEQUATE DISTANCE	
PHOSPHORUS LEVEL	UNKNOWN		????
PH	UNKNOWN		????

APPROVAL STATUS: APPROVED

APPENDIX 12

Process Review

=====

PROCESS REVIEW OAKVILLE SE

COMPARISON WITH HISTORICAL DATA

PARAMETER	VS. HISTORICAL AVERAGE	VS. LAST MONTH	CHANGE
ARSENIC MG/L	-77 %	-70 %	*****
CADMIUM MG/L	-97 %	-96 %	*****
COBALT MG/L	+91 %	+117 %	*****
CHROMIUM MG/L	+43 %	+371 %	EXTREME CHANGE
COPPER MG/L	+19 %	+241 %	EXTREME CHANGE
MERCURY UG/L	+96 %	+285 %	EXTREME CHANGE
MOLYBDENUM MG/L	+18 %	+28 %	***
NICKEL MG/L	+35 %	+113 %	*****
LEAD MG/L	+42 %	+600 %	EXTREME CHANGE
SELENIUM MG/L	+11 %	+12 %	*
ZINC MG/L	+38 %	+375 %	EXTREME CHANGE
%TS RAW	+31 %	+6 %	
%TS DIGESTED	+5 %	-17 %	**
VS RAW %	+17 %	+50 %	*****
VS DIGESTED %	+4 %	+11 %	*
VOL ACIDS MG/L	+41 %	+217 %	EXTREME CHANGE
PH	+1 %	+7 %	
ALKALINITY MG/L	-13 %	+4 %	
TOT PHOSPHORUS	+26 %	+50 %	*****
TKN	+27 %	+60 %	*****
AM. NITROGEN	+18 %	+23 %	**
NITRATE NITROGEN	+37 %	+5 %	
POTASSIUM	+23 %	+17 %	**

=====

POSSIBLE DIGESTER UPSET: VOLATILE ACIDS > 500 IS TOO HIGH
 POSSIBLE DIGESTER UPSET: PH OUTSIDE 6.5-7.5 RANGE
 POSSIBLE DIGESTER UPSET: ALKALINITY > 2500 IS TOO HIGH

REVIEW COMPLETE

=====

APPENDIX 13

Sludge Annual Quality Reports

SLUDGE GENERAL DATA REPORT OAKVILLE SE

	%TS RAW	%TS DIGE	VS RAW %	VS DIGES	VOL ACID	PH	ALKALINI
SEP	9.50	5.00	75.00	50.00	950.00	7.50	2295.00
AUG	9.00	6.00	50.00	45.00	300.00	7.00	2200.00
JUL	6.00	5.00	80.00	45.00	1000.00	8.00	3000.00
JUN	9.00	5.00	70.00	50.00	990.00	7.80	2955.00
MAY	10.00	6.00	80.00	55.00	1000.00	8.00	3000.00
APR	7.00	4.50	55.00	49.00	500.00	7.20	2550.00
MAR	2.50	2.00	50.00	45.00	250.00	6.50	2100.00
FEB	_____	_____	_____	_____	_____	_____	_____
JAN	_____	_____	_____	_____	_____	_____	_____
DEC	_____	_____	_____	_____	_____	_____	_____
NOV	_____	_____	_____	_____	_____	_____	_____
OCT	_____	_____	_____	_____	_____	_____	_____
HISTORICAL AVERAGES							
	7.57	4.79	65.71	48.43	712.86	7.43	2585.71

SLUDGE NUTRIENTS REPORT OAKVILLE SE

	TOT PHOS	TKN	AM.NITRO	NITRATE	POTASSIU	SPARE	SPARE
SEP	4500.00	4800.00	1170.00	23.00	140.00	_____	_____
AUG	3000.00	3000.00	950.00	22.00	120.00	_____	_____
JUL	4999.00	4950.00	1190.00	23.00	140.00	_____	_____
JUN	4500.00	4700.00	1100.00	20.00	145.00	_____	_____
MAY	5000.00	5000.00	1200.00	25.00	150.00	_____	_____
APR	2500.00	3000.00	900.00	10.00	70.00	_____	_____
MAR	1500.00	2100.00	600.00	1.00	60.00	_____	_____
FEB	_____	_____	_____	_____	_____	_____	_____
JAN	_____	_____	_____	_____	_____	_____	_____
DEC	_____	_____	_____	_____	_____	_____	_____
NOV	_____	_____	_____	_____	_____	_____	_____
OCT	_____	_____	_____	_____	_____	_____	_____
HISTORICAL AVERAGES							
	3714.14	3935.71	1015.71	17.71	117.86	0.00	0.00

APPENDIX 13 (cont'd)

SLUDGE AMMONIA/METAL RATIOS OAKVILLE SE

	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER M	MERCURY	MOLYBDEN
SEP	7953.3	> 10000	183.5	14.9	15.9	3.0	1549.4
AUG	1944.0	972.0	324.0	57.2	44.2	9.3	1620.0
JUL	1010.8	1213.0	247.6	22.1	12.3	4.1	2426.0
JUN	1258.4	658.8	243.5	11.3	11.8	4.0	1178.9
MAY	1361.1	615.6	250.0	12.3	12.3	4.1	1361.1
APR	2022.2	758.3	303.3	15.2	18.2	5.1	1654.5
MAR	> 10000	> 10000	> 10000	120.2	50.1	10.0	1502.5
FEB	----	----	----	----	----	----	----
JAN	----	----	----	----	----	----	----
DEC	----	----	----	----	----	----	----
NOV	----	----	----	----	----	----	----
OCT	----	----	----	----	----	----	----

	NICKEL M	LEAD MG/	SELENIUM	ZINC MG/	SPARE	SPARE
SEP	140.4	8.5*	2651.1	2.5*	----	----
AUG	243.0	48.6	2430.0	9.7	----	----
JUL	121.4	8.1*	2021.7	2.4*	----	----
JUN	117.9	7.7*	2488.9	2.3*	----	----
MAY	123.7	8.2*	2450.0	2.5*	----	----
APR	267.6	7.6*	2676.5	2.0*	----	----
MAR	601.0	120.2	4006.7	24.0	----	----
FEB	----	----	----	----	----	----
JAN	----	----	----	----	----	----
DEC	----	----	----	----	----	----
NOV	----	----	----	----	----	----
OCT	----	----	----	----	----	----

* INDICATES RATIO IS BELOW LIMIT

APPENDIX 13 (cont'd)

SLUDGE METALS REPORT OAKVILLE SE

	ARSENIC	CADMIUM	COBALT	CHROMIUM	COPPER M	MERCURY	MOLYBDEN
SEP	0.15	0.04	6.50	80.00	75.00	400.00	0.77
AUG	0.50	1.00	3.00	17.00	22.00	104.00	0.60
JUL	1.20	1.00	4.90	55.00	99.00	298.00	0.50
JUN	0.89	1.70	4.60	99.00	95.00	280.00	0.95
MAY	0.90	1.99	4.90	100.00	100.00	300.00	0.90
APR	0.45	1.20	3.00	60.00	50.00	180.00	0.55
MAR	0.02	0.02	0.03	5.00	12.00	60.00	0.40
FEB	-----	-----	-----	-----	-----	-----	-----
JAN	-----	-----	-----	-----	-----	-----	-----
DEC	-----	-----	-----	-----	-----	-----	-----
NOV	-----	-----	-----	-----	-----	-----	-----
OCT	-----	-----	-----	-----	-----	-----	-----

HISTORICAL AVERAGES

0.59 0.99 3.85 59.43 64.71 231.71 0.67

	NICKEL M	LEAD MG/	SELENIUM	ZINC MG/	SPARE	SPARE
SEP	8.50	140.00	0.45	475.00	-----	-----
AUG	4.00	20.00	0.40	100.00	-----	-----
JUL	9.99	150.00	0.60	499.00	-----	-----
JUN	9.50	145.00	0.45	490.00	-----	-----
MAY	9.90	150.00	0.50	500.00	-----	-----
APR	3.40	120.00	0.34	450.00	-----	-----
MAR	1.00	5.00	0.15	25.00	-----	-----
FEB	-----	-----	-----	-----	-----	-----
JAN	-----	-----	-----	-----	-----	-----
DEC	-----	-----	-----	-----	-----	-----
NOV	-----	-----	-----	-----	-----	-----
OCT	-----	-----	-----	-----	-----	-----

HISTORICAL AVERAGES

6.61 104.29 0.41 362.71 0.00 0.00

APPENDIX 15

Print File Data For Sludge Storage

LOCATION	% FULL	DAYS LEFT	PRODUCTION M3/DAY	AVAILABLE SLUDGE: CAP.-M3	TRUCKLOADS	LAST UPDATE
OAKVILLE SE	9.5 %	151	90.00	1420	41 @ 35 CU.M	83 10 14
OAKVILLE SW	0.0 %			0	0 @ 10 CU.M	83 10 14
MID-HALTON	0.5 %	199	10.00	10	0 @ 35 CU.M	83 09 14
BURL. SKYWAY	1.0 %	495	10.00	50	5 @ 10 CU.M	83 10 15
MILTON-AEROBIC	3.3 %	193	30.00	200	8 @ 25 CU.M	83 10 07
MILTON-ANAEROBI	0.5 %	199	35.00	35	1 @ 25 CU.M	83 10 10
ACTON	0.7 %	596	5.00	20	1 @ 20 CU.M	83 10 11
GEORGETOWN	1.0 %	198	10.00	20	1 @ 25 CU.M	83 10 10
LAWRENCE LAGOON	0.5 %	995	40.00	200	7 @ 30 CU.M	83 10 13

APPENDIX 16

Blending Calculation Results

=====

BLENDING CALCULATION RESULTS : QUALITY DATA--HISTORICAL

=====

SOURCE:	PERCENT
OAKVILLE SE	50.00
OAKVILLE SW	30.00
MID-HALTON	20.00

=====

BLENDING QUALITY

ARSENIC MG/L	0.49
CADMIUM MG/L	0.69
COBALT MG/L	4.55
CHROMIUM MG/L	75.50
COPPER MG/L	79.50
MERCURY UG/L	337.00
MOLYBDENUM MG/L	0.80
NICKEL MG/L	8.13
LEAD MG/L	141.00
SELENIUM MG/L	0.46
ZINC MG/L	288.50
%TS RAW	8.40
%TS DIGESTED	5.05
VS RAW %	70.50
VS DIGESTED %	50.70
VOL ACIDS MG/L	862.50
PH	7.39
ALKALINITY MG/L	2577.50
TOT PHOSPHORUS	3950.00
TKN	4550.00
AM. NITROGEN	1070.00
NITRATE NITROGEN	21.90
POTASSIUM	124.00

=====

AMMONIA/METALS RATIOS

ARSENIC MG/L	2251.34	
CADMIUM MG/L	1582.46	
COBALT MG/L	239.98	
CHROMIUM MG/L	14.46	
COPPER MG/L	13.73	
MERCURY UG/L	3.24	
MOLYBDENUM MG/L	1373.46	
NICKEL MG/L	134.31	
LEAD MG/L	7.74	-BELOW LIMIT VALUE OF 15
SELENIUM MG/L	2378.87	
ZINC MG/L	3.78	-BELOW LIMIT VALUE OF 4

APPENDIX 17

Forecast Sludge Production

LOCATION	M3/D/1000 PEOPLE	DAILY SLUDGE PRODUCTION-CU.M						
		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 10	YEAR 20
WAKVILLE SE	2.11	2.11	2.57	6.33	8.44	10.55	12.66	16.71
WAKVILLE SW	1.10	22.00	24.20	3.85	4.40	5.50	6.60	7.70
MID-HALTON	2.60	9.10	11.54	12.12	15.60	18.20	26.00	31.20
BURL. SKYWAY	1.22	138.10	141.52	142.74	144.81	146.28	173.73	207.40
MILTON-AEROBIC	1.40	2.66	3.64	4.90	5.60	7.00	7.00	7.00
MILTON-ANAEROBIC	2.60	55.90	60.32	62.92	64.74	66.30	67.34	67.34
WACTON	1.20	84.48	86.76	87.36	87.84	88.20	103.56	120.00
GEORGETOWN	1.40	24.92	25.34	25.62	25.76	26.04	40.74	56.00
LAWRENCE LAGOON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REGIONAL TOTALS		339	356	346	357	368	438	513

APPENDIX 19

Sludge Quality Data Entry Blanks

 DATA ENTRY: OAKVILLE SE

METALS

	LOW LIMIT	HIGH LIMIT	DATA
ARSENIC MG/L	0.01	0.99	.....
CADMIUM MG/L	0.01	1.99	.....
COBALT MG/L	0.01	4.99	.....
CHROMIUM MG/L	2.00	100.00	.....
COPPER MG/L	10.00	100.00	.....
MERCURY UG/L	50.00	300.00	.....
MOLYBDENUM MG/L	0.20	0.99	.....
NICKEL MG/L	0.10	9.99	.....
LEAD MG/L	4.00	150.00	.....
SELENIUM MG/L	0.10	0.50	.....
ZINC MG/L	20.00	500.00	.....

 GENERAL CHARACTERISTICS

	LOW LIMIT	HIGH LIMIT	DATA
%TS RAW	2.00	10.00	.....
%TS DIGESTED	2.00	6.00	.....
VS RAW %	45.00	80.00	.....
VS DIGESTED %	40.00	55.00	.....
VOL ACIDS MG/L	200.00	1000.00	.....
PH	6.00	8.00	.....
ALKALINITY MG/L	2000.00	3000.00	.....

 NUTRIENTS

	LOW LIMIT	HIGH LIMIT	DATA
TOT PHOSPHORUS	1000.00	5000.00	.....
TKN	2000.00	5000.00	.....
AM. NITROGEN	500.00	1200.00	.....
NITRATE NITROGEN	0.00	25.00	.....
POTASSIUM	50.00	150.00	.....

 PREP BY ENTERED ON BY

COMMENTS:
