

Illinois State Water Survey Division

GROUND-WATER SECTION

AT THE

UNIVERSITY OF ILLINOIS



SWS Contract Report 417

RCRA MONITORING DATABASE DEVELOPMENT PROJECT

*by Susan C. Schock, Ann M. Johnson, Julie Rose,
Maxine Peyton, and Tyrie Smith*

Prepared for the
Illinois Department of Energy and Natural Resources

Champaign, Illinois

March 1987



Illinois Department of Energy and Natural Resources

ACKNOWLEDGMENTS

This project was funded under a grant from the Illinois Department of Energy and Natural Resources (DENR). The study team wishes to thank the staff at DENR who helped to implement the grant, especially Tim Warren and David Baker. Illinois State Water Survey (ISWS) staff who helped immeasurably with this project were Anna Zahn and Jim Kirk, whose unfaltering help with all aspects of the computer made the progress of the work possible. The second author of this report, Ann M. Johnson, who is no longer with the Survey, planned and initiated the workplans for the project. Her thoroughness and care made the achievement of the goals of the project possible. Those staff who remained after her departure for graduate school are grateful to her for her efforts. Gail Taylor edited the report, and Gloria Marsh performed the mechanical reproduction of the report.

Mary Cruse and Steve VanHook of the Illinois Environmental Protection Agency (IEPA) helped by organizing and supplying the raw information. Their continuing help with problems and questions is deeply appreciated. Bob Miller and Dick Blankenship, also with the IEPA, processed both the tapes from which we took the initial data and those which we created for their system. They supplied the documentation used to develop the data entry programs and the tape structures for return to their system.

ABSTRACT

The Illinois State Water Survey (ISWS) has developed a database containing the Resource Conservation and Recovery Act (RCRA) data collected by the Illinois Environmental Protection Agency (IEPA) over the past several years. These data were not computerized by the IEPA because of time, money, and personnel shortages. The cooperation of the ISWS with the IEPA has resulted in these data becoming available in an interactive relational database management system. The database will be useful to researchers and those who enforce the RCRA regulations.

The data in the database are the concentrations of chemicals determined in the analyses of samples taken from ground-water monitoring wells. These samples were collected at sites around the state which are being monitored under RCRA regulations and/or state monitoring programs for management of hazardous wastes.

CONTENTS

Acknowledgments	i
Abstract	ii
Figures	v
Abbreviations Used in This Report.....	vi
Background	1
RCRA - Source of the Data	1
IEPA Data Situation in 1986.....	2
Hardware and Software.....	3
Phase I - Data Processing and Tape Creation.....	4
Data Receipt.....	4
Pre-Processing of Raw Data.....	4
Information in the Data Fields.....	6
Data Entry.....	12
Data File Processing.....	12
Creation of Tape for the IEPA.....	15
Archive Final Data Files.....	16
Phase II - Database Development.....	17
Receipt of IEPA Tapes.....	17
Downloading of Data from Tape.....	17
Pre-Processing of Data Downloaded from Tape.....	17
Movement of Data to the Database Host.....	18
Creation of the R:Base Data File Structures.....	18
Loading the Data into the Database.....	19
Use of the Database.....	19
Appendix A. Some Definitions Used in RCRA Regulations.	21

CONTENTS (concluded)

Appendix B. STORET Codes in the Current RCRA Monitoring Database.....23

 A. Alphabetic Order.....23

 B. Numeric Order.....29

 C. Dummy Codes Used Temporarily in the RCRA Monitoring Database.....35

Appendix C. Data Entry Program.....36

Appendix D. Program to Fill Out the Value Field with Zeros When the Data Have a Fixed Format.....44

Appendix E. Program to Fill Out the Value Field with Zeros When the Data Have a Variable Format.....46

Appendix F. Batch Job to Create IEPA Tape.....49

FIGURES

Figure 1.	Example of Data Entered with Fixed Position	13
Figure 2.	Example of Raw Data as Entered	14
Figure 3.	Data After Padding the Value Field with Zeros.....	14
Figure 4.	Phase I - Data Entry and Tape Creation for IEPA.....	16
Figure 5.	Phase II - Database and Software Applications Development.....	20

ABBREVIATIONS USED IN THIS REPORT

DENR - Department of Energy and Natural Resources

DOT - Department of Transportation

GNC - General Non-Compliance

IEPA - Illinois Environmental Protection Agency

ID - Identification number

ISWS - Illinois State Water Survey (

Kb - kilobyte (1000 bytes)

Mb - megabyte (1000000 bytes)

PC - Personal Computer

PCB - Pollution Control Board

PCM - Permit Conditions Master

RCRA - Resource Conservation and Recovery Act

STORET - STORage and RETrieval System

USEPA - United States Environmental Protection Agency

WATSTOR - WATER Information STORAge System

WQANM - Water Quality Analysis Master

RCRA MONITORING DATABASE DEVELOPMENT PROJECT

by Susan C. Schock, Ann M. Johnson, Julie Rose,
Maxine Peyton, and Tyrie Smith

BACKGROUND

RCRA - Source of the Data

The Resource Conservation and Recovery Act (RCRA) of 1974 is a federal regulatory program established to create guidelines for the management and control of hazardous waste from its generation to its final disposal. Permitted treatment, storage, and disposal facilities have been placed on compliance schedules. The facility owners have been given time to upgrade their facilities to meet the requirements of the regulations. In Illinois, the records of the permitting, manifesting and monitoring system are kept by the Illinois Environmental Protection Agency (IEPA). The United States Environmental Protection Agency (USEPA) and the other states have similar programs in place, in addition to RCRA, to control air and water pollution and restrict unsafe pesticide use.

Regulations in matters of the generation, movement, and disposal of hazardous wastes are necessary since the long-term consequences of inadequate hazardous waste management include the potential for serious surface- and ground-water contamination, the direct contact poisoning of humans and animals, air pollution, and the more immediate and serious potential for fires and explosions. As a result of the reporting stipulations in the regulations, data on the status, characteristics, volumes, and locations of hazardous and toxic materials have become available. Some of the information generated through the reporting and monitoring aspects of these programs has been used by groups involved in environmental protection in order to determine whether or not sites are in compliance with the regulations.

Runoff of leachate from sites is the most frequent pathway through which contaminants enter the environment from hazardous waste disposal sites. It is necessary to document the components of the waste volumes and all aspects of the generation, treatment, transport, storage, and disposal of wastes to and from these sites in order to have a reasonable estimate of the potential contaminants from these sites, and their concentrations.

The manifest tracking document is a form which was designed to record the movement of hazardous waste from the generator (source) to any authorized off-site treatment, storage, or disposal facility. The information which must be written on the manifest includes a

description of the shipped waste; the class of the hazardous waste as prescribed in the regulations; the quantity, volume, or weight of each waste; the type of container in which the waste was moved or shipped; and the shipper's certification number. This information is then available as data for tracking, monitoring, and research purposes.

Chemical analyses of samples from monitoring points for RCRA sites around the state are required under the RCRA regulations. The reports from these analyses are a valuable part of the data record. They can be used by researchers and enforcement groups to determine the state of the environment at and around regulated sites.

Several definitions used in the regulations determine those who must report and what they must report. Though the strict adherence to these definitions has made it simpler to determine who reports and what must be reported, this strict interpretation of the regulations has at times resulted in a lack of depth and completeness of the information available about these wastes. Some of the definitions as paraphrased from the regulations (Federal Register) appear in Appendix A of this report.

IEPA Data Situation in 1986

The IEPA maintains extensive paper files which contain a variety of chemical analytical and site information concerning RCRA and state monitored sites in Illinois. These data could be useful to researchers at the Department of Natural Resources (DENR) and IEPA, as well as at other agencies including the Illinois State Water Survey (ISWS) and the Pollution Control Board (PCB), if they were accessible for analysis. The information at IEPA includes chemical analytical results of water quality samples from the monitoring wells at the RCRA sites around the state, facility identification numbers, number and type of monitoring wells, and dates of collection.

The project which is the subject of this report was funded by the DENR. One of its purposes was to computerize a large volume of those data which have previously been kept only in paper form. A second purpose was to develop an interactive relational database management system for the use of those data for research purposes.

In October 1985 meetings were begun, with participants from the IEPA, DENR, and ISWS. These meetings were held to determine the volume of uncomputerized data, its variety of forms, and the feasibility of ISWS participation in a cooperative effort between the IEPA and ISWS to organize the data to be entered into an RCRA Monitoring Database by the ISWS. The details of the transfer of the data between the agencies were worked out at subsequent meetings, as well as the required structures for output data and any conventions to be used in formatting the files.

Two phases of effort were agreed upon in the final meeting before the inception of the grant for this project. Phase I is the computerization of current but not computer-available data, and of historical data from sites which are monitored under RCRA regulations and state programs. This data entry had to meet the format specifications required by the IEPA computer system in order to be added to the IEPA data system. Phase II is the creation of a personal computer (PC) based relational database management and application software system for the retrieval of data from the RCRA Monitoring Database System. Applications were to be developed for the production of files for research, analysis and reports from that database. The initial development of the database has been funded by DENR, as was the first year of data entry. There is sufficient volume of data to warrant data entry beyond one year of cooperation. The data that have been entered during the first year will be ready for addition to the original or initial database after that first year, and further update will be warranted as additional data entry takes place at the IEPA and ISWS. Potential funding for these continuing efforts has been suggested by the IEPA only for the data entry phase. No other potential user groups or agencies have shown an interest in further development of the database or applications programs, so that the efforts in that phase may cease for lack of fiscal support.

HARDWARE AND SOFTWARE

The selection of hardware and software for the database development phase of the project was based on several considerations. Since the system to be developed was intended for use by researchers who may not be experts on computers, the system had to be compatible with the common hardware available at most of the agencies, with which researchers may already be familiar. The intention was that users spend their time learning the RCRA Monitoring Database, and not another computer system in general. This need was met by the purchase of IBM equipment since almost every agency has at least one of these computers or a compatible computer in-house. The hardware had to have adequate memory to process large volumes of data, and to store much larger volumes of data. The software had to be "user-friendly" enough that a relatively unsophisticated user could produce lists, reports or files with nothing more than the documentation for the system at hand. .

To fulfill these requirements, the following purchases were made for the development of the system.

HARDWARE:

IBM PC-AT with 512 Kb initial memory and 256 Kb additional memory, 1.2 Mb (high density) disk drive, 20 Mb fixed hard disk drive, keyboard, and six long-user expansion slots.
Enhanced Graphics Adaptor
Amdtek monochrome monitor

HARDWARE (Concluded)

- . Enhanced Color Adaptor
- . 320/360 Kb dual-sided disk drive
- . Tecmar Maestro Board
- . Parallel and Asynchronous Adaptor
- . Epson. FX-286 printer and cable

SOFTWARE:

- . RBase: V version 1.01
- . Clout version 2.0
- . Extended Report Writer
- . DOS version 3.1
- . Microsoft FORTRAN Compiler
- . Basic
- . IBM Professional Editor

These selections were made during the first month of the grant work. Preparation for the data entry phase of the project was made before the arrival of the hardware and software for the database development phase. During this time period, the members of the project team attended a short-course given by the Computer Science Department at the University of Illinois for the use of R:Base V, the selected database management system.

PHASE I - DATA PROCESSING AND TAPE CREATION

Data Receipt

When data were received from the IEPA for entry to the system, the data sheets for each batch received were assigned sequential numbers to identify the order of receipt. A file folder for each batch was clearly marked with the date of receipt of the data, the batch number, and the type of data in the batch. At this point in the process the receipt of the batch of data was logged into a notebook for tracking through the processing phase. In this notebook there was an entry showing the batch number, type, date received, date or dates entered, file names used during the data entry process for future reference, and any comments or remarks by the various team members about each batch of data.

Pre-Processing of Raw Data

A variety of data were received from the IEPA. They were classified by type of data, i.e., the reason for their collection. The types are historic data, RCRA data, general non-compliance data, and ground-water data.

Historic data (H) are sets or accumulated packets of data for the

past several years, for any site, which have not been previously entered into the computer because of time, money and personnel shortages. These data are recorded on different forms, or listed on typewritten sheets, or they may be a combination of site information hand-written onto an analysis report. The data entry personnel must assemble and code all the information required before data entry.

RCRA data (R) are those chemical analyses and support data which have been put on the present standard IEPA form for reports of analyses of samples from monitoring points around sites regulated under RCRA that have been in compliance with the regulations. These data are from sites which have been entered on a continuing basis into the IEPA computer, but which only very recently have been entered at the ISWS because of personnel and time problems at IEPA.

General Non-Compliance data (GNC) are those data for sites regulated by RCRA and state programs which have been removed from the data entry procedure at IEPA for several years because of time, money, and personnel constraints.

Ground-water data (W) are those data which are being collected for sites that are establishing their baseline or background levels during the first year or two after entering the regulatory system.

The GNC data usually come to the ISWS in a form which is ready or nearly ready to be entered into the computer. RCRA and ground-water data are often similarly ready to be entered. Historic data all require pre-processing so the information can be entered into the system in the form required by the IEPA. The pre-processing includes assuring that the support information such as facility ID number, monitoring point number, and replicate number has been identified and fits the format used in the present IEPA system. In addition, Storage and Retrieval System (STORET) codes for all parameters must be written on the sheets to accompany the measured values. STORET is a federal data system developed by USEPA in 1974 for the storage and use of water quality data. A set of codes is kept by the central STORET system offices. Numbers are created for compounds being entered into the system for the first time upon request by a certified contributor such as IEPA. Appendix B is a list of the STORET codes used in the first year of data entry and database development. There is a list in alphabetical order by parameter, a list in numerical order by STORET code, and a list of the "dummy codes" created by the ISWS during the data entry phase. These dummy codes are discussed later in this section. All remaining questions noted on each form either by the IEPA pre-processors or the ISWS staff which may alter the entry codes must be answered before the data are entered.

All of these information items may appear to be very straightforward but frequently are not. Several phone calls and consultations between ISWS staff and IEPA staff may be required to resolve some of the questions which arise.

Information In the Data Fields

Codes and conventions govern the data to be entered. In the case of samples which are collected quarterly, the intervals of collection are determined by the date when those reports are due at the IEPA. The quarters as they are designated by the IEPA and the due dates of the reporting for that quarter are as follows:

Quarter	Due Date (1st of the designated month)
1st	October
2nd	January
3rd	April
4th	July

Before any data can be accepted by the IEPA information system, certain fields or items must be completed. These are the site inventory number, region, county, facility number, monitoring point number, date collected, and STORET number. There are fifteen other fields of data which may or may not contain information. All of the fields are described below.

The Site Inventory Number is the unique IEPA identification number which has been assigned to every site.

The Facility Number is the IEPA identification number given to the facility. A facility may contain more than one site. A site will contain more than one monitoring point, frequently many more. The facility number consists of the Federal Information Processing System (FIPS) county code and a sequential number for the site.

The Monitoring Point Number identifies a specific monitoring well where samples have been collected within a given site. The first character of the monitoring point number identifies the type of monitoring point or well. The digit following that first character gives more information about the type of well being monitored. The codes for the RCRA monitoring well types used in this field are:

G - GROUND-WATER	L - LEACHATE
0,1 or Alpha - Monitor Well	1 = Flow or Seep
2 = Private Well	2 = Pond
3 = Spring	3 = Collection System (riser, sump, etc)
S - SURFACE WATER	X - SPECIAL
1 = Upstream	1 = Soil
2 = Mid-site	2 = Waste
3 = Downstream	3 = Other

The last two digits in the monitoring point number are a sequential numbering which indicates the monitoring point type. For

example, the number G104 is a common monitoring point number. The first letter indicates that this is a sample from a ground-water well. The "1" indicates that this is a monitoring well. The next two digits indicate that this is the fourth well.

Note that the "0" or "Alpha" characters are used only in special situations and that if a private well is used as a routine monitoring point for the required monitoring program, the G1 code rather than the G2 code is used. G2 is reserved for private wells sampled for private well inventories which are not part of the required monitoring program.

At some ground-water monitoring sites there are nested wells. This is a more complex identification problem than that given in the example above. Each point in the nest must be given a unique number. The monitoring point identifier is composed of four characters. The first character is the letter G, indicating ground-water. Two digits follow which show the numbering of the nested locations. The last character of the monitoring point number is used to signify whether the well is shallow (S), upper middle (U), middle (M), lower middle (L), or deep (D).

If there is a nested location number such as 0, 30, or 40, there may be confusion since those beginning digits signify a particular ground-water monitoring type as given above (i.e., "2" designates a private well and "3" designates a spring). A conversion has been created for these situations. These conversions are as follows:

A = 20's	A4 = 24
B = 30's	B6 = 36
C = 40's	C3 = 43
D = 50's	D7 = 57
E = 60's	E9 = 69
F = 70's	F2 = 72
G = 80's	G5 = 85
H = 90's	H8 = 98

For a facility with four nested wells numbered 7, 14, 26 and 32 (one shallow and one deep at each location), the following conversion would be used.

Site Well Number	Conversion
7 shallow	G07S
7 deep	G07D
14 shallow	G14S
14 deep	G14D
26 shallow	GA6S
26 deep	GA6D
32 shallow	GB2S
32 deep	GB2D

Finally, when there are more than 99 sampling points at a site, a more complex system of conversion is used to ensure that the wells have a number which in combination with the site number will yield a truly unique identification number. The conversion is as shown below. In each case, the conversion for a sequence of wells is given in the first column, and an example of a well to be numbered is given in the second column.

Conversion	Example	Conversion	Example
A = 100's	A3 = 103	N = 230's	N3 = 233
B = 110's	B4 = 114	O = 240's	00 = 240
C = 120's	C2 = 122	P = 250's	P1 = 251
D = 130's	D1 = 131	Q = 260's	Q5 = 265
E = 140's	E5 = 145	R = 270's	R7 = 277
F = 150's	F9 = 159	S = 280's	S9 = 289
G = 160's	GO = 160	T = 290's	T6 = 296
H = 170's	H1 = 171	U = 300's	U7 = 307
I = 180's	I7 = 187	V = 310's	V8 = 318
J = 190's	J9 = 199	W = 320's	W1 = 321
K = 200's	K2 = 202	X = 340's	X5 = 345
L = 210's	L5 = 215	Y = 350's	Y7 = 357
M = 220's	M6 = 226	Z = 360's	Z2 = 362

When a facility replaces a ground-water monitoring point because the existing point has been damaged, destroyed, or found to be continually dry or because a sample cannot be collected for any reason, a new monitoring point number needs to be assigned to the replacement point. A replacement point is one that is located in the same general area and monitors the same hydrogeologic zone as the point it is replacing. In order to distinguish the new point as a replacement point, the letter "R," "A," "B," "C," etc. is used as the first character of the monitoring point identifier. The last three characters are the same as in the old monitoring point number.

The Replicate Number is the number used to denote that replicate analysis measurements, numbered in sequence, have been run on this sample.

The Remarks field tells the various reasons why the test for a particular constituent was not performed. The list below gives the possible entries in the remarks field and their explanations.

- - Negative value
- A - Well does not allow access to measure depth to water or total depth
- B - Field measuring equipment breakdown or malfunction
- C - Value reported is larger than space provided, see lab comment section for value
- D - Value was calculated, or estimated
- E - Sample bottle broken in transit to lab

- F - Sample not properly preserved for this constituent
- G - Sample was discarded before constituent was analyzed
- H - Lab accident, sample lost
- I - Not enough sample to analyze for constituent
- J - Sample interference, could not analyze for constituent
- K - Presence of constituent verified but not quantified
- L - Sample analyzed but analysis lost
- M - Sample lost
- U - Constituent was analyzed for but not detected
- X - Remarks not listed above, see lab comment section or collector comment section

Collection date is the date the sample was collected from the monitoring well.

EPA Lab is the field which indicates that the sample was collected by IEPA personnel and analyzed by an IEPA laboratory. Some sites have their own collectors and submit analyses to independent, certified labs.

The Greater-than/Less-than field is used to show that a constituent which was measured has less than or greater than the limits measurable by the method used for analysis. The appropriate mathematical symbol (i.e., < or >) is used to indicate this information.

Reporting level is the field used to indicate the position of the last significant digit in the measured value field. For example, iron is analyzed and found to be present at a level of 1560.0 ug/l. If the reporting level is 1R, the 0 to the right of the decimal point is the last significant digit. If on the other hand the reporting level were 2L, the 6 to the left of the decimal point would be the last significant digit.

The Value field contains the value measured for the constituent of interest. The field is a 10-place field into which the value has been placed, assuming that the decimal point is between the fifth and sixth places. During pre-processing the staff checks to see that the units reported fit the standard units as designated in the format. If the units do not match, a conversion is performed.

Report due date indicates the reporting period for the sample analyses submitted.

An "X" in the Background Sample field indicates that the sample collected is part of the establishment of the background or "initial quality" data for the monitoring point.

Time Collected indicates the time that the sample was collected. It is reported in military format, which is the hour based on twenty-four hours, the minutes, and the seconds.

Date Collected is the date the sample is collected from the monitoring point. The date must be entered numerically in month, day, year order.

The Unable to Collect Sample field is used if there is indication that a sample could not be collected. The list below shows the codes used in this field and their explanations.

- A - Sampling equipment malfunction
- B - Monitoring point could not be located
- C - Area flooded; could not get to monitoring point
- D - Stream dry
- E - Stream frozen
- F - Pond dry
- G - Pond frozen
- H - Well not yet installed
- I - Well dry
- J - Well damaged or destroyed
- K - Well obstructed
- L - Well silted in
- X - None of the above, See Collector Comment for reason

The Monitoring Point Sample Method field indicates the method used to collect the sample at the monitoring point. Those codes and their explanations are given below.

- 1 - Bailer of a type not otherwise indicated below
- 2 - Pump of a type not otherwise indicated below
- 3 - Other. Sampling method not specified below
- A - Bailer---Teflon
- B - Bailer---PVC
- C - Bailer---Plastic other than above
- D - Bailer---Galvanized
- E - Bailer---Copper
- F - Bailer---Stainless steel
- G - Bailer---Metal other than above
- H - Pump---Suction lift
- I - Pump---Submersible
- J - Pump---Air lift
- K - Pump---Gas lift
- L - Pump---Squeeze or bladder
- M - Grab---Using a dipper
- N - Grab---Using a weighted bottle
- O - Grab---Using a sample bottle
- P - Grab---Glass "thieving" tube
- Q - Grab---Other than above
- R - Tap---Off a distribution line

Sample Appearance is a description of the physical characteristics of the sample at time of collection. This includes such things as turbidity, color, or odor.

Collector Comments are any comments made by the sample collector at the time of the sample collection which increase the knowledge or understanding of the sample analysis results.

Lab ID Number is the identification number which designates the laboratory performing the analysis on this sample. The current laboratories used are as follows:

000B = Champaign
000C = Chicago
000D = Springfield

The Federal ID Number is the identification number which has been assigned to a federally tracked site by the USEPA.

Time Card Program. Date Received and IEPA codes are used for billing and tracking purposes within the IEPA.

Sampling Purpose codes indicate the reason for collecting the sample. These codes are:

- 1 - Special request by the Governor's office, the Director of the IEPA's office, the courts, the Attorney General's office, USEPA, elected officials, etc.
- 2 - Sample associated with criminal enforcement cases
- 3 - Sample associated with emergency response actions
- 4 - Routine sampling associated with day-to-day program activities. These samples would include ground-water monitoring, leachate collection, sampling associated with civil enforcement cases, etc. that are not in response to any of the above.

An "X" in the Sample Field Filtered field indicates that the sample was field-filtered.

STORET Number is a manifestation of the STORET system as described above. It is a 5-digit code number identifying the chemical constituent being reported. In many cases, a STORET code for a chemical compound may not exist yet or may not be readily recognizable. In these cases, an agreement was reached with the IEPA that a set of "dummy codes" would be created such that the codes could be readily selected with the aid of a computer program, and a list of these codes and the compounds for which they were used would be kept. When the new or correct codes are determined, the dummy codes will be replaced. A list of the dummy codes appears as part C of Appendix B of this report.

In most cases, a new STORET number will have to be assigned to a compound by the STORET system creators in Washington, D.C. In the remainder of the cases, when the correct STORET number has been identified by the IEPA staff, the numbers can be substituted into the datasets containing the dummy numbers. The reasoning behind the entry of data with dummy numbers is that all the information for one site and date of collection should be kept together and entered together. In addition, the volume of data to be entered is great enough that to hold out forms for which not all STORET numbers are precisely known would result in the non-entry of more than half of the historic data. Therefore, the use of dummy codes allows the entry and use of a large volume of data whose correct codes are being sought.

Data Entry

Data entry is effected through the use of an interactive data entry program. When the data entry program is initiated, the system prompts the entry person, asking the data entry person for the necessary information, and returns those responses to a data file. Appendix C contains the code for the data entry program. The program was written in FORTRAN 77 for use on an ALTOS computer or any computer with a compatible compiler. The program was later transferred to a VAX 11/750 computer. The program produces a dataset which meets the specifications of the IEPA data system. It was written according to the documentation supplied by IEPA.

After the entry of the data for any given batch, the data entry is verified. During the entry steps, at the time the information from each site has been entered it is written back onto the screen for verification by the data entry person. The second verification is done on the completed and formatted dataset. This kind of checking allows the staff to see such errors as the wrong type of data in a column. For example, a column of data may appropriately contain only one particular letter or number. If a different letter or number is in that column, this formatted checking will make such an error obvious. Between the two types of verification, it has been determined that very few errors remain in the data, if any.

Data File Processing

After entry and verification of the values and support information, files of data are combined and moved to the computer system upon which the computer tape for the IEPA will be made. Some further machine verification of codes will be performed at this time.

During the project, the IEPA data processing staff determined that the IEPA information processing system required a different format for the data in the measured value field of the output files. The requirement was that the value appear in a 10-digit field where the decimal point in the value field is assumed to be between the fifth and

sixth digits, but the decimal point is not printed in the field. In addition, the field must be filled out, before and after the value, with zeros. Unfortunately, this requirement creates a problem for the data users. The field immediately following the measured value field is the "reporting level." According to the IEPA staff, this field shows the level of accuracy which must be met by the laboratory doing the chemical analyses for the particular compound. For example, if a value of 3.40 is entered into the value field, and a reporting level of 2R is given, the assumption can be made that the laboratory has achieved its required level of accuracy. If, however, a value of 3.4 is entered along with the 2R, the assumption can be made that the laboratory has either reported the value incorrectly, or that the required level of accuracy has not been achieved. In either case, the laboratory can be notified that there is a problem and can correct it.

However, if the value of 3.4 is processed to look like 0000340000 with a reporting level of 2R, there is no way for the IEPA staff to know that there is a problem without returning to the original paper forms. Converting the reported analytical values to the padded-out form is time-consuming and negates the benefit of computerizing the data since the researcher must return to the paper file to determine if the laboratory is meeting its requirements. This problem was related to the IEPA staff, and a decision was made by the IEPA that the ISWS should continue to process the value field to fill the requirements of the IEPA data system, but that the IEPA would contact all the laboratories and request that they not send improperly coded forms any longer.

A set of programs was added to the processing procedures to fill out the value field with zeros and positionalize the value in the field to meet the requirements. Two programs to fill out the value field were required since two versions of data entry had been performed. The first set of entries was done with the entry personnel hand-spacing the value to the center of the field and not entering the decimal points. Figure 1 is an example of the data as entered in the first version of the data entry program.

1*LPCSM01A0850250001G105032085	041585041585	1335 NX
2*		
3*LPD0193		
LPCSM02A0850250001G105032085	72019	54 1R
LPCSM02A0850250001G105032085	72008	236 1R
LPCSM02A0850250001G105032085	00011	45 1L
LPCSM02A0850250001G105032085	00941	10 2L
LPCSM02A0850250001G105032085	01046	< 10 2L
LPCSM02A0850250001G105032085	70300	480 2L

Figure 1
Example of Data Entered
with Fixed Position

This version of data entry was used before the IEPA discovered that their system had been rewritten requiring zeros in the field, so no leading and trailing zeros had been entered to this point. Since the production of the original documentation for the IEPA, their in-house data entry program was changed to accommodate the new requirements. However, the documentation was never changed to show this. Therefore, the information that zeros are required does not appear in the system documentation sent to ISWS. The ISWS determined that the method requiring the data entry person to hand-positionalize data was not efficient. Furthermore, such a method makes it easy to make a spacing error in the actual value. Therefore, the data entry system was re-written to allow the data entry person to enter a left-justified value exactly as it appears on the laboratory report sheets. Figure 2 is an example of that data.

```

1*LPCSM01A0110950003G113091086          112686          0810 B
2*RUSTY
3*DNL0021
LPCSM02A0110950003G113091086 72019    41.10    1R
LPCSM02A0110950003G113091086 00400    7.1      1R
LPCSM02A0110950003G113091086 00094    7000.    4L
LPCSM02A0110950003G113091086 00011    56.8     1R
LPCSM02A0110950003G113091086 00335    12000.   3L
LPCSM02A0110950003G113091086 78115    310.     2L

```

Figure 2
Example of Raw Data as Entered

After the more efficient method of entry was developed, the ISWS wrote a procedure to process the data to pad the field with leading and trailing zeros, so files put on tape for the IEPA will fulfill the requirements. Figure 3 is an example of the processed data.

```

1*LPCSM01A0418080001G101101584          011585120684          X0915 2X
2*COLORLESS, SLIGHTLY TURBID
3*JP 0180ANALYSIS DONE BY 3 LABS
LPCSM02A0418080001G101101584 00094 1 00704000001L
LPCSM02A0418080001G101101584 00094 2 00704000001L
LPGSM02A0418080001G101101584 00094 3 00699000001L
LPCSM02A0418080001G101101584 00094 4 00699000001L
LPCSM02A0418080001G101101584 00400 1 00007660002R
LPCSM02A0418080001G101101584 00400 2 00007660002R

```

Figure 3
Data after Padding the Value
Field with Zeros

The two programs which were written to process the two forms of data to fill out the fields with zeros appear in Appendices D and E of this report.

The STORET codes entered are checked with a program which creates a list of all the codes which appear in the file and a count of the frequency of their appearance in the file. This list is used to verify that all codes are either bona fide codes or appear on the list of dummy codes created for the input of parameters without current codes. The frequency-of-appearance numbers are reviewed to assure that any code which appears infrequently is a correct code, and not a data-entry error. The assumption is that an error will probably not be repeated frequently in the same manner within any given set. Therefore, checking all codes that appear in any given file only a few times may yield those which have been entered in error. It also yields a list of those valid codes for compounds which appear only rarely among the analyzed parameters. A running list is kept of all the STORET codes which have appeared at any time in the data which have been entered by the ISWS staff into the RCRA Monitoring Database.

Creation of Tape for the IEPA

A batch job is initiated to create the tape which will be sent to the IEPA. This job executes a compiled module of a program which was written to create a tape which meets the specifications required by the IEPA data system for acceptance by their analysis programs. A listing of the program which makes the tape appears in Appendix F of this report. The batch job also initiates an examination of the tape which has been created by the previous step. The examination creates an output listing which shows the details of the structure of the tape. The examination utility is told no more about the tape than that it is in EBCDIC code and has a density of 1600 bits per inch. The result of the listing then gives all the information needed to assure that the tape is actually in the required format for the IEPA system.

A letter is written to accompany the tape to IEPA. The letter includes the tape name and number of lines contained in the tape. A copy of the examination output is included with the letter. Any problem data which were not entered in the batch are also sent back to the IEPA for solution. These forms are then returned to the ISWS for entry and processing.

At the completion of the verification and processing, the log book is marked so that it reflects the filename, data type, date received, date entered, tapename which will be used to transmit the data to IEPA, date the tape was made, date the tape was sent, and any comments about the tape and the data on it.

Archive Final Data Files

After a tape has been made and sent to the IEPA, all files which have been saved during the processing of the tape are archived on a set of two tapes. The archiving procedure assures that if any problems occur in the future which require checking of the data or remaking of any tape, the data will be available without having to be kept on line. The large volume of data which passes through the system makes this a necessary step.

Figure 4 is a flow chart of the steps carried out in Phase I of this project.

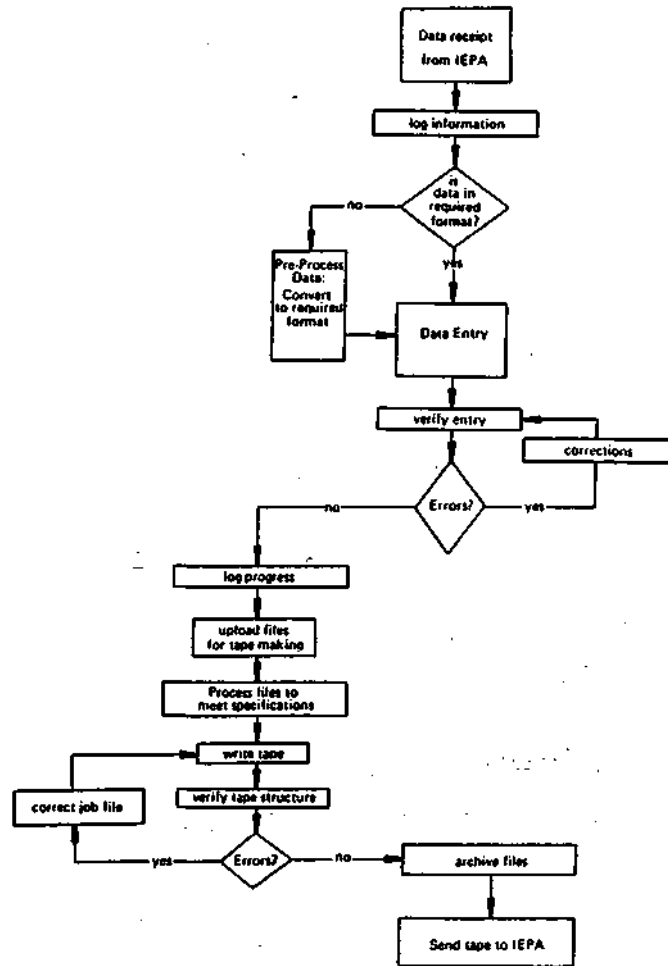


Figure 4
Phase I - Data Entry
and Tape Creation for IEPA

PHASE II - DATABASE DEVELOPMENT

Receipt of IEPA Tapes

Once the hardware which was discussed earlier in this report had been acquired and set up, and the selected software had been installed and tested, the data from IEPA could be processed and moved into the database. The IEPA sent a set of tapes containing the data which were already in its system and which were needed by the ISWS to develop the RCRA Monitoring Database structure on the PC. This information was the total of the data which had been entered into the computer system by the IEPA staff up to the beginning of September 1985. Although the volume of data was expected to increase considerably during the year of this project, the data structures were not expected to change in any appreciable way. Therefore the database development phase could be carried on simultaneously with the data entry phase. The initial data would be installed in the database system. By the time the newly entered data were processed at the IEPA, the method and procedures for installation and the software for retrieval and use would be ready and tested.

The files received from IEPA included the Applications Master, the Water Quality Analysis Master, the Water Quality Standards Master, and the Permit Conditions files. The tapes were logged into the records and all pertinent information was noted for use in reading them. The tapes were submitted to be mounted on the Cyber mainframe computer at the computer center at the University of Illinois.

Downloading of Data from Tape

The procedures for tape reading and initial downloading of data were developed on the Cyber 175 computer, but could be carried out on any system with a FORTRAN compiler and tape drives, with tape reading utilities.

In this situation, a Cyber utility called DEBLOCK was used to download the data from the IEPA tapes. The Water Quality Analysis Master (WQANM) tape was a three-volume tape file which contained all the water quality analyses which had been computerized from the beginning of the IEPA tracking program until the date the tape was made. Since the large volume of data could not be easily manipulated or edited, the file was separated into several segments by site and year groupings and saved. The Permit Conditions Master (PCM) and the Water Quality Standards Master were similarly downloaded from the tapes.

Pre-Processing of Data Downloaded from Tape

Once the tapes had been downloaded to disk, the files had to be separated into the different record types which were to be used to

develop the database on the PC. Several programs were written to separate the records. The programs converted some data to formats which were required by the R:Base V relational database management system. Two basic requirements were to add slashes (/) to the date fields and colons (:) to the time field. A list of the programs written to process the files, and their uses, is given below.

CNTSITE	Source code for the procedure SITECNT
SITEGNT	Program to count and list the different sites in the Water Quality Analysis File (can be used with either the IEPA or R:Base Ready Format)
SEPPCM	Source for PCMSEP
SEPSITE	Source for SITESEP
SEPSITE2	Source for SITESEP2
SEPWQAM	Source for WQAMSEP
SITESEP	Program to separate the lines for a given site from a Water Quality Analysis file from the IEPA format
SITESEP2	Program to separate the lines for a given site from a Water Quality Analysis File in R:Base Ready format
WQAMSEP	Program to separate a Water Quality Analysis file into two files: SUPPORT DATA (Type 1), PARAMETER DATA (Type 2).

Movement of Data to the Database Host

The files which had been separated into different record types and grouped by years were next moved to the PC. The data were then broken into smaller groups to be saved as interim sets. These smaller sets were easier to use and less likely to be lost in case of a machine failure. A log of all of the names used for files was kept. The files were downloaded onto labeled floppy disks for storage and future use. File transfer to the PC was accomplished with the PCPLOT (ref) software system. Simple editing of the downloaded files was required to remove system echoes from the transferred files before they were ready to be loaded into R:Base V.

Creation of the R:Base Data File Structures

Edited data were next loaded into the R:Base database management system for easy access. The loading was carried out by using Definition Express, a procedure available in the R:Base package. The fields to be created in the new database were determined by using the information given in the documentation from the IEPA. A small subset of the data was used as the example from which the table structures were developed. The fields containing the data in the example dataset were marked with the cursor, and entries to the tables, which are the R:Base files, were made. Files were given names compatible with R:Base. Fields were named within those files (tables).

Loading the Data into the Database

Once the table structure had been created, another R:Base utility, FileGateway, imported data from the prepared files into the database management system.

Use of the Database

The file system installed in R:Base V can be used in several ways. Users may wish to review data or query the information to see if certain aspects which they desire in their files are available. The utility BROWSE allows the user to do this. There are several menu-type screens in the software applications which allow the user to select sites, years, monitoring points, and specific information or chemical analyses from the database. The output from these selections can be placed into a report format for the printer, echoed back onto the screen, or saved into a file for further use.

Figure 5 is a flow chart of the steps involved in Phase II of this project.

A user's guide will be published under separate cover for use with the RCRA Monitoring Database. It will give examples and instructions for the use of the software applications which have been developed during this project.

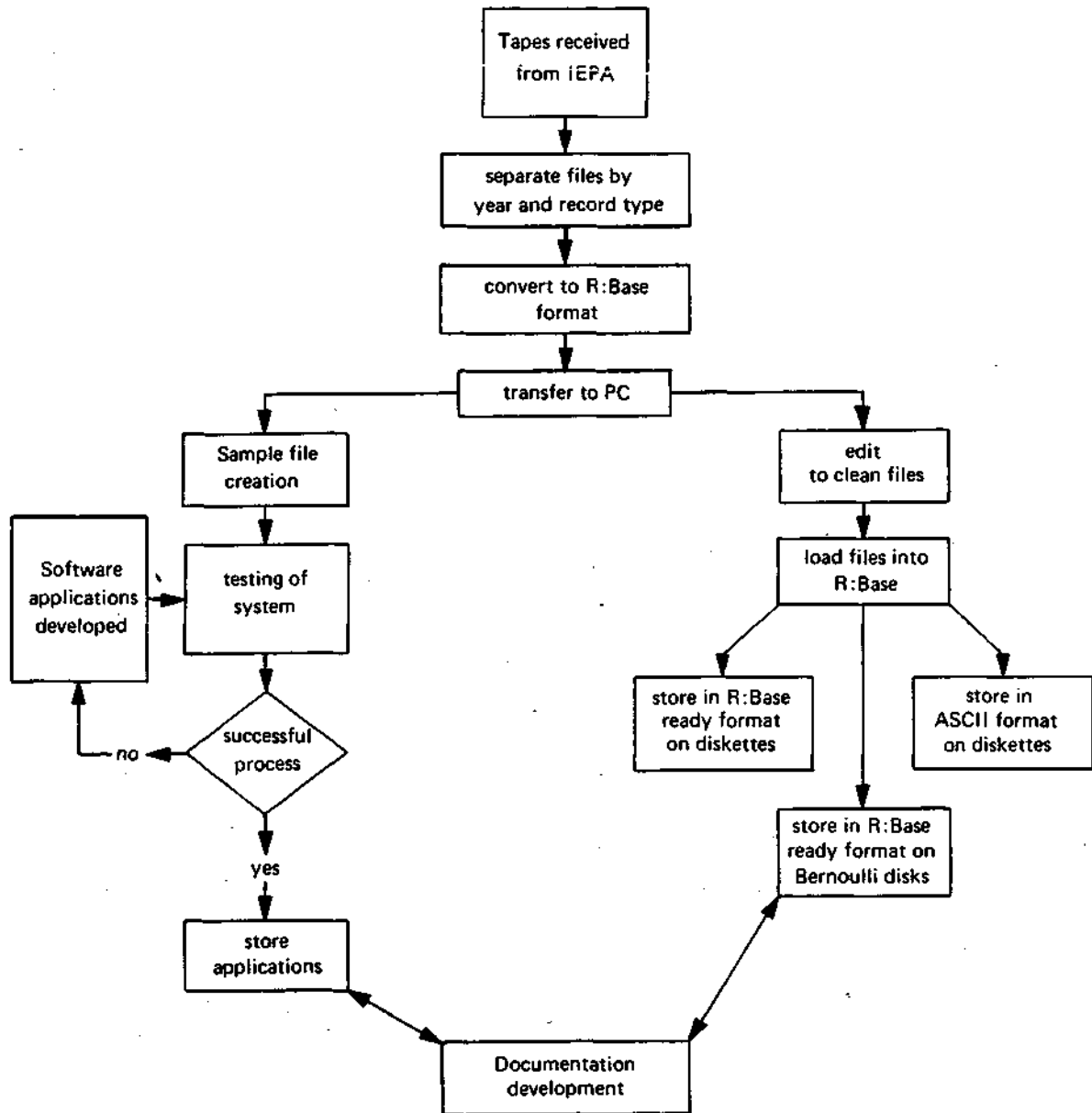


Figure 5
Phase II - Database and Software
Applications Development

APPENDIX A

SOME DEFINITIONS USED IN RCRA REGULATIONS

Solid Waste - any material which is:

abandoned or committed to final disposition, that is, not recycled or reused,

any material which is reused when that use or recycle constitutes disposal,

waste oil which is incinerated, or burned fuel, excluding animal or vegetable oil,

any material reused by placement into or on any land or water so that any constituents from it may enter the environment, including such materials reused as soil conditioners, fertilizers, fill material, dust suppressants, and similar materials.

Hazardous Waste - a solid waste, or combination of solid wastes, which because of its quantity, concentration or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or which may cause an increase in serious, irreversible or incapacitating reversible illness, or which may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

Hazardous wastes fall into groups by characteristics which include ignitability, corrosivity, reactivity, toxicity, radioactivity, infectiousness, phytotoxicity, teratogenicity, and mutagenicity. It is the responsibility of the generator to determine if waste is hazardous.

Hazardous Waste Generation - the act or process of producing hazardous waste.

Hazardous Waste Generator - anyone whose activities or process produces hazardous waste. Until 1985 only those disposing of more than 100 kilograms of hazardous waste per month had to report on these wastes. As of November 1985 anyone disposing of more than 10 kilograms (220 lbs.) per month must comply with the RCRA regulations.

Storage - the containment of hazardous waste, on a temporary basis or over a period of years, in a manner described in the regulations that does not constitute disposal of hazardous waste.

Disposal - the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste or hazardous waste into or on any land or water so that the solid or hazardous waste or any constituent of the waste may enter the environment, be emitted into the air, or be discharged into any waters, including ground waters.

Under the regulations, generators are allowed to accumulate hazardous waste on-site for 90 days before it is to be shipped off-site without their site being considered a storage facility.

Storage Facility - any facility which stores hazardous waste, except when the facility is used by a generator to store his own hazardous waste on-site for less than 90 days in containers which meet Department of Transportation (DOT) specifications for eventual transport off-site.

Aquifer - any water-bearing stratum or unit which, due to its ability to store and transmit water, is capable of yielding a usable quantity of ground water to a well or spring.

Contamination - degradation of naturally occurring water, air or soil quality either directly or indirectly.

Ground Water - water in the saturated zone beneath the land surface.

Leachate - liquid that has passed through or drained from hazardous waste or other man-emplaced materials and contains soluble, partially soluble, or miscible components removed from such waste.

Monitoring Well - a well used to obtain water samples for water quality analysis or a well used to determine ground-water levels.

Surface Impoundment - a natural topographic depression, artificial excavation or dike arrangement which is used for holding, treating or disposal of waste. It may be above, below or partially in the ground, or in navigable waters such as wetlands, and may or may not have a permeable bottom and sides.

APPENDIX B

STORET CODES IN THE
CURRENT RCRA MONITORING DATABASE

A. Alphabetic Order

34205 UG ACENAPHTHENE, TOT
34200 UG ACENAPHTHYLENE, TOT
77017 UG ACETIC ACID, TOT
81552 UG ACETONE, WHOLE WATER SAMPLE
00435 MG* ACIDITY, TOT (CAC03)
34210 UG ACROLEIN, TOT
34215 UG ACRYLONITRILE, TOT
39330 UG ALDRIN, TOT
>00431 MG* ALKALINITY, FIELD, TOT
00410 MG* ALKALINITY, LAB, TOT
39337 UG A-BHC (ALPHA-BHC (HEXACHLOROCYCLOHEXANE)), TOT
34362 UG A-ENDOSULFAN (ALPHA-ENDOSULFAN), TOT
01501 PC* ALPHA, TOT, PC/L
01502 PC* ALPHA, TOT, COUNTING ERROR, PC/L
>01106 UG ALUMINUM, DIS
01105 UG ALUMINUM, TOT
34220 UG ANTHRACENE, TOT
>01095 UG ANTIMONY, DIS
01097 UG ANTIMONY, TOT
>01000 UG ARSENIC, DIS
01002 UG ARSENIC, TOT
>01005 UG BARIUM, DIS
01007 UG BARIUM, TOT
34030 UG BENZENE, TOT, GC-MS, HEXADECONE EXTR.
39120 UG BENZIDINE, TOT
34526 UG BENZO(A)ANTHRACENE 1,2-BENZANTHRACENE, TOT
34522 UG BENZO(GHI)PERYLENE, TOT
34231 UG BENZO(B)FLUORANTHENE (3,4-BENZO), TOT
34242 UG BENZO(K)FLUORANTHENE, TOT
34247 UG BENZO(A)PYRENE, TOT
77247 UG BENZOIC ACID, TOT
>01010 UG BERYLLIUM, DIS
01012 UG BERYLLIUM, TOT
39338 UG B-BHC (BETA-BHC (HEXACHLOROCYCLOHEXANE)), TOT
34357 UG B-ENDOSULFAN, (BETA-ENDOSULFAN), TOT
03501 PC* BETA, TOT, PC/L
03502 PC* BETA, TOT, COUNTING ERROR, PC/L
00310 MG* BOD 5 DAY (BIOCHEMICAL OXYGEN DEMAND), 20 DEG C
34268 UG BIS(CHLOROMETHYL)ETHER, TOT
34273 UG BIS(2-CHLOROETHYL)ETHER, TOT
34278 UG BIS(2-CHLOROETHOXY)METHANE, TOT
34283 UG BIS(2-CHLOROISOPROPYL)ETHER, TOT
39100 UG BIS(2-ETHYLHEXYL)PHTHALATE, TOT

>01020 UG BORON,DIS
 01022 UG BORON,TOT
 99012 UG BROMOCHLOROMETHANE, TOT
 32101 UG BROMODICHLOROMETHANE, TOT
 32104 UG BROMOFORM, TOT
 99011 UG BROMOPHENYL PHENYL ETHER,TOT
 34292 UG BUTYL BENZYL PHTHALATE,TOT
 >01025 UG CADMIUM,DIS
 01027 UG CADMIUM,TOT
 >00915 MG* CALCIUM,DIS
 00916 MG* CALCIUM,TOT
 32102 UG CARBON TETRACHLORIDE, TOT
 >00335 MG* CHEMICAL OXYGEN DEMAND (COD)-LOW
 00340 MG* CHEMICAL OXYGEN DEMAND (COD)-HIGH
 39350 UG CHLORDANE(TECH MIX & METABS),TOT
 39348 UG CHLORDANE, ALPHA, TOT
 39810 UG CHLORDANE, GAMMA, TOT
 >00941 MG* CHLORIDE,DIS
 00940 MG* CHLORIDE,TOT
 34301 UG CHLORO BENZENE, TOT
 77297 UG CHLOROBROMOMETHANE, TOT
 34306 UG CHLORODIBROMOMETHANE, TOT
 34311 UG CHLOROETHANE, TOT
 32106 UG CHLOROFORM, TOT
 >01030 UG CHROMIUM,DIS
 01032 UG CHROMIUM,HEXAVALENT, TOT
 01220 UG CHROMIUM,HEXAVALENT,DIS
 01034 UG CHROMIUM,TOT
 01033 UG CHROMIUM,TRI-VAL
 34320 UG CHRYSENE, TOT
 34704 UG CIS-1,3,DICHLOROPROPENE, TOT
 39140 UG COAL TAR CRESOL, TOT
 31501 ##* COLIFORM, TOT, MEMBRANE FILTER, /100ML
 >01040 UG COPPER,DIS
 01042 UG COPPER, TOT
 >00723 UG CYANIDE,DIS
 00720 MG* CYANIDE, TOT
 81570 UG CYCLOHEXANE, TOT
 39370 UG DDT, IN WHOLE WATER SAMPLE
 46323 UG D-BHC (DELTA-BHC(HEXACHLOROCYCLOHEXANE)), TOT
 72039 FT* DEPTH TO BOTTOM OF CASING FROM MEASURING PT.
 72019 FT* DEPTH TO WATER LEVEL (FT BELOW LAND SURFACE)
 72109 FT* DEPTH TO WATER LEVEL FROM A MEASURING POINT
 72008 FT* TOT DEPTH OF WELL (FT BELOW LAND SURFACE DATUM)
 99006 UG DI-BENZYL PHTHALATE, TOT
 39110 UG DI-N-BUTYL PHTHALATE, TOT
 34596 UG DI-N-OCTYL PHTHALATE, TOT
 34556 UG DIBENZO(A,H)ANTHRACENE, TOT
 81302 UG DIBENZOFURAN (C12H8O),TOT
 32105 UG DIBROMOCHLOROMETHANE, TOT
 99005 UG DICHLOROBROMOMETHANE, TOT
 >34328 UG DICHLOROBROMOMETHANE, TOT

34668 UG DICHLORODIFLUOROMETHANE ,TOT
39380 UG DIELDRIN ,TOT
34336 UG DIETHYL PHTHALATE ,TOT
81531 UG DIMETHYL NAPHTHALENE ,TOT
34341 UG DIMETHYL PHTHALATE ,TOT
34657 UG DNOC(4 ,6-DINITRO-ORTHO-CRESOL) ,TOT
71993 FT* ELEVATION OF GRD WATER W/ REF. TO MEAN SEA LEVEL
34352 UG ENDOSULFAN SULFATE ,TOT
34367 UG ENDRIN ALDEHYDE ,TOT
39390 UG ENDRIN ,TOT
81585 UG ETHYL ACETATE ,TOT
78113 UG ETHYL BENZENE ,TOT
31616 ##* FECAL COLIFORM ,MEMBRANE FILTER ,/100ML
99001 UG FLUAZIFOP ,TOT
99009 UG FLUAZIFOP-BUTYL ,TOT
34376 UG FLUORANTHENE ,TOT
34381 UG FLUORENE ,TOT
>00950 MG* FLUORIDE ,DIS
00951 MG* FLUORIDE ,TOT
99013 UG G-BHC ,TOT
78115 UG TOTAL ORGANIC HALOGEN
81375 MG* HALOGENATED ORGANICS
00900 MG* HARDNESS ,TOT (CAC03)
39420 UG HEPTACHLOR EPOXIDE ,TOT
39410 UG HEPTACHLOR ,TOT
39700 UG HEXACHLOROBENZENE ,TOT
34391 UG HEXACHLOROBUTADIENE ,TOT
34386 UG HEXACHLOROCYCLOPENTADIENE ,TOT
34396 UG HEXACHLOROETHANE ,TOT
81590 UG HEXANE ,WHOLE WATER SAMPLE
34403 UG INDENO(1 ,2 ,3-CD)PYRENE ,TOT
01045 UG IRON ,TOT
>01046 UG IRON ,DIS
74010 MG* IRON ,TOT ,FOR LEACHATE ANALYSIS
34408 UG ISOPHORONE ,TOT
77015 UG ISOPROPYL ALCOHOL (C3H8O) ,TOT
>01049 UG LEAD ,DIS
01051 UG LEAD ,TOT
39782 UG LINDANE ,TOT
77151 UG M-CRESOL ,WHOLE WATER
>00925 MG* MAGNESIUM ,DIS
00927 MG* MAGNESIUM ,TOT
>01056 UG MANGANESE ,DIS
01055 UG MANGANESE ,TOT
72020 FT* MEASURED TOT WELL DEPTH ELE (FT REF MSL)
82514 FT* MEASURING POINT ELEVATION
>71890 UG MERCURY ,DIS
71900 UG MERCURY ,TOT
39480 UG METHOXYCHLOR ,WHOLE WATER SAMPLE
34413 UG METHYL BROMIDE ,TOT
34418 UG METHYL CHLORIDE ,TOT
81595 UG METHYL ETHYL KETONE ,TOT

81547 UG METHYL NAPHTHALENE ,TOT
81596 UG METHYL-ISOBUTYL KETONE ,TOT
34423 UG METHYLENE CHLORIDE ,TOT
77766 UG MYRISTIC (TETRADECANOIC) ACID ,TOT
34428 UG N-NITROSODI-N-PROPYLAMINE ,TOT
34438 UG N-NITROSODIMETHYLAMINE ,TOT
34433 UG N-NITROSODIPHENYLAMINE ,TOT
81332 UG N,N-DIMETHYL ACETAMIDE ,TOT
78111 UG N,N-DIMETHYL FORMAMIDE ,GC/MS METHOD 625
34696 UG NAPHTHALENE ,TOT
>01065 UG NICKEL ,DIS
01067 UG NICKEL ,TOT
>00618 MG* NITRATE NITROGEN ,DIS (N03-N)
00620 MG* NITRATE NITROGEN ,TOT (N03-N)
>00613 MG* NITRITE NITROGEN ,DIS (N02-N)
>00631 MG* NITRITE & NITRATE ,DIS (N02&N03)
00630 MG* NITRITE & NITRATE ,DIS (N02&N03)
34447 UG NITROBENZENE ,TOT
>00608 MG* NITROGEN ,AMMONIA ,DIS
00610 MG* NITROGEN ,AMMONIA ,TOT
77152 UG O-CRESOL ,WHOLE WATER
00556 MG* OIL & GREASE (FREON EXTR. -GRAV METH) ,TOT ,REC
84066 *** OIL & GREASE , VISUAL ,ALPHA-NUMERIC CODE
77832 UG OLEIC ACID ,TOT
00090 MV* OXIDATION REDUCTION POTENTIAL (REDOX) , MILLIVOLTS
00300 MG* OXYGEN ,DISSOLVED ,LAB
77146 UG P-CRESOL ,WHOLE WATER
77807 UG PALMITIC ACID ,TOT
34452 UG PARACHLOROMETA CRESOL ,TOT
39540 UG PARATION ,WHOLE WATER SAMPLE
34671 UG PCB-1016 ,TOT
39488 UG PCB-1221 ,TOT
39492 UG PCB-1232 ,TOT
39496 UG PCB-1242 ,TOT
39500 UG PCB-1248 ,TOT
79688 UG PCB-1254 ,TOT
79689 UG PCB-1260 ,TOT
79690 UG PENTACHLOROPHENOL ,TOT
99003 UG PENTANE ,TOT
78071 UG PENTENE
99002 UG PERMETHRIN ,TOT
>00400 *** PH ,FIELD ,STANDARD UNITS
00403 *** PH ,LAB ,STANDARD UNITS
34461 UG PHENATHRENE ,TOT
34694 UG PHENOL (C6H5OH) -SINGLE COMPOUND ,TOT
32730 UG PHENOLICS ,TOT (PHENOLS)
00650 MG* PHOSPHATE ,TOT (P04)
>00666 MG* PHOSPHORUS ,DIS
00665 MG* PHOSPHORUS ,TOT
>00935 MG* POTASSIUM ,DIS
00937 MG* POTASSIUM ,TOT
77031 UG PROPIONIC ACID ,TOT

78114 UG PROPYL ETHER,TOT,GC/MS METHOD 624
 34469 UG PYRENE,TOT
 11504 PC* RADIUM 226 + RADIUM 228,TOT,COUNTING ERROR,PC/L
 >11503 PC* RADIUM 226 + RADIUM 228,TOT,PC/L
 09501 PC* RADIUM 226,TOT,PC/L
 09502 PC* RADIUM 226,TOT,COUNTING ERROR,PC/L
 11502 PC* RADIUM 228,TOT,COUNTING ERROR,PC/L
 11501 PC* RADIUM 228,TOT,PC/L
 >70300 MG* RESIDUE ON EVAPORATION (ROE),DRIED AT 180 C
 00500 MG* RESIDUE,TOT
 00530 MG* RESIDUE,TOT,NONFILTERABLE
 >01145 UG SELENIUM,DIS
 01147 UG SELENIUM,TOT
 >00955 MG* SILICA,DIS
 00956 MG* SILICA,TOT
 >01075 UG SILVER,DIS
 01077 UG SILVER,TOT
 39760 UG SILVEX,WHOLE WATER SAMPLE
 >00930 MG* SODIUM,DIS
 00929 MG* SODIUM,TOT
 99007 UG SORBITOL,TOT
 00095 *** SPECIFIC CONDUCTANCE,LAB (UMHOS/CM @ 25 C)
 >00094 *** SPECIFIC CONDUCTANCE,FIELD (UMHOS/CM @ 25 C)
 72013 *** SPECIFIC GRAVITY (INCLUDE TEMPERATURE)
 72012 C * SPECIFIC GRAVITY TEMPERATURE IN DEGREES CELCIUS
 81300 UG STEARIC ACID (C18H36O2),TOT
 99008 UG STODDARD SOLVENT,TOT
 13501 PC* STRONTIUM 90,TOT,PC/L
 13502 PC* STRONTIUM 90,TOT,COUNTING ERROR,PC/L
 >00946 MG* SULFATE,DIS
 00945 MG* SULFATE,TOT
 >00746 MG* SULFIDE,DIS
 00745 MG* SULFIDE,TOT
 70298 *** SUSPENDED SOLIDS (#/DAY/CFS STREAM FLOW)
 00011 F * WATER TEMPERATURE, DEGREES FARENHEIT
 00010 C * WATER TEMPERATURE, DEGREES CELCIUS
 34475 UG TETRACHLOROETHYLENE,TOT
 01059 UG THALLIUM,TOT
 >01057 UG THALLIUM,DIS
 >01100 UG TIN,DIS
 01102 UG TIN,TOT
 34010 UG TOLUENE,TOT,GC-MS,HEXADECONE EXTR.
 00680 MG* TOTAL ORGANIC CARBON
 39400 UG TOXAPHENE,TOT
 34699 UG TRANS-1,3-DICHLOROPROPENE,TOT
 39180 UG TRICHLOROETHYLENE,TOT
 34488 UG TRICHLOROFLUOROMETHANE,TOT
 78810 UG* TRIMETHYL NAPHTHALENE IN SEDIMENT DRY WEIGHT UG/KG
 78212 UG TRIMETHYLNAPHTHALENE,TOT
 00076 *** TURBIDITY (NTU)
 39175 UG VINYL CHLORIDE,TOT
 99010 *** VISCOSITY IN SOKES GRAMS/SEC.CM.DENSITY

39141 UG WOOD CREOSOTE ,TOT
 34020 UG XYLENES ,TOT ,GC-MS ,HEXADECONE EXTR.
 >01090 UG ZINC ,DIS
 01092 UG ZINC ,TOT
 99014 UG 0-DICHLOROBENZENE ,TOT
 78112 UG 1-METHYL-2-PYROLI DINONE (GC/MS METHOD 625)
 34496 UG 1,1-DICHLOROETHANE ,TOT
 34501 UG 1,1-DICHLOROETHYLENE ,TOT
 34506 UG 1,1,1-TRICHLOROETHANE ,TOT
 34511 UG 1,1,2-TRICHLOROETHANE ,TOT
 34516 UG 1,1,2,2-TETRACHLOROETHANE ,TOT
 99015 UG 1,2 DICHLOROETHYLENE ,TOT
 34536 UG 1,2-DICHLOROBENZENE ,TOT
 34531 UG 1,2-DICHLOROETHANE ,TOT
 34541 UG 1,2-DICHLOROPROPANE ,TOT
 34346 UG 1,2-DIPHENYLHYDRAZINE ,TOT
 34546 UG 1,2-TRANS-DICHLOROETHYLEN ,TOT
 34551 UG 1,2,4-TRICHLOROBENZENE ,TOT
 34566 UG 1,3-DICHLOROBENZENE ,TOT
 77173 UG 1,3-DICHLOROPROPANE ,TOT
 34561 UG 1,3-DICHLOROPROPENE ,TOT
 99004 UG 1,3-DICHLOROPROPYLENE ,TOT
 34571 UG 1,4-DICHLOROBENZENE ,TOT
 99016 UG 2 METHYL-4,6-DINITROPHENOL ,TOT
 34576 UG 2-CHLOROETHYL VINYL ETHER ,TOT
 34581 UG 2-CHLORONAPHTHALENE ,TOT
 34586 UG 2-CHLOROPHENOL ,TOT
 34591 UG 2-NITROPHENOL ,TOT
 34676 UG 2,3,7,8-TETRACHLORODIBENZ-DIOXIN ,TOT
 39730 UG 2,4-D,WHOLE WATER SAMPLE
 34601 UG 2,4-DICHLOROPHENOL ,TOT
 34606 UG 2,4-DIMETHYLPHENOL ,TOT
 34616 UG 2,4-DINITROPHENOL ,TOT
 34611 UG 2,4-DINITROTOLUENE ,TOT
 34621 UG 2,4,6-TRICHLOROPHENOL ,TOT
 34626 UG 2,6-DINITROTOLUENE ,TOT
 34631 UG 3,3'-DICHLOROBENZIDINE ,TOT
 99017 UG 4 CHLORO-3-METHYLPHENOL ,TOT
 34636 UG 4-BROMOPHENYL PHENYL ETHER ,TOT
 34641 UG 4-CHLOROPHENYL PHENYL ETHER ,TOT
 34646 UG 4-NITROPHENOL ,TOT
 34651 UG 4,4-DDD (P,P-TDE) ,TOT
 34653 UG 4,4-DDT , (P,P-DDX) ,TOT
 39300 UG 4,4-DDT ,TOT
 78208 UG 4,6-DINITRO-O-CRESOL ,TOT

v

B. Numeric Order

00010 C * WATER TEMPERATURE, DEGREES CELSIUS
00011 F * WATER TEMPERATURE, DEGREES FAHRENHEIT
00076 *** TURBIDITY (NTU)
00090 MV* OXIDATION REDUCTION POTENTIAL (REDOX), MILLIVOLTS
>00094 *** SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM @ 25 C)
00095 *** SPECIFIC CONDUCTANCE, LAB (UMHOS/CM @ 25 C)
00300 MG* OXYGEN, DISSOLVED, LAB
00310 MG* BOD 5 DAY (BIOCHEMICAL OXYGEN DEMAND), 20 DEG C
>00335 MG* CHEMICAL OXYGEN DEMAND (COD)-LOW
00340 MG* CHEMICAL OXYGEN DEMAND (COD)-HIGH
>00400 *** PH, FIELD, STANDARD UNITS
00403 *** PH, LAB, STANDARD UNITS
00410 MG* ALKALINITY, LAB, TOT
>00431 MG* ALKALINITY, FIELD, TOT
00435 MG* ACIDITY, TOT (CAC03)
00500 MG* RESIDUE, TOT
00530 MG* RESIDUE, TOT, NONFILTERABLE
00556 MG* OIL & GREASE (FREON EXTR.-GRAV METH), TOT, REC
>00608 MG* NITROGEN, AMMONIA, DIS
00610 MG* NITROGEN, AMMONIA, TOT
>00613 MG* NITRITE NITROGEN, DIS (N02-N)
>00618 MG* NITRATE NITROGEN, DIS (N03-N)
00620 MG* NITRATE NITROGEN, TOT (N03-N)
00630 MG* NITRITE & NITRATE, DIS (N02&N03)
>00631 MG* NITRITE & NITRATE, DIS (N02&N03)
00650 MG* PHOSPHATE, TOT (P04)
00665 MG* PHOSPHORUS, TOT
>00666 MG* PHOSPHORUS, DIS
00680 MG* TOTAL ORGANIC CARBON
00720 MG* CYANIDE, TOT
>00723 UG CYANIDE, DIS
00745 MG* SULFIDE, TOT
>00746 MG* SULFIDE, DIS
00900 MG* HARDNESS, TOT (CAC03)
>00915 MG* CALCIUM, DIS
00916 MG* CALCIUM, TOT
>00925 MG* MAGNESIUM, DIS
00927 MG* MAGNESIUM, TOT
00929 MG* SODIUM, TOT
>00930 MG* SODIUM, DIS
>00935 MG* POTASSIUM, DIS
00937 MG* POTASSIUM, TOT
00940 MG* CHLORIDE, TOT
>00941 MG* CHLORIDE, DIS
00945 MG* SULFATE, TOT
>00946 MG* SULFATE, DIS
>00950 MG* FLUORIDE, DIS
00951 MG* FLUORIDE, TOT
>00955 MG* SILICA, DIS

00956 MG* SILICA,TOT
 >01000 UG ARSENIC,DIS
 01002 UG ARSENIC,TOT
 >01005 UG BARIUM,DIS
 01007 UG BARIUM,TOT
 >01010 UG BERYLLIUM,DIS
 01012 UG BERYLLIUM,TOT
 >01020 UG BORON,DIS
 01022 UG BORON,TOT
 >01025 UG CADMIUM,DIS
 01027 UG CADMIUM,TOT
 >01030 UG CHROMIUM,DIS
 01032 UG CHROMIUM,HEXAVALENT,TOT
 01033 UG CHROMIUM,TRI-VAL
 01034 UG CHROMIUM,TOT
 >01040 UG COPPER,DIS
 01042 UG COPPER,TOT
 01045 UG IRON,TOT
 >01046 UG IRON,DIS
 >01049 UG LEAD,DIS
 01051 UG LEAD,TOT
 01055 UG MANGANESE,TOT
 >01056 UG MANGANESE,DIS
 >01057 UG THALLIUM,DIS
 01059 UG THALLIUM,TOT
 >01065 UG NICKEL,DIS
 01067 UG NICKEL,TOT
 >01075 UG SILVER,DIS
 01077 UG SILVER,TOT
 >01090 UG ZINC,DIS
 01092 UG ZINC,TOT
 >01095 UG ANTIMONY,DIS
 01097 UG ANTIMONY,TOT
 >01100 UG TIN,DIS
 01102 UG TIN,TOT
 01105 UG ALUMINUM,TOT
 >01106 UG ALUMINUM,DIS
 >01145 UG SELENIUM,DIS
 01147 UG SELENIUM,TOT
 01220 UG CHROMIUM,HEXAVALENT,DIS
 01501 PC* ALPHA,TOT,PC/L
 01502 PC* ALPHA,TOT,COUNTING ERROR,PC/L
 03501 PC* BETA,TOT,PC/L
 03502 PC* BETA,TOT,COUNTING ERROR,PC/L
 09501 PC* RADIUM 226,TOT,PC/L
 09502 PC* RADIUM 226,TOT,COUNTING ERROR,PC/L
 11501 PC* RADIUM 228,TOT,PC/L
 11502 PC* RADIUM 228,TOT,COUNTING ERROR,PC/L
 >11503 PC* RADIUM 226 + RADIUM 228,TOT,PC/L
 11504 PC* RADIUM 226 + RADIUM 228,TOT,COUNTING ERROR,PC/L
 13501 PC* STRONTIUM 90,TOT,PC/L
 13502 PC* STRONTIUM 90,TOT,COUNTING ERROR,PC/L

31501 ##* COLIFORM,TOT, MEMBRANE FILTER, /100ML
 31616 ##* FECAL COLIFORM, MEMBRANE FILTER, /100ML
 32101 UG BROMODICHLOROMETHANE, TOT
 32102 UG CARBON TETRACHLORIDE, TOT
 32104 UG BROMOFORM, TOT
 32105 UG DIBROMOCHLOROMETHANE, TOT
 32106 UG CHLOROFORM, TOT
 32730 UG PHENOLICS, TOT (PHENOLS)
 34010 UG TOLUENE, TOT, GC-MS, HEXADECONE EXTR.
 34020 UG XYLENES, TOT, GC-MS, HEXADECONE EXTR.
 34030 UG BENZENE, TOT, GC-MS, HEXADECONE EXTR.
 34200 UG ACENAPHTHYLENE, TOT
 34205 UG ACENAPHTHENE, TOT
 34210 UG ACROLEIN, TOT
 34215 UG ACRYLONITRILE, TOT
 34220 UG ANTHRACENE, TOT
 34231 UG BENZO(B) FLUORANTHENE (3,4-BENZO), TOT
 34242 UG BENZO(K) FLUORANTHENE, TOT
 34247 UG BENZO(A) PYRENE, TOT
 34268 UG BIS(CHLOROMETHYL) ETHER, TOT
 34273 UG BIS(2-CHLOROETHYL) ETHER, TOT
 34278 UG BIS(2-CHLOROETHOXY) METHANE, TOT
 34283 UG BIS(2-CHLOROISOPROPYL) ETHER, TOT
 34292 UG BUTYL BENZYL PHTHALATE, TOT
 34301 UG CHLOROBENZENE, TOT
 34306 UG CHLORODIBROMOMETHANE, TOT
 34311 UG CHLOROETHANE, TOT
 34320 UG CHRYSENE, TOT
 >34328 UG DICHLOROCHLOROMETHANE, TOT
 34336 UG DIETHYL PHTHALATE, TOT
 34341 UG DIMETHYL PHTHALATE, TOT
 34346 UG 1,2-DIPHENYLHYDRAZINE, TOT
 34352 UG ENDOSULFAN SULFATE, TOT
 34357 UG B-ENDOSULFAN, (BETA-ENDOSULFAN), TOT
 34362 UG A-ENDOSULFAN (ALPHA-ENDOSULFAN), TOT
 34367 UG ENDRIN ALDEHYDE, TOT
 34376 UG FLUORANTHENE, TOT
 34381 UG FLUORENE, TOT
 34386 UG HEXACHLOROCYCLOPENTADIENE, TOT
 34391 UG HEXACHLOROBUTADIENE, TOT
 34396 UG HEXACHLOROETHANE, TOT
 34403 UG INDENO(1,2,3-CD) PYRENE, TOT
 34408 UG ISOPHORONE, TOT
 34413 UG METHYL BROMIDE, TOT
 34418 UG METHYL CHLORIDE, TOT
 34423 UG METHYLENE CHLORIDE, TOT
 34428 UG N-NITROSODI-N-PROPYLAMINE, TOT
 34433 UG N-NITROSODIPHENYLAMINE, TOT
 34438 UG N-NITROSODIMETHYLAMINE, TOT
 34447 UG NITROBENZENE, TOT
 34452 UG PARACHLOROMETA CRESOL, TOT
 34461 UG PHENANTHRENE, TOT

34469 UG PYRENE ,TOT
 34475 UG TETRACHLOROETHYLENE ,TOT
 34488 UG TRICHLOROFLUOROMETHANE ,TOT
 34496 UG 1,1-DICHLOROETHANE ,TOT
 34501 UG 1,1-DICHLOROETHYLENE ,TOT
 34506 UG 1,1,1-TRICHLOROETHANE ,TOT
 34511 UG 1,1,2-TRICHLOROETHANE ,TOT
 34516 UG 1,1,2,2-TETRACHLOROETHANE ,TOT
 34522 UG BENZO(GHI)PERYLENE ,TOT
 34526 UG BENZO(A)ANTHRACENE 1,2-BENZANTHRACENE .TOT
 34531 UG 1,2-DICHLOROETHANE ,TOT
 34536 UG 1,2-DICHLOROBENZENE ,TOT
 34541 UG 1,2-DICHLOROPROPANE ,TOT
 34546 UG 1,2-TRANS-DICHLOROETHYLEN ,TOT
 34551 UG 1,2,4-TRICHLOROBENZENE ,TOT
 34556 UG DIBENZO(A,H)ANTHRACENE ,TOT
 34561 UG 1,3-DICHLOROPROPENE ,TOT
 34566 UG 1,3-DICHLOROBENZENE ,TOT
 34571 UG 1,4-DICHLOROBENZENE ,TOT
 34576 UG 2-CHLOROETHYL VINYL ETHER ,TOT
 34581 UG 2-CHLORONAPHTHALENE ,TOT
 34586 UG 2-CHLOROPHENOL ,TOT
 34591 UG 2-NITROPHENOL ,TOT
 34596 UG DI-N-OCTYL PHTHALATE ,TOT
 34601 UG 2,4-DICHLOROPHENOL ,TOT
 34606 UG 2,4-DIMETHYLPHENOL ,TOT
 34611 UG 2,4-DINITROTOLUENE ,TOT
 34616 UG 2,4-DINITROPHENOL ,TOT
 34621 UG 2,4,6-TRICHLOROPHENOL ,TOT
 34626 UG 2,6-DINITROTOLUENE ,TOT
 34631 UG 3,3'-DICHLOROBENZIDINE ,TOT
 34636 UG 4-BROMOPHENYL PHENYL ETHER ,TOT
 34641 UG 4-CHLOROPHENYL PHENYL ETHER ,TOT
 34646 UG 4-NITROPHENOL ,TOT
 34651 UG 4,4-DDD (P,P-TDE) ,TOT
 34653 UG 4,4-DDT (P,P-DDX) ,TOT
 34657 UG DNOC(4,6-DINITRO-ORTHO-CRESOL) ,TOT
 34668 UG DICHLORODIFLUOROMETHANE ,TOT
 34671 UG PCB-1016 ,TOT
 34676 UG 2,3,7,8-TETRACHLORODIBENZ-DIOXIN ,TOT
 34694 UG PHENOL(C6H5OH)-SINGLE COMPOUND ,TOT
 34696 UG NAPHTHALENE ,TOT
 34699 UG TRANS-1,3-DICHLOROPROPENE ,TOT
 34704 UG CIS-1,3,DICHLOROPROPENE ,TOT
 39100 UG BIS(2-ETHYLHEXYL)PHTHALATE ,TOT
 39110 UG DI-N-BUTYL PHTHALATE ,TOT
 39120 UG BENZIDINE ,TOT
 39140 UG COAL TAR CRESOL ,TOT
 39141 UG WOOD CREOSOTE ,TOT
 39175 UG VINYL CHLORIDE ,TOT
 39180 UG TRICHLOROETHYLENE ,TOT
 39300 UG 4,4-DDT ,TOT

39330 UG ALDRIN, TOT
39337 UG A-BHC (ALPHA-BHC (HEXACHLOROCYCLOHEXANE)), TOT
39338 UG B-BHC (BETA-BHC (HEXACHLOROCYCLOHEXANE)), TOT
39348 UG CHLORDANE, ALPHA, TOT
39350 UG CHLORDANE (TECH MIX & METABS), TOT
39370 UG DDT, IN WHOLE WATER SAMPLE
39380 UG DIELDRIN, TOT
39390 UG ENDRIN, TOT
39400 UG TOXAPHENE, TOT
39410 UG HEPTACHLOR, TOT
39420 UG HEPTACHLOR EPOXIDE, TOT
39480 UG METHOXYCHLOR, WHOLE WATER SAMPLE
39488 UG PCB-1221, TOT
39492 UG PCB-1232, TOT
39496 UG PCB-1242, TOT
39500 UG PCB-1248, TOT
39540 UG PARATION, WHOLE WATER SAMPLE
39700 UG HEXACHLOROBENZENE, TOT
39730 UG 2,4-D, WHOLE WATER SAMPLE
39760 UG SILVEX, WHOLE WATER SAMPLE
39782 UG LINDANE, TOT
39810 UG CHLORDANE, GAMMA, TOT
46323 UG D-BHC (DELTA-BHC (HEXACHLOROCYCLOHEXANE)), TOT
70298 *** SUSPENDED SOLIDS (#/DAY/CFS STREAM FLOW)
>70300 MG* RESIDUE ON EVAPORATION (ROE), DRIED AT 180 C
>71890 UG MERCURY, DIS
71900 UG MERCURY, TOT
71993 FT* ELEVATION OF GRD WATER W/, REF. TO MEAN SEA LEVEL
72008 FT* TOT DEPTH OF WELL (FT BELOW LAND SURFACE DATUM)
72012 C * SPECIFIC GRAVITY TEMPERATURE IN DEGREES CELCIUS
72013 *** SPECIFIC GRAVITY (INCLUDE TEMPERATURE)
72019 FT* DEPTH TO WATER LEVEL (FT BELOW LAND SURFACE)
72020 FT* MEASURED TOT WELL DEPTH ELE (FT REF MSL)
72039 FT* DEPTH TO BOTTOM OF CASING FROM MEASURING PT.
72109 FT* DEPTH TO WATER LEVEL FROM A MEASURING POINT
74010 MG* IRON, TOT, FOR LEACHATE ANALYSIS
77015 UG ISOPROPYL ALCOHOL (C3H8O), TOT
77017 UG ACETIC ACID, TOT
77031 UG PROPIONIC ACID, TOT
77146 UG P-CRESOL, WHOLE WATER
77151 UG M-CRESOL, WHOLE WATER
77152 UG O-CRESOL, WHOLE WATER
77173 UG 1,3-DICHLOROPROPANE, TOT
77247 UG BENZOIC ACID, TOT
77297 UG CHLOROBROMOMETHANE, TOT
77766 UG MYRISTIC (TETRADECANOIC) ACID, TOT
77807 UG PALMITIC ACID, TOT
77832 UG OLEIC ACID, TOT
78071 UG PENTENE
78111 UG N,N-DIMETHYL FORMAMIDE, GC/MS METHOD 625
78112 UG 1-METHYL-2-PYROLI DINONE (GC/MS METHOD 625)
78113 UG ETHYL BENZENE, TOT

78114 UG PROPYL ETHER, TOT, GC/MS METHOD 624
78115 UG TOTAL ORGANIC HALOGEN
78208 UG 4,6-DINITRO-0-CRESOL, TOT
78212 UG TRIMETHYLNAPHTHALENE, TOT
78810 UG* TRIMETHYL NAPHTHALENE IN SEDIMENT DRY WEIGHT UG/KG
79688 UG PCB-1254, TOT
79689 UG PCB-1260, TOT
79690 UG PENTACHLOROPHENOL, TOT
81300 UG STEARIC ACID (C18H36O2), TOT
81302 UG DIBENZOFURAN (C12H8O), TOT
81332 UG N,N-DIMETHYL ACETAMIDE, TOT
81375 MG* HALOGENATED ORGANICS
81531 UG DIMETHYL NAPHTHALENE, TOT
81547 UG METHYL NAPHTHALENE, TOT
81552 UG ACETONE, WHOLE WATER SAMPLE
81570 UG CYCLOHEXANE, TOT
81585 UG ETHYL ACETATE, TOT
81590 UG HEXANE, WHOLE WATER SAMPLE
81595 UG METHYL ETHYL KETONE, TOT
81596 UG METHYL-ISOBUTYL KETONE, TOT
82514 FT* MEASURING POINT ELEVATION
84066 *** OIL & GREASE, VISUAL, ALPHA-NUMERIC CODE
99001 UG FLUAZIFOP, TOT
99002 UG PERMETHRIN, TOT
99003 UG PENTANE, TOT
99004 UG 1,3-DICHLOROPROPYLENE, TOT
99005 UG DICHLOROBROMOMETHANE, TOT
99006 UG DI-BENZYL PHTHALATE, TOT
99007 UG SORBITOL, TOT
99008 UG STODDARD SOLVENT, TOT
99009 UG FLUAZIFOP-BUTYL, TOT
99010 *** VISCOSITY IN SOKES GRAMS/SEC. CM. DENSITY
99011 UG BROMOPHENYL PHENYL ETHER, TOT
99012 UG BROMOCHLOROMETHANE, TOT
99013 UG G-BHC, TOT
99014 UG 0-DICHLOROBENZENE, TOT
99015 UG 1,2 DICHLOROETHYLENE, TOT
99016 UG 2 METHYL-4,6-DINITROPHENOL, TOT
99017 UG 4 CHLORO-3-METHYLPHENOL, TOT

**C. Dummy Codes Used Temporarily in the
RCRA Monitoring Database**

11111	Silvex, same as valid STORET 39760*
22222	Chloromethane, same as valid STORET 34418*
33333	Bromomethane, same as valid STORET 34413*
39310	p,p'-DDD (WATSTOR parameter)
39315	o,p'-DDD (WATSTOR parameter)
39320	p,p'-DDE (WATSTOR parameter)
39327	o,p'-DDE (WATSTOR parameter)
39516	PCB's tot (WATSTOR parameter)
44444	benzo(1)Pyrene, same as valid STORET 34247*
55555	endosulfan I, same as valid STORET 34361*
55554	ethyl ether
55556	trifluoromethylbenzene
55557	1,2 dichloropropylene
55558	1,4 dioxane
55561	phthalates
55564	Indenedione
55565	1,1 trichloroethane
55566	total dissolved solids
66666	endosulfan II, same as valid STORET 34356*

* These codes were used in the data entry phase and the tapes submitted before the correct codes were discovered. The decision was made between the IEPA and ISWS to convert all the dummy codes at one time rather than confuse the issue with several conversions.

APPENDIX C

DATA ENTRY PROGRAM

PROGRAM IPROG

```
C
C THIS IS A DATA ENTRY PROGRAM FOR RCRA DATA
C
C VARIABLE DEFINITIONS:
C -----
C     BACKSAM     BACKGROUND SAMPLE
C     CHECK       INTEGER VARIABLE TO CHECK FOR NUMERICAL DATA
C     COLCOM      COLLECTOR COMMENTS
C     DATEC       DATE COLLECTED
C     DATED       REPORT DUE DATE
C     DATER       DATE RECEIVED
C     GTLT        GREATER/LESS THAN
C     I           GENERAL INDEX VARIABLE
C     IEPAL       IEPA - LAB
C     INITS       INITIALS
C     INORG       INORGANICS
C     INPUT       DECISION CHARACTER, 'Y' OR 'N'
C     LABCOM      LAB COMMENTS
C     LABID       LAB ID #
C     LEVEL       REPORTING LEVEL
C     MONPT       MONITOR POINT
C     MPSBY       MONITOR POINT SAMPLED BY
C     N           NUMBER OF ANALYTICAL VALUES ENTERED
C     OFILE       UNIT NUMBER OF OUTPUT FILE
C     OFILEN      NAME OF OUTPUT FILE
C     ORG         ORGANICS
C     OVER        LOGICAL VARIABLE; TRUE IF USER WANTS TO END
C                 SESSION; FALSE OTHERWISE
C     PCOD        PROGRAM CODE
C     RECCOD      RECORD CODE
C     REM         REMARKS
C     REP         REPLICATE
C     SAMAP       SAMPLE APPEARANCE
C     SAMPUR      SAMPLE PURPOSE CODE
C     SITENO      SITE NUMBER
C     STORET      STORET NUMBER
C     TRACOD      TRANS CODE
C     TIME        TIME COLLECTED
C     TSITE       TEMPORARY STORAGE FOR SITE NUMBER
C     UCOD        UNIT CODE
C     UNABLE      UNABLE TO COLLECT SAMPLE
C     VALUE       VALUE
C
C ----- LOCAL VARIABLES -----
C     INTEGER     CHECK, I, OFILE, N
```

```

CHARACTER BACKSAM, COLCOM*40, DATEC*6, DATED*6, DATER*6,
:         GTLT(150), IEPAL, INITS*3, INORG, INPUT, LABCOM*50,
:         LABID*4, LEVEL(150)*2, MONPT*4, MPSBY, OFILEN*12, ORG,
:
:         PCOD*4, RECCOD*7, REM(150), REP(150), SAMAP*40,
SAMPUR,
:         SITENO*10, STORET(150)*5, TIME*4, TSITE*10, TRACOD,
:         UCOD, UNABLE, VALUE(150)*10
LOGICAL    OVER
C-----
C
C
C OPEN OUTPUT FILE, ASSIGN UNIT NUMBER:
C-----
      OFILE = 1
      WRITE (*,*) 'ENTER NAME OF OUTPUT FILE'
      READ (*,'(A12)') OFILEN
C
      OPEN (OFILE, FILE = OFILEN, STATUS = 'NEW')
C
C
C INITIALIZE VARIABLES:
C-----
      OVER = .FALSE.
      SITENO = '
C C                               SITE DATA
C
C
C START OF LOOP:
C-----
10    CONTINUE
C
C
C INITIALIZE ALL FIELDS:
C-----
      RECCOD = 'LPCSM01'
      TRACOD = ' '
      MONPT = '
      DATEC = '
      DATED = '
      IEPAL = '
      DATER = '
      SAMPUR = ' '
      PCOD = '
      UCOD = ' '
      BACKSAM = ' '
      TIME = '
      UNABLE = ' '
      MPSBY = ' '
      INORG = ' '
      ORG = ' '
      SAMAP = '

```

```

COLCOM = ' /
INITS = '
LABID = '
LABCOM = '
C
C
C START ENTERING THE SITE DATA:
C-----
      WRITE (*,*) 'NEW RECORD'
      WRITE (*,*) 'ENTER THE TRANSACTION CODE: (OR Q TO QUIT)'
100  READ (*,'(A1)') TRACOD
      IF ( TRACOD .EQ. 'Q' ) THEN
          GO TO 990
      ELSE IF ( TRACOD .NE. 'A' .AND. TRACOD .NE. 'C
:          .AND. TRACOD .NE. 'D' ) THEN
          WRITE (*,*) 'THE TRANSACTION CODE MUST BE ',
:          'A, C, OR D. PLEASE REENTER CODE:'
          GO TO 100
      END IF
C
      WRITE (*,*) 'ENTER REPORT DUE DATE:'
      READ (*,'(A6)') DATED
C
      WRITE (*,'(1X,A30,A10,A1)') 'ENTER SITE INVENTORY NUMBER: (',
:          '          SITENO, ' ) '
110  READ (*,'(A10)') TSITE
      IF ( TSITE .NE. ' ' ) THEN
          READ (TSITE,'(A10)') SITENO
          READ (SITENO,'(I10)',ERR=991) CHECK
      END IF
C
      WRITE (*,*) 'ENTER MONITOR POINT NUMBER:'
      READ (*,'(A4)') MONPT
C
      WRITE (*,*) 'ENTER DATE COLLECTED:'
120  READ (*,'(A6)') DATEC
      READ (DATEC,'(I6)',ERR=992) CHECK
C
      WRITE (*,*) 'ENTER IEPA LAB:'
      READ (*,'(A1)') IEPAL
C
      WRITE (*,*) 'ENTER DATE RECEIVED:'
      READ (*,'(A6)') DATER
C
      WRITE (*,*) 'ENTER SAMPLE PURPOSE CODE:'
      READ (*,'(A1)') SAMPUR
C
      WRITE (*,*) 'ENTER TIME CARD PROGRAM CODE:'
      READ (*,'(A4)') PCOD
C
      WRITE (*,*) 'ENTER UNIT CODE:'
      READ (*,'(A1)') UCOD

```

```

C
WRITE (*,*) 'ENTER BACKGROUND SAMPLE:'
READ (*,'(A1)') BACKSAM
C
WRITE (*,*) 'ENTER TIME COLLECTED:'
READ (*,'(A4)') TIME
C
WRITE (*,*) 'ENTER UNABLE TO COLLECT SAMPLE (CODE):'
READ (*,'(A1)') UNABLE
C
WRITE (*,*) 'MONITOR POINT SAMPLED BY:'
READ (*,'(A1)') MPSBY
C
WRITE (*,*) 'ENTER SAMPLE FIELD FILTERED - INORGANICS:'
READ (*,'(A1)') INORG
C
WRITE (*,*) 'ENTER ORGANICS:'
READ (*,'(A1)') ORG
C
WRITE (*,*) 'ENTER SAMPLE APPEARANCE:'
READ (*,'(A40)') SAMAP
C
WRITE (*,*) 'ENTER COLLECTOR COMMENTS:'
READ (*,'(A40)') COLCOM
C
WRITE (*,*) 'ENTER INITIALS:'
READ (*,'(A3)') INITS
C
WRITE (*,*) 'ENTER LAB ID NO.:'
READ (*,'(A4)') LABID
C
WRITE (*,*) 'ENTER LAB COMMENTS:'
READ (*,'(A50)') LABCOM
C
C
C NOW WRITE BACK ALL THE DATA FOR VERIFICATION:
C-----
WRITE (*,'(1X,A7,1X,A1)') RECCOD, TRACOD
WRITE (*,'(3X,A6)') DATED
WRITE (*,*) '-----'
WRITE (*,'(3X,A10,12X,A4)') SITENO, MONPT
WRITE (*,'(23X,A6)') DATEC
WRITE (*,'(24X,A1)') IEPAL
WRITE (*,*) '-----'
WRITE (*,'(22X,A1,4X,A4)') BACKSAM, TIME
WRITE (*,'(2X,A6,14X,A1)') DATER, UNABLE
WRITE (*,'(5X,A1,16X,A1)') SAMPUR, MPSBY
WRITE (*,'(2X,A4,2X,A1,16X,A1,3X,A1)') PCOD, UCOD, INORG, ORG
WRITE (*,*) '-----'
WRITE (*,'(10X,A40)') SAMAP
WRITE (*,'(10X,A40)') COLCOM
WRITE (*,*) 'INITIALS: ', INITS

```



```

WRITE (*,*) 'ENTER REMARKS (CODE):'
READ (*,'(A1)') REM(I)
WRITE (*,*) 'ENTER REPLICATE:'
READ (*,'(A1)') REP(I)
WRITE (*,*) 'ENTER GREATER/LESS THAN:'
READ (*,'(A1)') GTLT(I)
WRITE (*,*) 'ENTER VALUE:'
READ (*,'(A10)') VALUE(I)
WRITE (*,*) 'ENTER REPORTING LEVEL:'
READ (*,'(A2)') LEVEL(I)
IF ( I .GE. N ) THEN
    N = I
    I = I + 1
    GO TO 220
ELSE
WRITE (*,*) 'CHANGE ANOTHER?'
225 READ (*,'(A1)') INPUT
    IF ( INPUT .NE. 'Y' .AND. INPUT .NE. 'N' ) THEN
        WRITE (*,*) 'PLEASE ANSWER Y OR N'
        GO TO 225
    END IF
    IF ( INPUT .EQ. 'Y' ) THEN
        WRITE (*,*) 'WHICH ONE DO YOU WANT TO CHANGE?'
        READ (*,*,ERR=994) I
        WRITE (*,*) 'PRESENT VALUE: ', STORET(I),
:           REM(I), REP(I), GTLT(I), VALUE(I), LEVEL(I)
        GO TO 220
    END IF
    END IF
    END IF
END IF
C
C
C END OF ANALYTICAL VALUES:
C-----
    IF ( N .EQ. 0 ) THEN
        WRITE (*,*) 'NO PARAMETER VALUES FOR THIS SITE'
    ELSE
        WRITE (*,*) 'ANALYTICAL DATA:'
        DO 230 I = 1, N
            WRITE (*,'(1X,I2,3X,A5,1X,A1,1X,A1,1X,A1,1X,A10,1X,A2)')
:           I, STORET(I), REP(I), REM(I),
:           GTLT(I), VALUE(I), LEVEL(I)
230     CONTINUE
        END IF
        WRITE (*,*) 'GO ON TO NEW SITE? (Y, N, OR Q) '
240     READ (*,'(A1)') INPUT
        IF ( INPUT .NE. 'Y' .AND. INPUT .NE. 'N'
:         .AND. INPUT .NE. 'Q' ) THEN
            WRITE (*,*) 'PLEASE ANSWER Y, N, OR Q'
            GO TO 240
        END IF
        IF ( INPUT .EQ. 'Y' ) THEN

```



```

CONTINUE
ELSE IF ( INPUT .EQ. 'Q' ) THEN
OVER = .TRUE.
ELSE
WRITE (*,*) 'DO YOU NEED TO CHANGE ANY VALUES?'
250 READ (*,'(A1)') INPUT
IF ( INPUT .NE. 'Y' .AND. INPUT .NE. 'N' ) THEN
WRITE (*,*) 'PLEASE ANSWER Y OR N'

END IF
IF ( INPUT .EQ. 'Y' ) THEN
WRITE (*,*) 'THERE ARE ', N, ' PARAMETER LINES'
WRITE (*,*) 'WHICH ONE TO YOU WISH TO ',
: 'CHANGE FIRST?'
READ (*,*,ERR=994) I
WRITE (*,*) 'PRESENT VALUE: ', STORET(I),
: REM(I), REP(I), GTLT(I), VALUE(I), LEVEL(I)
GO TO 220
ELSE
WRITE (*,*) 'REDO THIS SITE?'
260 READ (*,'(A1)') INPUT
IF ( INPUT .NE. 'Y' .AND.
: INPUT .NE. 'N' ) THEN
WRITE (*,*) 'PLEASE ANSWER Y OR N'
GO TO 260
END IF
IF ( INPUT .EQ. 'Y' ) THEN
GO TO 10
ELSE
WRITE (*,*) 'THEN WE"LL GO ON'
END IF
END IF
END IF

C
C
C WRITE THE DATA TO A FILE:
WRITE (OFILE, '(A2,A7,A1,A10,A4,A6,A1,6X,A6,A6,A1,A4,A1,A1,A4,
: A1,A1,A1,A1)') '1*', RECCOD, TRACOD, SITENO, MONPT, DATEC,
: IEPAL, DATED, DATER, SAMPUR, PCOD, UCOD,
: BACKSAM, TIME, UNABLE, MPSBY, INORG, ORG.
WRITE (OFILE, '(A2,A40,40)') '2*', SAMAP, COLCOM
WRITE (OFILE, '(A2,A3,A4,A50)') '3*', INITS, LABID, LABCOM
DO 300 I = 1, N
WRITE (OFILE, '(A7,A1,A10,A4,A6,A1,A5,A1,A1,A1,A10,A2)')
: 'LPCSM02', TRACOD, SITENO, MONPT, DATEC,
: IEPAL, STORET(I), REM(I), REP(I),
: GTLT(I), VALUE(I), LEVEL(I)
300 CONTINUE
C
C
C GO ON TO THE NEXT SAMPLE:
C -----

```

```

        IF ( .NOT. OVER ) GO TO 10
C
C                                     END OF LOOP
C C
C END OF PROGRAM:
C -----
990  STOP 'END OF PROGRAM'
C
C
C ERROR READING IN SITE NUMBER:
C -----
991  WRITE (*,*) 'ERROR READING IN SITE NUMBER, MUST BE NUMERIC
      WRITE (*,*) 'PLEASE REENTER SITE NUMBER:'
      GO TO 110
C
C
C ERROR READING IN DATE COLLECTED:
C -----
992  .. WRITE (*,*) 'ERROR READING IN DATE COLLECTED, MUST BE NUMERIC
      WRITE (*,*) 'PLEASE REENTER DATE COLLECTED:'
      GO TO 120
C
C
C ERROR READING IN STORET NUMBER:
C -----
993  WRITE (*,*) 'ERROR READING IN STORET NUMBER, MUST BE NUMERIC
      WRITE (*,*) 'PLEASE REENTER STORET NUMBER:'
      READ (*, '(A5)') STORET(I)
      GO TO 221
C
C
C ERROR READING IN I:
C -----
994  WRITE (*,*) 'ERROR READING IN LINE NUMBER, MUST BE NUMERIC
      . WRITE (*,*) 'PLEASE REENTER LINE NUMBER:'
      READ (*,*,ERR=994) I
      WRITE (*,*) 'PRESENT VALUE: ', STORET(I),
      :           REM(I), REP(I), GTLT(I), VALUE(I), LEVEL(I)
      GO TO 220
C
C
C END OF CODE:
C -----
      END

```

APPENDIX D

PROGRAM TO FILL OUT THE VALUE FIELD WITH ZEROS WHEN THE DATA HAVE A FIXED FORMAT

```
      program fillin
C     program to read RCRA data files with fixed decimal points
C     in the value field and pad the field with leading and trailing
C     zeros.
      character s1*37,s2*36,buf*83,ch2*1,c1*1,c2*1,c3*1,c4*1,c5*1,
      lc6*1,c7*1,c8*1,c9*1,c10*1
C     open files to read and write
      open(5,file='rcrain',status='old',form='formatted')
      rewind 5
      open(6,file='rcraz',status='new',form='formatted')
C     read first card to determine if it is a value card or a header
      1  read(5,'(a)',end=99)buf
         if(buf(1:1).ne.'L')then
           II=1
           do 15 I=1,83
             if(buf(I:I).ne.' ')II=I
           15 continue
           write(6,'(a)')buf(:II)
           go to 1
         endif
         ch2=' '
         read(buf,20)s1,c1,c2,c3,c4,c5,c6,c7,c8,c9,c10,s2
C     add leading and trailing zeros
         if(c1.ne.ch2)go to 3
         c1='0'
           3  c1-c1
             if(c2.ne.ch2)go to 4
             c2='0'
           4  c2=c2
             if(c3.ne.ch2)go to 5
             c3='0'
           5  c3=c3
             if(c4.ne.ch2)go to 6
             c4='0'
           6  c4=c4
             if(c5.ne.ch2)go to 7
             c5='0'
           7  c5=c5
             if(c6.ne.ch2)go to 8
             c6='0'
           8  c6=c6
             if(c7.ne.ch2)go to 9
             c7='0'
           9  c7=c7
```

```
        if(c8.ne.ch2)go to 10
        c8='0'
10     c8=c8
        if(c9.ne.ch2)go to 11
        c9='0'
11     c9=c9
        if(c10.ne.ch2)go to 12
        c10='0'
12     c10=c10
C Write with leading and trailing zeros
        write(6,20)si,c1,c2,c3,c4,c5,c6,c7,c8,c9,c10,s2
        go to 1
20     format(a37,10a1,a36)
99     stop
        end
```

APPENDIX E

PROGRAM TO FILL OUT THE VALUE FIELD
WITH ZEROS
WHEN THE DATA HAVE A VARIABLE FORMAT

```
#include <stdio.h>
#define isdigit(c)  c>='0' && c<='9'
#define MAX        512
#define PARTLEN    5
#define STARTNUM   37

main()
{
    FILE *fopen(), *infile, *outfile;
    char *inname= "rcrain";
    char *outname= "rcraz";
    char line[MAX];
    char intpart[PARTLEN], fractpart[PARTLEN];
    int lp, ip, fp;

    infile= fopen(inname, "r");
    if (infile == NULL) {
        printf("Can't find %s\n", inname);
        exit(1);
    }
    outfile= fopen(outname, "w");
    if (outfile == NULL) {
        printf("Can't make %s\n", outname);
        exit(1);
    }

    intpart[PARTLEN]= NULL;
    fractpart[PARTLEN]= NULL;
    while (readln(infile, line) != EOF) {
        if (line[0] != 'L') {
            fprintf(outfile, "%s\n", line);
            continue;
        }
        for (lp=0; lp < STARTNUM; lp++)
            fprintf(outfile, "%c", line[lp]);
        lp= STARTNUM;
        ip= fp= 0;
        while (isdigit(line[lp]) && (ip < PARTLEN))
            intpart[ip++]= line[lp++];
        lp++;
        while (isdigit(line[lp]) && (fp < PARTLEN))
            fractpart[fp++]= line[lp++];
    }
}
```

```

    rshift(intpart,ip);
    fillin(fractpart,fp);
    fprintf(outfile,intpart);
    fprintf(outfile,fractpart);

    lp= STARTNUM +10;
    while (line[lp]!= NULL)
        fprintf(outfile,"%c",line[lp++]);
    fprintf(outfile,"\n");
}

rshift(partarray,len)
char partarray[PARTLEN];
int len;
{
    int i,p;

    if (len < PARTLEN) {
        p= PARTLEN;
        for (i= len; i>=0 ; i--)
            partarray[p--]= partarray[i];
        i= PARTLEN - len;
        while (i-- > 0) partarray[i]= '0';
    }
}

fillin(partarray,len)
char partarray[PARTLEN];
int len;
{
    int i;

    if (len < PARTLEN)
        for (i=len; i < PARTLEN; i++)
            partarray[i]= '0';
}

fprintf(fp,partarray)
FILE *fp;
char partarray[PARTLEN];
{
    int i;

    for (i=0; i < PARTLEN; i++)
        fprintf(fp,"%c",partarray[i]);
}

readln(fp,s)

```

```
FILE *fp;
char *s;
{
    char ch, *p= s;
    while ((ch= getc(fp))!= '\n' && (ch != EOF) && (p-s < MAX)) {
        *p++ = ch;
    }
    *p= NULL;
    if ((ch= EOF) && (p!= s)) {
        ungetc(ch,fp);
        return( '\n' );
    }
    else return((ch== EOF)? EOF: '\n');
}
```

APPENDIX F

BATCH JOB TO CREATE IEPA TAPE

```
/JOB
/NOSEQ
/SIGNON PROCEDURE.
/PRINT/FETCH/BANNER=CREATAP
SETTL,000.
GET,RCRALGO.
ATTACH,JR0305.
FILE(TAPE1,RT=F,BT=K,FL=238,MBL=238,MNB=238,MNR=238).
LABEL(TAPE1,VSN=TAPENAME-RACK,PO=W,W,F=L,CV=EB,NT,LB=KU).
R.RCRALGO,TAPE1,JR0305,RCRASUM.
RETURN,TAPE1.
LABEL(TAPE1,VSN=TAPENAME-RACK,F=F,NT,LB=KU,FC=6000,PO=R).
GRAB,EXAMINE.
R.
EXAMINE(TAPE1,N=0,RL,PG,L=EXAMJ,LO=EB).
PRINT,EXAMJ/RJE=SWS/BIN=22/EJ/NAME=EXAMINE.
DEFINE,EXAMJ.
COPY,EXAM,EXAMJ.
REPLACE,EXAMJ.
RETURN,TAPE1.
```