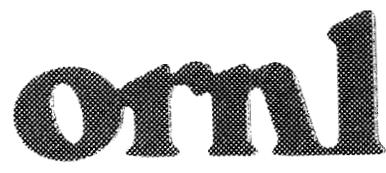




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ORNL/TM-10133



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EPA Short-Term Task 2:  
Workload Capacity  
and Telecommunication Analyses

L. Jung

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ORNL/TM-10133

Energy Division

**EPA SHORT-TERM TASK 2:  
WORKLOAD CAPACITY AND TELECOMMUNICATION ANALYSES**

L. Jung  
Engineering Technology Division

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## EXECUTIVE SUMMARY

The Oak Ridge National Laboratory (ORNL) is tasked with this Workload Capacity and Telecommunication Analyses. ORNL is to survey each region and each state that inputs data directly into the Hazardous Waste Data Management System (HWDMS). Questions were designed to help determine the minimum number of IBM PC/ATs thought necessary for data entry at the regions and to identify telecommunication needs and potential bottlenecks. Of a secondary concern is whether the equipment can be physically accommodated in existing space and with available power.

Although there are many PC/ATs in the regions, the HWDMS data entry people usually do not have access to any. A minimum of two PC/ATs is recommended for each region to ensure data entry continuity. Based upon (1) the response to the questions, (2) consultation with the Regional Project Officer and automatic data processing personnel, and (3) the consideration of two PC/ATs as a minimum, the recommended number of PC/ATs and copies of PC-FOCUS that will need to be furnished are shown in Table ES1.

In May the Washington Information Center announced an untested but very promising error-free transmission method, Primelink, that has been included in this analysis. Depending upon (1) equipment on-hand, (2) hook-up arrangement, (3) distance to the logical mainframe, and (4) states doing direct data entry, a telecommunication recommendation is made for each region. Other choices that are nearly equal are indicated. The final choice should be left to the regions as they complete their plans.

A bottleneck may develop at the end of the day when the data entry people have a tendency to transmit the data. The bottleneck should be localized for those using the cluster controllers. However, the present number of transactions is small, and no severe problem is expected.

No problems about power availability and space requirements have been expressed or uncovered.

Twelve states in four regions were surveyed. In Region 4, however, Alabama, North Carolina, and Tennessee were not surveyed because their decisions to do direct data entry were too late and there were no

Table ES1. Summary table for regions

EPA Region	Estimated number of PC/ATs needed	Number of PC/ATs to be furnished	Number of PC-FOCUS to be furnished	Telecommunication option recommended	Other telecommunication choices
1	2	0	2	Primelink	Error-checking modem
2	4	4	4	IRMA	
3	3	2	2	IRMA w/BALUNS	
4	4	0	3	Primelink	Error-checking modem or IRMA or IRMA w/BALUNS
5	3	2	3	Primelink	As plans develop, may change; plans are not definite
6	2	2	2	Primelink	Error-checking modem
7	2	2	2	Error-checking modem	Primelink
8	3	3	3	Primelink	Error-checking modem
9	2	2	2	Primelink	Error-checking modem
10	2	1	2	IRMA	IRMA w/BALUNS
Total	27	18	25	6 Primelinks <sup>a</sup> 2 IRMAs for Region 10 <sup>a</sup>	

<sup>a</sup>These items will need to be furnished.

persons named to contact. Also, there was a common thread for most of the states -- a budget problem that will require the loan of, or another method of somehow obtaining, the equipment. The survey results are shown in Table ES2. A backup plan should be developed to support these PC/ATs if malfunctions occur.

Table ES2. Summary table for states<sup>a</sup>

EPA Region	State	Estimated number of PC/ATs to be furnished	Estimated number of PC-FOCUS to be furnished	Unresolved questions	Telecommunication capability
3	DE	?		Entering data to NCC via a RJE	
4	AL	?		Identified after survey was completed	
4	FL	0	1		IRMAcom
4	GA	1	1		
4	KY	0	1		
4	NC	?		Identified after survey was completed	
4	MS	0	1		Error-checking modem
4	TN	?		Identified after survey was completed	
6	AK	1	1		
6	LA	?	1	Likely, but not definite can get PC/AT	Possibly IRMA
6	NM	1	1		
6	OK	1	1		
6	TX	?	4	Trying to get another PC/AT through grant money	
7	KA	?	1	Zenith 158 w/10 megabyte disk may work	IRMAcom
7	NE	?	1	Likely, but not definite can get PC/AT	
9	AZ	1	1		
Total		5	15		

<sup>a</sup>Note: If Primelink is installed on these regions' Prime computers, these states could do their file transfers with their existing telecommunication hardware. If not, then some form of telecommunication hardware will need to be furnished, based upon each region's and/or state's decision.

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EPA SHORT-TERM TASK 2:  
WORKLOAD CAPACITY AND TELECOMMUNICATIONS ANALYSES

L. Jung

ABSTRACT

This report contains data acquired from a survey conducted of the 10 Environmental Protection Agency's (EPA's) regions and 12 states that enter data directly into the EPA's Hazardous Waste Data Management System (HWDMS). Problems and additional hardware and software needs related to data entry are identified in planning for a change in the data entry method. Alternative communication methods were evaluated, and recommendations were made for each of the locations.

---

1. INTRODUCTION

Information for the Hazardous Waste Data Management System (HWDMS) is generated at the regional and state levels. Entering this information into the national data base has been slow, tedious, and unreliable. Before trying to overcome these problems, consideration must be given to (1) the direction that the Environmental Protection Agency (EPA) has taken in its regional modernization update of the computer systems, (2) the decision to greatly increase the use of new developments in technology, and (3) the expanding federal reporting requirements. The regions' PDP 11/70 minicomputers are to be replaced with IBM 4361s or 4381s. Throughout EPA the use of many IBM PC/ATs is anticipated. High-speed telecommunications will link the regions and certain selected states to the National Computing Center (NCC).

With these considerations, EPA has embarked on a project to speed HWDMS data entry. Using the IBM PC/AT and PC-FOCUS, Pete Gattuso of EPA Headquarters developed a more desirable method of entering data into the notification screens.<sup>1</sup> The overall results were promising enough to warrant a pilot study with Region 3. Throughput was estimated to have almost doubled when compared with a time when the PDP 11/70 was not loaded, and the many frustrations previously encountered were gone.

Under a loaded condition, the throughput should show further substantial increases. The pilot project was successful and will be discussed in a report by George Bonina. EPA is moving toward the conversion of all HWDMS screens to PC-FOCUS.

## 2. TASK DESCRIPTION

The Oak Ridge National Laboratory (ORNL) is tasked with these Workload Capacity and Telecommunication Analyses. The initial overview of the task received from EPA follows.

Given the Stipulated configuration environment (to be specified by ORNL based on the Region III pilot evaluation), ORNL will identify alternatives and implementation plans for each Region and for States currently using direct data entry. The analysis will include an evaluation of the IBM AT to function as the sole data entry source for RCRA and must analyze hardware constraints in terms of estimated storage, memory, and other raw requirements. The report should also review existing equipment in each Region (or delegated State) and detail costs, timeframes, and priorities required to implement the screens by December, 1986. A telecommunications analysis, previously performed by OIRM should be extended to include all Regions and "direct entry" States. Design considerations identified by OIRM/CSC in Task 1 will be forwarded to ORNL for inclusion in such estimates as required memory.

Specific requirements were determined in meetings primarily with Pete Gattuso and by formulating a series of questions for use when surveying the regions. After an initial test at Region 3, these questions were modified.

Each region and each state are to be surveyed by collecting information to evaluate the hardware and telecommunication requirements necessary for the regions and direct data entry states to implement the PC-FOCUS screens for HWDMS data entry. A report summarizing the results will be issued with recommendations concerning (1) the number of PC/ATs required, (2) the number of copies of PC-FOCUS, and (3) telecommunication options. Of a secondary concern is whether the equipment can be physically accommodated in existing space with available power.

### 3. SURVEY METHOD

The survey method entailed using the modified questions, divided into two parts, developed with Pete Gattuso. One part was directed to the Regional Project Officer (RPO); the other part was directed to persons in the automatic data processing (ADP) area. The modified questions are in Appendixes A and B.

Because of the many differences among regions, it was decided that direct contact rather than a mailed response to the questions would be a better choice. Concerned persons in Regions 1, 2, 4, 6, 7, and 8 were surveyed by phone. In addition to Region 3, Region 5 was visited, and a copy of the last 15 months of the HWDMS data entry log was obtained for use in this analysis. The RPOs of Regions 9 and 10 were interviewed at the April RPO meeting in Washington, D.C, and the ADP personnel were surveyed by phone.

#### 4. RESULTS FOR EPA'S REGIONS

An area of primary interest is the number of IBM PC/ATs needed at each region. Also, the regions have different communication hardware and require different communication methods to satisfy their needs. Telecommunication problems are to be identified. Of a secondary concern is whether the equipment can be physically accommodated in existing space and with available power.

Significant results of the survey are tabulated in Table 1. Results that do not fit well in a table are discussed.

##### 4.1 NUMBER OF IBM PC/ATs NEEDED

Questions were formulated to help determine the minimum number of IBM PC/ATs thought necessary for data entry at the regions. The answers correspond to columns 2 through 6 of Table 1.

Part of the desired information was the number of persons doing data entry at any time and their need of PC/ATs (column 2). No correlation seems to exist between the size of the different regions and the number of persons doing data entry. Region 5 has more data entry activity than the other regions. When Region 5 was surveyed, two persons were doing data entry; a third person has since volunteered for that position.

Questions were asked to determine if the data entry persons spent the day at a terminal or if turns were taken (columns 3 and 4). In Region 1 only one person at a time enters the data, and the data entry session is administratively limited to 15 minutes to reduce the amount of lost data and time caused by system crashes. In Region 4 the limiting time is set at 1 hour, and the people average about 2 hours each day inputting data. Region 7 has a unique problem: only one terminal to use. During March the one terminal averaged 3.7 hours/day of connect time to the PDP 11/70; however, the average for February was 8.5 hours/day. For the other regions the data entry persons spend considerable time at the terminal on some form of rotating schedule.

Table 1. Consolidated information from workload capacity survey and telecommunication analysis

Col. 1 EPA Region	2 Number doing data entry	3 Number at any one time	4 Session length (h)	5 Time of day	6 Estimated number of PC/ATs needed	7 Number of PC/ATs to be acquired	8 Number of PC-FOCUS to be acquired	9 3270 cluster controller available	10 Option choice
1	2	1	0.25	All day	2	0	2	No	4 or 5
2	6	4	2-8	Morning	4	4	4	Yes	1
3	5	3	2	Varies	3	2	2	Yes	1a
4	6	6	1	All day	4	0	3	Yes	1, 1a, 4, or 5
5	3	3	5	All day	3	2	3	No	1, 1a, 2, or 5 <sup>a</sup>
6	3	2	8	All day	2	2	2	No	4 or 5
7	4	1	4-8	All day	2	2	2	No	4 or 5
8	4	2	1.5	All day	3	3	3	No	5
9	2	2	.1-8	Varies	2	2	2	No	4 or 5
10	2	2	.5-2	Morning	2	1	2	Yes	1, 1a

<sup>a</sup>Plans are not definite.

A question was asked to determine if there is a preferred time of day for data entry and, if so, the reason (column 5). This question, along with other questions, would help determine if a telecommunication bottleneck may be generated when the data are transferred to the mainframe. The preferred time is usually in the morning before the PDP 11/70 becomes loaded and the response time becomes excruciatingly slow.

Since the first of the year, Region 5 has found it necessary to input data during some nights and on weekends. In fact, about two-thirds of Region 5's total transactions were done during these off-hours, and the region has not caught up. The elimination of overtime pay would quickly pay for a PC/AT.

Column 6 lists the estimated number of PC/ATs thought necessary for each region. Based upon their understanding of the benefits of using PC-FOCUS for data entry, the regions were asked to estimate the number of PC/ATs necessary to keep up with their workloads. Where they made no estimates, a best estimate was furnished. For Region 2 there is some uncertainty about whether three or four PC/ATs are needed to satisfy load requirements. Four persons can be found doing data entry at any time, but they only input data in the morning. Although a single PC/AT may appear sufficient in some instances, a minimum of two for each region was selected. Unlike having plentiful terminals if one should malfunction, having only a single PC/AT virtually ensures that data entry would cease until repairs are made. The second PC/AT would serve as a backup and be extremely useful. On the surface three PC/ATs for Region 8 may seem excessive. However, Region 8 has a field office in Montana, and the data entry person is a secretary. When the PDP 11/70 is removed, she will need a PC/AT to continue data entry. The PC/AT could also be used for office work.

Column 7 lists the number of new PC/ATs that must be acquired to match the number estimated in column 6. Some of the regions already have some PC/ATs for use by the data entry group, Region 4 has the PC/ATs, and Region 10 will need another PC/AT. The question of how these PC/ATs will be acquired was not included as part of the questionnaire. However, almost every region expressed a funding problem for the needed equipment.

The number of PC-FOCUS copies to be acquired was not included in the questions because of an erroneous assumption; for each PC/AT needed, a copy of PC-FOCUS would also be necessary. The quantity listed in column 8 was either stated or inferred from the general response to other questions. Unless informed otherwise, a copy of PC-FOCUS is assumed to be furnished. Regions 3 and 4 each have a copy.

#### 4.2 TELECOMMUNICATION ISSUES

A detailed discussion of telecommunication procedures, processes, and terminologies is not included. The intended audience either understands these terms or can obtain the information readily.

##### 4.2.1 Telecommunication Criteria

An important part of the PC-FOCUS project is the formulation of a consistent dependable data transmission method that is (1) fast, (2) error-free, and (3) easy-to-use for transmitting the generated data into HWDMS. The use of on-hand or planned equipment in the modernization is highly desirable. Equally important is the determination of the magnitude of the data transmission traffic and the impact upon the EPA telecommunication system. Bottlenecks should be identified.

The PC-FOCUS screen project has demonstrated three file transfer methods that meet all of the critical criteria. These methods are consistent, dependable, easy-to-use, error-free, and as fast as the communication system will allow. The first method transmitted HWDMS data to the mainframe computer at NCC by using synchronous communication with an IRMA board and the IRMALink FT/3270 file transfer software. The second method used an IRMAcom board and was successfully tested by Pete Gattuso. The third method used an error-checking Racal-Vadic 2400PA modem and was successfully tested at Region 7 although there was no visual indication that any transmission was occurring.<sup>2</sup> NCC states that eight of these modems will be in each region by the end of Phase I of the modernization.

#### 4.2.2 Primelink

Another promising method of telecommunicating with NCC using asynchronous communication with error checking is the recently announced Primelink.<sup>3,4</sup> Although communication from a PC to the Prime computer is asynchronous, transmission from the Prime computer to NCC is synchronous. This option has been tested for file transfers to NCC and does appear to meet all of the stated criteria. There has been no test using a HWDMS data file.

Because all of the regional Prime computers can communicate with the NCC mainframe, this option was investigated. Drawbacks are the necessity of purchasing the software for each Prime computer and the limited number of simultaneous users supported. A specified amount of disk storage is assigned to handle only five or ten simultaneous users. If Primelink is used only for file transfers, the user's limit has little impact. On the positive side, if the PC/AT and the Prime computer are located in the same building, speeds up to 19,200 baud are obtainable. Included in the "standard buy" for the many PC/ATs is a serial port that will allow a hardwired asynchronous connection into the port selector without additional cost for modems. Primelink runs only on IBM-compatible PCs and MacIntosh computers. For others, namely, the states doing direct data entry, there is no restriction on the type of asynchronous modems used. Because this option may appeal to the states, the error-free transmission capability should be confirmed.

#### 4.2.3 Telecommunication Items' Cost

Summarized in Table 2 are each individual item's cost for use in comparing options. Cost alone, however, should not be the overruling factor. These costs are reasonable single-unit retail prices for representative equipment. Detailed costs for communication software for the PC/ATs, cabling, and hook-up are not provided.

By the end of this year, a cluster controller will be at each region. The \$6000 cost of the cluster controller is an estimate from the 16 available models of the IBM 3274 and is included because purchasing a separate unit may be required by the data entry group.

Table 2. Individual item cost<sup>a</sup>

Item	Cost (\$)
IRMA board	1195
IBM 3274 cluster controller	6000
BALUNS (dual-coaxial to twisted-pair adapters)	90
IRMAcom board	895
4800-baud synchronous dial-up modem	1495
ABC switch	100
ABCDE switch	165
Primelink (5 users)	2100
Primelink (10 users)	4000
Additional copies of Primelink for PCs	60
Racal-Vadic 2400PA modem	795

<sup>a</sup>These costs were obtained from a number of sources (e.g., vendors, catalogues, etc.); when a specific item is named, a single-unit retail is given.

When a synchronous modem might be a required purchase by the data entry group, a speed of 4800 baud — the fastest dial-up synchronous modem with high reliability and cost-effectiveness — was selected. The speed is adequate in handling the maximum anticipated daily transactions in a reasonable time. Instead of purchasing a modem for each PC/AT, an ABC switch to handle two PC/ATs or an ABCDE switch to handle up to four PC/ATs is recommended for sharing the modem.

#### 4.2.4 Telecommunication Options

Any telecommunication option listed will perform satisfactorily but may not be the best choice for a particular region. All options except for Primelink have been tested by transmitting HWDMS data to NCC. Because of their limited support capabilities, the regions have expressed a concern that the options not be internally mixed. Also, some consideration should be given to the kind and level of support at the national level. Because there are already enough viable options, many other available options were not considered.

The discussion of the different options will consider the telecommunication capabilities of the states entering data into HWDMS although the results from the states surveyed will not be discussed until Section 5. Because there was no cluster controller found for use by the data entry group, no mention is made of the advantages or disadvantages until options 4 and 5.

The options considered and a discussion of their advantages and disadvantages are listed. The costs for each option vs the number of PC/ATs supported are shown in Table 3.

Table 3. Additional telecommunication costs with varying number of PC/ATs vs different options

Option No.	Number of PC/ATs required		
	2	3	4
1	2,390	3,585	4,780
1a	2,570	3,855	5,140
2	3,385	4,345	5,240
3	9,985	11,080	11,975
4 <sup>a</sup>	100	165	165
5	2,100	2,100	2,100

<sup>a</sup>If an existing error-checking modem can be accessed through the port-selector, there is no cost.

#### Option 1

An IRMA board will be installed in each PC/AT. The ADP section's existing or planned cluster controller will be used. Coaxial cables will connect the PC/ATs to the cluster controller.

#### Advantages:

1. The IRMA board concept has proven viable.
2. Presently, the IRMA board is compatible with IBM's system.
3. The cost is low for a small number of units.

Disadvantages:

1. The file transfer capability was tested with one PC/AT. As use grows, there may be a bottleneck at the cluster controller. The survey reveals a tendency to transfer the data at the end of the day.
2. This item should be viewed more as a caution than as a disadvantage. IBM has entered the datacom market. As Melinda McAdams has stated, "Software written to run with another company's datacom board will not run with IBM's, and new datacom software from IBM may not run with other firm's datacom boards."<sup>5</sup>

Option 1a

An IRMA board will be installed in each PC/AT. The ADP section's existing or planned cluster controller will be used. BALUNS dual-coaxial to four-wire twisted-pair adapters<sup>6</sup> will be used with phone lines to connect the IBM PC/ATs to the cluster controller.

Advantages:

1. Same as advantages 1, 2, and 3 in Option 1.
4. Coaxial cables are not needed.

Disadvantages:

1. Same as disadvantages 1 and 2 in Option 1.

Option 2

An IRMAcom board will be installed in each PC/AT. A 4800-baud synchronous modem and an ABC or ABCDE switch will be needed. Access to NCC will use a dial-up line and the modem.

Advantages:

1. Same as advantages 1 and 2 in Option 1.
3. The unit cost decreases as more PC/ATs are added.
4. With appropriate software, the PC/AT can emulate a remote job entry (RJE) terminal in a binary synchronous communication (BSC) environment.

Disadvantages:

1. Same as disadvantage 2 in Option 1.
2. The unit cost increases over Option 1 for a smaller number of PC/ATs.

3. As use grows, there may be competition for use of the 4800-baud modem.

#### Option 3

An IRMA board will be installed in each PC/AT. An additional cluster controller and a 4800-baud synchronous modem will have to be procured. Option 3 is discussed only because to use Option 1 or 1a, some regions must purchase an additional cluster controller. Therefore, Option 3 represents a more expensive implementation of Option 1 or 1a caused by the physical location of certain regions.

#### Advantages:

1. Same as advantages 1 and 2 in Option 1.

#### Disadvantages:

1. Same as disadvantages 1 and 2 in Option 1.
3. High initial cost because of the cluster controller.

#### Option 4

An error-checking Racal-Vadic modem is assumed to be used at no cost to the data entry group. If a modem must be assigned from the ADP section, an ABC or ABCDE switch will be needed.

#### Advantages:

1. Initial zero or low cost.
2. Cost is low for a large number of users.

#### Disadvantages:

1. Slowest speed of all the options.
2. States will require a Racal-Vadic 2400PA modem.
3. No visual display of the data being transmitted.
4. May produce a bottleneck if all of the regions, especially those that have direct data entry states, upload the data at the end of the day.

#### Option 5

The five-user Primelink will be purchased and installed on the Prime Computer. Primelink will be supplied for each PC/AT. Hardwired phone lines inside the region's building or any existing asynchronous modems could be used for communicating with the Prime Computer.

**Advantages:**

1. Low cost for many users.
2. High data transmission rates.
3. Any asynchronous modems can be used.
4. Another EPA telecommunication system available to all the regions.
5. Same distributive telecommunication load as present system. Information is uploaded to NCC at predetermined designated time.

**Disadvantages:**

1. Limited number of simultaneous users.
2. Another computer system is added. Reliability will reflect the reliability of the Prime system.
3. Additional load on the Prime computers.

**4.2.5 Telecommunication Findings**

The telecommunication findings for each area of interest to HWDMS data entry will be discussed and lead to the recommendations made in Section 4.2.6.

**4.2.5.1 Transactions in Regions**

Collecting information for this question was the survey's most difficult portion of this task. Most of the regions were able to provide information in varying forms, and others could only estimate the numbers. However, Region 5 was able to furnish a copy of its HWDMS log for the period January 1985-March 1986. This log contains daily entries that included the transactions. In comparison with values from the other regions, Region 5 does indeed have the most activity.

There is concern that the number of transactions may affect the telecommunication system. Region 5's transactions will be used for this analysis because of two reasons: no detailed information was available from the other regions, and no major impact was found from an examination of Region 5's values. Over the 15 months of entries in the log, the maximum number of transactions for any day, a Sunday, was 3283, more than any other region's monthly total. This maximum is not typical and was caused by a catch-up attempt. Because 3270 type transmission is a

full 80-column card with no data compression, about 450 cards or transactions per minute at 4800 baud can be transmitted. The transmission time for this set of transactions is less than 8 minutes.

One potential bottleneck that may appear is the tendency to send the transactions at the end of the day. Two users sending their transactions at the same time would compete with either the cluster controller or the data line. The total impact to NCC, however, is abated because of the regional differences in time zones.

After all of the other collected transaction information has been reviewed, a 4800-baud modem seems more than adequate and is the recommended speed for a modem if one must be acquired. There is little justification for a higher speed modem unless one is already available.

#### 4.2.5.2 Availability of Cluster Controllers

Initially, the PC-FOCUS screen project assumed that all of the regions had an IBM 3270 cluster controller. As shown in column 9 of Table 1, only Regions 2, 3, 4, and 10 have this controller. However, plans are to have a cluster controller in all of the regions by December 1986.

These cluster controllers would normally be adjacent to or near the regional computers. When the users are in the same building, they would usually be within range to communicate with the controller. Three of the regions report a potential problem with the distance between the data entry location and the site for the future logical mainframe (LMF) where the PDP 11/70 is now located. The Region 1 data entry group will be separated from the LMF by 5 city blocks; the Region 6 data entry group will be separated from the LMF by 2 city blocks; the Region 8 data entry group will be separated from the LMF by 12 miles. Therefore, if IRMA boards are used in Regions 1, 6, and 8, a cluster controller will be needed near the data entry equipment. In a normal situation the controller and required modem would be funded out of the ADP budget. For the three mentioned regions, purchasing these items could be a problem if the funds must come out of these groups' scant budgets. Option 3 shows that the cost for this choice is the highest and may be a reason for exclusion.

#### 4.2.5.3 Availability of Cluster Controller Ports

Each region that has a cluster controller is using less than one-half of the total ports. The minimum number of available ports found was 16. The data entry group will need, at the most, a few ports. At this time, port shortage is not a problem.

#### 4.2.5.4 Availability and Use of Coaxial Cables

Most of the regions do not have any coaxial cables although Region 2 is planning to run them. For Regions 2, 3, 4, 5, 7, 9, and 10, planning is under way for either coaxial cables or four-wire twisted-pair phone lines. Region 5 is not certain who owns the hard wire and what problems may be encountered by attempting to use it. If the users in Region 5 can make use of the phone lines, they will.

#### 4.2.5.5 Number of IRMA Boards

Regions 2 and 3 are the only regions with definite plans for IRMA boards. Region 2 will have IRMA boards in all of its PC/ATs. Region 3 will furnish the data entry group the necessary IRMA boards from the six on order.

Region 10 will not make any IRMA boards available to the HWDMS data entry group; therefore, two IRMA boards will need to be acquired. Region 5 will wait to see how well the PC-FOCUS data entry works before making any decision. The other regions have no IRMA boards.

#### 4.2.5.6 Availability of Communication Software

XTALK is available in all of the regions; KERMIT is in Regions 2, 3, 4, 8, and 9. The experience has been good using XTALK for simple communication setups. KERMIT has given the most problems. Except for simple trials, none of the regions has had much experience in file transfers.

#### 4.2.5.7 Prime Computer's Load

All of the regions were surveyed concerning the load on the Prime computer. All but Region 7 expressed a loaded condition. Midway through the survey, the question was changed to the use of the Prime to handle a simple communication function. With that qualifier, all except Region 10 stated that there were resources available. Region 10 was not resurveyed.

#### 4.2.6 Telecommunication Recommendations

Recommendations will be made by region with consideration of the responses to the survey, the various options, and cost. Option 3 was excluded, mainly because of cost. Option 5 is viable for all regions except for Region 10. Where many options are recommended, that region has not reached a definite plan, and it can select from those listed. The final decision should be made by Regional Management.

The options for each region (column 10 of Table 1) follow.

For Region 1, either option 4 or 5 is recommended because of the distance between the data entry location and the site for the future LMF.

For Region 2, option 1 is recommended because it has a cluster controller and definite plans for a coaxial cable system.

For Region 3, option 1a is recommended because it has a cluster controller and is wired to handle the BALUNS adapters.

For Region 4, either option 1, 1a, 4, or 5 is recommended. Option 1 or 1a is included because the region has a cluster controller and its choice will depend upon the decision to use coaxial cables or four-wire twisted-pair connections. Option 4 was included because the region has the necessary modems. Option 5 may be a better choice because of the number of states doing direct data entry into HWDMS (see Section 5.2).

For Region 5, either option 1, 1a, 2, or 5 is recommended. Option 1 or 1a is included because the region has not finalized the choice of coaxial cables or four-wire twisted-pair connections. It does not have a cluster controller, but plans are for one to be installed this year. Option 2 is included in the event a cluster controller is not installed soon. Option 5 is included because of its lower cost and speed.

For Region 6, either option 4 or 5 is recommended because of the distance between the data entry location and the site for the future LMF. Option 5 is the better choice because of the many states doing direct data entry.

For Region 7, either option 4 or 5 is recommended. Option 4 was tested at Region 7, which does have the necessary modems. Option 5 is perhaps the better choice because of the states doing direct data entry.

For Region 8, option 5 is recommended because of the proximity of the Prime computer and the distance to the LMF.

For Region 9, either option 4 or 5 is recommended because it does not have a cluster controller and has one state doing direct data entry.

For Region 10, option 1 or 1a is recommended because it has a cluster controller and is finalizing plans for either coaxial cables or four-wire twisted-pair connections.

#### 4.3 SPACE AND POWER ISSUES

There was a question concerning whether (1) space is available to place the PC/AT and (2) sufficient power exists to power the anticipated large number of PCs. The question was also an attempt to understand how the computer would be placed in relation to an existing or anticipated IBM 3270 cluster controller.

In general, no problems have been expressed about power and space requirements. Some furniture has been ordered, but none has arrived. Meanwhile, those users who have PC/ATs are glad to have them and will be accommodating until the furniture arrives. Space and power requirements do not seem to be any problem and can be handled by coordination. The PC/ATs will be placed where the data entry equipment was formerly placed, on people's desks in most cases. Region 5 will place the PC/ATs in the data entry room.

## 5. RESULTS FOR STATES

EPA is sensitive to the fact that some of the states are anchored to non-IBM type computers, and having an IBM/AT would be alien enough without having to purchase the cluster controller or IRMA-type boards. Because those states that are inputting data directly into HWDMS are providing a valuable source of information, care was exercised when they were surveyed. After an explanatory introduction, only two questions were asked: if there was access to a compatible hardware-software PC/AT and, if not, through what process the computer could be acquired.

The answers received are varied. The states will be discussed by regions, listing the name, area of responsibility, and the phone number of the key individual responding although several persons were usually surveyed. The main topics will be addressed, and attention will be given to problem areas uncovered.

There was one common response from most of the states -- a budget problem. There seems to be no money to buy any ADP equipment or software.

Table ES2 itemizes those states, by region, that will need an IBM PC/AT and a copy of PC-FOCUS. The minimum recommendation is one PC/AT for any state. In case of malfunctioning, a backup plan should be developed to support these ATs. The assumption in the telecommunication area is that all states have an asynchronous modem. Most of the states entering data directly into HWDMS are using the region's PDP 11/70 and a VT100-type terminal. Where there are some unresolved questions, a question mark is entered, and the text should be consulted.

Table ES2 should be used in the following discussions.

### 5.1 REGION 3

In Region 3 the only state doing direct entry is Delaware, which was not contacted because the information was available from the region's ADP group. Delaware does not do direct data entry via the PDP 11/70 but instead uses an IBM PC and a software package, Barr-HASP, to emulate a RJE terminal. Only compliance data are being entered by this

terminal to NCC. To interface this setup for transmitting the data from a PC/AT would be a simple matter. This choice of entering data via a RJE may be another option that EPA should later consider.<sup>7</sup>

## 5.2 REGION 4

The states doing direct entry are Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, and Tennessee. Alabama, North Carolina, and Tennessee decided to do direct data entry near the end of this survey and were not contacted because no names were provided to respond to the questions.

### 5.2.1 Florida

Contact: Mike Redig, ADP

Phone number: (904) 488-0300

Data entry takes about 40 hours/month.

After the survey Redig was informed that he has been authorized to use carryover money to purchase a PC/AT and an IRMAcom board. The approval process for ADP equipment takes about 6 weeks; the delivery time takes about 90 days.

The state has IN-WATS to NCC, so a telecommunication line is no problem. An account would be needed. Redig has a 208A/B modem, an AT&T term for a 4800-baud synchronous dial-up modem. Downstairs from Redig's office is a RJE, remote 172, to NCC.

Redig will need a copy of PC-FOCUS.

### 5.2.2 Georgia

Contact: Ted Jackson, ADP

Phone number: (404) 656-6593

Georgia is developing its own system and is willing to share the data. Plans are to pass on the HWDMS screens with the state Prime computer with the current thought being with INFO, a fourth generation language developed by HENCO.

The available telecommunication lines are a 9600-baud hard-wired line to Region 4, a 1200-baud dial-up line, and a "supposed-to-be-reconnected" 14,400-baud line to NCC. There is an uncertainty about

whether the IRMAcom board can be used without a modem on this high-speed line.

The state will need an IBM PC/AT and a copy of PC-FOCUS.

### 5.2.3 Kentucky

Contact: Linda Hancock, data entry

Phone number: (502) 564-6716, Ext. 281

Hancock spends about 3 hours/day entering data.

She has a Compaq Deskpro with a built-in modem and a 30 megabyte hard disk on order. She is not certain that it is IRMA compatible. She also has a Racal-Milgo 1200-baud modem.

Hancock will know what the budget situation will be after the first of May at midyear review time. However, a PC/AT is on order. If the Primelink option is viable, no other hardware is necessary. If not, an IRMAcom board and a 208B modem will be needed.

### 5.2.4 Mississippi

Contact: Charlie Yates, Head of Data Processing

Phone number: (601) 961-5035

A cluster controller is not available, and CDPA, a state-controlling organization on ADP, will not let Yate's group have any 3270 capabilities. There is a 2400 auto-dial Hayes compatible type, Racal-Vadic 2400, model PA, modem.

Data entry takes about 5 hours/week.

Yates is going to order a PC/AT with 1 megabyte of memory and 30 megabytes of hard disk. He will need a copy of PC-FOCUS.

## 5.3 REGION 6

The states doing direct data entry are Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

### 5.3.1 Arkansas

Contact: Robert Gage, ADP

Phone number: (501) 562-7444 Ext. 601

Although the state has a VAX 11/750 computer, it also uses the NCC mainframe.

Gage said that his group is investigating getting a cluster controller on a split line to run a RJE and 3270 type terminals for accessing NCC. The planned line speed is 9600 baud, but he would like to see it go to 19.2 kilobaud.

Gage will need an IBM PC/AT and a copy of PC-FOCUS. If the state gets a cluster controller, an IRMA board is the recommended choice.

### 5.3.2 Louisiana

Contact: Dale Givens, ADP

Phone number: (504) 342-6363

The state uses a VAX 11/780 and a VAX 11/750 computer.

Givens thinks that the budget will allow him to get something, but he is not certain what. Some lead time is needed. The lead time for the IRMA board is 21 days, and concurrence is all that is required for software. The group has a 208B modem and no cluster controller but is considering obtaining one to connect with NCC.

If the cluster controller is obtained, an IRMA board is recommended. Givens should be resurveyed at a later date to determine what he can get.

### 5.3.3 New Mexico

Contact: Boyd Hamilton, data entry

Phone number: (505) 827-2926

New Mexico is an oil-producing state and is feeling the effects of the lower oil prices. In fact, there is a total freeze on equipment. Even with grant money there is no money for the state's matching portion. Travel for training is totally curtailed.

Hamilton has a Racal-Vadic 1200-baud dial-up modem. Data entry takes about 4 hours/week.

The recommendation is a loan of one PC/AT and a copy of PC-FOCUS. If Region 6 adopts Primelink, Hamilton can use his modem. If not, the error-checking modem option is recommended.

#### 5.3.4 Oklahoma

Contact: Al Coulter, data entry

Phone number: (405) 271-5338

Oklahoma is an oil-producing state. Coulter states, "With the price of oil being depressed, they cannot spend any grant money because the state is not approving the spending unless the situation is dire."

Coulter does all of the data entry on a VT102 terminal loaned from Region 6. Telecommunication is via an Anderson Jacobson acoustic-coupled modem (only 300 baud).

The recommendation is a loan of a PC/AT. If Primelink is installed in Region 6, the loan of a faster modem should be considered. If not, the error-checking modem is another option and may have to be furnished.

#### 5.3.5 Texas

Contact: Ken Zarker, data entry

Phone number: (512) 463-7762

Texas is an oil-producing state but does not seem to have a budget problem. The state uses Sperry computers.

Zarker said that his group has IBM PC/ATs and a couple of more have been ordered. The group is trying to get another through grant money. From other information collected, four persons are entering data all day.

Data are going to the NCC computer with Region 6 controlling the data. A Televideo 970 terminal is used to access INFORM, a Decwriter III is used to print the reports, and the modem used is a Multi-Tech MT212A (probably a 1200-baud asynchronous modem).

If Region 6 installs Primelink and Zarker's group is able to get the other PC/AT, no other equipment will be necessary although higher speed modems would be desirable. If not, the second choice is the error-checking modems, and they may have to be furnished.

## 5.4 REGION 7

Kansas is the only state doing direct data entry. However, Nebraska is presently accessing HWDMS and will start doing direct data entry before the end of the year. The region's RPO suggested that Nebraska be surveyed.

### 5.4.1 Kansas

Contact: Steve Brown, ADP

Phone number: (913) 862-9360

Kansas uses many types of IBM equipment. The IBM 3033 is being upgraded to an IBM 3084. Also, there are three IBM 3276 cluster controllers and ten emulated controllers. IRMA boards are used to talk to this computer.

Kansas is using Zenith 151 and 158, PC look-a-likes, with Z STEM software for data entry; a VT100 terminal is emulated when entering data in the PDP 11/70 with INFORM; XTALK is used for data communication; and Multi-Tech's 300- and 1200-baud modems are used. There is a RJE that goes to NCC and a dial-up 4800 Prentice 208A/B modem.

Brown is proceeding with a test to upload a flat file to NCC using the Zenith 158, an IRMAcom board, and the Prentice 208A/B modem. Brown needs to know if FOCUS can operate on a Zenith 158 with a 10 megabyte disk and a S100 bus. If it can, no equipment is needed.

If he has to get a PC/AT, there are normally 5 years required to plan. Urgency could cause a sign-off in months. There is no problem in using grant money.

The recommendation is to determine if the Zenith 158 can be used. If so, no additional equipment is needed. PC-FOCUS will be needed.

### 5.4.2 Nebraska

Contact: Mike Stefsensmeier

Phone number: (402) 471-4217

Nebraska is a very small state, and a budget for a PC/AT would be a large part of Stefsensmeier's portion. An in-house review is required for an approval for the PC/AT, but he does not think there is any problem. Data entry takes less than 2 hours/week.

If Region 7 installs Primelink, this is the first choice. However, the error-checking modem option was tested in this region, and Region 7 may choose this option. If so, Stefsensmeier may not have the budget to get the proper modem and may need one loaned.

#### 5.5 REGION 9

Arizona is the only state doing direct data entry in Region 9.

Contact: Cherry Moyer, data entry

Phone number: (602) 257-2258

Arizona has only 15 major facilities. The data collection takes about 4 hours/month. Data entry would take another 4 hours if it were done.

Because there has been no new facility, all of the data being entered is compliance information. Presently, there is no problem in entering data into HWDMS because she was told not to enter data by Region 9. The major facility status sheet has been down since November because of version 6.5.

Moyer feels that there is no urgency in getting Arizona ready. She will need an IBM PC/AT and a copy of PC-FOCUS. The telecommunication option should be decided after Region 9's decision.



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Appendix A

QUESTIONS FOR RPOs — WORKLOAD ANALYSIS



## Appendix A

## QUESTIONS FOR RPOs -- WORKLOAD ANALYSIS

REGION (STATE)

NAME OF PERSON RESPONDING

POSITION

PHONE NUMBER

1. How many users do data entry?
2. Of the total, how many are simultaneously entering data?

QUESTIONS 3, 4, AND 5 ARE CLOSELY RELATED.

3. How long is a data entry session?
4. What time of day is the data entry session?
5. Is the person(s) who enters the data sitting at the terminal all day or for a few minutes per hour? If more than one person, do they take turns on the equipment? In other words, can one PC/AT suffice or are more needed? (Need dumb terminal to PC/AT replacement ratio.)
6. How often is the information uploaded? after a group of information is entered or hourly? if daily or weekly, the time-of-day?
7. What type of terminal is used for data entry? Is it to the PDP 11/70?
8. Are you using other than a dumb terminal to the PDP 11/70? If so, what is it?
9. If a 3270 cluster controller is available, where are these terminals located in relation to the 3270 controller? in the office? terminal room? If the PC/AT is to be placed in an office, is sufficient power and desk-top space available? (Impact of putting PC/AT in the location.) If the terminal is located in a terminal room, will the PC/AT be placed in the same location as the terminal or in someone's office?
10. What has been the past experience with data entry (good, bad, slow, OK, etc.)? with correcting input errors during data entry? ease of use? delays when PDP 11/70 is loaded?

11. Have you had any experiences with PC-to-mainframe file transfer? If so, what kind? (Note: this question also applies to the communication questionnaire.)
12. What is the number of transactions over any given time frame? (Note: A transaction is an 80-columns card sent or whatever unit can be gotten.) This question is also directed to the communication analysis.
13. Are any states in your region doing direct data entry? If so, who are they?

Appendix B

QUESTIONS FOR ADP CHIEFS -- COMMUNICATION ANALYSIS



## Appendix B

## QUESTIONS FOR ADP CHIEFS — COMMUNICATION ANALYSIS

REGION (STATE)

NAME OF PERSON RESPONDING

POSITION

PHONE NUMBER

1. Is a 3270 cluster controller available? type and speed?
2. Is it used for data entry?
3. How many ports are used for data entry? How many will be available after December 1986?
4. Are enough coaxial cables available and in the right locations? If not, can 4-wire twisted-pairs phone lines instead of a coaxial cable be used to the controller?
5. Do you have any PC/ATs? How many? How many can be used for data entry?
6. If so, do you have any IRMA boards? How many or how many planned?
7. Do you have any experience in file transfers from PCs to the mainframe? If so, what type?
8. What software is used for communications?
9. From HWDMS data entry, what is the number of transactions over any given time frame? (Note: A transaction is an 80-columns card sent. Get whatever unit that can be gotten.)
10. Do you have any smart modems that do error checking during telecommunication? If so, what type and speed?
11. Are you actively using the Prime computer?



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