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EVALUATION OF A DECISION SUPPORT SYSTEM FOR THE PRIORITIZATION OF MULTIMEDIA FACILITIES

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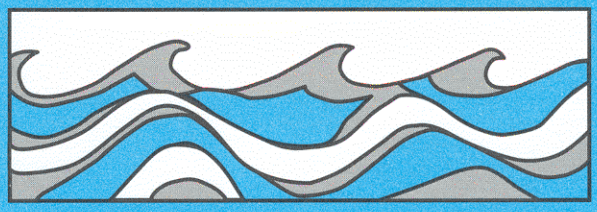

Water Resources Series
Technical Report No.132
August 1991

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ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to the Valle Scholarship and Scandinavian Exchange Program and Dr. Dale Carlson and Bobbie Greer for their support. I would also like to thank Dr. Richard Palmer for guiding me through this work.

Chapter 1: INTRODUCTION

A. Multimedia Enforcement

The United States Environmental Protection Agency (EPA) is responsible for implementing the Federal laws designed to protect the environment. This is accomplished, in part, by establishing and enforcing environmental standards. Enforcement of these standards is performed in three programmatic areas of EPA, water, air, and hazardous waste. These programs are responsible for all components of the permitting, compliance, and enforcement processes and were initially established as independent areas within EPA. Enforcement resources are focused on the dischargers thought to present the greatest risk to human health and the environment in each media program. It has been recognized recently that a number of facilities are regulated by several or all of the media programs. A concern has been expressed that the harm to the environment from a single discharger that impacts several medium may be greater than the environmental damage assessed by each media program independently.

Multimedia enforcement is one solution to this concern. Multimedia enforcement involves evaluating a facility's discharges and the resulting risk to human health and the environment, from the perspective of all three media together rather than any single media alone. The goal of multimedia enforcement is to target resources efficiently to reduce the combined harm to human health and the environment. To accomplish this overall goal, two secondary aims must be met. First, the facilities discharging to more than one media must be identified. Second, a process must be developed to enable EPA to prioritize the multimedia dischargers so enforcement efforts can be focused on the facilities of most concern. Many factors must be considered in prioritizing the facilities in each media separately, prioritizing the facilities from the combined media perspective, and evaluating each facilities'

potential harm to the environment. This process is complex, time-consuming, and complicated. However, computerized decision support tools can be used to organize and facilitate this process and ease the burden of the decision maker.

B. Decision Support Tools

Decision support systems are broadly defined as those systems that can be used to integrate other computer applications and decision support technologies. The purpose of decision support tools is to assist people in their decision making activities and enhance the effectiveness of their decisions. This can be accomplished in many ways including automating tasks, bringing data that was not previously used into the decision making process, and providing analytical tools and a structure to decision making. In this paper, the focus is on the computer-based tools that can be used to improve the human's capabilities for solving complex problems. A number of computer technologies have been developed recently that can be used to aid the process of decision making. These technologies include expert systems, multiobjective analysis, database technology, and geographic information systems.

C. Objectives and Overview

This report describes research undertaken as part of the Expert Systems Phase of the EPA Multimedia Inspection Targeting Project. This project was called the Multimedia Enforcement Project. It's purpose was to develop a prototype decision support system to aid EPA decision makers in prioritizing multimedia dischargers. To accomplish this goal the project was divided into three phases: 1) obtain background information on enforcement procedures, 2) develop a prototype decision support tool, and 3) evaluate the model and determine implementation issues. The first phase of the project was carried out through a series of interviews with EPA Region X enforcement and management staff. The goals of the first

phase of the project were to obtain background information on the enforcement processes used in each of the media programs; to determine what data is generated and how this data is stored, accessed, and used; and to identify the benefits and limitations of the multimedia approach. The second phase of the project focused on the development of a decision support system called the Multi Objective Prioritization System (MOPS). The purpose of MOPS was to address the needs of EPA managers in prioritizing multimedia dischargers for enforcement. The system was created using Level 5 Object, an object oriented expert system. The purpose of the third phase of the project was to evaluate the usefulness of the prototype program and to determine the requirements of, and obstacles to implementation. The focus of this paper is on the third phase of the project describing model evaluation and implementation issues.

This paper begins by reviewing the literature on decision support tools and the implementation of decision support systems. The three phases of the Multimedia Enforcement Project are then described. The evaluation of the project is discussed and the implementation issue of the project are explored in detail. The paper is concluded with a summary of the research accomplished and the conclusions reached.

Chapter 2: LITERATURE REVIEW

The purpose of this research was to identify how a decision support system could aid EPA managers in prioritizing multimedia dischargers for inspection and to develop such a system. This paper focuses on the evaluation and implementation of the system developed. The purpose of this literature review is to provide the reader with information on useful decision support tools and their implementation. Hence, the literature review is composed of two parts: a discussion of decision support tools and a review of the implementation of decision support tools.

A. Decision Support Tools

This section of the paper briefly describes some of the basic tools used in decision making. The discussion includes a review of decision support systems, expert systems technology, multi-objective analysis techniques, geographic information systems, and database technology. The prototype program created in this project includes aspects of each of these areas with the exception of geographic information systems (GIS). Though a GIS would certainly be appropriate and useful in this prototype decision support system, the implementation of a GIS is beyond the scope of the current project.

1. Decision Support Systems

The concepts of decision support systems (DSS) were first described in the early 1970s under the term management decision systems. Since then, DSS have been defined in a variety of ways from very narrow definitions (allowing few computer applications to be considered DSS) to very broad definitions (considering almost any computer application to be a DSS). One broad definition is: "interactive computer-based systems which help decision makers utilize data and models to solve unstructured problems" (Sol, 1987). In general DSS imply the use of

computers to 1) assist managers in their decision making process with unstructured tasks, 2) support, not replace, managerial judgement, and 3) improve the effectiveness of decision making rather than its efficiency (Boseman, 1987). The goal of the DSS is not to automate the task of decision making, but to support the intuition of the decision maker (Boseman, 1987). DSS may also "improve the productivity and effectiveness of decision makers by helping them to use the knowledge more effectively" (Ghiaseddin, 1987). DSS are characterized by being easy to use and supporting interdependent as well as independent decisions. Some of the advantages of DSS include their usefulness to address ad hoc, unexpected problems, and their capability to evolve as the decision maker learns more about the problem.

Growth in the subject area of DSS has accelerated recently for several reasons. First, there is the realization that better decisions mean more efficient allocation of limited resources, and even a small improvement in decision making can add considerable value to the final outcome of a decision. Secondly, the reduction in costs and the faster processing capabilities of computers due to technological improvements, have made it feasible to use computers to solve semi-structured problems. The term semi-structured identifies problems for which the information needed cannot be determined in detail before making the decision. The third reason for the increasing growth, discussed previously, is that DSS have been shown to increase decision maker's effectiveness and productivity (Ghiaseddin, 1987).

Two appealing characteristics of DSS for this project are that they are interactive and aim to support unstructured or "semi-structured" problems. First, the DSS is able to interact with users to provide information that might not otherwise be used in the decision making process. Allowing the responsible person to interact with the

system and learn quickly about the kind of situation they are facing is an important part of any system supporting the decision making process. Secondly, the tasks facing the decision makers are usually multidimensional, multi-objective, and only partially defined. For example, in the current project of prioritizing multimedia dischargers, the dimensions of air, water, and hazardous waste, each with different criteria, must all be considered and the objectives of identifying the problem dischargers must be combined with budget and time constraints. In these problems, expert judgement alone may not be adequate because of the size or computational complexity of the problem. On the other hand, models and data are also inadequate because the solution requires judgement and subjective analysis. In these situations the decision maker in conjunction with the DSS can provide a more effective solution than either could provide alone (Pfeifer, 1987).

In general, DSS are composed of three elements: a language system, a knowledge system, and a problem processing system (Bonczek et al., 1981). The language system translates the user's problem into a structure that can be incorporated into the DSS. It creates a plan of action to produce an acceptable answer to the user's questions rather than to solve a problem in a mathematical sense. The knowledge system consists of the knowledge about the decision maker's problem domain. Much of the power of a DSS is derived from the knowledge it contains about a problem. The problem processing system is the interfacing mechanism between expressions of knowledge (in the knowledge system) and expressions of the problem (in the language system). The problem processing system is the dynamic component that determines the behavior of the DSS (Holsapple et al, 1987).

The internal structure of the problem processing system is dependent on the language system. At one extreme the language could be procedural, requiring the

user of the DSS to explicitly state the details of the procedure that should be followed to arrive at the solution. While this approach is very flexible and often efficient, it requires the user to know a sophisticated programming language and takes considerable time for programming. The other extreme is an easy-to-use nonprocedural query language that would simply require the user to state what is desired and rely on the system to figure out a plan of action to bring about an answer to the question. In this situation the problem processing system must be very complex and sophisticated. Existing DSS structures lie between these two extremes, though most tend toward the nonprocedural approach. Some of the reasons for this include: 1) DSS are used by people who do not have the time or desire to learn a complex programing language, 2) the DSS user is often under time pressure and desires a quick answer, 3) the DSS user may reach an answer after trying several options in the nonprocedural system, and 4) many decision problems are instantaneous one time problems and the decision maker is not concerned with efficiency if a reliable answer can be reached quickly (Ghiaseddin, 1987).

The DSS developed for the multimedia project contains expert system technology, multiobjective analysis, and database technology. These techniques are discussed individually below. Geographic information systems can also be a powerful component of decision support systems. As mentioned earlier, though a geographic information system would be useful and applicable to the prototype program, the implementation of a GIS is beyond the scope of this project at this time. However, a GIS application would be a positive addition to the project at a future date and is included in this review.

2. Expert Systems

An expert system is an interactive computer program that uses experience, knowledge, and rules of thumb to solve problems. These systems are typically user-friendly and attempt to simulate or reproduce a human expert's intelligent problem-solving behavior. Similar to human experts, expert systems solve problems by using available knowledge as well as asking for additional information from the user. Expert systems technology is a branch of artificial intelligence (AI) which covers a broad range of topics related to computer simulation of human intelligence. A variety of software packages exist to implement expert systems on PCs, workstations, and mainframes. (Palmer and Mar)

The two main components of expert systems are the knowledge base and the inference engine. The knowledge base contains information specific to the problem being solved. It is the mechanism through which expertise is incorporated into the problem solving process. Information and expertise can be represented in the knowledge base in a variety of forms. The use of "rules" is the most common, although frames and objects are also often used. Rules often take the form:

IF condition

THEN conclusion

More complex rules using AND, OR, and ELSE can also be developed.

The inference engine is the mechanism used to efficiently process and evaluate the information contained in the rules to arrive at a conclusion. They are not specific to a problem, but rather, generic. Inference engines can be either backward or forward chaining. Backward chaining inference engines are goal driven, evaluating the condition that must be true to arrive at a specific goal. Forward chaining inferencing is rule driven, requiring the establishment of known conditions to reach

the solution these conditions support (Maher, 1987).

Expert systems differ from conventional programs in a number of ways. An expert system emphasizes a heuristic or inferential process rather than an algorithmic process. In expert systems, knowledge, rather than data, is represented and manipulated. The knowledge (in the knowledge base) is separated from the reasoning (the inference engine) and this separation is maintained. Also, the knowledge used in solving problems with expert systems is expressed in mainly symbolic terms such as linguistic phrases, rather than numeric terms. If a problem is primarily numeric, an expert system is probably inappropriate except as a pre- or post-processor of information. Another important way expert systems differ from conventional programming is their capability to show the assumptions and reasoning used to arrive at any answer.

Problems appropriate for expert system solutions are characterized by a number of properties. First, the problem domain must be limited. Expert system technology is most useful on clearly defined problems that are sufficiently narrow in scope to be captured in a computer program in a reasonable amount of time. If the task requires minutes or hours when performed by a human expert, it is probably appropriate for an expert system. Tasks performed in seconds are too trivial to be worth building an expert system and tasks requiring weeks, months, or years are too complex. Secondly, recognized experts must exist in the problem area. Human experts are needed to provide the heuristic knowledge that is acquired essentially through personal experience. Also, expert systems are designed to solve many problems where there may not be a "correct" solution, but only one judged to be better or more appropriate. Since there may not be well-defined criteria for evaluating a solution, a human expert must be relied upon to perform the

evaluation. Next, problems appropriate for expert system solutions utilize cognitive activities rather than intuition. Intuition often employs highly subjective and emotional judgements and draws on knowledge from many different domains as well as using analogies to personal experiences. For these reasons, intuitive reasoning is not usually accessible to conscious inspection and is difficult to formalize and capture in a computer program. Finally, the task should be repetitive. The effort of building an expert system is considerable, and to acquire a payoff for the effort, the expert system should be frequently used (Davis, 1982).

Expert systems are similar to DSS in that both are computer programs designed to assist decision makers in solving problems. However, the term DSS generally implies a broader and less specifically defined system. Expert systems can be viewed as one component of the DSS that can be used to tie the other applications together.

3. Multiobjective Decision Analysis

Environmental problems are frequently very complex, involving multiple conflicting objectives, uncertainties, unknown costs and benefits, and unforeseeable long-lasting effects. The current project of prioritizing multimedia dischargers is definitely characterized by these factors. These uncertainties are incorporated into the DSS with the use of decision analysis techniques. Decision analysis attempts to aid the decision maker in choosing a course of action in an uncertain environment. It usually involves three parts: the structuring of the problem, an uncertainty analysis, and a preference analysis. Structuring or organizing the problem can be difficult due to the uncertainty and complexity of the problem, but is an important step in decision analysis. The uncertainty phase can involve such things as statistical validation of a model, the use of historical and experimental data for inference, and

the codification of judgements by the decision maker and expert groups. Preference analysis examines the decision maker's attitudes toward risk and determines the tradeoffs associated with potentially conflicting decision making objectives (Palmer and Lund, 1985).

Multiobjective decision analysis is a branch of decision analysis that aids the user in balancing judgements about potentially conflicting objectives. Its purpose is to organize conflicting objectives, or goals when evaluating different courses of action to arrive at a reasonable decision or the best compromise. Multiobjective solution techniques are of two types: 1) generating techniques (those generating a set of non-inferior solutions) and 2) preference techniques (those that incorporate preferences). The generating techniques delay the incorporation of preferences into the decision making process until the non-inferior set of solutions has been identified. In these techniques, the goal is to identify tradeoffs among objectives over the entire range of feasibility. Preference techniques, however, rely on explicit statements of preferences. Preferences can be represented by various weighting schemes, such as the one used in MOPS, or by the constraints or goals. The goal of the preference techniques is to identify the best-compromise solution (Cohon, 1978).

One of the techniques that incorporates preferences involves the decision maker establishing weights for each of his/her objectives. The alternative that maximizes the sum of the weighted objectives is considered the best choice. If the objectives are conflicting, the weighting process involves subjective decisions and the incorporation of professional or personal biases.

Many techniques have been suggested for generating weights including those that

obtain the weights directly from the decision maker and those that arrive at the weights indirectly. One technique for direct weighting requires the decision maker to rank criteria on a simple arbitrary scale, perhaps from one to ten. These weights are normalized to one by dividing each weight by the sum of all the weights. This type of method, though simple to implement and easily understood by users, suffers from the uncertainty resulting from the specific scale chosen. Other disadvantages of such a method include the lack of sensitivity to the effects of changing marginal returns on criteria and the absence of an internal check on the consistency of the weights generated (Palmer and Lund, 1985).

Several of the indirect weighting methods can overcome these problems. Methods of generating the weights indirectly include the utility method, the surrogate-worth trade-off method, and the Saaty analytical hierarchy process. In the utility function method, utility functions are developed for each criteria. Each separate utility function is created by setting up a number of comparisons in which a certain return is weighed against an uncertain return. The surrogate-worth trade-off method also overcomes some of the problems posed by the direct methods. In this method, "surrogate worth" values are derived from a series of questions regarding trade-offs among objectives. Trade-offs to which the decision maker is indifferent are thus identified, which allows the identification of a preferred solution. A third indirect method for establishing subjective weights was introduced by Thomas L. Saaty (Saaty, 1980). To formulate a problem using this technique, criteria are organized into a hierarchical structure. Elements on the same level are compared two at a time and a scale value describing their relative importance is chosen. These comparison scale values are recorded in matrices so rankings and consistency statistics can be evaluated (Holden, 1990). All of these indirect methods account for changing marginal returns and provide redundancy to improve the certainty of the

weighted values. However, there are several disadvantages to the indirect methods. The complexity and extensiveness of the questioning procedure for the indirect methods may be tedious and time-consuming which may tire the repondent and lessen the quality of the responses. Also, the manipulation of the question responses to obtain the final weighted values may be lengthy and complex (Palmer, Lund, 1985).

The prototype multimedia project utilizes six preference techniques in determining the rankings of the facilities. Three of those techniques require the user to use weights to establish their preferences. These procedures are discussed in the project description section of this paper.

4. Database Technology

Background information is needed to support intelligent decisions. One purpose of a database is to store this information and knowledge to support decisions. For example, in the current project background information on the different facilities' violations and compliance histories must be made available to the user. Databases in each of the media areas, water, air, and hazardous waste are used to store information about the facilities. One of the main functions of the prototype DSS developed in this project is to provide easier access to information contained in the media databases. Hence, database technology is a crucial part of the current project.

A database is an organized collection of related information or data. An effective database must be able to retrieve, manipulate, and store data, making modifications as needed, as quickly, accurately, and efficiently as

possible. Some advantages of database systems over other file systems and spreadsheets include 1) the ability to handle complex relationships and large numbers of files 2) the centralized control of the data, 3) the ease of search for the information, 4) the ability to control the redundancy of the data, 5) the accessibility of the data, and 6) the ease of creation, restructure, update, and maintenance of the system (Clark, 1980). The purpose of database technology can be summarized as the interaction of a group of people and data processing equipment to select, store, process, and retrieve data to reduce the uncertainty in decision making by yielding information for decision makers at the time they can most efficiently use it (Murdick and Ross, 1971).

The data that is stored in a database has a logical organization as well as a physical organization on tape or disk. Each database has a data model that defines the logical organization of the relationships between data. A data model does not imply any specific physical storage. The data in a database can be organized in several different ways. One-to-one correspondence is a storage system where each record type corresponds to a physical file. This system has the advantage of being straightforward and easy to visualize. Transposed-file organization occurs when there is one file for each data item in the record type. This organization is useful for fast searches on a particular data item. Data pool organization is characterized by a record type being represented as a file. In this organization, data item values are not stored directly in a file. They are stored in separate files and the record type file contains a pointer for each data item. The pointers point to the location of the data item values in the appropriate data item file. This organization reduces data duplication, especially if many data item values

occur frequently (Tsichritzis and Lochovsky, 1977).

The physical storage of data in a system can be very different from the representation required by the logical data model. The degree to which the logical data model is insulated from the physical storage structure is called physical data independence. Physical data independence is important for a number of reasons. First it allows the physical storage structure of the data to be changed or new hardware technologies introduced without causing reprogramming of the applications that use the data. Also, data duplication is reduced because data can be shared by different applications. Finally, unauthorized operations, such as update or deletion of data can be prevented (Tsichritzis, Lochovsky, 1977).

The database used in the prototype multimedia project was dBase3. The interaction of the various EPA databases with the multimedia project is discussed later in this paper.

5. Geographic Information Systems

One of the most difficult problems researchers in many different fields have faced is the storage, manipulation, and analysis of large volumes of spatial data. Spatial information has traditionally been stored on paper in the form of maps. However, substantial improvement in computer systems in the last two decades have made the application of computer technology to this problem much easier. Geographic information systems (GIS) are the result. GIS record, store, analyze, manage, retrieve and display geographic information. There are many potential applications of a GIS in the current project, but due to budget and time constraints, these applications have not yet been developed. However, much GIS work is being done

at EPA on another phase of the Multimedia Inspection Targeting Project that may relate to this project in the future. Some of the potential uses of GIS in this project are discussed at the end of this section.

Two characteristics distinguish GIS from many other graphic systems. First, GIS model the real world rather than a database world. Second, GIS can combine information in such a way as to create new information. These systems can take raw data and transform it, via overlays and other analytical operations, into new information which can support the decision making process (Gahegan, 1988). For example, in the multimedia project, a GIS could be used to determine the distance from a violator to the nearest population center or endangered species habitat. This information is not contained in any database, but would be relatively simple to access with the use of a GIS.

There are two contrasting, but complementary ways of representing spatial data in a computer: explicit or raster representation, and implicit or vector representation. Explicit representation is built up from a set of points on a grid or raster. Implicit representation makes use of a set of lines, defining vectors by starting and ending points; pointers between the lines indicate to the computer how the lines are linked together (Burrough, 1986). The following paragraphs describe these different representations and the advantages and disadvantages of each.

Raster representation can be described as a set of cells located by coordinates where each cell is independently addressed with the value of an attribute. Each grid cell is referenced by a row and column number and contains a number representing the type or value of the attribute being mapped. This type of data structure is easy to handle in the computer with programing languages such as FORTRAN because

of the ease with which rows and columns can be stored, manipulated, and displayed. However, the two-dimensional surface upon which the geographic information is represented is not continuous, but quantized or discretely quantified with indivisible units. This can have a serious effect on the estimation of lengths and areas when the grid cell sizes are large with respect to the features being represented. This characteristic is described as the resolution or scale of the raster data and is the relation between the cell size in the database and the size of the cell on the ground. Because each cell in a two-dimensional array can hold only one number, different geographical attributes are represented by separate sets of Cartesian arrays called "overlays". These overlays can be used together to form a three-dimensional data matrix.

Vector representation, on the other hand, is an attempt to represent the object as accurately as possible with the use of points, lines, and areas. All features of the landscape can be reduced to one of these spatial data categories. The coordinate space is assumed to be continuous, not quantized as with the raster space, allowing all positions, lengths and dimensions to be defined precisely. Three things must be specified when inputting the field spatial data of points, lines, and polygons to the computer: 1) where each feature is geographically 2) what each feature is, and 3) what each feature's relationship is to the other features (Gahegan, 1988). First, the geographic location must be specified. Simply establishing the coordinates is not difficult, but the use of cadastral data in many databases referencing ground data with no connection to geographic coordinates can introduce substantial spatial discrepancies. Secondly, the computer is told what the feature is through labels called attributes. For example, a lake may be described by its name, depth, water quality, fish population, or chemical composition. Finally, the computer must be told of the relationship between features. The geometrical relationship between

features is called topography and its expression is a key factor in the practical utility of GIS technology.

The raster and vector methods for spatial data structures are distinctly different approaches to modeling geographic information and each method has its advantages and disadvantages. The advantages of the raster method include the use of simple data structures and the ease of overlaying and combining mapped data with remotely sensed data. Spatial analysis is quite easy with the raster method and simulation is simple because each spatial unit has the same size and shape. Probably the biggest advantage for this method is that raster technology is relatively inexpensive and is being energetically developed. However, there are disadvantages as well. Though the data structures are simple, rastor methods require huge computer memories to store and process images at levels of spatial resolution obtained by vector data structures. Large cells can be used to reduce this data volume, but the use of large cells can sometimes result in a serious loss of information. Finally, the maps produced by the rastor method are more crude and less precise than the maps produced by the vector method (Burrogh, 1986).

The ability to produce accurate graphics is one of the main advantages of the vector method. Also, graphics and attributes can be retrieved and updated with ease in this system. Other advantages of the vector method include a compact data structure and good representation of phenomenological data. However, there are disadvantages of the vector method as well. For example, the technology is expensive, and the data structures are complex. Simulation is difficult with this method because each unit has a different topological form. Also, certain kinds of data manipulation, such as spatial averaging, are very difficult with the vector method, and spatial analysis within polygons is nearly impossible. Finally, the

display and plotting of the maps can be expensive, particularly for high quality maps with cross-hatching (Burrough, 1986).

Though GIS applications have not yet been developed for the prototype multimedia project, possible uses of GIS were discussed in detail with Ray Peterson, the Chief of Geographic Information Section of EPA Region X. GIS could be particularly useful in the current project in accessing difficult to obtain information on the human health and ecological impacts of a facility. For example, through GIS, the locations of the facilities of concern could be overlaid with the locations of endangered species habitats and the possibility of a facility damaging a more sensitive area could be determined. GIS could also be useful in determining the distances between facilities with potential hazardous discharges and human recreation areas. There are many potential uses of GIS in this project and the possibilities are further discussed later in this paper.

B. Implementation of Decision Support Tools

The first problem encountered in reviewing the implementation of decision support tools is the relatively small number of implemented systems and the lack of documentation of the implementation of the working systems. "In the decision making framework, very little work has been reported on support for problem formulation and on the implementation of DSS" (Neethi and Krishnamorthy, 1988). Many system are developed as prototypes and are never implemented. A possible reason for this is the magnitude of the resources needed to fully implement a system. Another obstacle is the possibility of the system giving defective advice. Mistakes by human experts are often tolerated while mistakes by decision support systems tend to discredit the entire system (O'Keefe, 1987). However, that the number of full implementations of decision support systems is growing is due in part

to the sophistication of development tools (Connell, 1988).

Like the term DSS ther is no simple definition of the term implementation. Implementation issues range from determining what tasks are appropriate for the DSS, to the technical issues of what languages and hardware should be used to build the system, to the institutional issues of the expense of the system and its usefulness (Dym, 1987). Other authors take a more limited view that the implementation phase of the project involves ensuring that the DSS is usable and is used. Users of the system must be informed and trained to use the system and the system itself must be carefully documented and supported (Tuthill, 1990). However defined, there is a consensus that planned implementation is crucial for the ultimate success of a working system. For the purpose of this discussion, implementation will be described in three parts: training, documentation, and support. Maintenance and validation of the system are also often included in the implementation phase and are discussed at the end of this section.

1. Training

Training the user population to use the decision support tool may be optional or required depending on the type of application. Some applications are user friendly and self-explanatory. Other applications require training to make them useful. If training is needed, some of the questions that need to be answered include: How many people does the training need to support now? How many people will need to be trained in the future? What level of knowledge and performance should the participants have at the conclusion of the training? Will the training be conducted as self-study, computer-delivered, and/or leader-led? etc. If no formal training is required, a workshop or demonstration can be used to implement the system. In these sessions, hands-on training with the system has been found to be more useful

than handing out documentation or showing a videotape of someone using the system. (Tuthill, 1990).

Another part of implementation is building support for the project. For this reason, some authors recommend providing the system on an "as requested" basis. A selected group is given the application. As they use the system and discuss it with their peers, others begin making demands for the system and it is further distributed (Tuthill, 1990).

2. Documentation

Documentation is the result of information being collected, abstracted and coded for future use. Good documentation is indispensable for the implementation of a project. Poor documentation, confusing the reader, can be worse than no documentation. Good documentation is characterized by being clear, concise, and unambiguous. It provides the reader with the procedural knowledge needed to use the system rather than with the "nice to know" information. Organization is another important part of good documentation. The information should be organized in logical clusters so it can be easily found and updated. Identifying key terms before they are used can improve the documentation. The use of graphics and the inclusion of pictures of the computer screens can also clarify the documentation for the reader. Distributing the documentation at a hands-on workshop can help the user become familiar and comfortable with the documentation and greatly increase its use (Ghiaseddin, 1987).

3. Support

Support is the third important part of the implementation of a DSS. The users of the application should have the opportunity to report errors or operating difficulties and make suggestions for enhancements. This kind of support can be provided by

the designers of the system or by a focal person in the application workplace who is trained to be a resident expert. In either case, it is important that timely and specific feedback are provided to the user when needed or requested. Other aspects of support include ensuring that: 1) people have access to the proper resources including correctly configured equipment and complete documentation, 2) everyone is kept in the information loop, and 3) a feeling of unity is established among the users of the system (Tuthill, 1990).

4. Validation

In some cases, validation has been considered a part of implementation. Validation is the process of testing systems to ascertain whether they achieve acceptable performance standards. The effective implementation of an invalid system is useless so validation is crucial to the success of a system (Tuthill, 1990). Typically engineers have validated system performance by running test cases through the system and comparing the results against expert opinion. Validation is not a one time job, but may occur through out the implementation of a system. A broad cross-sectional performance validation is useful prior to implementation, while more specific validation tests can be used as the system evolves through the implementation process (O'Keefe, 1987).

5. Maintenance

Some parts of maintenance have also been considered to be part of the implementation phase. Maintenance refers to the continuing ability of the system to perform as designed. A well conceived maintenance plan can increase the life-span of a system by years (Connell, 1988). Planning ahead for maintenance can be considered preventative maintenance and can result in more efficient and accurate solutions to problems. Maintenance considerations for DSS include: refining,

modifying, expanding, and upgrading the knowledge base and making the system portable across hardware and software systems. DSS are dynamic entities and are expected to change, grow, and meet additional requirements. Planning for maintenance requirements can greatly ease this process (Tuthill, 1990).

C. Summary

This literature review provides the reader with an understanding of the decision support tools that could be used in this project and some of the factors involved in the implementation of the tools. The computer tool developed in this project incorporates aspects of each of the tools described above (decision support systems, expert systems, multiobjective analysis, and database technology) with the exception of geographic information systems. GIS were included in this review because there are many ways in which a GIS application could be used in this system and it is hoped that one will be added in the future. This review also summarized five aspects of the implementation of decision support tools. Four of these aspects, training, documentation, support, and validation, were found to be important in the implementation of the tool developed in this project and are further discussed in Chapter 4 of this paper.

Chapter 3. MULTIMEDIA ENFORCEMENT PROJECT

A. Introduction

The Multimedia Enforcement Project is one of several multimedia projects sponsored by Regional EPA offices around the country. The purpose of these projects is to examine the potential of multimedia enforcement as a comprehensive and effective approach to achieve compliance of point source dischargers. Developing an approach for multimedia enforcement is a difficult task, considering EPA's current single media approach to maintaining compliance. The enforcement programs for air, water, and hazardous waste have developed separately, resulting in different approaches for tracking and maintaining a discharger's compliance. The programs are considered independent and there is little coordination or communication between the media programs. This situation may result in the combined risk to human health and the environment for all of the media being larger than accounted for in the separate media programs. Hence, the main goals for the Region X Multimedia Enforcement Project are to identify the multimedia dischargers and violators, and to target enforcement resources efficiently to minimize the risk to human health and the environment from all three medias.

The Multimedia Enforcement Project was divided into three phases. The first phase involved obtaining background information on the enforcement, compliance, and database procedures used at the Region X office of EPA, and identifying the benefits and limitations of the multimedia approach. The second phase focused on the development of a decision support system designed to capture the framework of the prioritization of multimedia facilities. The purpose of the third phase was to evaluate the prototype decision support system and identify and discuss implementation issues.

The goals of the first phase of the project were to 1) obtain background information on the permitting, compliance, and enforcement procedures used in each of the three media programs, 2) determine what data is generated through these procedures and how this data is stored, accessed, and used in these processes, and 3) identify the benefits and limitations of the multimedia approach. The following paragraphs will discuss the methods used, the results found, and the conclusions reached in this phase.

1. Methods

Information was obtained through interviews and reviewing documents. This process is denoted as knowledge acquisition in this report. Knowledge acquisition is the process of extracting knowledge from sources of expertise such as human experts, books, journal articles, and tapes. Acquiring knowledge from human experts is a complex task and is often considered the most difficult task in the development of an expert system (Gaines and Boose, 1988). In this project, people were chosen to be interviewed on the basis of their knowledge and experience in permitting and enforcement procedures at EPA and their knowledge of database management in each of the three media programs. The expert's ability to communicate their knowledge and their willingness to commit time to the project also were important criteria for selection. With few exceptions, the experts interviewed were knowledgeable in the domain, able to effectively communicate their knowledge and experience, had the time available to commit to the project and were interested in contributing to the project. A list of the people interviewed and their positions at EPA can be found in Appendix A.

The interviews were conducted in the offices of the EPA personnel interviewed or in EPA conference rooms. This arrangement allowed the EPA staff to avoid time taken

The interviews were conducted in the offices of the EPA personnel interviewed or in EPA conference rooms. This arrangement allowed the EPA staff to avoid time taken in transportation to the offices of the researchers. The conference rooms, when used, provided a distraction free environment. The interviews were taped whenever possible. After the interview, the main interviewer wrote a detailed summary of the interview. The tapes were found to be very useful in the interview write-up process. The interview summary was then sent to the interviewee for revisions and comments. In this way, the interviewer's perceptions of the information gained in the interview were clarified and evaluated for accuracy. The interviewee was contacted by phone and their suggestions and revisions were incorporated into the interview summary.

2. Results and Discussion

The information gained from the interviews was organized according to the goals of the interview process stated earlier. A brief review of this information for each of the media programs water, air, and hazardous waste is given below. Summaries of the individual interviews can be found in Appendix A.

Goal 1

The first goal was to obtain background information on EPA enforcement procedures used in each of the three media programs. Enforcement is implemented with a combination of state and EPA effort. The EPA sometimes functions as the lead agency, carrying out the facility specific work, though in most cases the state acts as the lead agency and the EPA acts in an oversight or review capacity.

Water - The enforcement process for water involves permitting, compliance review, and specific enforcement procedures. The permitting process begins when the application from the facility arrives in the EPA Regional office or the state permitting office. The permit writer then drafts a permit. This is followed by a public notice period of thirty days during which time comments from the public are received and a public hearing may be held. The comments are reviewed and responses to the comments are made. The final permit is then written and sent to the appropriate office. If the permit is written by the state it is then sent to the EPA office, if it is written at EPA it is then sent to the state office. The permits are routed through the compliance branch during the permitting process to ensure that they are enforceable.

The compliance activities for water are initiated with Discharge Monitoring Reports (DMRs) which are sent to the lead agency (the state office or EPA) by the facility. This self-reporting from the dischargers is supplemented by EPA inspections when necessary. State enforcement efforts are reviewed by EPA through enforcement summaries, prepared by the states and sent to EPA on a quarterly basis. When permit violations occur and EPA sees that no enforcement action has been taken by the state, an order is issued to the state to initiate enforcement action within 30 days or EPA will assume authority. If EPA takes the lead from the state, the states enforcement activities are discontinued, but copies of documents pertaining to EPA's enforcement activities are sent to the state. The types of enforcement actions taken can vary a great deal from small violations that may be remedied by an informal letter or a phone call to Notices of Violations (NOVs) which are formal warnings of violation. Enforcement actions for more serious violations may include fines.

Air - The State Implementation Plan (SIP) guides the permitting process in the air program. The state is designated as the lead agency for air permitting, monitoring, and enforcement. Each state creates a SIP which is then submitted to the EPA for approval. The SIP is used as a guidance document by the state and EPA to set the standards for air quality control and contains the regulations on emission limits, permitting requirements, monitoring regulations, and all legislation the state passes on air pollution. SIP development is a two stage process: 1) state development of SIP regulations and guidelines and 2) an EPA review of the proposed SIP.

EPA has oversight responsibilities for the rules and permits that are components of the SIPs. The compliance focus is on major sources of any type. EPA tracks the major sources in the areas in which they have specific authority such as the Potentially Significant Discharge (PSD) source program, the National Standards for Hazardous Air Pollutants (NESHAPS), and the New Source Pollutant Standards (NSPS). The states summarize violations in these categories in a report that details information on the source, state, and EPA actions (i.e. inspection dates, violation determination dates, enforcement actions, etc.) called significant violation reports.

State inspection reports are sent to the EPA and are used to prioritize sources for EPA inspections. Enforcement actions are primarily performed by the state, but as part of their oversight role EPA may try to increase state enforcement action of longterm ongoing compliance problems. EPA enforcement activities are generally implemented informally, by conversations with the dischargers and the appropriate state agencies. Formal enforcement actions have rarely been taken.

Hazardous Waste - The permitting process for hazardous waste is similar to the process for water and uses many of the same procedures. Permits are written for treatment, storage, and disposal facilities (TSD) only and are not written for generators of hazardous wastes. The permitting process begins when the TSD facility turns in an application to EPA. The permit is then drafted and goes out for public review. A public hearing is scheduled if required. Responses to the comments are made, the permit is corrected if necessary, and the final permit is written. If the permit is unacceptable to the permittee, they have thirty days to lodge a petition for reconsideration. This petition goes to the administrator in the EPA headquarters office for arbitration. The permit is then finalized and becomes effective. The permitting process often takes four to six years to complete.

The compliance process begins with inspections. TSD facilities are inspected yearly. The inspection includes evaluation of all of the operating units, inspecting any areas where hazardous wastes are treated or stored, looking for any possible leaks, and checking that health and safety requirements are met. Generators of hazardous wastes are not inspected on a regular basis but must notify EPA of their activities through notification records. Notification records contain a description of the facility with a listing of all the hazardous waste units and information on the engineering specifications and operating requirements of the facility. Site inspections can be done at any facility at any time but are not done on a regular basis. The usual reason for a site inspection is a questionable figure or report or an employee complaint. Enforcement efforts include warning letters, notices of deficiency, and notices of violation with penalty assessments. Penalty calculations are based on the severity of the problem, the risk to human

health and the environment, the quantity of material involved and the length and number of incidents of the violation.

Goal 2

The second goal of the first phase of the project was to identify data generated through the procedures described above and how the data is stored, accessed and used.

Water - The Permits Compliance System (PCS) is the database used for NPDES facilities. There are approximately 170 mandatory fields in the data base for each major facility. Permit effluent standards are entered into PCS as are scheduling and monitoring requirements, reporting requirements, information from Discharge Monitoring Reports (DMRs) and enforcement actions. Compliance information is also included in PCS.

PCS was developed to track the requirements in any NPDES permit and to determine the compliance status of a facility at any time. PCS can also be used by the states to generate the Quarterly Non-Compliance Reports (QNCRs) or compliance status summaries for the quarter. The Region generally uses the QNCR for counting purposes to determine the number of facilities in non-compliance. QNCRs are also sent to national headquarters where they are used to investigate trends and facilities that have remained out of compliance for some time. In addition to the QNCRs, PCS can generate a variety of other reports customized to meet the user's needs.

The PCS database is not user-friendly and can be very cumbersome and difficult to use. It is a large database and is still growing. Another limitation is the

quality of the database. Because much of the information gathered by the states is optional, the database is incomplete. Also there is often a significant lag between the time data is gathered and the time it is entered into the database.

Air - The primary database used by the air division is called the Areometric Information Retrieval System (AIRS) and includes three subsystems: the Airs Facility Subsystem (AFS), the Air Quality Subsystem (AQS), and the Continuous Emissions Monitoring Subsystem (CEMS). There is also an air database known as SAMS which is separate from AIRS and contains State Implementation Plan (SIP) data.

The AFS database contains compliance and emissions data for major sources. The pollutants of concern include: VOCs, PM-10s (particulates that are ten microns or less), carbon monoxide, sulfur dioxide, and nitrous oxides. This system is used to identify significant polluters but these sources may or may not be significant violators. Information found in the database includes facility name and address, inspection history, violation status, enforcement summary, pollutants emitted, and compliance status.

One significant limitation of this database is the quality of the data. For example, the states are required to collect annual emissions inventories from individual sources once a year and report their complete emissions inventory to the EPA. However, the amount of emissions information received is largely dependent on the efforts of the state. Often states do not get complete information for the inventories and states may not supply inventories at all in certain years.

Hazardous Waste - The hazardous waste division currently uses a database called the Hazardous Waste Data Management System (HWDMS), but a new database called RCRIS (Resource Conservation and Recovery Information System) will be implemented in the near future. RCRIS will contain approximately twenty databases and will be a much more complex and complete system than HWDMS.

HWDMS contains notification information from the generators and transporters of hazardous wastes and permitting information from TSD facilities. The RCRIS database will include all the information in HWDMS along with additional fields for information not currently available in HWDMS.

The data stored in HWDMS is used to track the number of generators and the compliance history of the TSD facilities. Reports of generators with the facility name, address, and EPA identification number are sent to the states weekly. These reports are used to verify the notification information given EPA by the states and to keep a current list of the generators. Compliance reports of the TSD facilities which contain the history of the inspections including dates, type of violation, scheduled penalty or fine etc. are also generated weekly.

One of the limitations of the HWDMS database is its inflexibility. Other databases have had to be created by the hazardous waste division to accommodate their needs. Also, HWDMS is a batch system; the information is sent and updated in batches which can be inconvenient and unwieldy. RCRIS on the other hand will be an interactive system so any information needed can be called up on the computer at any time.

Goal 3

The third objective of the interview process was to identify the benefits and the difficulties or limitations of the multimedia approach.

Benefits - The multimedia approach has several advantages relative to the individual media process. First, EPA experience suggests that the operators of facilities often have a more receptive attitude towards enforcement when it uses a multimedia approach. One reason for this acceptance is that the discharger can work with one group of representatives from the lead enforcement office rather than several groups of enforcement officers each from a different media. Another advantage is the comprehensive summary of the problems at the facility. The discharger is provided with a single list of items for corrective action and can begin to work with and budget for all of the difficulties at one time.

The multimedia approach also holds benefits for the lead enforcement agency. Working jointly with all of the media programs prevents the shifting of problems from one program to another. For example, with independent media inspections, a facility might attempt to resolve their water discharge violation by resorting to air stripping or another process that would change the form of pollution, but fail to solve the problem. This conflict is avoided by a comprehensive program with the three media branches working together.

A final advantage of the multimedia approach is the reduction in the number of facilities that are overlooked by programs. Some sources may have minor problems in several media programs, but because of the limited resources and time of each of the programs, they are not investigated. However, when viewed

in its totality, the facility may present significant overall impacts. In the multimedia approach, these sources are identified as significant because the inspections are based on the combination of media discharges rather than a single media discharge.

Limitations - A number of difficulties in developing a multimedia approach were also identified in the interviews. One difficulty is the result of the combination of state and EPA effort in the enforcement process. EPA is not necessarily the lead enforcement agency for each of the media programs. The states may be the lead agency in one media program while EPA is the lead agency for another program.

Data availability is a second difficulty. Some media programs have more complete and detailed databases than others. In fact, because some of the fields in a database may be optional, the quantity of data on any source can vary within the program databases as well as from state to state and between media programs. The data necessary for a multimedia approach is not clearly defined which also contributes to the uncertainty of the process. The quality of the data is another problem. The accuracy of the information in a database is difficult to assess, but it is clear that it varies considerably between the media programs.

Another limitation of the multimedia approach is the lack of resources. Limited funds have been delegated to the multimedia enforcement effort. Region X is currently at the pilot project stage of funding.

Logistics and the coordination of the different media programs are one more difficulty within the multimedia project. Currently there is only minimal

interaction between the enforcement programs in each media and one program may not even be aware of what another program is doing. Facilities sometimes lack a common identification number, thus tracking a single facility in each of the programs can be difficult. The databases are also completely separate for each program and there may be a number of different databases in one program. These factors make the gathering of all the different media information on one facility quite difficult to accomplish.

C. Phase II - Development of DSS

A DSS called the Multi Objective Prioritization System (MOPS) was developed to address the needs of monitoring and enforcement of multimedia dischargers. The system was created using Level 5 Object, an object oriented expert system. In this section, the system is described and a brief description of object oriented programming is given. The program is composed of five modules or knowledge bases, and these modules and their purposes are described. The structure of the three media modules and the processes the user progresses through in the program are discussed in detail. Finally, the multimedia module is described. A more detailed description of the program and its development is available. (Keyes, 1991).

1. Object Oriented Programing

Level 5 Object was chosen as the language for this application because of its structure (object oriented) and because of the excellent user interface capabilities of the language.

Object oriented languages describe everything as a system of interacting objects. These languages allow the user to think about programming the same way

people think about the world. Most people think in terms of objects: of people they know, appliances they use, bicycles, animals, etc. Both data and behavior are associated with each object. In object oriented programming the data are called attributes and the behaviors associated with each object are called procedures.

Object oriented languages can be characterized by three features: 1) encapsulation, 2) inheritance, and 3) message-passing. Encapsulation is the concept that an object is self-contained. In one sense, an object can be considered a virtual program. Each object has a name, attributes and procedures. When an object is given input, it applies its procedures to its attributes or data and produces some output. Encapsulation provides an important benefit. When an object is modified the programmer can be certain that all the procedures affected by the modifications are contained in the same object. This avoids the source of many problems in conventional programming.

Inheritance expresses the idea that objects can be related to other objects. An object may represent a refinement or "child" of another object. The "child" object inherits the data and procedures contained in the parent object. In general the higher level objects are more abstract while the lower level objects are more specific. In this way a hierarchy of objects is developed that describes situations in a more natural manner than conventional programming languages. Specialization is another feature of inheritance. The "child" objects can inherit all of the attributes and procedures of the parent objects, but can have attributes and procedures special to themselves as well. Inheritance and specialization allow for reusing code to a great degree. This facilitates rapid development and easy maintenance of the application.

The third feature of object oriented languages is message-passing. Objects accept messages as inputs and when necessary, generate other messages as outputs. A message is a request for an object to perform a procedure so when a message is received, the object looks at its procedures to see which one corresponds to the message received, and fires that procedure. Message passing is the key to encapsulation. The objects communicate through passing messages and no object directly accesses any data associated with another object.

Object oriented programming has several advantages over conventional programming. In conventional programming, the emphasis is on the procedures and secondary importance is put on the data structures. Object oriented programming allows the user to program in a more natural way by focussing on objects and thinking of both the procedures and the attributes corresponding to that object. Another benefit of object oriented programming is the reusable code. "Child" objects can inherit procedures and attributes from parent objects so the code for these features does not have to be rewritten. Also, maintenance is easier in object oriented programming then in conventional programming. As new objects or functions are developed it is natural to make the necessary changes in the object hierarchy. Finally, because objects are encapsulated, the programmer can be certain that a change in a data item will lead to the systematic modification of all the relevant procedures.

2. Five Modules of MOPS

The purpose of MOPS is to aid EPA decision makers in prioritizing multimedia dischargers. In this capacity, MOPS would be used by people in the Office of Enforcement and the Environmental Services Division (ESD) of EPA Region X.

Several times a year, the program would be used to develop a list of facilities that would be the best candidates for multimedia inspections. The use of MOPS for prioritizing dischargers within the single media programs has also been suggested. In this case, MOPS, or a single media module of MOPS would be used by a staff person in the media program to develop a prioritized list of facilities in the media of concern.

MOPS is composed of five modules or knowledge bases that are linked. A diagram of the relationships of the five modules is given in Figure 3-1. The first module introduces the user to the system. It describes the purpose of the system and explains the procedures the user will follow as they proceed through the program. A "Session Basics" option describes the tools encountered in the program such as pushbuttons, promptboxes, valueboxes, radiobutton groups, and

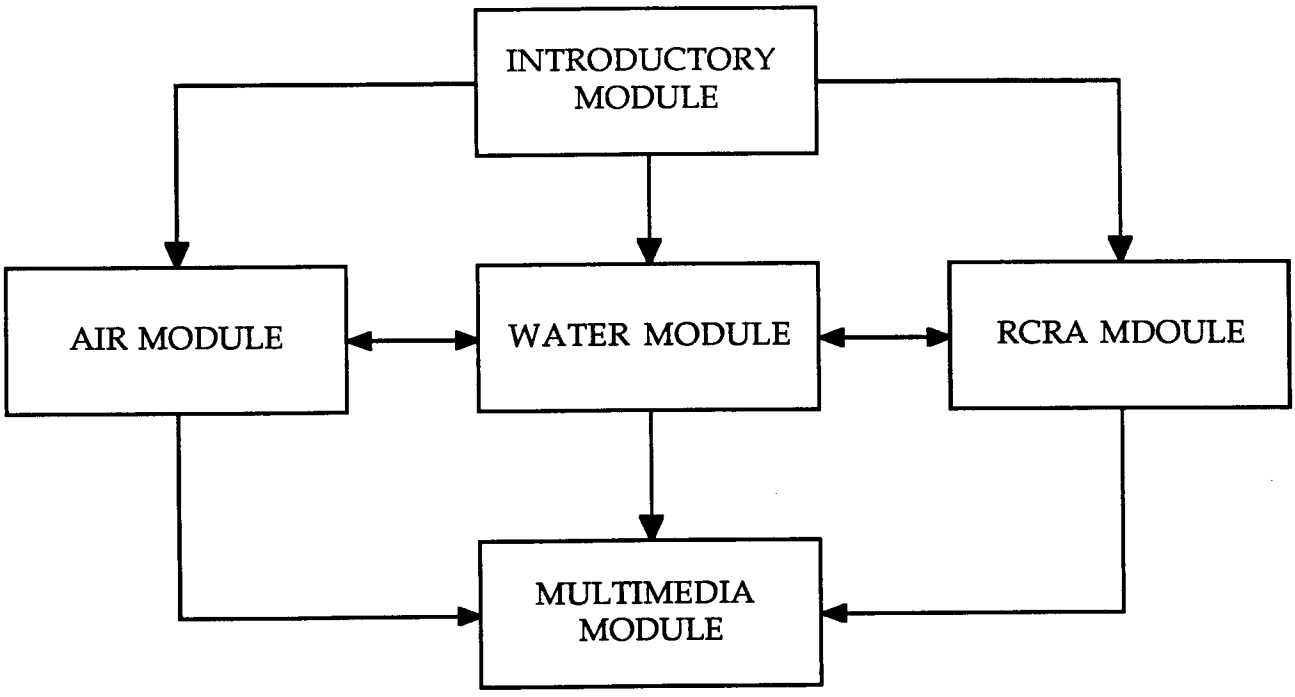

Figure 3-1: Relationship of 5 Modules of MOPS

listboxes. The three media modules correspond to the three media programs at the EPA. The purpose of each of these modules is to prioritize the violating facilities in each of the media according to their potential harm to human health and the environment. The structure of these modules is described below. The final multimedia evaluation module uses the facility ranking files created in the three media modules to prioritize the facilities from a multimedia perspective.

3. Structure of the Three Media Modules

After the introductory screens and the section basics option, the user is asked to select a media, water, air, or RCRA, to evaluate. This selection activates the main screen of the media chosen. The main screen is shown in Figure 3-2. The screen is composed of a map showing the states in Region X with the locations of the six dischargers chosen for this prototype program, and a series of pushbuttons which control the processes of the program. The actions of the pushbuttons are described in detail below.

Evaluate

The facilities are evaluated according to four criteria established through the information gathered in the first phase of interviews. The evaluation criteria provide the critical structure for the task of evaluating a facility's performance. These criteria may be changed and revised as more information becomes available. The four criteria used in the prototype system are violation magnitude, compliance history, human health impacts, and ecological impacts. Each criteria is described in the program according to its meaning in the specific media: water, air, or hazardous waste. General descriptions of the criteria are given below.

The violation magnitude criteria is concerned with the extent to which the permit level has been exceeded, the frequency of the violation, and the number of permit levels violated. The toxicity of the pollutants are also considered here. This criteria focuses on the severity of the violation.

The compliance history criteria considers such variables as failure to report, late reporting, and failure to pay a violation fine. It summarizes the behavior pattern of the dischargers. The compliance history criteria differentiates between people who have been consistently out of compliance and have taken few actions to correct the continuing problems, and dischargers who have been in compliance for several years and are showing their first violation problem.

The human health impacts criteria is more subjective than the first two criteria and the data supporting this criteria is more difficult to obtain. The purpose of this criteria is to consider the effects of the violation on human health. Such factors as the distance of the discharging facility to population centers and recreational areas is recognized. In the water program, the nature and use of the receiving waters are accounted for in this criteria. For example, a toxic unauthorized discharge into a public drinking water supply is a higher priority than a toxic discharge into a shipping canal.

The ecological impacts criteria is similar to the human health criteria in that it is more subjective than the previous criteria. The location of endangered species habitats and wilderness areas relative to the discharging facility are considered. The ecological impact of the violation is evaluated and taken into account here. In the water program, the nature and use of the receiving waters and critical species that could be affected by the discharger are considered under this

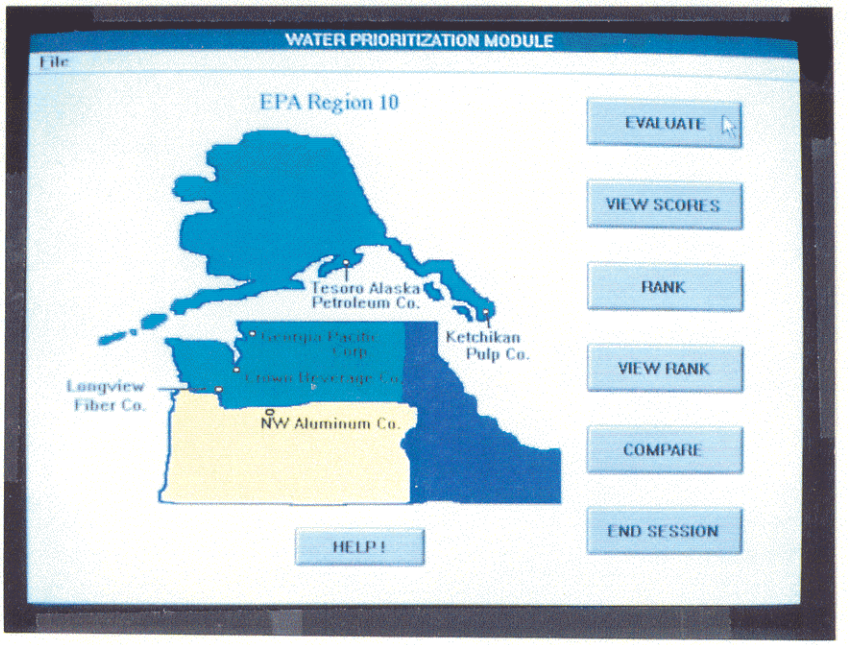

Figure 3-2: Main Screen of MOPS

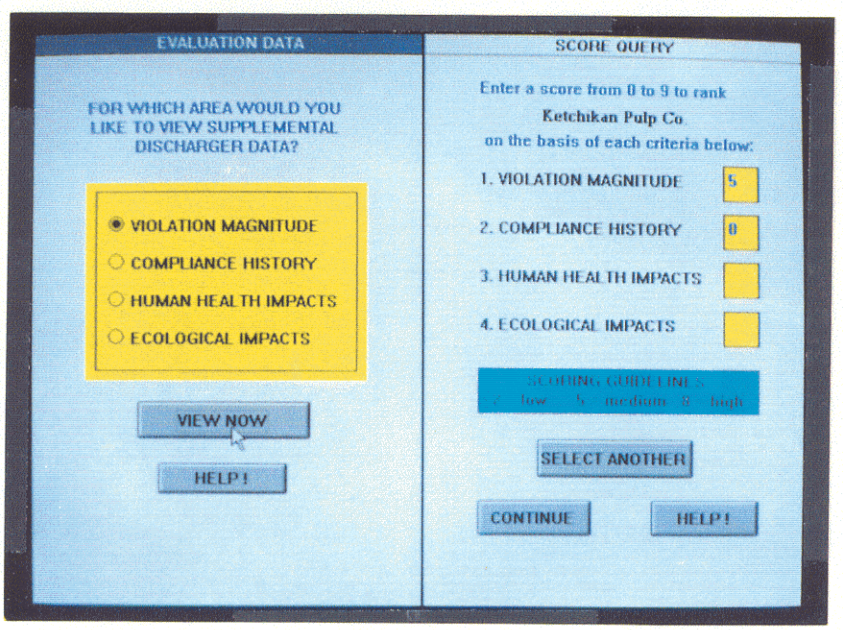

Figure 3-3: Evaluation Screen of MOPS

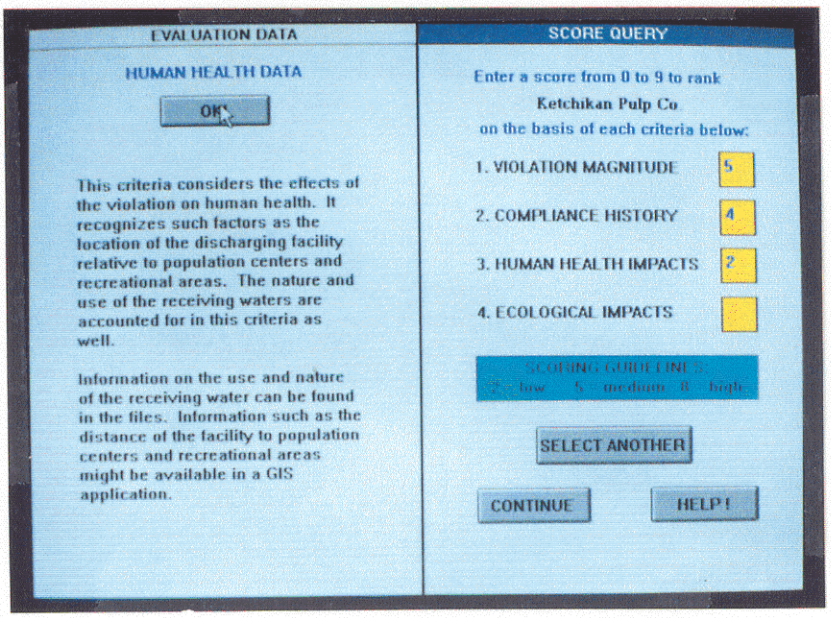

Figure 3-4: Evaluation Screen with Database Information

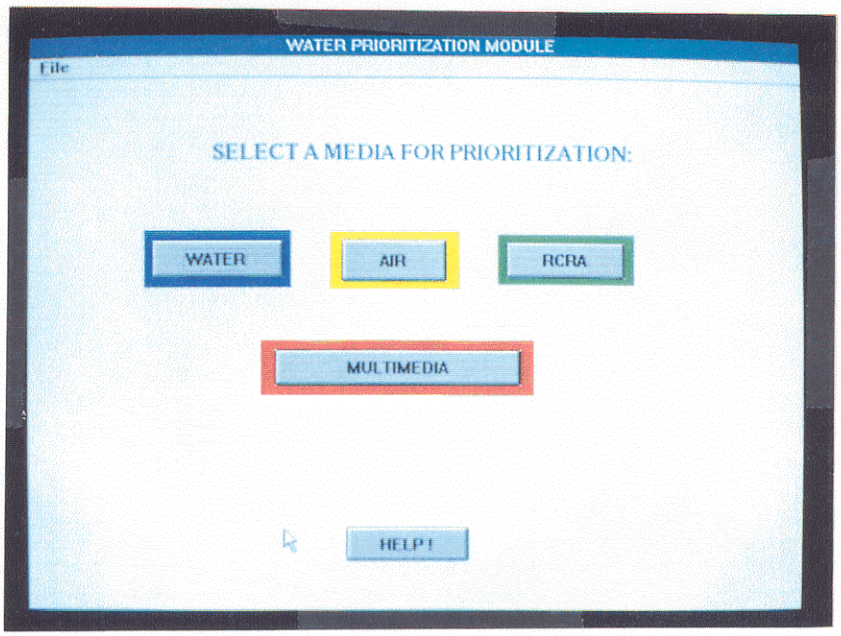

Figure 3-5: Media Selection Screen

criteria. In the RCRA program, such factors as the distance of the toxic discharge relative to endangered species habitats would be considered.

Figure 3-3 shows the screen activated after the user has chosen a facility to evaluate. On the right side of the screen, the user is asked to evaluate each facility according to the criteria, choosing a number between zero and nine. The scores indicate the impact from the criteria according to the specified meanings given in Table 3-1. The possible criteria to evaluate are displayed on the left side of the screen. Figure 3-4 shows the screen after a criteria has been selected. On the left side of this screen, the user is provided with relevant information from the database for each criteria and each facility. If the information needed to evaluate the criteria is not available in the database, the user is provided with

Table 3-1: Criteria Scores and their Meanings

Score	Meaning
0	No impact, no violations
1-3	Adverse impacts low, compliance status is good few minor improvements needed.
4-6	Adverse impacts are moderate, compliance status need improvement.
7-9	Adverse impacts are high, compliance status is poor and needs improvement.

suggestions of where further information may be obtained. The prototype system used a dBase3 database created for the purpose. Future improvements to the system could include a program written to facilitate the downloading of the relevant information from each media database to an interface database.

View Scores

The view scores option allows the user to view all of the criteria scores entered for each discharger. This provides the user an opportunity to revise the scores of one discharger relative to the scores of the other dischargers as needed.

Rank

The rank option allows the user to choose the ranking method used to prioritize the facilities. MOPS offers six different ranking methods. Three ranking methods called total score ranking, ordered ranking, and threshold ranking are described below. Each of these methods has a criteria weighted option making the total number of ranking options six. The weighted option is explained in detail below as well.

The total score ranking method simply adds the evaluation scores assigned to each of the four water criteria for each facility. This sum, called the final ranking score, is then used to rank each discharger. This ranking method is most appropriate when the user is interested in the influence of evaluation scores within the full evaluation range of zero to nine on the final ranking of dischargers. It is also more useful when the user has high confidence in the specific ranking scores entered.

When the ordered ranking method is chosen, the system uses the evaluation scores to rank each discharger's performance within each of the original evaluation criteria. The scores of the top three dischargers for each criteria are preserved, while those ranked lower than the top three are reassigned evaluation scores of zero. These revised scores are then totaled for each discharger to calculate a final ranking score. This ranking method is useful when the ranking of the dischargers in each evaluation area is of primary importance, and specific evaluation scores are viewed to be secondary.

The threshold ranking scheme reassigns scores that are less than a user specified threshold to zero. These revised scores are then summed to calculate a final ranking score for each discharger. This ranking method is most appropriate when the user views scores below the selected threshold as negligible. Comparison of the ranking results produced using this method with those calculated according to the total score method provides some insight regarding the influence of these sub-threshold scores.

The user may chose the weighted ranking method of any of the ranking schemes described above. In any prioritization process, one may make decisions using different subjective criteria. However, often certain criteria may be viewed as more important than other criteria. The relative importance of each criteria to the decision maker may be incorporated into the ranking process by selecting the appropriate weighted ranking scheme. If all criteria are equally important, the appropriate non-weighted ranking method can be used.

Compare (Ranking Schemes)

After several ranking methods have been used to rank the facilities, the rankings

obtained from the various methods can be compared. The comparison is provided as a set of bar graphs, each graph representing the different ranking method chosen. This single screen comparison allows the user to quickly identify if the different ranking methods ranked the same facilities high or if a certain facility was high according to one ranking method, and lower according to another.

End Session

When a user has gone through the evaluation of the facilities and the ranking processes, the single media session is ended. The user then has the choice to go on to either of the other media modules or, if all the modules have been completed, to continue with the multimedia module.

4. Multimedia Module

The multimedia module retrieves the final ranking scores saved from each media and evaluates each facility on a multimedia basis. This module is accessed by choosing the multimedia pushbutton from the media selection screen shown in Figure 3-5. After an introductory screen, the user is presented with directories of the files created in the individual media modules and asked to select the files to be used in the final multimedia ranking process. A main screen similar to the main screens for the media modules appears. The user may view the scores to be used in the ranking, select the ranking method to be used, or compare the results of the different ranking schemes used. The four first ranking method from the single media session are available. These ranking methods are the total score method, the weighted total score method, the rank order method, and the weighted rank order method. The weighted rank methods in this module allow the user to weight the media relative to each

other. The threshold ranking schemes are not appropriate at this level. The final rankings can then be saved and printed.

D. Model Evaluation and Implementation Issues

The final two chapters of this paper address two important issues required to transform this prototype system into a functioning, production expert system. Chapter Four focuses on the evaluation of the model and addresses the question of how well the model satisfies the needs of the users. In Chapter Five, the issues surrounding the implementation of the model are explored.

It should be noted at this point, that much of the following material is anecdotal in nature. The evaluation and implementation issues were determined through a series of discussions with the potential users of the system at EPA. Though the study included all of the people who are involved with the prioritization of multimedia facilities for inspection in the EPA Region X office, the study size was small. Also, this project was conducted on a relatively small budget ($35,000). The limited resources and time available, to a great extent, dictated the methods used in the study. The study methods adopted were people-oriented and pragmatic within the budget, but were not rigorously scientific. However, within these limitations, this study provided insights into some important implementation issues and answered questions about the usefulness of a decision support system multimedia prioritization.

Chapter 4: MODEL EVALUATION

The final two chapters of this report document the research completed in the third phase of the Multimedia Enforcement Project. This chapter evaluates the current prototype system and reports EPA personnel opinions about the system. In the following paragraphs, the process of evaluating the model is described and the responses to the model are discussed.

A. Process of Model Evaluation

The evaluation of the model was performed with a series of demonstrations, written surveys and interviews with EPA personnel. This process is described with emphasis placed on: 1) the selection of the participants, 2) the development and administration of the questionnaire, 3) the conduction of the demonstration meetings, and 4) the management of the individual interviews.

1. Selection of Participants

The EPA personnel interviewed for this phase of the project were selected on the basis of their involvement in the process of targeting multimedia facilities for inspection or for their knowledge in other pertinent areas such as database integration or geographic information systems. The people selected and their positions at EPA are provided in Table 4-1. The majority of the people selected are members of the Enforcement Targeting Committee. This committee is currently responsible for developing lists of potential facilities for multimedia inspections. In the past, these lists have been generated based on the personal knowledge of the members of the committee through a process of group consensus. The people indicated by an asterisk in Table 4-1 are not members of the Environmental Targeting Committee, but were selected on the recommendation of William Schmidt, Head of the Region X Multimedia Enforcement Projects.

Table 4-1: EPA Personnel Interviewed in Phase III

Paul Boys
Chief of Engineering and Investigations Section

Gil Haselberger
Chief of TSCA Section

Greg Kellogg
Chief of Water Compliance Section

Barbara Lither*
Chief of Office of Enforcement

Rich Martin*
Acting Chief of Information Branch Management

Ray Peterson*
Chief of Geological Information Section

Ann Pontius
Chief of Air Operations Section

William Schmidt*
Technical Support Branch Chief

Dan Tangarone
Engineering and Inspection Team Leader

David Teta
Chief of RCRA Compliance Section

* Not members of Enforcement Targeting Committee

Beginning in August 1991, Barbara Lither will be the head of the Office of Enforcement which will be administered under the Deputy Regional Administrator (DRA) and will be a major player in multimedia enforcement. Rick Martin, is on temporary assignment to Region X from EPA headquarters and has been involved with the data integration processes enabling people to access the raw data with which multimedia decisions are made. Ray Peterson, was interviewed because of his involvement with GIS and the potential for GIS applications in MOPS.

2. Questionnaire

A questionnaire was developed as one of the primary evaluation tools of the prototype model. The questionnaire also was designed to explore issues and concerns related to implementation. Schmidt, reviewed the questionnaire and his suggestions were incorporated before the questionnaire was administered. The questionnaire can be found in Appendix D.

The questionnaire was administered in conjunction with demonstrations of the prototype. The participants were given the questionnaire at the beginning of the meeting, so they would be aware of the aspects of the program to be evaluated as they viewed the demonstration. The questionnaires were collected at the time of the follow-up interview, one to five days after the demonstration meeting.

The questionnaire was composed of fifteen questions and took approximately 15 minutes to complete. Two types of questions were included in the questionnaire. The first question format asked for the participant's opinion using a 5-point scale. Descriptive words were presented along with the numbers to avoid confusion.

An example question is given below:

1. "How difficult would it be to learn to use this tool?"

very difficult		somewhat difficult		not difficult
1	2	3	4	5

This type of question is simple and quick for the participant to complete and the results can be tabulated quickly and easily as well.

The second type of question requested responses in writing related to options the participants felt were important, options that were not found on the questionnaire, or suggestions for improvements to specific aspects of the program. A third question format was used in which the reader was asked to rank the functions provided by the program from the most useful to the least useful. An example of the third type of format is given in question 6 below, while an example of the second type of question can be seen in question 7.

6. Which of the following functions would you find the most useful in your work? Please rank them. (1 - most useful, 7 - least useful)

The functions of the program are:

_____ - to automate portions of the decision making process

_____ - to provide a structure for decision making

_____ - to generate a paper trail

_____ - to standardize the decision making process

_____ - to serve as a tutorial for new employees

_____ - to encourage the user to examine their own decision making process

_____ - to make pertinent information from the database easily accessible.

7. Are there other functions the program could fulfill?
Please describe briefly.

3. Demonstration Meeting

Selected EPA staff were notified that this project had progressed to its final stage and invited to participate in the evaluation process. These meetings reviewed the need for the MOPS system, its purpose, and the multi-criteria decision making theory included in the program. MOPS was then demonstrated on a 486 IBM personal computer. This demonstration included an actual multimedia ranking example.

The majority of the selected participants were familiar with the project and many had been involved with earlier phases of the project. These participants were invited to attend the first demonstration meeting on July 3. Participants being introduced to the program for the first time attended the second demonstration meeting on July 15. A list of the participants at each of meetings is given in Table 4-2. More details relating to the history and background of the project were given at the second meeting and more time was devoted to questions and answers. The demonstration meetings lasted approximately one hour.

Table 4-2: Demonstrations attended by Participants

July3	July 15
Paul Boys	Barbara Lither
Gil Haselberger	Rick Martin
Greg Kellogg	Ray Peterson
Ann Pontius	
Dan Tangarone	
David Teta	

4. Individual Interviews

Appointments were made for individual interviews within a few working days after the demonstrations. The interviews were conducted in a similar manner to interviews completed in the first phase of the project. The interviews were conducted in person with the exception of one telephone interview mandated by schedule constraints. Most of the interviews were conducted in the interviewee's office. The sessions were taped and later transcribed for easy reference. Copies of the transcribed interviews can be found in Appendix C.

The questions posed during the interviews addressed both model evaluation and implementation issues. The questions required responses in four general areas. Broad questions were asked first. This allowed the participant to lead the discussion with his or her issues and minimized the potential bias of the interviewer. More specific questions about different aspects of the program were then asked if these topics had not been covered under the broad question.

Because of the widely varied backgrounds and positions of the people interviewed, the interview questions were tailored to the individual participants. For example, questions concerning the appropriateness of the information provided in the databases could only be answered by the compliance section chiefs. The other participants who were not involved in a particular media program could not answer detailed questions in specific media areas. Other participants, however, were much more knowledgeable on the computer systems available at EPA and were able to answer questions on computer accessibility which the compliance branch chiefs could not answer. An example of the full interview with all of the questions posed can be found in Appendix E. In the transcribed interviews, only those questions

relative to the particular participant are seen.

B. Responses to the Model

The responses to the model are summarized below. The evaluation provided by the participants was very positive, although participants did note potential areas of improvement. Many participants expressed their feeling that MOPS, even with its drawbacks, would be a great improvement over the current manual system. The positive responses to the model were categorized into two general areas:
1) comments on the usefulness of different functions of the program, and
2) unexpected benefits of the program. A list of the positive responses can be found in Table 4-3. The negative responses were divided into three categories:
1) suggestions for additions to the system, 2) suggestions for changes to the current system, and 3) comments about the functions of the system. A list of these responses can be found in Table 4-4. The questionnaire and the interview transcripts are referenced throughout the following sections. The responses to the questionnaire can be found in Appendix D. The interview transcripts, arranged alphabetically by last name, are located in Appendix C.

1. Positive Responses

The positive responses to the program include a number of comments on the usefulness of various functions of the program as well as a number of unexpected benefits of the program. As mentioned earlier, the overall tone of most of the interviews was quite positive. A number of participants expressed their general support for the program with comments like "You're on the right track", "I'm excited about the program - I think it is great", and "It is one thousand times better than what we do right now . . ." Another participant summarized the program: "The presentation is good, the program is logical, and the output is clear." The results of

Table 4-3: Positive Responses to System

Comments on Usefulness of Functions

- Consensus that program is useful
- Capture of decision making process
- Organization of decision making process
- Provide more complete list of facilities

Other Benefits

- Target information needed to make decision
- Aid media chiefs in arriving at consensus on facility list
- Time saver
- Ranking methods well reviewed
- Provide defense for EPA in court

Table 4-4: Negative Responses to System

Additions to system

- Need for rulebase
- Need for other information (additional criteria suggested)

Changes to system

- Human health and ecological impact criteria
- Focus of weighting system
- Comparative ranking display

Responses to functions of program

- Tutorial not useful function
- Legal concerns about generating paper trail
- Difficulty in identifying referrals
- Decision making process not automated

the questionnaire were also generally positive. When asked how well the program performed each of seven functions listed, the vast majority of the answers were between 1 (very well) and 3 (somewhat well) with very few answers in the 4 or 5 (not at all well) range.

Comments on Usefulness of Functions

Consensus that program is useful

There was general consensus that the program was useful in its present state, but several different opinions as to which function made it the most useful. When asked on the questionnaire if the program was useful in its present state, nine of the ten participants chose answers between "very useful" (1) and "somewhat useful" (3). The function most consistently chosen as most useful was "to provide a structure for decision making". This function was ranked first, second, or third in usefulness by all of the participants. "To standardize the decision making process" was also considered a very useful function and was ranked as the most useful function by four of the participants.

Capture of decision making process

A number of people felt that the program captures the decision making process. Kellogg felt that the process of decision making used by the program is very similar to the process used now, but that the program is more precise because it relies on real data more and speculation less. Boys felt the MOPS process was more analytical than the current manual process and Pontius stated that the program was more empirical. Schmidt commented that the program is considerably more consistent than the process that is used now.

Organization of decision making process

Haselberger stated that the strength of the program lay in its ability to organize the decision making process. He also noted that the program doesn't do anything a person couldn't do by hand, but reduces some of the drudgery and provides a different perspective which can stimulate a person's thinking. If a person has confidence in their decision making abilities, they will see this program as a tool. However, if a person is less sure about their abilities, Haselberger felt that the program may or may not be useful. He emphasized that the power of the program is to organize and set out in a clear manner a process that is difficult to articulate, but if people expect the program to do their job for them they will be disappointed. Teta also saw the purpose of the program as making sense out of the decision making process and performing this process more systematically. He stated that the process is not necessarily done this way currently. Decisions are made on a much more subjective level presently and Teta felt that a main advantage of this program would be making the process more systematic.

Provide a more complete list of facilities

For Tangarone, the two most important functions of the system were to encourage the user to examine their decision making processes and to provide a more complete list of facilities than the Enforcement Targeting Committee would determine. Tangarone stated that he can quickly and easily generate a list of potential candidates for multimedia inspections . However, because of the speed and thoroughness of computers, he felt MOPS might develop a more complete list. He felt that the program would probably list the facilities he would determine as well as pointing out some facilities that might be missed on his list based on institutional knowledge.

Other Benefits

Target information needed to make decision

EPA databases can be very large and unwieldy and determining and accessing appropriate information can be difficult. Schmidt noted that the program targets the data EPA believes is necessary to make a multimedia prioritization decision. The identification of the important information in the databases is the first step towards the use of the information. People currently make multimedia prioritization decisions based on information they know, rather than information in the databases. With MOPS, people will be more likely to use the database information. Schmidt emphasized that as more database information is made available to the decision makers, more decisions will be based on the database information, and better decisions will be made.

Aid media chiefs in arriving at consensus of multimedia facilities

Teta felt the program did a good job of screening out the higher priority facilities and that the usefulness of the program lay in helping the media chiefs arrive at a consensus on the top multimedia facilities to target. A relative ranking of facilities rather than an absolute predictability was also stated as a main value of the program by Kellogg. Pontius also noted that the coordination between the media programs can be inconsistent and that a tool accepted by each of the programs and establishing a consensus of the highest priority facilities would be useful.

Time saver

Kellogg felt the program would be a time-saver as well. The program accomplishes with information from the databases what the Enforcement Targeting Committee does more slowly and manually with a reliance on institutional knowledge. Two of

the steps in the committee's decision making process (identifying the universe of multimedia facilities and ranking these facilities) would be performed by MOPS. Kellogg noted that in the past, the process of identifying the multimedia enforcement candidates has taken several meetings. He felt this process could be accomplished much more quickly with the use of MOPS.

Ranking methods well reviewed

The different ranking methods were generally well reviewed. Several participants felt the ranking methods provided good flexibility and valued the different perspectives presented. Pontius appreciated being able to compare the different rankings generated by the various methods and thought it was interesting and useful to see the changes in the rankings from the different weighting processes used. Boys and Schmidt felt that the various ranking schemes covered the range of possibilities quite well and that the multiple ranking schemes could increase the user's confidence in the results. If a particular source was found to rank high in four or more of the ranking methods, the user could be confident that facility should be examined more closely.

Provide EPA with defense in court

Several people interviewed thought the program would be very useful in defending EPA decisions in a court of law. Kellogg pointed out that EPA strives to be objective and that the program captures the objective logic. He also felt that MOPS shows that EPA decisions are consistent though they may not be perfect. If the program makes mistakes, it makes the same mistakes on all the facilities. Though the decision making process may be flawed, it is consistently flawed and the facilities are judged consistently. Boys also felt that the most important aspects of the program were the fact that the decision making was done in a systematic way and

having a record of how the decision was made. Boys and Schmidt stated that the decision making process captured in MOPS might qualify as a "neutral inspection scheme". A neutral inspection scheme is defendable in a court and indicates that the selection was done in a fair way and that each facility had an equal chance.

2. Negative Responses or Suggestions for Improvements

The negative responses to the system fit into three general areas: 1) additions to the system, 2) changes to the current system, and 3) comments about the functions of the system. The suggested additions to the system include the need for a definite rule base and the addition of new criteria emphasizing different information than is currently found in the system. In the second category, three suggestions for changes to the system were made. It was recommended that the human health and ecological impact criteria be changed due to the lack of supporting data for these criteria. Secondly, it was recommended that the focus of the weighting system be changed to consider the amount of data available. The third recommended change suggests an improvement in one of the displays. There were a number of comments about the functions of the program and they are discussed in detail at the end of this section. A list of the topics discussed in this section is found in Table 4-4.

Additions to system

Need for rulebase

Martin felt that too much emphasis was put on the development of a pretty system and not enough time was spent on developing the decision making rules on which the system is based. The rules can be extremely difficult to make, and it can be even more difficult to get agreement on the rules once they are made. However, if agreement has not been reached on the rules used to make a decision, Martin felt that little progress had been made in standardizing the decision making process. He

stated that the reason the media programs work so independently from each other is that they can't or won't agree on what the rules should be. Martin felt that there has been too much focus on the tool and not enough focus on the management process that captures the heart of the problem.

Need for more information

Peterson felt that the program does not capture the decision making process because it doesn't include all of the important information. He suggested several criteria be added to the system. A criteria to capture the vulnerability of the setting and a potential hazard or potential toxicity criteria were suggested to incorporate Toxic Release Inventory (TRI) information in the program. A management criteria to incorporate some of the subjective and political issues of managers was also suggested. These suggestions were first made in an interview with Bill Schmidt and Ray Peterson on April 4. A transcript of this interview can be found in Appendix B. Peterson commented that the development of a criteria to capture the subjectivity of the information used in the decision making process might be a good idea as well. For example, this criteria could take into consideration whether a criteria score was backed up by data, by professional judgement, or by a guess.

Changes to system

Change human health and ecological impact criteria

Teta raised the issue of the lack of data to support the human health and ecological impacts criteria. He felt that the question was not whether or not these criteria were appropriate, but whether there was enough data to effectively evaluate these criteria. Would these criteria be regularly useful or would they be ignored the majority of the time because of the lack of data? Teta felt that MOPS would not be able to identify the facilities for which the human health and ecological impacts are

high. The people doing the inspections might have a sense of the human health and environmental impacts, but this information cannot be obtained from the RCRIS database and it is determined subjectively rather than objectively. Concern was expressed that the presence of these criteria in the program might give a false sense of including human health and ecological impact considerations when they weren't fully known or considered.

However, Haselberger also pointed out that the system is only as good as the analyst using the system. Without very much data to support the score chosen by the user, the user's judgements about the human health and ecological impact criteria may have a large effect on the ranking. On the other hand, Teta and Haselberger agreed that the human health and ecological impacts were important aspects to consider when evaluating a facility. Though the data available in the EPA databases is limited, what information there is made accessible to the user by MOPS. MOPS does not exclude any available data, but points out what data is not currently available through the database and suggests other places the information might be found. Schmidt pointed out that GIS applications could increase the data available for these criteria.

Change focus of weighting system

Teta also suggested that the focus of the weighting system be changed. At present, the weighting system is used to weight the relative importance of each of the criteria. Teta felt that the weighting system should specifically relate to the amount of information available to support the criteria. The human health and ecological impacts are important criteria, and perhaps should even be driving the whole ranking process, but if there is little data to support the scores chosen, perhaps these criteria should be given lower emphasis. This could be accomplished by weighting

the criteria with less supporting data lower than the criteria with more data available.

Change comparative ranking display

Concern was expressed by Pontius about the ranking display and the ability of the program to graphically illustrate the comparative rankings of a larger number of dischargers. It was felt that the screen would become too complex and the simplicity lost when more facilities were ranked. At present, the screen shows histograms of the six facilities ranked in six different ways on one screen. The format of this screen probably will need to be changed to accommodate a larger number of dischargers.

Responses to functions of program

Many different opinions were expressed about which functions of the program were most useful, and which functions the program was able to fulfill. The following three paragraphs discuss the participants views of the functions of the program.

Tutorial not valued function

There was a consensus that the function of the program as a tutorial was less useful than the other functions. When asked to rank the seven functions of the program from most useful to least useful, every participant ranked serving as a tutorial as sixth or seventh. Schmidt stated that the tool is more of a management tool than a tool for new employees, but that it could be used as a teaching tool for managers. There was also agreement that the tool would not be very difficult to learn, but that some training would probably be necessary. (See questions one and two of the questionnaire.)

Legal concerns about paper trail function

Concern was expressed about the function of generating a paper trail by Lither. She felt that for the purposes of EPA defending the ranking schemes in a court of law, it was important that a paper trail on the ranking process not be allowed into the hands of the regulated community. She felt that any ranking system clearly documented could be attacked in court. Lither ranked generating a paper trail as the lowest priority function. Peterson on the other hand, ranked this function as his second priority and stated that generating a paper trail of the logic used to make a decision was one of the more important functions of the system. The other participants ranking of this function ranged between these two.

Identifying referrals

Part of the purpose of prioritizing the facilities is to identify the facilities that most need corrective action or the sources that can be referred to the Department of Justice for action. Tangarone expressed concern about this system's ability to effectively identify sources of referrals. Schmidt however, expressed hope that this system would improve EPA's ability to identify referrals.

Decision making process not automated

Tangarone felt the system would not automate portions of the decision making process. He felt that the system could be used to obtain a list of facilities, but that the decisions about which facilities to target from the list would be based on political considerations.

C. Summary

This chapter describes the process of evaluation of the MOPS tool and discusses EPA personnel responses to MOPS. The model evaluation process was performed

through the selection of participants, the development and administration of a questionnaire, the conduction of demonstration meetings, and individual interviews with the evaluation participants.

The responses to the model were positive overall, though suggestions for future improvements were also expressed. The positive responses included comments on the usefulness of the functions of the program as well as additional benefits provided by the program. There was consensus among the participants that the program was useful, and various participants noted that the tool captured the decision making process and performed it more consistently than the current process, that the tool organized the decision making process, and that the tool could provide a more complete list of facilities than the current process. Additional benefits of the tool described included the programs abilities to target the information needed to make a decision, to aid media chiefs in arriving at a consensus on the prioritized facility list, and to perform the functions more quickly than the current process. The multiple ranking methods were also well reviewed and the possible use of the program to provide a defense for EPA in court was discussed.

The negative responses to the program included suggestions for additions and changes to the system, and comments on the functions of the program. It was suggested that a rulebase for determining default scores be added to the system as well as several criteria to capture additional information. Changes to the system were recommended in the areas of the human health and ecological impact criteria, the focus of the weighting system of the criteria, and the comparative ranking display. The negative comments on the functions of the program included concerns that the tutorial was not a useful function, that the paper trail generated could be a

cause of legal problems, that the program might not identify referrals to the Department of Justice, and that the decision making process could not be automated.

The next chapter continues describing the insights gained from the evaluation process and describes the implementation issues raised.

Chapter 5: IMPLEMENTATION ISSUES

A goal of the evaluation process was to determine the important issues that must be considered for this program to be fully implemented. For the purposes of organization, the issues were divided into three categories: 1) issues related to all decision support systems, 2) issues related to EPA Region X, and 3) issues related to MOPS. Some of the issues discussed are relevant to all decision support systems such as the commitment of management, the need for a "champion" of the program, people's resistance to change, training, documentation, validation, and computer accessibility. Other issues are associated with the setting of the system or the organization in which the decision support system will be used. In this project, these issues are related to EPA Region X and include data quality issues, the transferability of the program to the states, the ability of the program to stand up to court scrutiny, the establishment of a default ranking method, and the central coordination of the programs. Still other implementation issues are specific to the decision support system developed, in this project, MOPS. These issues include the downloading of information from EPA databases, the flexibility of the program to incorporate other EPA programs, and the modification of the database information for certain criteria. These issues will be discussed below. A summary of the implementation issues is found in Table 5-1.

A. Implementation Issues Relating to All Decision Support Systems

The implementation issues discussed below were determined in reference to MOPS and Region X EPA, but relate to all decision support systems. The topics discussed include 1) the commitment of top management, 2) a "champion" for the program, 3) resistance to change, 4) adequate training, 5) good documentation, 6) validation of the system, and 7) computer accessibility.

Table 5-1: Implementation Issues

Issues related to:

Decision Support Systems

- Commitment of top management
- "Champion" of program
- Resistance to change
- Training
- Documentation
- Validation
- Computer accessibility

EPA Region X

- Data quality
- Transferability to states
- Ability to stand up to scrutiny in court
- Establishment of default ranking method
- Central coordination of media programs

MOPS

- Downloading of information from EPA databases
- Flexibility to incorporate other EPA programs
- Modification of database information for hazardous waste criteria
- Modification of database information for water criteria

Commitment of management

The most often mentioned requirement was the commitment of top management. (Seven of the ten people interviewed suggested this requirement of implementation.) Haselberger stated that the commitment of top

management would be crucial to the success of the program. Policies for a program's use must be specified by the management if the program it to be used. For the program to become a standard tool, top management must expect to see it used and incorporated in the decision making process. Schmidt commented that a project must have the support of the top leadership in order to obtain the resources for development. Schmidt also noted that one of the factors that affects management support is the cost/benefit ratio of the project. The benefit of multimedia inspections is currently being studied and the result of that study in relation to the cost of multimedia inspections could have a large impact on the future of the multimedia projects in progress. Currently, EPA leadership supports multimedia inspections. However, if it is found that multimedia inspections are not cost effective, top management support will decrease.

"Champion" of the project

A related issue is a "champion" of the project or a person who will inform people of the uses of the program, educate users in how the program is used, and defend and support the program. It has been found that a "champion" to a program is a key to its success. The people most often suggested as "champions" of the project were Barbara Lither or one of her staff in the Office of Enforcement or Bob Corson, Director of the Environmental Services Division. Peterson and Pontius mentioned that it is best if the "champion" of the program is in a position of authority. Jerry Emison, the Deputy Regional Administrator was also suggested as a potential powerful source of support.

Resistance to change

An obstacle to the implementation of a DSS in general, is peoples resistance to

change. People tend to be suspicious of the unknown and prefer known and comfortable ways of doing things. Martin noted that people often feel that they got along fine without the tool before and wonder why they should change the way they do things now. Kellogg emphasized that it is human nature to resist change and than an incentive is needed to encourage people to overcome their inertia. Martin suggested that the combination of a good product and management support can serve as the necessary incentive to overcome this inertia and resistance to change.

Training

Another often mentioned requirement common to all DSS was adequate training. In answering the questionnaire item "Do you think training sessions would be necessary to use this tool?" everyone answered between "definitely necessary" and "maybe necessary". Most of the people interviewed mentioned that they felt that some training would probably be necessary. Boys stated that though he did not think the program would be difficult to learn, he felt he would like to have an expert on the system lead him through it for the first time. Haselberger noted that is people are trained adequately and feel comfortable with the system, they will be more likely to use it. Tangarone stated that good documentation would also be necessary for training.

Documentation

Good documentation is the next requirement for implementation. Documentation is written material explaining and demonstrating the system. As mentioned above, documentation is crucial for training as well as later when people are using and possibly modifying the program. Tangarone noted that

documentation is a key to confidence in the program. Questions such as "How does the program work?" and "What factors are considered in the program?" must be answered and the reasoning behind the tool must be clearly explained for people to have confidence in the logic of the tool. Martin also stressed that the documentation for MOPS must indicate how the database information is used to obtain the criteria scores. The organization of the documentation is also important and should be clear, concise, and easy to follow. Tangarone also emphasized that the program must be reasonably simple and easily understood. He stated that complex systems that are not understood are rarely used.

Validation

Validation of the system is another requirement for implementation of any computer tool. Validation is the process of testing systems to ascertain if they achieve acceptable performance standards. Pontius felt that the confidence in the ranked facility lists produced by MOPS would correlate highly with the results of the test cases run. The lists produced by the program must be similar to the lists people would determine manually using the same database information. She suggested a good test case could be the Industrial Section of Washington state which oversees twenty-two multimedia facilities.

Computer Accessibility

A final implementation issue common to DSS is computer accessibility. Appropriate computers must be available for the DSS to be installed on. Martin stated he felt that widespread availability of a computer application was the key to it's use. MOPS runs under Microsoft's Windows environment and must be run on an IBM or IBM clone with a 386 or 486 motherboard. Currently

there are only two 486 machines in Region X and very few 386 or 486 machines are equipped with Microsoft Windows. Peterson noted that there are a number of 386 SX machines which would run MOPS, though the program would run somewhat slowly. However, Peterson suggested that these machines could be upgraded in memory quite easily and inexpensively to run the application more quickly if management supported the use of this tool.

B. Implementation Issues Relating to Region X EPA

These implementation issues relate to the organizational setting of the program, in this case Region X EPA. DSS are often designed to meet the needs of a particular setting and MOPS was built for Region X. Though the issues discussed here are obviously related to MOPS, they are due to the nature of the setting where MOPS will be used rather than to the nature of MOPS itself. The issues discussed below include: 1) data quality, 2) transferability of program to states, 3) ability of program to stand up to scrutiny in court, 4) the establishment of a default ranking method, and 5) the central coordination of the media programs.

Data quality

Nearly all of the participants in this study raised the issue of data quality at some time during the interview. Pontius stated that in the air program information often is not placed in a database and if it is, it may be put in the wrong place and be difficult to retrieve. Teta pointed out that in the RCRA system, a few facilities might be missed entirely because of the lack of data. The accuracy of the information in a database is difficult to assess, but it is clear that it varies considerably from state to state and between the media programs. Some of the

factors that contribute to this situation are: that some databases are fairly new and people are still learning how to use the database and store the necessary information; some of the information is entered by the states while some data is sent from the states to EPA to be input by EPA staff; and the data fields are not always well defined and there can be disagreement over what information various fields should contain and how that information should be stored. Other factors contributing to the lack of consistent data quality are the independence of the programs and the variable nature of the information. The databases for each of the media programs are managed independently by people who emphasize different aspects of information storage. The nature of the information stored varies a great deal between programs from some information that may be quite precise while other information is more subjective and "fuzzy".

Peterson described another data quality problem associated with the FINDS numbers. FINDS numbers are unique identification numbers used to specify a single facility. However, the databases presently contain examples of multiple FINDS numbers for the same facility and other examples of facilities with no FINDS numbers at all. It was also found in a recent study that the zip codes did not correspond to the latitude/longitude readings for 25-30% of the facilities in the databases.

Teta stated that there would be reluctance to accept MOPS because of the database quality and the "garbage in/garbage out" problem of any computer system. However, several more optimistic views were expressed as well. Schmidt related that though data quality is an obstacle, it is less of an obstacle in Region X than in other EPA regions because there are fewer facilities and effort

is being focused on improving the databases. Martin and Peterson pointed out that the use of data can improve the quality of the data. As the states see the need for the data they will be motivated to input the needed data more carefully. Martin also noted that though there is a lot of room for improvement, EPA has the best environmental information databases in the world. Finally, Kellogg and Teta pointed out that data quality is a problem with or without the MOPS tool and that at least the tool allows people to more easily access what data is available.

Transferability of program to states

Pontius, Lither, Peterson, and Schmidt all emphasized the role of the states in gathering information and the advisability of taking MOPS to the state level. Several advantages of involving the states were expressed. Most of the data collection and input is done at the state level and the states have been a source of many of the data quality problems. Martin pointed out that data has been collected in the past too often for the purpose of "bean counting" or "keeping score" rather than environmentally focused uses. It was felt that the more the state personnel saw the use of the data and the need for the data they were collecting, the more they would be motivated to collect and input more accurate and complete data. The states conduct many of the inspections and it was felt that the use of this program could improve the states facility targeting processes as well. Pontius felt that the states would want this program when they became aware of it but that it must be presented carefully and not forced on them. Schmidt, stated that the program must be carefully marketed to the states and shown to be a time-saving program for them. The states are limited in their time and resources, but if the program could be shown to make their job easier and

save time, it would be more readily accepted.

However, obstacles would be encountered in trying to implement the program at the state level. Peterson mentioned that the states may have different regulations than EPA in some areas and may keep different information so the database information in MOPS would probably need to be changed. Peterson also pointed out that the states may track more facilities than EPA. Martin mentioned that some of the states are severely limited in their computer availability and the computers necessary to run MOPS may not be available at the state level.

Ability to stand up to scrutiny in court

Another requirement of implementation specific to Region X EPA is that the decision making process used in the program be able to stand up to scrutiny in court if EPA is challenged on it. The users of the tool must be able to defend themselves against the accusation that they have manipulated the weights to obtain the list of facilities. Schmidt pointed out that emphasizing the pre-decision making parts of the program, such as the rule base determining the default criteria scores and a default ranking method, could increase the possibility of the program being considered a neutral inspection scheme. Neutral inspection schemes are defendable in a court of law.

Establishment of default ranking method

The suggestion of establishing a default ranking method which would be used most often was raised in several of the interviews. Schmidt originally made the point that a default ranking method could improve the consistency of the ranking

process and make the process more defendable in court. This opinion was seconded in interviews with Teta and Haselberger. Peterson felt that the system might have too much flexibility for some users with the various ranking methods available and he suggested a two-user system with access to the different ranking methods and weighting factors available to some users, but not to others.

Central Coordination of media programs

Pontius mentioned that central coordination of the MOPS program by someone outside of the three media programs would be crucial to the implementation of the system. Coordination between the programs can be inconsistent at times and a central person to shepherd the project and to be the expert was considered mandatory. Teta also noted that coordination between the media programs can be difficult and that a neutral coordinator would be very desirable.

C. Implementation Issues Specific to MOPS

The following implementation issues relate specifically to MOPS. These issues include the downloading of information from the EPA databases, the flexibility of MOPS to incorporate other EPA programs, and specific modification of the database information of several criteria.

Downloading of information from EPA databases

One of the most important requirements of implementation will be the expansion of the program to accept a large number of facilities and the downloading of the information from the RCRIS, AFS, and PCS databases. Several participants raised this point and though all of them stated it would be a large part of implementation, they did not feel that downloading the database

information would be an obstacle to implementation. Martin emphasized that the mapping of data from EPA databases to the MOPS downloaded database would be a time-consuming, challenging job, but very necessary. He stressed that the creation of an independent MOPS database must be avoided.

Flexibility of program to incorporate other EPA programs

Several participants in the interview process were concerned that only the three media program water, air, and RCRA were included in MOPS. The flexibility of the program to allow the addition of other programs such as TSCA or Underground Storage Tanks was considered very important. Schmidt felt that a template module should be developed that could be modified to add other EPA programs to MOPS as necessary. For this program to be useful in the long term, it would need the flexibility to be changed and modified as new ideas are developed. However, the addition of some of these programs is hindered by the nature of the programs to be added. MOPS was designed around process oriented programs where facilities may have continuous or on-going compliance problems. However, other programs may be less process and violation oriented. TSCA, for example, focuses on PCB regulations. There aren't any indicators of non-compliance in TSCA and it is not known if there is a violation until an inspection is done. There is no information on a particular facility unless an inspection has been carried out there. Even if an inspection has been done, there is no guarantee that the facility is in the same violation status as when the inspection was completed. The inspection might have found a violation and the facility has corrected the problem, or the facility might have been in-compliance on the day of the inspection and sprung a leak in their PCB containing equipment and be out of compliance now. These factors make inclusion of the

TSCA and other programs into MOPS difficult.

Modification of database information for RCRA criteria

Teta, suggested that the database information for the violation magnitude and compliance history criteria for the RCRA module be modified. He felt the violation magnitude criteria should indicate if the facility is in or out of compliance at this time. The database information displayed could be the class of the violation and if the facility is a high, medium, or low priority violator at this time. The last inspection date could be shown on this screen to indicate the age of the information. Teta also suggested that some of the information currently included under violation magnitude such as the past inspection dates and enforcement actions taken, could be moved to the compliance history database screen. The emphasis in the violation magnitude criteria should be on the current status of the facility while the compliance history criteria will emphasis the past performance of the facility.

Modification of database information for water criteria

Kellogg made some suggestions for the violation magnitude criteria for the water module of the program. The water module was the first module of the program to be developed and for the purpose of simplifying the database, the same most common permit constituents were shown for each facility. This was found to be too restrictive and the suggestion was made that the permit constituents be broken down into three categories: conventional pollutants, metals, and toxic pollutants. Any violation in the database could be found under one of these categories and the violation found in different types of facilities such as metals plants or pulp mills would be better captured. These suggestions came mainly

from an interview done with Greg Kellogg and Vaughn Blethen on April 5th which can be found in Appendix B.

D. Summary

This chapter focussed on the issues that must be addressed in the implementation of a decision support system. The issues were discussed under the broad categories of issues relating to all decision support systems, issues relating to the setting of the decision support system (in this project EPA Region X), and issues relating to the specific decision support system being implemented (in this project, MOPS).

Some of the issues discussed in this chapter are fundamental to the implementation of the project. Other issues discussed are strongly recommended, while other issues would be helpful, but are not crucial to the implementation of the project.

The fundamental implementation issues include the commitment of top management, the validation of the project, computer accessibility, the downloading of the information from the EPA databases, and the modifications to the database information for specific criteria. The resources to implement the project cannot be obtained without the support of EPA management. Validation is crucial to ascertain that MOPS achieves acceptable performance standards and is fundamental to the user's confidence in the system. Appropriate computers must be available to run the program for it to be effectively used. Making information from the EPA databases easily accessible is one of the prime functions of the program and the downloading of the

information from the databases is crucial to implementation. Finally, the specific modifications of the database information suggested by the media Chiefs is necessary to more accurately capture the information needed to make a decision and must be performed in the implementation phase.

The issues that are strongly recommended in the implementation phase include training, documentation, the establishment of a default ranking method, and the central coordination of the media programs. Training and documentation are necessary for the program to be understoods and used effectively and efficiently. The establishment of a default ranking method is strongly encouraged to improve the consistency of the decision making process. The central coordination of the media programs is important to gain the support of the users of the program and smooth the implementation process.

Though the other implementation issues described are important they are not considered crucial to the implementation process. These issues include identification of a champion of the program, consideration of people's resistance to change, the data quality of the EPA databases, the transferability of the program to the states, the ability of the program to stand up to scrutiny in court, and the flexibility of the program to incorporate other EPA programs.

The final sixth chapter provides a summary of this thesis and describes some conclusions drawn from this research.

Chapter 6: SUMMARY AND CONCLUSIONS

A. Summary

The U.S. Environmental Protection Agency is responsible for implementing Federal laws with the purpose of protecting the environment. This is accomplished in part by establishing and enforcing environmental standards on the facilities that discharge pollutants into the environment. The regulation of a large numbers of facilities with limited resources requires prioritization of the facilities. This research addresses this need by describing the development and evaluation of a prototype decision support system that aids decision makers in prioritizing multimedia facilities for enforcement.

This thesis documents the development and evaluation of the MultiObjective Prioritization System called MOPS. MOPS is a computer program that allows the user to access relevant information from various EPA databases and leads the user through an organized decision making process for the prioritization of multimedia facilities. This work was accomplished under the Multimedia Enforcement Project and was performed in conjunction with EPA Region X. Introductory and background information are provided in the first chapter. The following chapters are composed of a literature review, a description of the three phases of the Multimedia Enforcement Project, a discussion of the evaluation process and the results of the evaluation, and an exploration of relevant implementation issues.

Chapter 2 provides background information on a number of decision support tools and the implementation of those tools in the form of a literature review. The decision support tools determined relevant to this research include decision support systems, expert systems, multiobjective analysis, database technology,

and geographic information systems. All of the tools listed above, with the exception of geographic information systems, were used in the development of MOPS. A geographic information system application was not developed for this project because of the lack of resources, but it is hoped that one might be added in the future. The aspects of implementation that were discussed in the literature review included training, documentation, support, validation, and maintenance.

Chapter 3 describes the three phases of the Multimedia Enforcement Project. The first phase involved obtaining background information on the enforcement, compliance and database procedures used at the Region X office of EPA, and identifying the benefits and limitations of the multimedia approach. The second phase focused on the development of MOPS, the decision support system designed to capture the framework of the prioritization of multimedia facilities. The purpose of the third phase of the project was to evaluate the prototype decision support system and identify and discuss implementation issues.

The evaluation of the prototype system is discussed in Chapter 4. First, the process of evaluation is described. Evaluation of the prototype included the selection of the participants, a questionnaire, demonstration meetings, and individual interviews. Though the methods used were not rigorously scientific, the process yielded some interesting and useful results. The second part of Chapter 4 describes the responses of the participants of the evaluation process to the prototype system. The majority of the responses were very positive, though potential areas of improvement were described as well.

The implementation issues discovered through the evaluation process are discussed in Chapter 5. The issues identified for MOPS are typical of those of any complex DSS. Specific areas of concern include the issues relating to all DSS, the issues relating to the setting of the system, in this case Region X EPA, and the issues relating specifically to MOPS.

B. Conclusions

Several conclusions can be drawn regarding the use of a decision support system for prioritizing multimedia dischargers for enforcement and the implementation of such a decision support system. The conclusions related to the use of the decision support system will be discussed below followed by the conclusions related to implementation.

Conclusions related to the use of a DSS

1. **The creation of a DSS for prioritizing multimedia facilities is appropriate and effective.** The creation of the DSS was a two-step process. First, the program developers were required to understand the process of decision making used in each of the media programs. This understanding was gained through the interviews conducted in the first phase of the project. The second step required the organization and codification of the decision making process into a computer program. These steps were described in Chapter 3. That they were successful can be verified by the many positive responses to the system described in Chapter 4.

2. **A DSS can provide a systematic means of prioritizing multimedia facilities.** Systematic procedures provide structure, reduce bias, and increase consistency.

MOPS divides the complex process of prioritizing multimedia facilities into smaller, more well-defined decisions. In MOPS the decision making process is divided into single media ranking modules. Within each of the modules, the rankings of the individual facilities are based on decisions about the facilities performance in specific criteria areas. This structuring of a typically unstructured problem provides more consistency in the decision making process, and better documented and more defendable decisions.

3. **A DSS can provide helpful information to the decision maker.** MOPS will provide helpful information by accessing large, non-user friendly databases and providing the data needed to make a decision. MOPS is a user-friendly system and organizes the necessary information so it can be accessed quickly and easily. MOPS also provides on line support for the user and printed files of the data used, the criteria scores selected, the ranking method used the resulting ranking of the facilities.

Implementation conclusions

One purpose of the evaluation process was to determine if the prototype system would meet the needs of the decision makers at EPA well enough to continue with the project. A rigorous cost/benefit analysis of the implementation of this project has not been completed. However, on the basis of this initial study, work on the project should continue.

Most of the implementation issues discussed in Chapter 5 are manageable and will require relatively little time and few resources. However, a few

implementation issues that will require particularly careful consideration are discussed below.

1. **Downloading of EPA databases to MOPS is a concern.** The identification of the necessary information to be downloaded is one of the most difficult parts of this job. This step has been accomplished in the development and evaluation of MOPS. The actual mapping of the database elements from the EPA databases to the MOPS database will be the next time-consuming part of the task. Though this effort will be significant, no one interviewed felt this would be an obstacle to the implementation of the system.

2. **The quality of the data available is a concern.** The quality of the data is a serious concern and was raised many times in the evaluation process. That the data in the databases is inconsistent and often unreliable has been documented. However, MOPS allows the data that is available to be utilized in the decision making process. Because of the difficulty of accessing the appropriate database information, decisions are currently made on the basis of institutional knowledge. Though the data is far from perfect, using the database information in the decision making process may improve the decisions made.

3. **Support of EPA management is crucial to the success of the project.** Support of the top management was the most often mentioned requirement of implementation. Currently, EPA management supports multimedia inspections. With this support, it is only necessary to show the benefits of the decision support tool in this area. However, if it is determined that multimedia inspections are not cost effective, support for the project is likely to dwindle.

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Appendix A

Interview Conducted in Phase I

of the Multimedia Enforcement Project

List of Interviews for Phase I

Individuals Interviewed and their Agency Responsibility

Arranged alphabetically

Paul Boys
Multimedia Inspections
Environmental Services

David Bray
SIP (State Implementation Plan) Region X Expert
Air Programs Branch

Nancy Brown-Brincefield
Database Manager, PCS (Permit Compliance System)
Office of Water

Bill Chamberlain
Compliance Officer
Office of Water

Chris James
Compliance Officer
Air Operations Section, Air Programs Branch

Susan Lee
Contractor for CSC
Database Manager, DOCKET
Office of Regional Counsel

Mike Paztor
CSC Contractor, Database Integration
Management Division

Ray Peterson
GIS Manager
Environmental Services Division

Bill Puckett
Database Manager, NEDS (National Emissions Data System) and AQS (Air Quality Subsystem) Air Programs Branch

Kathleen Rawdon
Kelly Richter
Database Managers, HWDMS (Hazardous Waste Data Management System)

Hazardous Waste Division

Joe Roberto
Permitting Officer
Office of Water

Jeffrey Rodin
Compliance Officer
Hazardous Waste Division

William Schmidt
Technical Support Branch Chief and
Multimedia Enforcement Pilot Project Head
Environmental Services Division

Carrie Sikorsky
Chief, Permitting Department
Hazardous Waste Division

Betty Swan
Database Manager, AFS (Air Facility System)
Office of Air

Phillip Wong
TRI (Toxic Release Inventory) Program Manager
Air Toxics Division

Mr. Paul Boys
Interview Summary
September 13, 1990

Participants:
EPA Region X: Paul Boys
University of Washington: Richard Palmer, Allison Keyes

Interview Questions:

1. What is your involvement in the multimedia inspection program?
Mr. Boys helps to coordinate and conduct multimedia inspections for EPA Region X.

2. How do you select a facility for a multimedia inspection?
To date, most Region X's multimedia inspections have been conducted at federal facilities where their enforcement authority for federal facilities is limited; they cannot impose fines and pursue other traditional enforcement actions. Thus, Region X initiated this multimedia inspection program for federal facilities in 1985 or 1986 as a means of directing the attention a federal facility towards its environmental problems. These inspections are not intended for use in the Superfund program inspections; they are geared to identify current violations.

Approximately 20 federal facilities which are multimedia dischargers within Region X were ranked by senior staff members to select sites for inspection. The criteria used included compliance history and the potential for compliance problems, e.g. the size of the facility.

Two or three facilities have been selected for inspection each year including Bangor, Puget Sound Naval Shipyard, and Fort Lewis.

3. What information do you collect during such an inspection?
A multimedia inspection is not so different from normal inspections for a single media, but may be more intense or comprehensive. However, the whole process is designed to spark concern at the facility over their current environmental problems. Prior to the actual inspection, letters are sent and a meeting is organized to explain the purpose of the inspection. The base commander, who usually has the ultimate responsibility for the facility, is normally involved in these meetings in addition to any other environmental staff.

An inspection may range from one week to two months in duration. The information collected during an inspection depends on the facilities compliance history, current land use, and what permits have been issued. Four or more individuals may be responsible for each part of or media inspected. When the state is the lead agency for a given media they are invited to conduct their own inspections concurrently with EPA Region X. Each EPA program e.g. water, air and RCRA, has their own guidance documents for inspection procedures. In addition, NEIC has issued a manual on conducting multimedia inspections.

A formal written summary of the inspection is compiled and sent to the base commander. This document concisely summarizes all the problem areas at the facility. A 1-2 hour close-out meeting between EPA personnel and appropriate federal facility members discusses the information presented in the written summary.

Recently, the Alaska Pulp Company, a multimedia discharger in the pulp and paper industry was the first non-federal facility selected for multimedia inspection. The approach taken by Region X was the same as that of a federal multimedia inspection with the addition of off-site inspections, including sediment and landfill sampling to look for dioxin. Whether other pulp and paper facilities will continue to be targets for multimedia inspection depends on the effectiveness of this initial effort.

4. How is this information used for enforcement?
Each Region X enforcement program receives copies of the multimedia inspection summary and is required to initiate some sort of follow-up action. For example, for a federal facility an advisory letter might be issued that demands resolution of the identified violations and emphasizes what a comparable penalty would have been for a non-federal institution. The purpose of these letters is to keep federal facility concern attention directed towards their problem areas so that resources are directed to address them. For a non-federal facility the lead enforcement agency (either EPA or the state) would begin to initiate appropriate enforcement measures for violations within their jurisdiction.

5. In what other aspects of the multimedia program are you involved?
N/A

Other Topics Discussed:

Job Description:
Mr. Boys is the section chief of engineering and investigations within Region X's Environmental Services Division. In addition to their involvement with the multimedia inspection program, his division provides technical support for the compliance efforts in each media, including sampling inspections and stack test reports.

Benefits of Multimedia Inspections:
A federal multimedia discharger may not have the staff and resources to comprehensively identify their environmental problem areas. In this respect the multimedia inspections provide a service to the facility, by providing them with ammunition to get funding and resources to resolve their violations. Also, a concurrent multimedia inspection might generate more tension and concern than if inspections for each media were conducted independently. Overall, multimedia inspections are likely to be more comprehensive and identify more problems than a separate media inspection approach.

Non-federal facilities are not as likely to be receptive to multimedia inspections because of the additional potential for enforcement action.

NEIC:
NEIC in Denver has developed their own ranking approach to rank federal facilities on the basis of the environmental risk posed. Mr. Clark Smith, who is EPA Region X federal facilities coordinator, might have more details on this program.

Mr. David Bray
Interview Summary
August 8, 1990

Participants:
EPA Region X: David Bray, Chris Solloway
University of Washington: Allison Keyes

SIP Questions:

What is the purpose of a SIP?
The State Implementation Plan (SIP) was developed by Congress to provide a mechanism for the development of air quality control programs and their implementation under the Clean Air Act. Under the SIP program, the state is designated as the lead agency for these programs. In the statute, the language used is that EPA will "approve" the SIPs, which left some question as to EPA's enforcement authority over these air quality control programs. Section 113 of the Clean Air Act also discusses enforcement in language that leaves room for interpretation as to whether or not EPA has any legal basis to take administrative and judicial actions on something that they have only "approved".

To give EPA clearer enforcement authority, the system that evolved was that EPA would approve the SIPs through a formal rulemaking process in which they would take what had been submitted & adopt it as federal law. So the states SIPs, what EPA can enforce, are actually incorporated by reference into 40 CFR in part 52. This applies for every state. 40 CFR part 52, embodies both the state submitted programs that EPA has approved, plus any programs that EPA has to promulgate if the state fails to do so. As SIPS are changed, EPA has to create new laws to reflect those changes. EPA as a whole publishes hundreds of federal register rulemaking changes each year, changing the SIPs for specific states.

Who is involved in creating a SIP?
Normally, a state creates its own SIP and then submits it to EPA for approval. Furthermore, if a state is divided into different air quality control regions each region will develop their own SIP standards, which are combined into the one state SIP which is submitted to EPA.

However, when a state defaults on creating an air quality program for a required pollutant, EPA is obliged by federal law to promulgate a Federal Implementation Plan, known as a FIP, for the state. Usually the FIP just fills in pieces of the state SIP. For example, EPA developed as FIP for lead emissions in Idaho as a result of the Bunker Hill smelter. In addition, EPA is in the process of promulgating a program for nitrogen oxide emissions for Idaho & Oregon because they failed to develop their own programs by the dates specified in federal statute.

What information is contained in a SIP and how is it used?
Information:
The specific requirements for SIP content are summarized in the Clean Air Act section 110(a)(2). In general, what happens is that
EPA sets ambient air quality standards for the entire country and then the state develops its own set of SIP regulations to meet the federal standards based on their geographic location. These

regulations include emissions limitations, permitting requirements, monitoring requirements, and other enforcement standards for sources. The state SIP may be a document over a foot thick. State SIP requirements can be stricter than federal requirements to meet other state needs. For example odor requirements, might be included in the SIP above what is required by EPA.

In EPA Region X, most of the states have to establish by rulemaking their own authority to require the source to do something, such as install a continuous monitoring system. As a result, all of those underlying statutes, anything passed by the state legislatures on air pollution, all the regulations that the state adopts to give themselves authority to do something become part of the SIP.

However, SIPs do not include specific enforcement actions that a state must take to correct a violation. That is a matter of state law and the states have enforcement discretion under their own statutes just the same way EPA does.

There are also databases that are supposed to be part of the SIP. These databases include information such as the locations of ambient air quality monitors within the state, a complete inventory of all the sources that are regulated under the program, how much money they spend on the program from all the agencies involved. The trouble is that the states do not update those databases very often.

Use:
The SIP is used as a guidance document for both the state and EPA to see what's enforceable. It sets the standard for air quality control of individual pollutants in the state. In addition, the SIP is enforceable by any private citizen. Any citizen can require that any aspect of a SIP be enforced.

Are new permits issued by the state ever incorporated into its SIP?
There are two different types of permits that a state may issue to a source and each is dealt with differently under the SIP program.

The Clean Air Act contains explicit requirements in the statute for states to have a permit program that for new construction & modifications of a source. Under the terms of the statute and EPA regulations, when a state issues that type of a permit for a source, the permit is then federally enforceable and it becomes in a sense part of a SIP, because it is issued under a regulation that EPA has approved. If the state issues a permit relating to a regulation that EPA has not approved, then the permit is invalid under the statute until EPA has approved that permit program.

Some states may also have what they call operating permit programs which are permits for existing sources to operate the plant. These permits authorize sources to operate and put pollution into the air subject to certain requirements. Currently, there is no statutory basis for that type of permit program under the Clean Air Act, it is something that states are doing that's above and beyond the requirements that EPA has for SIPs.

EPA's position in the past had been that state operating permits were not federally enforceable, regardless of whether the permit program had been approved by EPA, because that program had no basis on the Clean Air Act or EPA SIP regulations. Reasons for this included that many of state operating permits issued allowed the relaxation of requirements for sources beyond what EPA had approved as part of federal law. As a result, EPA was encountering situations of not

being sure whether the state's permit was actually going to protect the air quality of the area or not.

Since 1971, the basic position that EPA has taken is that operating permits could be made part of the SIP if they were submitted to EPA for approval, just like any other change to the SIP program. To do so EPA would go through a federal register rulemaking process and make that operating permit part of the SIP.

In 1983 EPA approved a federally enforceable operating permit program for Oregon (the first one in the country). This program was constructed very narrowly. EPA said that they would consider their operating permits to be federally enforceable by going through a public rulemaking process. EPA promulgated it into part 52 of the federal SIP for Oregon by using specific language saying that those permits were federally enforceable. This program went through the entire appeals period with no challenge. As a result this approach was tried again in 1986 for Idaho. EPA went through the same type of rulemaking action that said that when they issue a permit that becomes effective at the state level, it would then be enforceable by EPA as well.

Keying off of that precedent of those two programs, in 1989 EPA did national rulemaking that added a provision to part 51 the regulations for SIP programs saying that states could do that type of operating permit program. SIP guidance regulations spell out what such programs have to do.

How often is a SIP updated?
The SIP normally does not change until EPA acts upon it. However, a state may initiate their own SIP revisions based on their own needs. Such changes may be as straightforward as changes the permit fees to as complex as the adoption of control strategies for new EPA ambient standards. In Region 10, states are currently developing control programs for particulate matter, known as PM-10, as a result of the new ambient standard that EPA promulgated in 1987. That has been a multi-year effort involving many geographic areas in each state where the new ambient standards are violated. All of these types of SIPS are being developed now and are just starting to come in the door for EPA approval.

How does EPA ensure that the terms of a SIP are followed?
N/A

What actions are taken when a state fails to meet the responsibilities specified in the SIP?
It depends on the scope of the problem. If there is a problem with the state's program adequately protecting public health, the system works fairly well to get those addressed in most cases. The states have a hard time arguing against having to tighten their regulations or address regulation problems if the public health is being threatened. On the other hand, if the problem is administrative in nature, EPA and the state may not resolve the problem as quickly. Often it takes some type of overriding change, such as Clean Air Act amendments or some new regulation that EPA promulgates on a national basis to give EPA the opportunity to require the state to make modifications in their programs and to fix these other minor problems at the same time. On the other hand, sometimes that opportunity comes from other sources. For example, Kaiser aluminum plant in Spokane successfully challenged the state's opacity standards a few months ago. The state Supreme Court threw out the standard as not being enforceable because the state had not gone

through the right procedures to incorporate them into their regulations. EPA had been aware that this problem had existed for several years and had commented to the state about such weaknesses, with no response. But now the state is required to fix the problem by a source other than EPA.

Other Topics Covered:

Job Description:
Mr. Bray is in the SIP group of the EPA Air Programs Branch. Over the past ten years Mr. Bray has become the senior person on the acceptability of the SIPs and what they are from an enforcement standpoint. He keeps track of what regulations EPA has approved and if the states have met such requirements. He reviews SIPs as they are sent in from the states and writes the federal registers that approve or disapprove the SIPs. In addition, he tries to maintain the continuity of what is in the SIP.

Currently Mr. Bray is one of the Regional office members on the national task force that covers operation permits & regulation development, a new program that is patterned after the NPDES discharge permit program.

The New Clean Air Act:
When the new Clean Air Act Amendments are adopted many aspects of the SIPs are likely to change. For example, the new Clean Air Act will have a whole new section on operating permits. These amendments will set up a much more comprehensive program than most of the state have right now, and their SIPs will have to be changed to reflect this.

EPA as the Lead Agency:
EPA is in charge of the permit program for all sources on Indian reservations because the states do not have legal authority there. As a result EPA has promulgated a federal program that issues permits directly & enforces them directly. This authority applies to any major source on an Indian reservation, federal or non-federal.

Federal Source Requirements:
In general, federal sources are subject to state air quality requirements (as added by Congress in 1977, Clean Air Act, section 118). In the 1970 Act, federal sources were exempt from state requirements, although presidential order said that they should try to comply with the substance of the state laws. That approach was not successful. So now federal sources are subject to all requirements that the state & local agencies have, including everything outside the SIP under their statutes.

EPA SIPs versus State Enforcement version:
The SIP can be viewed as a snapshot. It represents was has been approved by EPA in the Federal Register at a given date. Today, the original intent of the SIP program has changed a bit primarily due to the mechanics of dealing with a program that was designed for state development & implementation while retaining some sort of EPA approval and overall enforcement authority. For example, there are time lags between when a state approves a rule to submit to EPA for approval & when EPA actually approves or disapproves this portion of the SIP. Such time lags are commonly over a year. In addition, if EPA does not approve the terms of the SIP then the state has to fix them. However, the state is still bound by its own laws to enforce the rules that they

currently have on the books.

In addition, there is an attitude around the country, that if the SIP is adequate to prevent ambient air quality standards from being violated then that was all EPA could ask for. If the state wants to go beyond those requirements by developing more stringent regulations than currently in the SIP, they did not have to submit their plans to EPA for approval. This practice can cause EPA and a state to have completely separate programs from an enforcement standpoint. As a result, there is a continual question of whether the rules that the state is enforcing are the same as those which EPA has approved.

For example, EPA may have approved a regulation for sulfur dioxide emissions from a pulp mill in 1975, as reflected by the current SIP, but the state may have changed their laws in 1978, and again in 1981 and in 1986. Since EPA has not approved such versions their federal enforcement authority only extends to the 1975 version. Meanwhile the sources in the state are dealing with these other versions.

Currently, if a state inspector is inspecting a source for compliance and cites the source for violation of a state standard, it is questionable whether EPA can enforce anything based on that inspection. This is because the state may not be able to supply the proper information for EPA to decide whether the source is in violation a *federal* requirement, because data has been collected to determine whether a source is violating a *state* requirement. As a result, if EPA did not have its own inspector at the site who knows that there is a difference between the state & federal requirements and does an independent inspection based on the federal requirements, they would have no case from an enforcement standpoint. This situation occurred in 1981, when EPA was all the way up to the district court filing an action with the department of justice, before someone realized that EPA had no authority over the type of violation that was cited.

To lessen the degree of confusion, EPA Region X has added a table in the federal register that identifies the current approved SIP version of state regulations. Every time EPA publishes in the federal register it reprints that table in its entirety, showing the newest version of everything in the SIP. Every section of the state SIP is listed and it shows exactly the version by state adoption date. So if for example, you wanted to know the definition of a "major source" for the state of Idaho, you could go into this table in the CFR and look through the section of definitions and find "major source" and see the date of that definition. Similarly if you wanted to conduct an inspection at a source, you could see what data was needed from an EPA enforcement perspective. Region X has been the only region to do this thus far, and it has greatly assisted their enforcement efforts.

The SIP Docket:

The SIP is compiled and maintained in the EPA Region 10 office. The docket is essential to track exactly what EPA did act on. EPA has a SIP docket clerk who's job is not only to maintain the rulemaking dockets for SIP approval, actions or SIP promulgations but to compile and maintain in one place the total current federally approved SIP. The docket is not a database, but rather is a documentation of EPA's formal rulemaking action. For example, it documents when EPA initiates a rulemaking procedure, any comments received from the public or industry, state contact, information received from any source, and any decisions made on whether a section of the SIP has been approved or disapproved.

The SIP Rulemaking Process:

SIP development involves the following two-stage process:

1) State Development of Regulations:
The state develops an air quality control program, proposing regulations and adopting them at the state level. During that process, EPA may have a great deal of involvement. For example, the state may send copies of draft emission inventories, modeling studies, air quality data, or draft regulations for EPA review, asking if their plan will meet EPA requirements. In addition, EPA may send the state comments on their plan, and even testify at they state public hearing, all as a part of the state rulemaking process. This process may take two years or more.

2) EPA Review Process:
Whatever program is adopted by the state, as signed by the governor of the state or the governor's delegatee, is sent to the Regional EPA Administrator. When that document arrives, EPA sets up a formal rulemaking docket and begins the process of formal rulemaking including:

a. EPA review of the SIP and any supporting documentation that the state supplies

b. Notice of proposal

c. Proposal announcement in the Federal Register

d. 30 - 60 day public comment period

e. Review of public comments - 95% of the SIPs do not have any public comment at all.

f. Publish a notice of final rulemaking, signed by the EPA Administrator

g. Administrative appeals process

h. Judicial appeals process

The usual length of time from submittal by the state, to actual SIP approval that EPA shoots for is 14 months, but that time frame is often optimistic. This process often takes two to five years. One of the reasons why this process is so slow, is that the SIP has to go all the way through to the office of general counsel, the administrator for air & radiation, and be signed off by everyone all the way up through Sununu before the Administrator will issue his approval. Also, everything has to be seen by OMB, where it could be held up for close to a year, especially if an action is controversial. Some SIPs even go to the White House (Sununu) for review.

Headquarters tends to overrule the EPA Regions more often than not. The Regions work with the state closely, and tend to be very familiar with the situation and the specific needs of the community, whereas headquarters wants to follow its own guidance specifications. There is usually as much work for the Regions to deal with Headquarters and explain why their program will achieve the goal of protecting public health as there is with trying to get the state to adopt a good program to start with.

Due to the minimal amount of public comment generally received, EPA has set up a new streamlined SIP approval process. Now instead of having to go through this formal two-step rulemaking proposal signed by the regional Administrator & the final signed by the EPA administrator, the region has authority to approve some types of final SIP rulemakings.

Selective Approval/Disapproval of the SIP:
EPA can approve parts & disapprove parts of the SIP as long as they are somewhat separable. For example, if the state has one regulation that says that the source shall meet 20% opacity and another that says that it can be exempt in certain situations EPA cannot approve the first section and disapprove the exemption because that would be equivalent to changing the meaning of the standard at that point. However, it the state submits a particulate matter emissions limit for one source type and a sulfur dioxide emissions limit for another source, EPA can approve one and disapprove the other because they are completely separate. And that is why SIP changes are piecemeal. These types of partial SIP approvals happen all of the time.

SIP Enforcement Responsibilities
EPA's enforcement authority and responsibilities are outlined in the Clean Air Act. Other enforcement authority is given in 40 CFR part 52. Some requirements, such as the need to have a continuing thirty day violation before EPA can take judicial action, come right out of the statute. EPA has certain obligations to enforce when the state does not meet the terms of their SIP.

In contrast, the state's enforcement authority rests upon their statutory authority under their legislation for what they can enforce, and what sorts of penalties they can impose. There are two types regulations that give the state its enforcement authority: the state regulations, and the administrative rules that they adopt which give them civil penalty provisions.

EPA Enforcement Authority
In general, EPA thought it had the right to initiate enforcement actions based on its interpretation of state rules. However, recently EPA lost about four major court cases in a row around the country where the judges have ruled very strongly in favor of the states' rights to interpret their rules.

There is an effort going on in Congress relating to the new Clean Air Act amendments to try and remedy this situation. Such a change is critical to EPA's enforcement efforts, because what is happening is that EPA approves a rule submitted by the state and then two years later the state is interpreting this same rule differently. For example, a state's rule might require a source to obtain a permit for something, but then their interpretation of the rule would change to not requiring a permit. The federal requirements generated from the approved SIP may clearly require that there be a permit for that source, since EPA's approval of the rule was, based on the state's assertions that it did require a permit.

The Clean Air Act says that EPA can enforce a SIP, so what EPA is saying is that if they approve the SIP, and make a statement through federal law by incorporating it into part 52, that we should have the authority to enforce that federal law. The state now is thinking that their state law says something different and that shouldn't affect EPA's ability to enforce the federal law. But the

judges have said "no, its a state rule, they adopted it, all you did was approve it, you didn't adopt it, you didn't know what it meant and therefore EPA you can't enforce it. If the state hasn't said its a violation, you can't say its a violation."

EPA has just received a notice of intent to sue by the Sierra Club for not enforcing the Oregon SIP and imposing some of the Clean Air Act sanctions on the state when they failed to enforce. They have issued an intent to sue to Oregon as well, for failure to enforce their SIP. EPA has been criticizing Oregon for a number of years for improper SIP enforcement. The basis for the Sierra Club suit was from information gathered from EPA under FOIA.

New Operating Permits Programs

EPA is in the process of developing new operations permits programs guidelines for the states, which are patterned after the NPDES discharge permit program. EPA's goal is to have an operating permit for every important source, and to have the contents of that permit be federally enforceable. Furthermore, EPA will have some veto authority as to whether the state permit is acceptable, as well as provisions for reopening a permits when a violation has been found or when there are new requirements that have to be met. This will be a completely new program, that is much different from the SIP process.

This program will not replace the SIP, rather it will implementand complement the SIP. It will take all of the things that are adopted by the states in forms of regulations and requirements, and turn all of that into plant specific permits that will stand separate from the SIP from an enforcement standpoint. This will not replace the SIP or the process behind it, but it will fill in a lot of grey areas by explicitly defining the requirements for each source. Currently, a source does not know what standards it has to meet. Even if they get an operating permit from the state, many times all that it will say is that the source must comply with all applicable federal, state, and local regulations. Furthermore, when a new inspector walks into a plant, he may often have no idea what is there, what sources are in the plant, and what requirements they have to meet. Without that information in that level of detail, the inspector does not know what applies. These permits will minimize all that confusion. The permit program will include plot plans, and unit identification of equipment as well.

Supplementary Documentation:

Headquarters should be able to provide the following documentation:

1) Compilation of SO_2 SIP guidelines that represents the current guidance on what states are suppose to have in their SIPs to protect SO_2 standards.

2) A general guidance document for SIPS (2 - 3 volumes), including everything on enforcement and the whole gamut of what SIPS are supposed to be.

3) A Guidance document for the new PM-10 standard

4) SIP Processing guidance that goes through exactly how to process SIPs and who does what.

Nancy Brown-Brincefield
Interview Summary
August 8,1990

Participants:
EPA Region X: Nancy Brown-Brincefield, Chris Solloway
University of Washington: Allison Keyes

EPA ENFORCEMENT QUESTIONS

Update Data Bases

What data bases are used by EPA?
In the Office of Water, PCS, Permits Compliance System, is the database for NPDES permit facilities. There is also a database called ODES, which is maintained by the oceans group.

What information is contained in these data bases?
The PCS database data dictionary encompasses a few large volumes. An index is available which lists just the names of each field, and a copy can be obtained from Chris. Sources are classified as either minor or major. Region X has approximately 530 major sources. PCS contains information on both minor & major sources to some degree, but the mandatory fields vary greatly for each type. There are approximately 170 mandatory fields for each major facility at this point & some of those are for multiple parameters.

In general, permitting information will be mandatory up to the point of permit issuance. However, from that point on, most of the information is optional. Out of the 12-15 pages of an average permit we probably have the equivalent of three pages coded into PCS. Permit effluent standards are coded into PCS as well as any scheduling or monitoring requirements, reporting requirements, DMR information, and enforcement actions. Certain information such as effluent limits, discharge monitoring reports (DMR's), and compliance schedules are optional for the minor sources but mandatory for the major sources. The PCS policy statement contains a chart that summarizes what mandatory data elements correspond to each type of facility. Through this information, PCS provides EPA with the compliance history of a facility over the past 10 years.

How often is this information updated?
The states send compliance information to EPA where it is coded into PCS. This is an ongoing practice. DMR's are due monthly, however sometimes the states do not submit compliance information on time. Therefore, there is a good amount of information coming into EPA throughout the month. The compliance information received includes approximately 400 to 500 DMR's as well as other required documents on things such as special dives, special toxicity monitoring, special sampling, or special requirements under an enforcement action. DMR's for both major and minor facilities are sent to EPA, but minor facility information is not required to be coded into PCS unless the discharger is considered to be regionally significant.

Accessing Compliance Information:
When compliance information is needed by EPA personnel one can go to the files for it or look at the PCS update. PCS is updated twice a week. Data can be retrieved from PCS by one of the coders or it can be retrieved on-line. Most of the people in the compliance section have access to PCS if they want to use it. However, PCS is not very user friendly.

What reports are generated and how often are they used?
PCS can automatically generate QNCR's. EPA generates the QNCR's for Idaho and Alaska using PCS, however Oregon and Washington are not yet up on an automated QNCR. Those states generate the QNCR manually. These states could use PCS to generate the QNCR's and other reports directly, but often the states do not have the staff or funding to train and maintain PCS staff.

PCS can generate a variety of other reports as well. They can be customized to meet an individual's needs. For example, PCS may be used to generate a list of facilities who have not met their compliance schedule requirements.

EPA has a special computer program called RNC, which summarized the facilities that have a status of reportable non-compliance. In addition, a program called SNC summarizes the facilities that are in significant non-compliance. SNC information is run once a month & updates the database as to where a facility stands in terms of their compliance status. This is only run once a month because it is a huge program. Yet EPA can review individual DMR's at any time. In general, compliance officers do not want to wait the lag time, they want to find out as the second week that something is wrong as opposed to waiting for another 2 1/2 to 3 weeks, to keep facilities off the QNCR.

State/Lead Agency Enforcement Questions

Notification/Reporting

To whom are the violations reported?
Facilities report violations directly to the state if they are the lead agency. The state then reports this information to EPA. If EPA is the lead agency, the state reports violation information to EPA directly.

How are violations reported to the EPA?
It depends on the state. In Region X, Oregon and Washington have delegated programs. These states do their own data entry into PCS. For Alaska and Idaho, which do not have delegated programs, the Region maintains its own people for PCS data entry. In this case, the states send copies of the DMR's directly to the Region.
This information goes to the state coordinator in the compliance group.

In addition, states with delegated programs are required to generate QNCR's for each quarter.

However, Washington and Oregon are currently doing this manually due to staff limitations. It may actually be easier to generate the QNCR manually. For example, in Oregon, which has only 60 to 80 major facilities, they may have only 8 to 10 facilities in the QNCR at any quarter.

What are the differences in reporting from state to state?
All states have mandatory fields for each type of facility. Other types of information are optional. Therefore, a state's reporting may differ in the types of optional information included.

What information is contained in the report?
This was not specifically discussed.

What types of information are required to be reported to EPA and what types are discretionary?
See the PCS policy statement for a chart that summarizes this information.

How is this information recorded?
This information is entered into PCS directly by the states or by EPA. State personnel are trained by EPA headquarters or Region X.

Washington uses PCS directly right now. They are in the process of developing their own system to better interface with the other state computer systems that the state. Once their own system developed they will they will upload the data to PCS.

Oregon normally uses PCS directly, however right now they are only entering DMR information and the Region is entering the remainder including: inspection reports, enforcement actions, and permit limits.

Other Topics Discussed:

Job Description:
Ms. Brown-Brincefield oversees PCS and has access to all parts of the database. As part of this role, she sees that all required data is in PCS and is up to date. In addition, she makes sure that EPA staff can get someone to help them access information when it is needed. She assures that PCS training needs are taken care of for the state, and runs Quality Assurance reports for the database. In addition to her PCS duties, she is a state coordinator that handles some of the NPDES facilities in Alaska, Oregon, and Washington.

QNCR's
The QNCR is a compliance status summary for the quarter. In general, QNCR's have a time lag. The current QNCR currently being compiled contains information for April, May and June. The Region generally uses the QNCR for counting purposes, e.g to see the number of municipal or industrial facilities in non-compliance.

In addition, QNCR's are sent to EPA Headquarters as part of their regional oversight role. At

Headquarters they are looking at the QNCR for trends, and special facilities that have been out of compliance two quarters in a row with no enforcement actions taken. If that occurs, the Region has to provide much more detailed information to Headquarters.

Other PCS Information:

Background:

PCS was developed to track the requirements in any NPDES permit, and to determine the compliance status of a facility at any given time. PCS has been in operation for about 10 years. It took a few years after startup before the database was fully operational due to the types of data elements and comparisons needed. PCS is a massive database that is still growing on a regular basis. About four years ago, the structure of the system was changed. It was rewritten and put into natural, an adabase. Today, most of the glitches have been worked out of PCS.

At EPA, nearly everyone is required to use PCS to track NPDES compliance. And everyone normally uses PCS. There are a few people at Region X who know how to run customized quick look reports to meet individual tracking needs. PCS can pull data on anyone who has any sort of numeric violation. However, it cannot flag facilities that are close to their effluent limits but not currently in violation.

FOIA:

PCS information is not yet open to the public. It will probably be 1994 before this happens. Part of the reason for this is that PCS contains enforcement confidential information. For example, information on enforcement actions may be coded into PCS but there may be lag time before the facility receives notification of such actions. Other types of PCS information are considered to be pre-decisional enforcement documentation and therefore are not subject to FOIA.

At the present time a way to secure these parts of PCS from public access has not been developed. In addition, PCS as it is now would be very difficult for the public to use, as it can be very cumbersome. A person could be very familiar with personal computers, Lotus, and Dbase, and still have major difficulties with PCS because it is so foreign.

New PCS developments:

Currently, EPA is working on the conversion of data from PCS into a format which can be downloaded to a personal computer. In addition, a pretreatment section was recently added to the database, but not many fields in this section are mandatory.

Headquarters use of PCS:

Do you ever use PCS to issue reports for headquarters?

Headquarters can access PCS information for the entire nation. They have some of their own reports that they use that the region does not have access to, i.e. some special programs that they run based on blank fields to do Regional QUALITY ASSURANCE checks.

EPA Maintenance of PCS:

At Region X PCS coders typically handle one aspect of the database. For example one person handles effluent data and reporting, another handles compliance schedules and enforcement actions. In addition, permitting people enter all of the permitting data up to the point of permit issuance. Other Regions maintain PCS in a similar fashion.

Quality Assurance:
Quality assurance is achieved through a comprehensive program in which all PCS users at EPA, as well as the states, participate in national meetings each year and in different work-groups across the country. The outcome of these efforts is recommendations on potential products for and improvements of PCS. Work-groups rank proposed enhancement options against PCS's 150,000 annual enhancement budget. One output of this program was the development of specially condensed QNCR report for PCS coordinators that supplies more information for someone dealing with the QNCR from a computing perspective.

Mr. Bill Chamberlain
Interview Summary
Tuesday, July 31, 1990

Participants:
EPA Region X: Bill Chamberlain, Chris Solloway
University of Washington: Richard Palmer, Donna Jabs, and Allison Keyes

Review Compliance Information

What is the procedure for reviewing compliance information supplied by the state?

Permits:
When permits are issues they are rerouted to the compliance branch, which then gets the chance to concur with the permit and make sure that it is enforceable. If the state is the lead agency as is the case with WA and OR, the EPA water compliance branch still gets the chance to review.

Monitoring Reports:
Most of the monitoring information received is monthly self- reporting from the NPDES dischargers. The reports are called DMR's, discharge monitoring reports. These reports are generally copied by the states to be sent to EPA or in the case of Idaho they are sent to EPA directly. The data in the reports is entered into the NPDES permit tracking system, called PCS, Permits Compliance System. The DMR information is entered into PCS and distributed to the appropriate coordinator for review.

The states can also enter data into PCS directly. Ideally, state data entry personnel have been trained by EPA to enter things properly. However, problems with late entries still mean that some of the information is still reported manually by the state. Typically there is a great deal of activity trying to get everything together before a monthly report is due.

What information is collected by the EPA and under what circumstances?
Generally, information is supplied from the state or from the discharger. Problems with a discharger may make it a prime candidate for EPA inspection which would supply more information about the source.

When is a site visit required to get the information needed?
A certain percentage of NPDES permittees are routinely inspected each year. Otherwise, EPA may receive a tip or complaints from other sources, which would make a facility a prime candidate for inspection.

Determine Further EPA Involvement

What is the procedure for reviewing state enforcement efforts?
States prepare enforcement summaries for EPA on a quarterly basis, maybe more often for WA. However, this information is also in PCS.

How is the need for additional EPA action determined?
If EPA sees that no enforcement action has been taken by the state, it issues an order to the state to enforce within 30 days or EPA will take over. If EPA is the lead agency, they will try to identify and track a violator before they are on the QNCR, the quarterly non-compliance report generated by PCS.

How is this process documented?
EPA and State enforcement activities are recorded in PCS.

Develop Enforcement Strategy

What are the different kinds of EPA enforcement efforts?
The decision on how to enforce is made based on a lot of different criteria, and depend on the severity of the problem. Class II constituents are a bit more discretionary in terms of enforcement. But both Class I and Class II types of violations are important, especially since EPA tries to catch smaller violations before they snowball._Similarly, EPA is concerned with both minor and major facilities.

EPA tries to keep a dialogue open with a discharge violator and may give them some leeway to remedy minor violations before issuing an NOV or imposing fines. When deciding upon an appropriate enforcement action, one must keep in mind that the goal is to achieve compliance most quickly and efficiently using the least amount of enforcement resources.

Types of enforcement actions vary. For example, before a facility is on the QNCR, violations such as late reporting may be remedied by informal letters or phone calls. For a start-up problem EPA might issue a 309a imposing different compliance deadlines, extra monitoring, and maybe even construction requirements. For more serious violations, which are chronic and clearly above permit limits, more severe enforcement actions will be taken. Usually when EPA is going after a discharger with heavy penalties and strong enforcement actions they succeed. Their cases are very strong if they are brought to court.

Specific types of enforcement efforts include the issuance of NOV's, Notices of Violation. A NOV is a formal warning, at the low end of the enforcement scale. More severe penalties include the imposition of fines. There are different strategies for fining. A general philosophy behind the penalty approach to enforcement is that sources who are not in compliance have not incurred the same cost of operation as those who are practicing BPT or BAT and remain in compliance.

The development of a penalty matrix for enforcement was discussed. Such a matrix would list criteria developed to determine the type or amount of penalty imposed. Apparently this has been tried before but abandoned due to the level of subjectiveness involved in selecting an enforcement strategy. However, formal guidelines do exist for penalty assessment and we need to get a copy of this.

How are the EPA enforcement efforts different from those of the state?
Ideally both EPA and the state have the same goals, i.e. trying to keep a discharger off the QNCR,

but the state may have some different enforcement authority than EPA and vice versa. The state can fine a facility immediately and they can issue NOV's when they are out on an inspection, whereas EPA has to go through some other procedural requirements first.

Coordinate EPA Role with State

How is EPA involvement coordinated with the state?
Either the state or EPA is the enforcing agency. Once EPA takes the lead from the state, the state's enforcement activities, if any, are discontinued. However, when EPA starts enforcing the state still continues its monitoring and reporting activities for that facility.

How are EPA efforts communicated to the state?
EPA sends the state copies of documents, and correspondence related to their enforcement activities to keep the state informed.

STATE/LEAD AGENCY ENFORCEMENT QUESTIONS

Determine Violation Status
How are violations identified?
Violations are identified on the basis of the terms specified in the permit.

What criteria are used in determining the nature and severity of the violation?
N/A

What actions are taken when a violation has been identified?
The state begins enforcement activities. However the state may have some enforcement abilities that EPA doesn't. An appropriate contact to get more information on this topic might be:

Department of Ecology
Redmond Regional Office: David Nunnelly
Lacey Regional Office: Roger Stanley

What kind of documentation is produced at this stage and how is it stored and accessed?
The state has their own databases to store information supplied in the DMR's.

Other topics discussed:

Job Description
Bill Chamberlain is in the Compliance Branch of the Office of Water. His job is to ensure that dischargers are meeting the requirements specified in their NPDES permits. Bill oversees municipal, industrial and federal facilities. His responsibilities include mining, oil, and gas facilities in Alaska, all NPDES facilities in Idaho, and the pretreatment programs of Alaska, Idaho, Washington, and Oregon.

Permitting
Although permitting is not his area of expertise, we did discuss some general concepts behind the permitting process. The criteria for issuing a permit, and the types of limits set and constituents regulated are site specific, they depend on the situation at hand. For example a municipal facility in Idaho might have limits set for TSS, BOD, heavy metals, organics, some toxics etc. Ultimately

however, what is regulated in the NPDES permit depends on what is going into the facility for treatment, and the type and amount of discharge.

EPA Region X issues the permits for Idaho which does not have a delegated program. Washington and Oregon both have a delegated program for municipal & industrial dischargers. Alaska has a semi-delegated program. EPA is responsible for the permitting, and enforcement of all federal facilities in the Region.

Permits will contain information including effluent limits, monitoring frequency, the types of testing required for each constituent, reporting requirements for the discharger, etc.

PCS

The PCS database generates the QNCR's but can generate other reports as well. The database does have some tabular capabilities. But PCS is not used extensively for other types of reporting. PCS is very broad. It was designed to handle all areas and generate customized reports, but in reality it is difficult to manipulate. As an alternative individuals may develop their own types of tracking systems to assist them with their work.

Pre-QNCR Tracking

The Compliance Branch tries to keep their QNCR load to a minimum, and therefore tries to track a facility before it gets on the QNCR. They get cues about compliance difficulties from many different sources. Dischargers are required to report excursions immediately by phone call, followed by a self-NOV and a brief report describing the incident. In addition, a site inspection may indicate that an enforcement action is needed. Also, PCS data is run every two weeks. The database pops out any types of violations.

Enforcement Statutes

The following statutes govern enforcement:
Clean Water Act:
section 308 - formal information request
section 309 - compliance order
309g - penalty
301 - referral to the permit justice

QNCR

The QNCR - quarterly non-compliance report is generated quarterly by EPA. This report shows what facilities are in violation of the TRC thresholds established by their NPDES permits. The QNCR will indicate the status of the facility, e.g. first time violator, or continuing non-compliance. A discharger will stay on this report until compliance has been reached. Most of the long term QNCR violators have an enforcement action in progress. EPA's authority is the same both before and after a discharger is on the QNCR and they can exercise that authority at any time.

EPA/State Relations

Are there any perceptions of troubles with the states as lead agencies within Region X?

Not with Washington at this time. However, Oregon has had some problems especially with

respect to its pretreatment program. EPA has tried to let the hammer come down hard on Oregon because it just isn't delegated resources and people to the pretreatment program. This creates problems for the Region because they have to deal with EPA Headquarters. Recently, EPA has undertaken a pretreatment enforcement initiative. At the time, it was perceived that EPA could not fine a state directly, so instead the Region enforced against the municipalities. However, this enforcement action was a clear signal to the state that they were falling down in their enforcement activities.

Mr. Chris James
Interview Summary
August 1, 1990

Participants:
EPA Region X: Chris James and Chris Solloway
University of Washington: Allison Keyes

EPA ENFORCEMENT QUESTIONS

Review Compliance Information

What is the procedure for reviewing compliance information supplied by the state?
EPA has oversight responsibilities of the rules and permits that are part of the State Implementation Plan (SIP) for each state in the region. As long as EPA approves the rules in the SIP they are considered to be federally enforceable.

Permits:
Permits that are part of the SIP are sent to EPA for approval before issuance by the state. Oregon and Idaho send EPA all permits because they are part of they SIP. In addition, permits for NSPS sources and any source that is subject to PSD (prevention of significant deterioration) regulations or PSD avoidance permits, are submitted to EPA for review.

Monitoring Information:
EPA's focus is on major sources of any type, especially in areas where EPA has specific authority. Such areas include PSD source programs, NESHAPS, NSPS, and any modifications to a major source. EPA is concerned about other non-major sources as well, but is limited by resources.

EPA tracks the major sources that fall into these categories each month through the operations office. Generally, they have each state summarize violations in these categories in what is called a significant violator report. There are 50 to 60 sources on this report now. The reports are a chronology of source/state/EPA actions for significant violators. They contain information including inspection dates, violation determination dates, enforcement actions, and planned actions by the state.

In addition, each state in the region is usually required to do an annual emissions inventory for EPA review summarizing what emissions were last year, as well as projections of future emissions, to show that emissions are going down.

What information is collected by the EPA and under what circumstances?
Compliance information is recorded in the Compliance Data System (CDS) which is now part of AFS. This information is updated at least monthly. (See the July 31st interview with Betty Swan for more information). AFS reports may show that a violation has been found or that an inspection was conducted but not give detailed information. As a result, EPA will often request supplemental information either directly from the state or via the EPA state operations office. Such requests are particularly made for sources that have been out of compliance for a long time

without state enforcement action, or for sources that have the most severe violations.

In addition, state inspection reports are supposed to be routinely sent to EPA for review. If this does not occur, the reports are available at EPA's request.

When is a site visit required to get the information needed?
The monthly reports generated from AFS, as well as state inspection reports, help to prioritize sites for inspection. Sources with ongoing violations are prime candidates for inspection. EPA only has the resources to do 20 inspections per year, so prioritization is important.

Determine Further EPA Involvement

What is the procedure for reviewing state enforcement efforts?
As discussed above, enforcement information is contained in the significant violator reports which are reviewed monthly. Inspection reports are also reviewed. In addition, EPA personnel review the brief monthly summaries, compiled by Oregon and Idaho, of the sources that are in violation of state standards. AFS compliance data printouts are reviewed at least monthly. EPA then selects a subset of state violators from this information for more detailed investigation.

How is the need for additional EPA action determined?
EPA rarely takes the lead in enforcement from the state. Basically EPA will not initiate enforcement actions unless a controversial issue comes up or the state specifically requests EPA assistance. However, if EPA sees a compliance problem that has been ongoing for a few years they try to step up state enforcement action.

Region X is one of the most state's rights oriented region in the country based on past politics and history. There is a definite direction that says that the state has the first crack at enforcement.

How is this process documented?
This process is documented in many ways including telephone memos of EPA communications with the state, written staff recommendations for EPA enforcement action to the department chief, Anne Pontius. If the department chief feels that enforcement is not warranted, this decision must be documented as well. Furthermore, all EPA enforcement actions are entered into AFS.

Develop Enforcement Strategy

What are the different kinds of EPA enforcement efforts?
EPA enforcement activities are generally done informally, by conversations with the sources themselves and appropriate state agencies. Even if EPA has greater enforcement authority, formal enforcement actions have traditionally not been taken.

There are requirements for EPA action if the state does not take the enforcement actions discussed above. For example, EPA is supposed to issue an NOV by day 120 where they see that the state hasn't taken appropriate action. However this does not happen. EPA can also issue a SIP call to a state, saying that you have failed to achieve compliance by a specified date so you have to make some changes to meet SIP standards.

The SIP call is different from the notice to enforce issue by the Water division which tells the state

that EPA will take the enforcement lead if the state fails enforce within 30 days. Although EPA has the authority to do that with respect to air, they usually try to get the state to maintain the lead on enforcement actions. What EPA wants the state to do is to demonstrate how they plan to further reduce emissions.

How are the EPA enforcement efforts different from those of the state?
The state has the primary role of enforcement while EPA's role is mainly one of oversight.

Coordinate EPA Role with State

How is EPA involvement coordinated with the state?
Involvement is generally coordinated through the EPA operations office in each state. Other times it will be coordinated by contacting the state directly. The extent of direct contact with the state is dependant on the preference of the of the EPA operations office.

How are EPA efforts communicated to the state?
EPA concerns over an issue, such as a permitting problem, are communicated by letter from the Section Branch Chief to the state.

STATE/LEAD AGENCY ENFORCEMENT QUESTIONS

Determine Violation Status

How are violations identified?
Permits are tracked by the state to see that sources are meeting emissions limits and compliance schedules. Inspections are conducted to insure that the source is in compliance. Major sources are usually inspected annually, whereas smaller sources are inspected biannually.

There is some self-reporting of the industries to the states as well. For example, Washington requires monthly self-reporting of pulp and aluminum mills. PSAPCA requires other reporting for sources that have continuous emissions monitoring. Based on these types of reports both the state and the local will issue a NOV, notice of violation.

What criteria are used in determining the nature and severity of the violation?
The criteria for a violation depends on what the state permit says. For example, Oregon has daily limits as well as different grain loading standards for different types of point dischargers which would have had a source test to meet a permit, including wood fired boilers, and oil fired boilers.

What actions are taken when a violation has been identified?
The state has a definite timeline that it has to follow as prescribed by the Compliance Assurance Agreement between each state and EPA. They have to follow Timely and Appropriate guidance document standards saying that where the state or EPA finds a violation that fits into this category, (e.g. a major source and a non attainment area for that pollutant), then it must issue an NOV within 30 days and continue enforcement activities to either resolve the violation, or develop a compliance schedule for the source, or refer the case to the attorney general within 120 days. This is a national policy. However, the actual types of enforcement actions taken depend on the state and the situation.

In Oregon, they issue a notice of non-compliance, followed by a notice of intent to issue a penalty, followed by a notice of intent to assess a penalty, and then they issue a penalty.

Furthermore, before they issue a notice of non-compliance another inspection is often performed. In addition, once Oregon has identified a violation they are in frequent contact with the source. However, as far as formal actions go, they prefer to work with the company under sort of an amicable relationship.

In Washington, once again you have the local agencies who enforce things differently from each other. For example, PSAPCA will conduct an inspection and issue what is like a traffic ticket type of NOV. They will site state statutes, determine that a violation exists, and have the source send in this inspection NOV to see what the penalty for non-compliance will be. Washington will also issue a penalty for ambient air quality violations. They have a number of sulfur dioxide monitors set up just down-wind of the pulp mills and when they get a violation, they fine the source $5000. They've been pretty aggressive about that. Washington, in general has a better program than Oregon as far as enforcement, although there is still definitely some deficiencies as well.

What kind of documentation is produced at this stage and how is it stored and accessed?
EPA enforcement actions, including notices of violation, notices of noncompliance, and penalty assessments are documented in the AFS database.

<u>Other Topics Covered:</u>

Job Description:
Mr. James works in the Air Operations Section of the Air Programs Branch. His basic responsibilities are to oversee the compliance of sources in the wood products industry, and VOC sources including paper coating facilities, graphic arts facilities and incinerators.

State enforcement role:
The Clean Air Act specifies air enforcement programs. Most of the states fully delegated enforcement programs with the exception of the new source performance standards, NSPS, which EPA has retained.

State Permitting
Each state has their own permit system and individual regions within the state may have their own permit systems. For example, Washington has nine local agencies, each with their own systems. The department of Ecology is the state agency, but PSAPCA covers the Seattle area, DWAPA covers Bellingham and Mount Vernon, Spokane has another, as well as the Vancouver area. Western Washington is completely divided up into smaller control agencies while eastern Washington has only a few regional agencies, such as Yakima, Spokane, and the tri-cities area.

PSAPCA requires a permit for anything with emissions over 10 tons, while other regions do not issue a permit for a source unless its has emissions over 20 tons. Oregon has a 10 ton limit for a minor source permit, but anything over 40 tons is considered a major source permit.

In general, the permitting agency prescribes the emission limits and other requirements for each source. For example, PSAPCA requires BAT, best available control technology for everything, that's in their rules, so sources in this region applying for a permit must demonstrate that they can meet BAT. In general, PSAPCA is the most stringent of the agencies.

NSPS:
NSPS, new source pollutant standards, apply to major new sources that fall into specific categories including large wood fire boilers, large incinerators, and oil refineries. These standards contain technical specifications for start-up, operation and maintenance, and reporting. These standards are stricter than those previously established by EPA for older sources of same type. Each source has its own NSPS specifications that must be met.

A state may not have delegated enforcement authority for NSPS standards. Either a state may not have that type of source or may not have developed an NSPS enforcement program for a certain type of source due to limited resources. For example, Alaska is not delegated NSPS subpart Db, which covers large fossil fuel fired boilers used on pulp mills and power plants.

NESHAPS:
NESHAPS, the National Emissions Standard for Hazardous Air Pollutants, refer to standards for toxic compounds promulgated by EPA. Such compounds include beryllium, arsenic, and vinyl chloride. NESHAPS standards are specific standards for companies who emit those compounds which are separate from permit standards, SIP limits, and PSD limits. NESHAPS is an additional set of rules to be met because the pollutants are toxic compounds. NESHAPS do not vary with the location of a source, i.e. attainment vs. non-attainment areas, they depend only on the pollutant being emitted from the source.

EPA has been criticized for not promulgating more standards like this. Congress' original intent was to have EPA promulgate a number of these standards, but between politics and OMB, and EPA getting sued by industries, standards have taken a lot longer to promulgate than originally hoped. For example, EPA tried to develop a benzene standard for gasoline refineries and received a great deal of opposition.

The new Clean Air Act
The new Clean Air Act, which is now in Congress, contains a "toxic list" of 191 compounds which EPA will have to promulgate standards for. It includes a very prescriptive schedule that will have to be met over approximately a ten-year period. If state have stricter standards for a pollutant those will stand. In states with less strict standards or with no program in place the new law will govern. This legislation is expected to pass in the near future.

State Implementation Plans
Each state develops a State Implementation Plan, known as a SIP, for approval by EPA. This plans specifies how the state is going to attain and maintain compliance with different standards. For example, Region X has PM-10 non-attainment areas because of wood products sources and wood smoke emissions. All states with such areas come up with PM-10 SIPS. So there are different SIPS for different areas within the state. SIPS are updated routinely when the state is not able to achieve compliance with a standard. In 1977 general state SIPs were developed describing how the state as a whole was going to achieve compliance for different pollutants, e.g. ozone, area wide.

Air Databases
CDS, which is now AFS, details source specific compliance information. It summarizes information

including inspections, permits issued, and consent agreements. This information is submitted by the states to EPA or entered directly into the AFS database. The purpose of such a database is to ensure that both the state and EPA are aware of the compliance statues of every source in the state.

Ms. Susan Lee
Interview Summary
August 7, 1990,
Tuesday, 11:00 am

Participants:
EPA Region X: Susan Lee, Chris Solloway
*University of Washington:*Donna Jabs, Allison Keyes

Database Questions
What information is contained in DOCKET?
The data elements found in DOCKET are listed in "The Consolidated DOCKET System" brochure that Ms. Lee gave us. There are several different data bases in DOCKET, including the Enforcement Docket and the Consent Decree Tracking System (CDTS). Several other data bases are included in the system but they are not involved in enforcement.

The Enforcement Docket is the tracking and reporting system for all judicial enforcement cases taken for all environmental statutes. When a program (air, water, or RCRA) brings a violation to the ORC (Office of Regional Counsel) indicating that they think there is a need for civil/judicial action, ORC attorneys then prepare a case and send it to Headquarters. The Enforcement Docket is used to track the entire process of the action through the system until its conclusion. These cases can be concluded in several ways: by litigation, dismissal or consent decree. Consent decree is the most common way for a case to conclude. The consent decree is a binding legal agreement between two parties that certain things will take place. CDETS tracks the cinditions of case consent decrees. If facilities do not follow the conditions of the decree, enforcement action is taken.

CDETS was developed by NEIC and the Enforcement data base was developed by Headquarters. They were developed for different purposed and from different view points. Work is now in process to interface the two systems and remove any duplicate information in the systems.

Who enters information into DOCKET and how often is it updated?
Ms. Lee enters all of the information for Region 10 into the system . There are usually about 35 active cases in the enforcement part of the system at any time. Information is entered as Ms. Lee recieves it. She requests information from the attorneys monthly and updates the data base and generates reports. Sometimes she must track down the information.

What reports are generated by DOCKET and how are they used in the enforcement process?
The reports that can be generated are listed in the yellow brochure.

Other Topics Discussed:

Job Description:
Ms. Lee is a contractor for the EPA and works for Computer Sciences Corporation (CSC). One or more people work in her position at every EPA regional office. She was placed by the Office of

Enforcement to manage the DOCKET data base for Region 10. Ms. Lee also coordinates a second data base called the Regional Matters Tracking System (RMTS). The purpose of this system is to track everything the attorneys are doing in the Region. This data base also contains enforcement information. It is used by the region as an office management tool to keep track of the workload in the legal office.

Other DOCKET Information:
DOCKET was developed in 1980 and was up and running in 1982. DOCKET does not track violations, it tracks the legal process. DOCKET follows civil/judicial actions only. It does not track the administrative actions for Region X. The system is used mainly by EPA national headquarters to pull information for Congressional requests, to allocate resources in the Office of Regional Council, and to track the timeliness of legal enforcement actions. To learn more about how the DOCKET system information is used we were referred to attorney Anne Prezyna. DOCKET information is not used by the regions very much.

RMTS:
RMTS is used at the regional level, as opposed to the national level , although some information is the same in the regional and national data bases. RMTS contains information that goes back to 1973 and keeps a history of cases so it can be used for research , i.e. one can look up if a certain facility has had a civil action taken against it in the past 20 years. ORC, the precursor to RMTS was established in 1984 while RMTS came on line the spring of 1990 and is being used now but is not entirely functional. Ms. Lee described it as an umbrella data base. It contains general information and keeps track of the attorneys case loads but does not contain the more specific information found in other data bases such as DOCKET. The database is organized by case name (little emphasis is placed on the facility name).

Multimedia Enforcement:
Ms. Lee felt that the important part of getting a multi-media program to function is to have the leadership behind it - the people to keep it going.

Mr. Ray Peterson
Interview Summary
August 27, 1990
10:00 am

Participants:
EPA Region X: Ray Peterson, Chris Solloway
University of Washington: Richard Palmer, Donna Jabs, Allison Keyes

1. Please describe your project in the Williamette Valley Region.
Currently there are two major EPA Region X GIS applications for Oregon, in which the Williamette is a subpart. The first project is the Oregon Clean Water Strategy , which has been ongoing for approximately two years. The second major application is part of the Superfund Site Discovery Pilot Project.

2. What types of data on the Williamette do you have available?
Many different types of data are available for Oregon. The data gathered for the Clean Water strategy includes fish production, beneficial use value, and stream segment uses.

The types of data that are available for the Superfund Discovery Project include:

NPDES permit site data
TRI site data
FINDS facilities in water, air and RCRA (locational accuracy is unacceptable)
drinking water intakes
soil texture
aquifer unit materials
geology e.g. metamorphic data
water supply wells & population served
fisheries production
sensitive environments e.g.endangered species
surface water intakes & population served
fish production in lbs/yr using fisheries estimates
potential runoff
population density
land use

This data is used to generate an estimation of the "overall vulnerability" of an area as determined by a ranking-type model that weights each of the chosen datalayers by different factors. These data sublayers might include things such as:

Top Layer: Overall vulnerability

Second Layer: Groundwater, Surface Water, and Air pathways

Third Layer: Population Density, Fisheries, Beneficial use value

Fourth Layer: Time to next permit issuance

3. How is this data currently being used?

The Superfund Discovery Project was designed to identify the relative sensitivity of areas within Oregon using hydrologic, geologic, population and other data. Presently, most superfund sites are discovered by a reactive process, such as response to a citizen complaint or a state discovery. This pilot project was developed to help EPA Region X develop more of a proactive approach to site discovery. Data on regional vulnerability to hazardous waste contamination via surface water, groundwater, or air pathways could then be intersected with existing industrial code data that identifies potential hazardous waste producers. This intersection would highlight the 10 - 20% of facilities that are located in the most sensitive areas. These facilities will then be targeted for site inspection and superfund discovery resources. This approach may ultimately prove to be a more economical and efficient way of finding superfund sites. The pilot project will be completed for the state of Oregon this year. Region X has plans to apply this approach to Washington and Idaho as well during the next year. The overall cost of the GIS project is dependant on the availability of the data layers. Data may be available but not digitized. The total cost for the GIS project might be $100,000 per state.

4. Do you think that the Williamette might be a good sample site for our project?

The Williamette may have 25 to 35% of Region X's multimedia violators that will be identified by Chris Solloway's database integration project. This integration is expected to be completed within a month. Therefore, if 40 to 50 multimedia dischargers were identified in Region X, then we might have 10 to 15 sites on the Williamette. If there were more sites not we could just use data for the upper half of the Williamette. However, each part of the Williamette may have different types of dischargers. By only studying an industrialized area only, the results of the study might be somewhat skewed due to different population densities, etc.

Other Topics Covered:

GIS at Region X:

Mr. Peterson is the head of Region X's four person GIS group. The Region is moving towards using GIS as a decision making tool in addition to a powerful way of displaying information.

The group uses Archinfo GIS software. This system defines topological attributes as points, polygons and lines. It can also generate buffer zones around any polygon, point, and line, zoom on any area, and determine the proximity of any region to another. Currently, the online

ARCHINFO information includes 5 to 6 data elements per database for each media. However, the database structure in Archinfo is sufficient to handle many years, or many other types of data. One can query from Archinfo in a batch job using the mainframe. Region X has plans to move to workstations to run their GIS applications.

Other Project Ideas:
The Williamette Region may fit our needs nicely. However, for an expert system, the accuracy of locational data may be particularly important. We might want to use only the overall vulnerability data as a ranking criteria. In addition, it would be ideal to develop some interactive tie between the expert system and the GIS system to make use of its display capabilities.

Other Contacts:
Pat Sarone, in the risk group, to discuss important data elements

Documents to Acquire:
1. List of multimedia criteria (both environmental & administrative) developed to determine Groundwater Vulnerability

2. List of the data layers used to estimate overall vulnerability (The complete report is not available at this time)

Mr. William Puckett
Interview Summary
August 7, 1990

Participants:
EPA Region X: William Puckett, Chris Solloway
University of Washington: Allison Keyes

Notification/Reporting

To whom are the violations reported?
N/A

How are the violations reported to the EPA?
N/A

What are the differences in reporting from state to state?
N/A

What information is contained in the report?
N/A

What types of information are required to be reported to EPA and what types are discretionary?
N/A

How is this information recorded?
N/A

Review Compliance Information

What is the procedure for reviewing the compliance information supplied by the state?
N/A

What information is collected by EPA and under what circumstances?
N/A

When is a site visit required to get the information needed?
N/A

Update Databases

What databases are used by EPA?
There are many databases used in the air division, and most are encompassed by AIRS, which includes three main databases or subsystems: AFS, the Air Facility Subsystem; AQS, the Air Quality Subsystem; and SEMS, the Continuous Emissions Monitoring Subsystem. The AFS

database contains data that was previously stored in EPA's NEDS, National Emissions Data System; and CDS, Compliance Data System. CDS is no longer operational, but NEDS is still being used. AIRS is an adabase written in natural code; it is in the CICS operating system.

There is also an air database known as SAMS which is separate from AIRS, and contains SIP data.

What information is contained in these databases?

AFS:

This database contains both compliance and emissions data previously contained in NEDS and CDS. However, some sources have NEDS data and not CDS data and vice versa. In general, the quantity of data contained in AFS is exponentially less than the amount in AQS.

CDS:

For more information on the CDS database, contact Ms. Betty Swan.

NEDS:

NEDS contains emissions data for all sources whose emissions exceed 100 tons/year. The pollutants of concern include: VOC's, PM-10's (particulates that are ten microns or less), carbon monoxide, sulfur oxides, and nitrous oxides. However, due to state reporting difficulties, EPA would like to receive data of sources that emit greater than 1000 tons per year as a very minimum. These sources represent 80% of all point source emissions in the United States. Other information included in the NEDS database is the Standard Classification Code (SCC), and state and county codes. NEDS can be used to identify significant polluters, but these sources may or may not be significant violators as well.

AQS:

AQS contains monitoring data which is used to determine attainment and non-attainment designations and to insure that states are meeting the terms of their State Implementation Plans. If a state can demonstrate that less than or equal to one violation of a federal ambient air quality standard per year has occurred for a three year period, EPA may be able to redesignate a region as an attainment area.

CEMS:

CEMS contains stacks emissions data that has been gathered through continuous monitoring. This data is similar to AQS data and is used in a similar way.

How often is this information updated?

NEDS:

NEDS data is updated annually. Currently 1988 data is being entered into the system. However, NEDS can only handle data for one year at a time. Therefore, before the new data can be entered into the system, the old data is removed.

AFS:

In AFS, emissions data will be entered annually, and past data will be archived within the system.

AQS:

EPA tries to enter and analyze AQS monitoring data on a quarterly basis. If a state has access to

AQS, they may update the information directly each month.

What reports are generated and how often are they used?
All the databases within AIRS can generate "quick look" reports, which are customized sorts on selected fields, as well as extended database dumps of all the fields in each subsystem. In addition, a user can interactively browse the database while on-line.

In Region X, AQS data is statistically analyzed using SAS, the Statistical Analysis System, and graphical reports which: 1) summarize the current status of state emissions and 2) analyze trends over five or six years, are generated. These analyses are performed quarterly and recently have been done on a monthly basis. The resulting reports are used by EPA and state personnel to supplement each state's annual monitoring data summary and analysis.

Other Topics Covered:

Job Description:
Mr. Puckett manages the NEDS air emissions database and the AQS air monitoring database for EPA Region X. His responsibilities include collection, analysis, quality assurance, and presentation of air data. Mr. Puckett is also a meteorologist by training.

Other Uses for NEDS:
NEDS has the potential to be used for enforcement. However, it would have to be updated more seriously and have more resources directed its way. Currently, NEDS emissions data does not have the same level of QA/QC as air monitoring data.

A main use of NEDS data today is for FOIA requests.

NEDS may also be able to be used for SIPs, by supplying data for dispersion modeling.

State Collection and Reporting of Data:
Emissions Data:
Each state collects annual emissions inventories from individual sources and has six months from the end of the calendar year to report their complete emissions inventory to the EPA. The amount of emissions information received from the sources is largely dependant on how aggressive the state is. Very often a state does not complete inventories annually, in reality years are skipped. For example, the data currently being entered into NEDS is from 1988, before that 1985 data was on-line.

Previously, the states would send their emissions data to EPA on magnetic tape to be uploaded onto NEDS. Now, with the development of AFS, states will be entering data directly into the database. However, there may be some difficulties with this approach, since AFS is not extremely user friendly. EPA has a computer program that checks the NEDS emissions data to see if calculations and entries were done correctly and make revisions as needed.

Many of the states have their own air databases. For example, Washington has WEDS, the Washington Emissions Data System.

Monitoring Data:
The frequency of monitoring is determined by the individual air pollutant. For example, gas data is collected continuously. Lead and PM-10 are normally collected every six days, or more frequently during periods of bad weather such as inversion layers. The frequency of PM-10 monitioring is determined by the levels that are being measured. Each state is supposed to obtain EPA approval of their monitoring networks, but may not always do so.

The states are required to report monitoring data quarterly, and some enter data directly into AQS on a monthly basis. State monitoring data goes through a comprehensive QA/QC process before it is submitted to EPA; therefore, a substantial time lag exists between when data is gathered and when it is actually submitted to the agency. In addition, each state is required to complete an annual analysis of their monitoring sites. Together with similar EPA analyses, these reports help EPA enforcement and SIP personnel make decisions.

AQS:
AQS has been on-line since July 1987. Currently, there are no major problems with the system. Furthermore, each year all AQS users meet to exchange comments and recommendations for system enhancements. Headquarters then prioritizes and implements these enhancements.

EPA offers a 3-day training course to introduce the system. With this training background, the system is quite user friendly, although some types of retrievals may still be difficult.

No major changes are seen for AQS in the future. However, if the new amendments to the Clean Air Act pass, fields for additional regulated pollutants, especially air toxics, or more meteorological data may be added to EPA's databases.

AIRS Expansion:
Currently, EPA is in the process of adding another database to AIRS which will store data on mobile/area sources including automobiles, airplanes, and wood stoves.

Kathleen Rawdon and Kelly Richter
RCRA Data Base Managers
Interview Summary
August 14, 1990 (Updated September 19)

Participants:
EPA Region X: Kathleen Rawdon, Kelly Richter, Chris Solloway
University of Washington: Donna Jabs

What data bases are used by EPA?
The Hazardous Waste Division currently uses a data base called HWDMS (Hazardous Waste Data Management System) but a new data base called RCRIS (from the Resource Conservation and Recovery Act) will be coming on line in the next 6 months to a year. (Training to use this new database was started in February.) RCRIS will actually contain something like 20 databases and will be a much more complex system. The states will also have access to this system and will be able to input their own inspection data. (Under the current system, the states send the data to EPA and it is put in the HWDMS system by Ms. Rawdon and Ms. Richter. There are ususally disagreements over the counts because the information that is sent is not always clear and can be interpreted and entered into the system in different ways.) Washington and Idaho are converting to the RCRIS system right now.

Other programs have indicated they may want to use this database to lookup the current status of a facility as well. Pesticides and Toxics were mentioned as were the Superfund program. Both of these programs have their own data bases (FTTS for Pesticides and Toxics and CERCLIS for the Superfund Program) but indicated they could use RCRIS to lookup the most up-to-date information on a facility quickly. It was mentioned that John Fogarty had talked about the Air and Water programs being interested in this data base.

Yvonne Spriggs is the woman who handles the FTTS data base including programs such as Pesticides and Toxics, asbestos in the schools, EPCRA (part of Toxics), and PCBs (now done all by the Air program though formerly the form had to come from the Hazardous Waste program.)

HWDMS was described as a batch system. Input information is sent and updated in batchs. The problem with this type of system is that a report must be run by headquarters (it is printed at the Region X office) to see what information is in the system. The RCRIS system, on the other hand, will be an interactive system so any information needed will be available to be called up on the computer at any time.

With the RCRIS system, the states Oregon, Washington, and Idaho will do their own data entry and upload their "core" information to the national data base. EPA will upload its core information as well. Information from Alaska will still be input by the EPA. This system will provide more flexibility with the data base because the non-core information can be tailored to the state's and EPA's specific needs.

A Memorandum of Agreement defines the agency reponsible for each specific field of core data. EPA is also responsible for overseeing how the state spends its grant money. The state is required to complete a certain number of inspections etc. to account for the grant money.

The HWDMS system was inflexible and did not allow input of all the necessary data so other data bases were developed to accomodate this information. (This problem will be solved to a great extent with RCRIS.) Several other systems were discussed. One is a data base kept by Lori Anderson to keep track of compliance dates. HWDMS could only take the date compliance was scheduled and the date compliance was attained. If someone attained compliance befor the scheduled date, it couldn't be entered on the system. Another system discussed was the Corrective Action Sytem. The information on this database will be incorporated as part of RCRIS. It keeps information on specific areas of a facility and can track compliance and cleanup dates on different areas within the facility.

People from the EPA who have worked in developing the RCRIS system were briefly discussed. Judy Fey is the RCRIS program person at EPA and the person to talk to about MOAs. She has had the most input into forming the RCRIS system. Christine Parker is the technical computer person for EPA. Her title is database administrator. Steve Dempsy, a CSC contractor, has been working on converting the historical HWDMS data into RCRIS for Idaho and Oregon.

How often is the information updated?
Notification information is entered into the computer every 7 days or so. Compliance information is done monthly or whenever it is recieved. A lot of information will be recieved in the few days before the end of the quarter. Currently the states send data entry sheets to the Region X office and the information is entered on the system. Reports are generated and mailed back to the states for proof reading.

What information is contained in these data bases?
We have an index of all of the fields available in the HWDMS while Chris has a copy of the dictionary explaining these fields. Both notification and permitting information is contained in the data bases.
Notification forms come from facilities that generate a hazardous waste (such as dry cleaners or auto repair facilities), transporters of hazardous wastes, and burners or blenders of waste oil. Generators do not need permits. The name of the company, the address, the hazardous waste activity (generator, transporter etc.), and the type of hazardous waste is listed on the notification form and entered into the data base. We have a copy of the Notification of Hazardous Waste Activity booklet with the notification form.

Facilities that treat, store, or dispose (TSD) of a hazardous waste need permits. The permitting process can take up to 10 years so few new permiters are added to the data base. However, certain event information on the permitters (such as the date of the public hearing or permit application withdrawal) is received from the permitting department and entered into the database. We have a copy of the RCRA Permit Tracking Turnaround Document (this is a computer generated report) with the fields available.

The data base does not track transportation manifests. These are kept by the facilities and at the state level. The manifests are used like shipping manifests and accompany the waste throughout the "cradle to grave" process. The cradle to grave processing policy determines that the same number is used throught out the process.

All the information in HWDMS will be included in the RCRIS data base as well as additional information not currently available in HWDMS.

What reports are generated and how are they used?

Reports of generators are generated by EPA identification number, address, and facility name and are sent to the states weekly. These reports are used to verify the notification information given by the states and are also used to have a current lists of all the generators (including new generators). We have a example page of this report.

Compliance reports contain the history of the inspections including the date of inspection, the type of violation, the scheduled penalty or fine, the date compliance is to be acheived, which agency did the inspection, and which agency determined the enforcement action. These reports are also generatored weekly. We have an example page of this report.

Permit reports are used by the permitting division with information about the complicance history. However, the HWDMS generated reports do not satisfy all of their needs so a different system is used to generator permit reports. The CARS (Corrective Action Report System) data base can keep information on clean-up programs in progress in various areas of a facility while HWDMS can only keep track of the single facility. Large facilities often have different cleanup programs in different areas and this information is documented in CARS.

Mr. Joe Roberto
Interview Summary
August 7, 1990
Tuesday, 2:00 pm

Participants:
EPA Region X: Joe Roberto, Chris Solloway
University of Washington: Donna Jabs, Allison Keyes

Mr. Roberto first explained that permitting is his area of expertise and he did not feel he was the right person to answer compliance or violation status questions. His answers to the permitting questions are described below.

Issue Permits:

Please describe the permitting process

EPA Water Permitting Process:

1. Application
Every discharger must send in an application. Different application forms are used by different dischargers. We have samples of the forms used to determine which application form will be sent and the application forms. These show the categories of facilities and the information required for each.

2. Draft permit
Permits vary greatly depending on the facility and the receiving waters.
The permit must meet the state water quality standards (these must be more stringent than the federal regulations.)

3. Preliminary Review
The drafted permit is sent to the state for the initial review when EPA writes the permit (for Idaho and Alaska). In Alaska, it is sent to the EPA operations office and then to the Alaska Department of Environmental Conservation. They have two weeks to review it. In Idaho, it is sent to the Idaho Department of Health and Welfare and they have 3 weeks to review it.

4. Public Notice
The public notice period lasts 30 days. The number of comments received depends on the facility and how controversial the permit is. A public hearing may be held but is not necessarily held.

Mr. Roberto gave us an example of a city who did not like the permit and contacted their Congressman. A Congressional Notice was sent and the response period to the comments was lengthened.

5. Review Comments
Comments are responded to either by individual letter or by a report summarizing the comments

and EPA detailed responses. (We have an example of such a report.) The permit is possibly changed in response to the comments, but not always.

City of Rexburg example: The city argued that their ammonia permit limit was based on only a few data points. As a result EPA is reconsidering the permit limit. Additional monitoring will be required, and the limit will not be established until more information it gathered.

6. Proposed Final Permit :
The proposed final permit is sent to Alaska and Idaho. (This step is not necessary in Oregon and Washington since the states are already involved in the whole process.) They respond with a form letter giving formal OK.

7. Final permit issued by EPA
The specific effluent limitation information contained in a final permit varies depending on the facility and the receiving waters.

Oregon and Washington Permitting Process:
Both Oregon and Washington issue their own NPDES permits following a procedure similar to the one outlined above. These states can set up any program they want to get permitting process taken care of. However, EPA maintains an oversight role during the permitting process to ensure that federal regulations are being met. Major facilities are reviewed with a higher priority than the minor facilities. For example, after a permit is drafted by the state, it is sent to EPA for review. Oregon has an unusual system of sending the drafted permit to facility before sending in to EPA and negotiating with the facility. (Joe Roberto thinks this practice is somewhat crazy as it slows down process, causes a backlog of work, and the permit may have to be changed when seen by the EPA anyway. He said permits written in Oregon often needed to be changed.) In addition, the compliance division of EPA reviews the permit and the Branch Chief signs the permit before it goes to public notice.

What information is needed to write a permit?
A great deal of judgement is used in writing a permit and deciding if the best available data is good enough or if more information is needed. The types of information that a permit writer may use include:

1. guidelines if there are any,
2. water quality standards - must use most stringent of technology or water quality standards,
3. training manual for permit writers - including effluent standard information,
4. information on receiving waters - this often can be found from the states such as state reports on sediment limitations, BOD limits etc.,
5. models, e.g. dilution models,
6. effluent samples from the facilities if necessary.

What criteria are most important in the permitting process?
No criteria is "more important" than any other, but some criteria are more difficult to establish and some are more straight forward and more easily determined.

What information does a final permit contain?
Permits include monitoring info - how, when, and where to monitor as well as how to report the information gathered.

How is the permit information stored and accessed?
Copies of the permit are kept by the state, the facility, EPA and any other interested parties. At EPA, the permit limits are kept in PCS.

Some of the permitters are not happy with the PCS system because it does not meet all of their needs. For example, the PCS system cannot handle variable limits which are used in fish processing permits. Paper trails must be kept for these permits because they cannot be entered correctly onto the system.

Other Topics Discussed:

Timeline:
Permit writing can take up to a year. Several months is more usual. Permits and reviews are reissued every 5 years.

New Permits:
If an application is received from a new facility, an environmental assessment is conducted by another part of EPA. Sometimes an EIS is required. After this process is completed, the permitting process is the same. The EIS is sometimes used in writing the permit.

Relation to Air and RCRA programs:
Under the Clean Water Act, facilities are required to control the sludge disposal of waste water plants, so the water program must coordinate with solids program. Sometimes the water division make deal with incinerators in cooperation with the air program. Otherwise, there is often no contact with other EPA programs.

Jeff Rodin
RCRA compliance
August 17, 1990
Interview Summary

Participants:
EPA Region X: Jeff Rodin, Chris Solloway
University of Washington: Donna Jabs

In response to talking about the mulit-media aspects of this project, Jeff suggested that we talk to people in the operations offices (EPA field offices) around the state. He thought that people in these offices often did multi-media inspecting because the offices are smaller and the same person might be responsible for several programs for example both RCRA and water programs.

Review Compliance Information
What is the procedure for reviewing compliance information supplied by the state?
N/A

What information is collected by the EPA and under what circumstances?
All TSD (treatment, storage, and disposal) facilities are inspected yearly. The inspection includes looking at all of the operating units, inspecting any areas where hazardous wastes are treated or stored, checking that health and safety requirements are met and looking for any possible leaks. The inspector may also request to see the operating records and make sure that the unit has been inspected weekly throughout the year.

There are hundreds of pages of checklists for going through the various inspections. There are different checklists for incinerators, for land bans, for underground tanks, and for general inspections. Most of the checklists are confidential so we could not get copies.

Generators of hazardous wastes are not required to have permits, but must notify EPA of their activities through notification records. The notification record has two parts: Part A is a general description of the facility with a listing of all the hazardous waste units, Part B contains the engineering specifications and operating requirements. Generators do not send any other information to the EPA unless specifically requested. Information such as copies of manifests, contigency plans, training records, and lab results are sometimes requested by letter.

When is a site visit required?
TSD facilities are inspected by site visits annually.

Most generators are inspected by the states if they are inspected at all. Large Quanity Generators are more likely to be inspected, but are not necessarily inspected.

Spot inspections can be done on any facility, but are not done on a regular basis. The usual reason for a spot inspection is a questionable figure or report or an employee tip.

Determine Further EPA Involvement

What is the proceedure for reviewing state enforcement efforts?

EPA may go along on inspections and review the inspections reports generated by the states. EPA and state personnel work closely to get the necessary information.

How is the need for additional EPA action determined?

N/A

How is this process documented?

N/A

Develop Enforcement Strategy

What are the different kinds of EPA enforcement efforts?

Different kinds of enforcement efforts include warning letters, notices of deficiency, and notices of violation with penalty assessments. Penalty calculations are based on the severity of the problem, the risk to human health and the environment, the quantity of material involved, and the consistency of the violation (a one time problem, or a continuing violation of the regulations.)

Monetary penalties cannot be assigned to federal facilities. However, federal facilities are often government owned, but contractor operated and the contractor can be fined.

How are the EPA enforcement efforts different from those of the state?

For a federal facility, one difference is that the state can fine the facility, while EPA cannot. Differences for enforcement for non-federal facilities were not known.

A report called the EPA Enforcement Summary Report was suggested as a possible source of information.

Coordinate EPA Role with State

How is EPA involvement coordinated with the state?

Operations offices are the liasons between the regions and the states. It was suggested that we talk to someone in the operations offices to further answer this question.

Federal facilities can be inspected by both the EPA regional office and the state. In some cases the state and regional office do inspections together.

How are EPA efforts communicated to the state?

In some cases, the personel in the regional office and the state offices work closely together and much of the information in communicated by phone calls.

Other Topics

Position

Mr. Rodin's position is somewhat different than the other compliance officers because he works with one very large facility (Idaho National Engineering Lab, INEL) and a few small facilities while others work with a larger number of facilities.

Corrective Action

Mr. Rodin works with INEL and oversees the clean-up activity at two chemical companies. This clean-up work is called corrective action. It is similar to work done under Superfund. The main difference between work carried out under CERCLA and RCRA legislation is that CERCLA covers abandoned facilities while RCRA covers facilities still in operation. Some facilities, however, are covered by both pieces of legislation such as Hanford.

Ms. Carrie Sikorski
Chief, Permit Department
Hazardous Waste Division
Interview Summary
Wednesday, September 26, 1990

Participants:
EPA Region X: Carrie Sikorski
University of Washington: Donna Jabs

Issue Permits:

Please describe the permitting process.
Treatment, storage, and disposal facilities are issued permits. Generators of hazardous wastes are not issued permits. An applicant comes into the system when they turn in a Part A application and qualify for interim status. Congress set deadlines for different types of facilities to be permitted. For disposal facilities the deadline was 1988; for incinerators the deadline was 1989; storage and treatment facilities must be permitted by 1992. Facilities either were required to file a Part B application by statute or are requested to submit a Part B application by the EPA regional office. Those which are requested by the regional office have six months from the request to return the Part B application which is a lengthy detailed description of operating procedures and plans for the facility. EPA then reviews the application and sends a Notice of Deficiency (NOD) describing what is deficient in the application. This begins a negotiation process between the facility and EPA. The application may go back and forth three or four times before an application is written that satisfies both parties. The RCRA program's purpose is largely prevention and permits are written to prevent the facilities from causing contamination or damage. The characterization of subservice properties of the soil is very important at facilities which must monitor ground water, and is a very time consuming process making this part of the procedure quite lengthy. Facilities have very general regulatory requirements to follow in writing the permit applications, but limited specific guidance.

When the application is complete, the permit is written. There is no comprehensive guidance document to use in writing the permit; the information comes from many different sources including
40 CFR Part 264, checklists, and technical guidance documents. The draft permit is circulated inhouse. If the state writes the permit, it is sent to EPA for approval. If EPA writes the permit it is sent to the state for review. Public review is the next step; announced by newspaper advertisements and radio announcements. A public hearing will be scheduled if requested. At the end of the comment period, a response to the comments is prepared and the permit is typically finalized. If anyone who lodged an initial comment is not satisfied with the response, they have thirty days to petition for reconsideration. This procedure, called an appeal to the permit, goes to the administrator at EPA headquarters for consideration. The EPA regional office must be shown to have been arbitrary or in error on the facts to warrent reconsideration; usually the permit stands unchanged. If the commentor is still not satisfied with the permit, they must take their disagreement to the appelate court. The permitting process can take two to six years to complete.

What information is needed to write a permit?

40 CFR Part 270 13-21 describes the information requirements for the Part B application. Information from the application is used to write the permit. The information varies a great deal with the type of facility being permitted.

What criteria are most important in the permitting process?
The important criteria vary with the type of facility. For incinerators the most important criteria is the trial burn, for land base activitiy or soil cleanup, the focus is on the subsurface hydrogeology.

What information does a final permit contain?
The final permit is the blueprint for how the facility should operate. It covers how they will sample, the quality control plans, the well maintenance plans, plans for how to analyze their waste, etc. The final permit is very involved and detailed. The permit essentially replaces the regulations and becomes the binding legal document. Permits generally incorporate the federal regulations but are much more specific to the facility.

How is the permit information stored and accessed?
Some permit information is put in the HWDMS system. However, HWDMS (the Hazardous Waste Data Management System) gives only skeletal information such as the name and address of the facility, the type of process done, the volumns handled by the facility, and the type of waste. The files are complete and contain detailed information. Permits are based on the Administrative Record which is a special file containing all information on which the permit was based.

HWDMS is used as a reference tool to respond to phone calls or quickly categorize facilities. The feeling was expressed the HWDMS is used mainly by headquarters, and that the regional office more on the hard copy files.

<u>Other Topics Discussed:</u>

Corrective Action and Omnibus Provisions
Prior to the HSWA (Hazardous and Solid Waste Amendments of 1984), the hazardous waste division had the authority to look only at ground water and soil contamination at landbased units managing RCRA hazardous waste. HSWA at section 3004 (c) required permits to require corrective action for all releases of hazardous constituents from any solid waste management units. The "omnibus" provision (Section 3005 (c)(3)) of the statue states "Each permit issued under this section shall contain such terms and conditions as the Administrator (or the state) determines necessary to protect human health and the environment." Together, these two provisions allow the agency to address multimedia releases of health concern.

Relationship with the state
The state writes and adopts regulations so they can administer the RCRA program. RCRA is meant to be a delegated program so much of the work is delegated to the states. The states write rules (these must be at least as stringent as the federal laws) and EPA oversees the states implementation of the rules. The state must be applying and enforcing the rules to be authorized by EPA.

The lead permit writer can be in either the state or the regional EPA office. This is decided in

Work Plans that are developed and negotiated each year. The work plans specify who is responsible for what, what the state is going to do, and how much grant money the state will recieve.

Ms. Betty Swan
Interview Summary
Tuesday July 31, 1990

Participants:
EPA Region X: Betty Swan, Chris Solloway
University of Washington: Richard Palmer, Donna Jabs,
Allison Keyes

EPA ENFORCEMENT QUESTIONS

Update Data Bases

What data bases are used by EPA?
The Office of Air has the AFS, Air Facility System, database which incorporates the information previously contained in the Compliance Data System database, CDS, and the NEDS database. AFS is a part of a larger database known as AIRS.

What information is contained in these data bases?
The CDS database contained compliance data for major facilties only including:

Corporate Name
Corporate Address
Corporate Owners
Inspection History
Violation Status
Enforcement Summary
State Industrial Code (SIC)
Pollutants Emited
Compliance Status
Attainment or Non-Attainment
Installation of New Equipment

The NEDS database contains emmissions data from the stack. Contact Bill Puckett for more information.

How often is this information updated?
This information is updated as they occur ideally, but many times data entry falls out of chronological order. It is difficult to adjust this in AFS when it occurs.

What reports are generated and how often are they used?
AFS generates customized reports, called quick look reports, for those in the air compliance section and others. Ms. Swan routinely generates reports summarizing major sources (>100 tons) that have been out of compliance for two months or more. In addition, a source data report, which is a composite of the masterfile, can be generated and used for noting information to be updated.

Notification/Reporting

To whom are the violations reported?
N/A

How are violations reported to the EPA?
The states normally maintain AFS on their own and this is one way of reporting violations to EPA. However, Ms. Swan has been entering data for Alaska since the oil spill.

What are the differences in reporting from state to state?
Some states enter more information or different types of information than others, but the basic information entered is the same. EPA has agreements with each state outlining how often the database must be updated. In some cases it is required monthly, in other cases it is quarterly since the advent of AFS.

What information is contained in the report?
See CDS information above.

What types of information are required to be reported to EPA and what types are discretionary?
This depends on the terms outlined in the State Implementation Plans (SIPs).

How is this information recorded?
N/A

Other Topics Discussed:

Ms Swan is the AFS database manager. Since AFS is newly operational, her involvement with the databases used by the Office of Air at EPA Region X has been primarily focused on CDS, the Compliance Data System. CDS is no longer operational; however AFS contains the same data elements. Currently,
many problems have been encountered during this new transition to AFS. Ms. Swan gave was able to lend us an AFS user's manual for three weeks as well as a copy of a typical AFS printout for a source. This documentation will supply more detailed information about the specific fields involved in the AFS database.

Phillip Wong
TRI Program Manager
Interview Summary
August 21, 1990

Participants:
EPA Region X: Phillip Wong, Chris Solloway
University of Washington: Donna Jabs

What is the purpose of the TRI database?
The purpose of TRI is to keep information on the most commonly manufactured chemicals and where they are produced and used. The list originally came from Maryland and New Jersey; therefore, it doesn't cover some chemicals such as dioxins. TRI covers all types of releases (air, water, RCRA) and was established under the 1986 Superfund Amendments. The legislation is called Title 3 of SARA or the Emergency Planning and Community Right to Know Act (EPCRA).

EPCRA was originated so EPA would have an idea of what chemicals were being released and what chemicals were stored on different sites. One purpose was for first response agencies, such as for fire departments, to know what kind of chemicals were at the plant. The purpose is not regulatory, but rather to gather information and to pull together information that would be scattered throughout the agency otherwise.

What information does TRI contain?
TRI contains information on the releases of chemicals from facilities that manufacture or process over 25,000 lbs or use over 10,000 lbs of certain common chemicals per year. The information includes the name and location of the facility, the type of facility, and the chemicals produced or used.

The facilities send the reports directly to headquarters with a copy to the state. The information is input to the data base at the national level. Oregon is the only state in this region that is preparing to input the information themselves. Mr. Wong has access to the national data base and can download some of the information, but does not input any information.

How is this information being used now?
The information has been requested by mortgage and insurance companies to determine if there may have been chemicals manufactured or used on a piece of property at some point in time.

The data has been requested by other programs at times - water or air, but there have been problems because the information created does not correlate perfectly with other programs. For example, not all of the facilities in the data base have FINDS numbers because some facilities aren't covered by any other programs.

Mr. Wong stated that part of the problem is that TRI data is not currently being used to a great extent. However, it is hoped that some data analysis will be undertaken in the near future. Because the TRI data base is so new there is not that much information to analyze at this point.

How could TRI data be used for enforcement?
The TRI program can require someone who should have filed a report but failed to do so, to file a report. Other times, if a TRI report is incomplete or inaccurate in some way, EPA will request that a facility refile a report. However, this is not an enforcement action in a strict sense. Releases are not regulated, but reported. The job of the TRI program is to try to ensure that the chemicals are being reported correctly and to ensure that enforcement is getting this information.

Many people not aware of the requirement to report because the TRI program is new. Failure to report may prompt EPA to conduct an inspection of the facilities. Companies that have failed to report are identified through the phone book yellow pages, through the Dunn and Bradstreet database (a database containing mainly business information on companies) or a manufacturer's directory. The facilities are first called confirm that they fall under TRI reporting requirements, and that they have not submitted a report to EPA. If they do meet the criteria and have failed to report, these companies are inspected to ensure that reports will be filed containing complete and correct information.

There is hope that eventually this data base will be able to tie into the other data bases for air, water, and RCRA but this will be some time in the future.

Appendix B

Interviews Conducted in Phase II

of the Multimedia Enforcement Project

Gregg Kellogg
Vaughn Blethen
Interview Summary
April 5, 2:00 pm

Comparative Risk Summary
It was suggested that I get a copy of the Comparative Risk Summary (CRS) from Bill Schmidt. The CRS contains information on the relative values of risks. For example, pesticides came out to be in the highest risk category, with point source discharges including hazardous waste discharges being in a much lower risk category. The summary was a one time exercise in determining risks from a comparative standpoint and is not updated. The summary is broken down into three parts including ecological risk, health risk, and welfare. The Region X office does not have access to a database with this information and specific information from this document would have to be obtained manually by a person paging through the hard copy. The databases in the water program of Region X are oriented towards compliance and enforcement.

Violation Magnitude Corrections
In terms of recieving waters and risk it is difficult if not impossible to compare conventional pollutants with other pollutants such as metals. Saying a facility is violating BOD limits by 5-10% is very different than saying the facility is violating dioxin by 5-10%. Comparing these is like comparing apples and oranges. The database needs to be broken down into different categories such as conventional pollutants and toxic pollutants. (Vaughn stated that in the QNCR manual, the significant non-compliance (SNC) and RNC could be a potential way to break the pollutants into smaller categories.) There are different ways internal values are placed on the significance of various violations. All violations are not equal. Metals have a much more significant weight in causing a facility to come to the attention of the office than something like pH which is mostly ignored. PCS lists 2200 pollutants, but this number could be much smaller for just Region 10 pollutants. For a facility violating their conventional pollutant limits, the facility must be out of compliance by a greater percentage, and more often for it to come to the attenton of the office than for a facility violating their metal permit.

Vaughn suggested using Class I and Class II as a way of breaking the pollutants down. The difference in these classifications is the percentage the facility is

allowed to be over the permit. In Class I a facility is allowed to be only 20% over their permit limit before it is considered a violation, while in Class II a facility can be allowed to be 40% over their permit. There was also a suggestion made that a yes/no factor be added under violation magnitude that asked the question "Is the facility in significant non-compliance?"

Different companies discharge many different things. A metals company could be discharging 15 different metals, none of which would be seen from other dischargers. So it is difficult to choose a list of pollutants that is appropriate for all of the different facilities. [This problem could be overcome by a database flexible enough to upload all pertinent information on violations, and by a system flexible enough to except any information uploaded.] Many facilities discharge specific materials that would not be common to other dischargers. TSS would be one factor in our database that is common across facilities, but it would be one of the only ones. The pollutants we have listed now are appropriate for a municipal waste water treatment plant, not industrial plants.

It was felt that perhaps we were making too big a deal of small things. Greg stated that the value of the system is not in its absolute ability to predict, but in its ability to compare facilities relative to each other and to provide a relative scale. He suggested that in the violation magnitude criteria we just differentiate between several groups of pollutants. The solution may lie in categorization rather than specificity. Perhaps we could group pollutants into 3-5 categories such as conventional pollutants, metals, toxics, chlorinated byphenols, etc.

Compliance History

A factor that needs to be added to this section is the duration or the number of quarters the facility has been out of compliance. A factor that can be deleted is the lab analysis deficiencies - this would come under failure to report and is just another excuse for why the facility does not have the necessary information. Another factor that can be deleted is the unauthorized discharge. This would not show up as a violation. Only compliance information is found in PCS and if something is not limited, it is not measured. The system cannot track unauthorized discharges which has been recognized as a failure of the system before. The only information the system tracks on the inspection is the date, the kind of inspection, and who did the inpection. What the inspection discovered cannot be stored in PCS but must go into the hard copy file. In fact all other information concerning the inspection is kept on hard copy only. Discharging without a permit it not tracked in any database. We can also delete the operation and maintenance deficiency category - it is also just another excuse.

Ron Lillich
Interview Summary
April 11, 1991, 11:00 a.m.
Corrected according to Ron's comments, April 24, 1990

Demonstration of MUMPS system.

EPA databases.
The states Idaho and Washington are currently converting to the RCRIS database and everyone will probably be using RCRIS in a year. But until that time HWDMS is the data base of concern. Another database that could be useful is the CARS or Corrective Action Reporting System which could contain some information pertaining to human health and ecological impacts. For some facilities a RCRA Facility Assessment (RFA) is done which tracks the releases of hazardous materials to ground water, air, and soils.

EPA Regional and National RCRA Ranking Systems
A formal ranking system which is used to rank the treatment, storage and disposal (TSD) facilities was discussed. It consists of a series of question such as "Is there ground water contamination?", "Was there a hazardous air emmission?" etc. With this system they determine an overall ranking based on environmental significance. The approximately 200 TSD facilities are then ranked on a scale of 0 - 30, with 30 indicating the greatest or most severe environmental significance. A national ranking system has also been developed and Region X recently went through a test comparing their ranking system to the national system. If the systems match within 85%, Region X will be allowed to keep their own system. Ron suggested I talk to Betty Weise to get more information about this system. (See Interview Summary for Betty Weise.)

Generators and TSD facilities
RCRA is broken down into TSD facilities and generators. The TSD facilities are inspected every year and most of the enforcement effort is focused on these approximately 200 facilities. There are approximately 10,000 generators, but these facilities are not followed closely because of a lack of resources.

Generators
A problem in relation to the MUMPS program and RCRA is that generators

may not show a violation because they have never been inspected. Generators are not permitted and they are inspected very rarely so there is a large universe of facilities for which we have very little information. If a facility has never been inspected the only information the database will have is the name of the facility and the approximate amount of hazardous material the facility produces. Most of the generators are in the category of never having been inspected so if the system is triggered by violations, many facilities will never show up. Ron stated that sometime the fact that a facility has never been inspected may make it a prime target for a multimedia inspection.

When a generator is inspected, the violations found could be such things as spillage around the hazardous waste drums, the drums themselves being in bad shape, the facility not having an up-to-date contingency plan, administration paperwork not completed correctly, or a shipping manifest not correctly filed. If the violations are serious enough, enforcement action will be taken and this will be put into HWDMS.

TSD Facilities

Some TSD facilities may be regulated under the RCRA program alone. For example, in the case of incinerators, the RCRA program would regulate the emmissions from the stacks and every aspect of the facility. However, other TSD facilities may discharge into water and air and be regulated under those separate programs. For example, Alaska Tesoro is classified as a TSD by RCRA but is also in the water and air systems.

Much more information will be found for the TSD facilities than for the generators. The kind of information tracked in HWDMS for TSD facilities include the number of inspections that have been done, the date of the inspection, the class of the violation found, and what the follow-up enforcement action was. Class I violations are more severe than Class II or Class III violations. If a facility was found to have several Class I violations the Region X office would be required to issue an administrative order for penalty. Information on this action would also be included in HWDMS such as when the issue was ordered, how much the penalty was, when the facility came into compliance etc. With lesser violations, only a warning letter would be sent and no penalty would be collected. Letters of warning are considered informal actions, and though information on this type of action is supposed to be kept, it is not always entered into the database by the states. So there is a possible problem in the quality of the information. If an administrative order is issued, the violation can be considered very serious. In the RCRA program inspections

are relied upon and little self reporting is done. Though the facilities are required to keep records on the hazardous materials (such as where the materials are kept, what chemicals they contain, etc.) this information is kept at the facility and would be examined only during an inspection.

Penalty calculations are figured on the extent of the deviation and a gravity based component. If a facility completely disregards a regulation, it would be considered a major violation. The gravity component considers the impacts on human health and the environment. For example, if a barrel leaks, gets into a stream and kills a number of fish, this would be considered a major violation and the fine could be as high as $25,000.

Factors that would be considered under compliance history would be the number of warning letters sent (though as mentioned earlier, this information is not always complete), the number of times the facility has been in and out of compliance, and whether the facility has paid the penalties it has had in the past.

Other Topics

Ron suggested I talk to Cheryl Williams for more information on the enforcement sections of HWDMS.

Region X carries out the inspections and enforcement actions for Alaska, but serves in more of an oversight role for Washington, Oregon, and Idaho. The main compliance and enforcement efforts for these states are carried out at the state level.

Ray Peterson
Bill Schmidt
Interview Summary
April 4, 1991, 1:00 p.m.

Demonstration of MUMPS system.

Three Additional Criteria

Vulnerability of Setting and Potential Hazard Ranking
Bill and Ray recommended two more criteria be added to the multimedia enforcement program. They called these criteria the vulnerability of setting, and the potential hazard ranking (potential toxicity). We could use these criteria to include information from the Toxic Release Inventory (TRI) into the program. TRI ranks hazardous chemicals on the basis of their toxicity; the hazardous ranking scale goes from one (high) to three (low). The listing is in terms of human health: chronic, acute, and cancer; and aquatic toxicity: acute and chronic. The rankings are based on the toxicity of the chemicals alone and do not consider the use of the recieving waters etc. Bill and Ray felt that the human health and ecological impact are reactive criteria and we will probably not have very much information on these until they've been tracked for a while. The two suggested categories, on the other hand, are pro-active and can be determined before a source is targeted and tracked. The TRI information is not connected to the permit or the violation, but could be used as a test to determine if there is the possiblity of a toxicity problem. It wouldn't be possible to determine if a certain discharger was worse than another until an inspection of both had been done, but the TRI information could be used to pre-screen for a problem. Ray described the hazardous ranking criteria as being composed of a series of sub categories such as the Standard Industrial Code (SIC) that could be used in prioritizing the dischargers on the basis of their potential toxicity. The SIC can be used for identifying what kinds of chemicals a certain industry produces. TRI data could be used to determine the toxicity of the chemicals identified by the SIC code. However, these criteria would not take into consideration such things as the distance of the source from a population center and how the pollutant would travel.

Managment Ranking Criteria
Ray also suggested adding a management ranking criteria. This criteria would

consider specific things that the managers are interested in at a particular time. For example, areas of significance could be specified - a particular basin of concern or an area that has been targeted by headquarters etc. This would be a subjective criteria.

Data for New Criteria

Bill and Ray will come up with the attributes and the data that would need to be in the database for each of the three new criteria. The TRI data could be a list of compounds, but how these should be summarized has not yet been determined.

Possible summary data listed for each facility could be the cast # or a summary of cast numbers, or an average score for the cast numbers. Eight mediums or pathways are listed such as: discharge to water, fugitive air emmisions, and discharge from stack. Factors that could be used in the database are the total pounds of the compound per year for each of the eight mediums (or pathways), or the total pounds of carcinogens, or perhaps a combined overall hazard ranking for the site.

TRI data is not related to a violation. This information may not concern a release or a discharge at all. It may be that the source handles the material or transports it for disposal off site. TRI compounds may not even be in the facilities permit. So TRI data does not relate to violations in the three medias as the rest of the program does at this time, but is another factor to be considered. Ray's point is that the fact that the facility handles these materials may constitute a serious human health or ecological threat even though the facility is not tracked for the compound in their permit. It was suggested that the TRI data be used as a screening method - or as another layer of the program. The TRI data could be used to rank the facilities again after ranking in each media has been completed. Headquarters has a program that starts by ranking the facilities according to TRI data and later considers the violations in the various medias. TRI data doesn't tie into permit limits, but Bill and Ray feel it is critical in determining where resources can best be used.

Human Health and Ecological Impact Criteria

It was determined that there is no database available now from which it would be possible to get information on human health and ecological impact directly. However, it was felt that the criteria were still important for people to consider subjectively or with information from the files.

Ray suggested that the three criteria: hazardous ranking, vulnerability of setting,

and the management ranking criteria be listed above human health and ecological impacts. He felt that these criteria would be more helpful in ranking sources, since there is no information in the databases on human health and ecological impact at the present, but there might be in the future. Some of the permits written now are including requirements for bioassays which could lead to better human health and ecological impact data in the future.

GIS Applications

Vulnerability of Setting

GIS has set up a system with polygons to determine the criteria Vulnerabilty of Setting. You could enter the source's longitude and latitude and pull up all the vulnerability settings for any particular source. Right now, this system is used in the superfund discovery process. Three contamination pathways (groundwater, surface water, and air) are considered and the system looks at the vulnerability of the site to contamination, using slopes, type of soil, land/use, population density, sensitive areas etc. They have developed the polygons for Idaho and Oregon at this time. [Bill suggested that I get together with Ray some time and see what they have in the GIS system that could be useful to this project.]

Main Screen Map

We talked about the mapping interface and how GIS could be used in the main screen map picture. The map we presently use was drawn in a paint program and is for the purpose of representation only. It can not be enlarged or broken down automatically or perform calculations such as determining the distance between dischargers. The sources were hand drawn on the map and are not perfectly accurately placed. A GIS application for this program could be to create a more accurate and interactive initial map with the possiblity of clicking on an area, a state, county or city and getting a more detailed picture of the smaller area. Since all sources are on GIS, they could be identified by a FINS number and picked out to appear on a GIS map. This would really be more appropriate if the system was going to be used for ranking sources within a single media. A more sophisticated map with many more points (sources) would be needed in that situation. Though the current map is probably adequate for multimedia enforcement purposes, Ray believes that the radio buttons or the way in which you will be able to point and click to pull up a particular source, should be defined sooner rather than later. Ray would like to see a software interface for the radio buttons put in place now. Ray also stated "As soon as they [the people working in each media program] see a nice ranking program like this they are going to want it for all sites - its a given." Bill also thought it

would be a good idea to use the program to rank sources within individual media because the program is flexible and will allow the user to change the criteria as necessary.

Interveiw with Ann Pontius
Chief of Air Operations Section
April 1, 1991

Would the criteria used for water be appropriate for air?

Yes, the four criteria used for water would be appropriate for air, but the definitions and descriptions of the criteria would be specific to air and different from water. It was stated that non-attainment areas might be a good place to start. The designation of non-attainment areas are related to human health and ecological risks. Non-attainment is based on not meeting national air quality standards. A city must have 3 violations in one year to be considered in non-attainment. Seattle will be designated as a non-attainment area this summer. Non-attainment could be used as first cut based on ambient air quality regulations. A potenial problem is that not all areas that should be designated as non-attainment areas are designated.

Human Health Impacts

The NESHAP (National Emmissions Standards for Hazardous Air Pollutants) database would contain information relevant to human health impacts. Currently there are only eight pollutants listed as hazardous air pollutants (regulated under section 112 of the Clean Air Act) including such chemicals as benzene, vinyl chloride, arsenic, asbestos, berillium, mercury, and dioxin. 189 chemicals that have been proposed to be designated as hazardous air pollutants and these will go into a database similar to NESHAP in the future. People are currently in the process of writing regulations for these chemicals and they are not likely to come on line for two or more years. A problem with using NESHAPS information in evaluating the human health criteria is that the limits set may be so high that they have little meaning. For example, sewage sludge incinerators are regulated for mercury but the emmisions limit for mercury is so high that Ann has never heard of anyone violating it. The AIRS Facility System (AFS) contains information on PSD (prevention of significant deterioration), NESHAP (National Emmissions Standards for Hazardous Air Pollutants), NSPS (new source pollutant standards), and non-attaintment status.

Violation Magnitude

Violation magnitude could be called the significance of the violation for air. A significant violator is defined as a major source violating air quality standards in a non-attainment area, or a violator of NESHAP, PSD, or NSPS (these don't have non-attainment areas attached to them). [Comment: Most of the sources we will be looking at will be significant violators.] Ann stated that it would be difficult to get information from the computer on which violator should be dealt with first - that this is a subjective determination. A person can prioritize the sources in the system by looking for particulate matter sources or volatile organic compound sources. The one thing we will be able to pull from the computer to use in the evaluation of this criteria is the number of quarters the source has been out of compliance.

A problem in this area is the quality of the data. The major responsibility for compliance and enforcement has been delegated to the states, but sometimes the states are not consistent in recording the information. (The EPA Region X office does only 20 or so inspections per state per year.) For example, the states will put in the date an inspection was done, but they may not include the follow-up that has been done in the correct places in the database. One of the frustrations is that the state with the most dischargers has been the worst about keeping the Region X EPA office informed of what is going on. Another state is backlogged for several months on the input of information into the computer system so the quality of the data is again a major problem.

Ann showed me the monthly report she gets from the computer which shows the major sources out of compliance, and the area in which they are out of compliance in such as TSP (total suspended particulate), VOC (volatile organic compound), or 'other' which means a NSPS, or PSD violation. The report also lists the sources out of compliance for two or more quarters by the classifications A1, A2, or B. These are classifications of potential to harm the environment. A1 is the classification of a source which discharges 100 tons per year with a control device. A2 classifies a source with the potential to emit 100 tons per year. B sources emit less than 100 tons per year and are mostly ignored. [Comment: The sources we will be dealing with will be mostly the largest sources, A1 or possibly the A2 classification.]

Compliance History

Compliance history, such as failure to report, late reporting, or procedural or scheduling violations may be difficult to pull from the computer. This information may be listed in the comments section but is not listed in specific

fields that would be easy to pull from the database. Procedural violations include such things as violations in record keeping, monitoring, or reporting. Scheduling violations could be such things as a failing to perform a test within the 180 days allowed to complete the test. Compliance history is important, though, as in water, it is probably of less significance than the other criteria. Violations of this type have no direct environmental consequence. However, if a source has been going in and out of compliance for several years then the source is a higher priority because the underlying problem needs to be fixed. So compliance history shouldn't be ignored, but the information to back up the evaluation of this criteria may have to come from the files.

Ecological Risk

Information to evaluate the ecological risk would come from the PSD section of AFS. PSD doesn't contain specific information on Class I violations. The idea behind the Class I classification is that there should be tighter controls on sources impacting certain pristine areas. To determine if the source was affecting a Class I area, you would need to know where the Class I areas are, where the source is located in relation to the Class I area, and the direction the wind is blowing. [Comment: Perhaps GIS could be helpful in this area.] The purpose of the PSD limits is to ensure that the source does not adversely affect the quality of the air and to prevent any further deterioration of air quality. The information we would be able to pull from the computer in this area would be the number of quarters the source has been violating their PSD permit.

Other Topics Discussed

Units

Air quality standards are in units of micrograms per cubic meter. Emission limits are in different units such as grams per second or grains per dry standard cubic foot. Emission limits are permit specific limits. It was stated that the percent over the permit level of the violation could probably be found in the files, but Ann wasn't sure if it was in the computer database. In general, all you will be able to tell from the database is that the source is in violation or not in violation. At this time the states are not required to include information on the 'magnitude' of the violation or the amount the source is discharging over their permit limit.

TRI

The Toxic Release Inventory (TRI) will include information relevant to the air

program and Ann thought it would be a good idea to include TRI information in the program.

State regulations

States are only required to report to EPA in criteria air pollutants. States may have their own toxic regulations, but EPA does not regulate these.

Feedback on MUMPS

Ann thought the program could be a useful tool and very helpful. She expressed some concern that if the number of sources was large, the system could become unwieldly. At present, people must go through the system manually to determine the multimedia dischargers. A computer tool directing the user step by step through a defined process to prioritize those sources would be useful.

A list was compiled manually of about 15 multimedia dischargers (in 3 media) and 100 multimedia dischargers (in 2 or more media). The purpose of this list was to encourage the states to begin multimedia inspections next year. [Comment: These numbers are much greater than the list of 22 multimedia dischargers we have. This is because our list is of sources with **violations** in 2 or more media, while Ann's list is of **dischargers** in 2 or more media.]

APPENDIX C

Interviews Conducted in Phase III

of Multimedia Enforcement Project

Paul Boys

Interview Summary
July 10, 1991

Does this program capture the decision making process?

To the extent to which I've been aware of what the process is supposed to accomplish, I think it does, but I guess I should qualify my answers by saying that I'm not sure I have a clear idea of the objectives of this whole thing. It does seem to me that it has captured the important parts of the process.

Criteria

Are the criteria used appropriate?

To the extent that I've had a chance to observe them, they seem reasonable. Whether they capture everything that might be relevant, I can't answer, but the criteria that are in the program do relate to the kind of things we normally think about and the certainly seem relevant.

I don't know what all would fall under the category of Human Health impacts, but anything I can think of that we would normally consider, we could put into one of those categories.

Are there other aspects of performance that are not captured in these criteria?

I can't think of anything.

The process used previously for determining what facilities to look at from a multimedia perspective, was not as analytical as this process.

Evaluation

Is the database information shown appropriate?

Not applicable.

Is there other information used in the decision making process that is not shown?

I think most of the factors that I can think of could be captured by this model. There may be such things as "gut feeling" or the historical reputation of this industry or facility that might be used in the decision making process. These are more subjective factors and I don't know that they could be captured.

Ranking

Are the ranking methods chosen appropriate for this decision making process?

Yes, I thought they were. I liked having several options. With the range of choices, you could run the ranking several different ways and if the answers were similar you would feel pretty confident about the results.

Will the user have confidence in the prioritized lists of facilities produced?
I would have confidence, but I'm not sure that everyone would. It seems that some people are reluctant to go with a black box type of answer or something that comes from a computer. From what I've seen, it seems like a logical approach and even-handen, and what data is available will churn through the system and give reasonable answers.

I would certainly be willing to go with any kind of list that came out of this process.

Are there elements of the decision making process that are not captured?
The only thing that I can think of right now are the subjective elements we talked about earlier.

Would this program be useful to you in your decision making process?

Certainly, I think it would be, though the ways things have worked in the past, those of us here in ESD have not played the major role in the selection process. The media programs have made their suggestions of selections and those are the ones we have gone with. This may change in the future. If this methodology gets accepted, we may be delegated with the task of coming up with the list of facilities as well as doing the inspections and I can see how this could be a very handy tool.

<u>Functions of the program.</u>

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Are these functions helpful to the decision maker?
Certainly most of them are, yes. However, the tutorial did not seem that useful as someone would have to introduce the employee to the program. I guess I don't see that as a major function of the program or even a need.

Some of the functions that I particularly like or think are important are having a record of what has been done, and having the decision making done in a systematic way. I think this would qualify as a neutral selection scheme so people would not be able to say the selection was not done in a fair way and everyone has an equal chance. It would be easy to defend EPA from the accusation that they are picking on a particular facility.

Are there other functions the program could fulfill?
I can't think of anything right now.

How can the program be improved?

I haven't really played with the program, so I don't have any specific suggestions at this time. It seems that the program was good as it was. However, at the last demonstration, the system was shown so fast that it looked impressive, but I really don't have a feeling for how it would be to work with it myself. It did impress me that you can do a lot of different things quite easily and I liked that.

Criteria selection

How could the criteria be improved?

It seems that there are always things that could be added, but it seems that it would be fairly easy to add other possible criteria as they arise. I didn't see any major gaps.

Ranking Schemes

Are all of the ranking schemes appropriate?

I don't have any other ideas right now. They all seemed like reasonable ways of ranking. There may be other schemes, but whether they would be any more useful, I don't know.

Format

Is the format of the program clear and easy to follow?

I don't have any suggestions. It looked like it would be reasonably easy to follow.

What would be necessary to make this program a useful working system at EPA?

Getting all the sources in and having the program available and updated regularly.

What would be the institution hinderances to using this tool?

I don't see any major hindrances unless it would be that people don't like change and doing something differently and don't see a need for the system. I think there are a lot of good reasons for applying a methodology like this.

General acceptance of DSS?

I don't think there would be a big problem with this. I guess you would need to test the system by comparing the results of the system with results people determined the way the lists are determined now. If the system comes up with totally different answers, there might be some problems, but I wouldn't expect this. I hope there is adequate documentation or explanation for what the decision making logic is in the program.

Would additional training be necessary to use this program or is the program self-explainatory?

I think I would like to be lead through it the first time by someone who was an expert on the system, so I quess some kind of training would be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?

I'm not sure who the best person would be, but I would suggest the reactivated Office of Enforcement headed by Barbara Lither might be a good place to start. The way the politics of

EPA work, the media programs would probably rather have the process done by the Office of Enforcement which is one level above them rather than in the ESD department.

Gil Haselberger
Chief, TSCA
Interview Summary
July 2, 1991

Before we started the interview questions, Gil wanted to tell me something about the TSCA program and where he sees it fitting in.

Every program manager thinks his program has unique characteristics. However, this is possibly more true in the case of TSCA than in the other programs. In the other programs, people deal with facilities that may have continuous compliance problems. TSCA and the PCB regulations (the main focus of TSCA) is not a process oriented issue. The regulations say there are requirements you must meet and observe with regard to PCB containing equipment, but that equipment might sit there for 50 years and be in compliance the entire time. The purpose of the regulations is to control material release into the environment. The regulations are directed at leaks, at doing quarterly inspections, at marking certain types of equipment, at proper disposal when a machine goes out of service etc. There is nothing in particular to trigger non-compliance. A facility may be in compliance for several years and then when EPA shows up to do an inspection the next day, they may have sprung a leak in a piece of equipment and be out of compliance. Once that piece of equipment is properly disposed of they are no longer out of compliance. There may be repeat violators but these are generally large facilities with a lot of equipment that they have not maintained well. Most facilities are not repeat violators.

Gil feels that TSCA does not fit well in MOPS with the other media programs. From the perspective of multimedia, TSCA is something of a poor relation. People haven't quite figured out how to integrate it with the other programs. At multimedia targeting meetings the other media programs are talked about and as something of an after thought it is asked if there is any TSCA connection - do they have any TSCA equipment there. Gil fells that he will probably never have the occasion to use this tool in his program.

There aren't any indicators of non-compliance in TSCA. It is not against the law to own PCB containing equipment. It is not known if there is a violation until an inspection is done. There is no self-reporting; all of the information known comes from the inspections carried out. There is only a sense of what type of facilities might have the pertinent equipment.

TSCA is not always involved in a multimedia inspection, but might be depending on the type of facility inspected. TSCA most often ties in with the hazardous waste inspections. Gil agreed that TSCA could be incorporated into the program by including a field that would indicate if the facility had a TSCA violation. However, a note would have to be made as to whether the equipment had been disposed of or if the violation had been taken care of in another way. At the current rate of inspections, it will probably be a couple of hundred years before all of the possible TSCA facilities are inspected once. So asking if the facility has a TSCA violation is not an indication that it is in compliance if it is not in violation because it might never have been inspected. So the data is very limited.

Gil is a member of the Enforcement Targeting or Screening committee, though he did not feel that his participation was that useful or helpful in this committee because of the nature of his program.

Does this program capture the decision making process?

Maybe. Gil has only sat in on a few meetings of the Enforcement Targetting Committee and does not feel that he can answer this question very knowledgeably. However, he felt that to the extent that MOPS reflects the frequency of violations, it does capture the decision making process.

Criteria

Are the criteria used appropriate?

Yes, he thought they were appropriate criteria, but he was suspicious of the scoring system. Though the system may be logical, it is only as good as the analyst who is using it and the soundness of the judgements made about the human health and environmental criteria.

He felt that the program helped to organize the decision process and set it down in a graphical mode though it may be difficult to articulate. However, if people expect the machine or program to do the job for them they will be disappointed.

Are there other aspects of performance that are not captured in these criteria?

Gil didn't think so, but he was not sure that he would know.

Ranking

Are the ranking methods chosen appropriate for this decision making process?

Gil didn't have any problems with the ranking methods.

Will the user have confidence in the prioritized lists of facilities produced?

Gil thinks this is a personal issue. If you have confidence in your decision making abilities you will see this program as a tool, but if you are a little more shakey about your abilities and you are depending on getting answers from the machine, you might have a hard time using it and justifying the results because it will be like a black box. It doesn't do anything you can't do by hand, it just reduces some of the drudgery and gives you different perspectives of the situation that can stimulate your thinking. If you can't do it by yourself, the machine may or may not be helpful.

Are there elements of the decision making process that are not captured?

He could not think of any off the top of his head, but said he would give it some more thought. (I will check back with him.) He has found the presentations to be fairly clear. He has not been extremely analytical because he is just absorbing new information about other peoples programs. He is trying to be one step removed and regard the program logically so it is more difficult for him to tell if anything has been overlooked.

Would this program be useful to you in your decision making process?

Yes. However, Gil thinks the main question is if the program will stand up to scrutiny if EPA is challenged about their decision making process and how readily they can defend themselves

against the accusation that they have manipulated weights to get to the answer.

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Does the program provide the functions listed above?
In general yes. However, EPA would need to make some decisions about who is going to use the system and who would have to sign off on it. You must have standardized procedures that go along with the standardized decision making process.

Are these functions helpful to the decision maker?
Yes. However, it may be a time tradeoff. Gil did not know how much time it would take someone to go through the procedure or how different that would be from the amount of time spent on the multimedia decision making process now, without the system. Does the program create extra work and if so do the advantages of automating the decision making process outweigh the extra time and effort needed? The program may look really slick in a presentation, but may not actually capture the way decisions are made. For example, the program may create a new work load because decisions are made in a much less formal manner now that is much faster, but more difficult to document or justify.
So who is going to use it? Will it be used for all multimedia inspection site selections? Who is going to make sure that it is used? Gil felt that these questions needed to be addressed to answer the original question.

Are there other functions the program could fulfill?
Not known.

How can the program be improved?

The presentation is good, the program is logical, and the output is clear. He didn't have any suggestions about improvements, but felt he couldn't really answer the question until he could have some time to play with the program. He did not feel that he could answer any of the specific questions about possible improvements.

What would be necessary to make this program a useful working system at EPA?

Gil felt that the committment of the top management to the program would be crucial to its

success. If the program is going to be used, that management will need to specify policies for its use. For the program to become a standard tool, top management will need to expect to see it used and expect to see the results in reports.

What would be the institutional hinderances to using this tool?
The first barrier would be training people to use it. If they are trained adequately, they will be more likely to use the system. Time will have to be set aside to use it on a continuing basis. Emphasis will have to be put on institutionalizing the tool as something that has to be used like the telephone. Probably, after it has been in use for a while a few deficiencies will be found. There a lot of valid reasons for picking out a facility for an inspection that may not come out of the system. In TSCA, 20% of their time is saved for problems that are referred such as an emergency spill, a fire, etc. If the inspection candidates are chosen with this program, will time be left to deal with new situations as they arise?

Access to computers?
He didn't know how many people had access to 386 or 486 machines. Most people are hooked up to the LAM system and do not necessarily have WINDOWS.

General acceptance of DSS?
Probably no problem with this.

Would additional training be necessary to use this program or is the program self-explainatory?
He felt that some training would definitely be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
All the division directors and the deputy regional administrator must be behind the program to make it work. Gil felt that it was crucial to include Jerry Emison, the deputy regional administrator in the process of creating this program and that his support would be crucial to the programs success. He suggested that we talk to him for two reasons: first, he has a great deal of technical knowledge about the programs, and second, he could really encourage people to use the system.

Greg Kellogg
Chief, Water Compliance Section
Interview Summary
July 8, 1991I

Does this program capture the decision making process?

Greg felt that the process is very similar to the process done manually now, but the program is more precise, because it relies on real data more and speculation less. The program is more empirical.

Criteria

Are the criteria used appropriate?

Yes, they are about and good as can be done. The value of the system is in its relative ranking, not its absolute predicatability.

Are there other aspects of performance that are not captured in these criteria?

There are a lot of small things. More emphasis would be put on the compliance history criteria, the duration of the violation, the frequency, etc. However, the general categories would capture the things that are important. The criteria capture the broad picture.

Evaluation

Is the database information shown appropriate?

The database information for the violation magnitude section of water needs to be changed to be more flexible. It was suggested that there be a section for conventional pollutants, metals, and toxic pollutants and that whatever there pollutant limit has been violated be called up on the screen. Gregg thought this information would be fine.

Is there other information used in the decision making process that is not shown?

There is really nothing else that is tangible or defensible that doesn't fit in one of the criteria categories. Gregg pointed out that they strive to be objective and the other political issues that might be considered do not need to be included in the program.

There is no question that this program would be very useful in defending EPA decisions against law suits. It shows that while EPA decisions may not always be perfect and absolute, at least they are consistent. If the program makes mistakes, it makes the same mistakes on all of the facilities. The consistency defense is a common defense of EPA. Yes, the process may be flawed, but at least it is consistently flawed.

Ranking

Are the ranking methods chosen appropriate for this decision making process?

Yes, there is enough flexibility there for anyone.

Do the weighted ranking methods capture important information not available in the other methods?

Yes, it is useful to have several different options and see how the rankings are changed. Greg didn't see anything wrong with it. He felt that the controlled approach can be taken too far.

Will the user have confidence in the prioritized lists of facilities produced?
The users will have as much confidence in this system as in any that we've used in the past or any we might use in the future. There's a trade off in the amount of time, effort, and money you're going to put in to provide the appropriate data and develop the software, and the outcome of the system, but the balance is fine. It may be discovered later that something else is needed, but it is just fine for now.

Are there elements of the decision making process that are not captured?
No.

Would this program be useful to you in your decision making process?

Absolutely. It would be very useful to the Enforcement Targetting Committee. The committee attempts to do what this system does in a less perfect way. The committee has had to manually collect data and rely on institutional knowledge, and we had some lists of facilities to work with. The value of this system is that two of the steps would go away, in terms of identifying the universe of multimedia facilities and ranking them. So the system would be a real time saver. We would probably start by using it to help the committee and who knows where its uses would stop.

<u>Functions of the program.</u>

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Are these functions helpful to the decision maker?
Yes, definitely.

Are there other functions the program could fulfill?
There is the potential for patterns or trends being identified such as a particular geographical areas and the identification of all of a particular type of facility in the area. From a geographic standpoint we could target in on risks, types of industries, and trends of violations. Probably more industry specific enforcement will be done in the future.

How can the program be improved?

Greg felt he would need to sit down and play with the program and try to break it to be able to answer this question.

For now, he stated, it appears that he could learn to use it without spending to much time learning how.

Databases

Could the information in the databases be more comprehensive?

Of course, the information could always be improved, and this process could go on and on.

Are there other sources of information that should be cited?
Greg was glad to hear that we sited places to find additional information and felt that we didn't need to go any further than that.

Format
Is the format of the program clear and easy to follow?
Yes, it was clear and easy to follow. I thought the icons were identifiable and I don't think it would be a problem to work through the program.

What would improve the format of the program?
No suggestions.

What would be necessary to make this program a useful working system at EPA?

First of all, the application for which this program was chartered is the multimedia perspective. Once a year, the committee sits down and plots out who the multimedia enforcement candidates are. Before that meeting, someone, probably in ESD, will need to have gone into this program and produced a list of facilities. Greg didn't think the process would need to be done in each of the specific medias, but rather by a central person for all of the programs. The group will then get together and decide on their plan of action. In the past the process of identifying the multimedia enforcement candidates has taken several meetings, but with this system Gregg didn't feel that will require several meetings in the future. Greg felt that this was how the tool would be used from a multimedia perspecitive. The broader perspective would include the use of the tool by Ann Pontius, David Teta, and Greg in each of the media programs. So the wider use would be in the individual programs and the rankings and everything else will be just as valuble in that way.

What would be the hinderances to completing the tool?
We'll need to clear the hurdle of getting state participation in this tool, and I'm not sure how that will work.

Would the lack of complete and accurate information in the databases be a serious problem?
Database accuracy becomes more of a problem when you start talking about single media, because then you start moving away from the relative ranking to more of an absolute scale. However, PCS is the only database we have and if the information in your program is bad, than so is the information we use now, so I don't know if that would make the automated system better or worse than the unautomated system used now.

The real key is generating interest in folks as far as potential applications go. Sometimes that involves showing them what it can do. People have seen many different systems and they have learned that there is an expense associated with learning how to use another system in terms of time and effort. People know now that nothing is free, that you will never be able to just push a button and get the answer. So the novelty of another system in itself will not be enough to get people interested. We could perhaps show them the system and an application relevant to their interests.

What would be the institution hinderances to using this tool?
Access to computers?
Everyone has access to a terminal on their desk right now (in the water department), but people may not have access to windows. If a machine had to be devoted to this tool, that would certainly be a hinderance.

Other hinderances?
People will always resist new things and changes. This is just the nature of people and is why you need to provide them with an incentive to encourage them to overcome their inertia. You would also like to stay away from disinsentives such as mandatory ordering that people use this system.

The buz word of "multimedia" has been misused. When people hear the word, they may immediately turn off because many people see it as a passing fad. EPA has been talking about multimedia for a long time. It gets paid lip service, but little has actually been done. However, there are people in the programs, like myself, who think it is a good idea, that it is still another tool we can use to solve problems.

Would additional training be necessary to use this program or is the program self-explainatory?
Yes, it was clear and easy to follow. I thought the icons were identifiable and I don't think it would be a problem to work through the program.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
It would be nice if Bob Corson was excited about this. He is in the best condition to make sure that it continues to be available. Bob has a forum as the division director and he has the authority that goes along with that, that we in the individual programs do not have.

Barbara Lither
Interview Summary
July 15, 1991

Barbara was going out of town the day after the demonstration and she was going to be gone the rest of the week. She suggested talking on the phone that afternoon, instead of an in-person interview. Because the interview was by phone, I did not have a tape-recorder and had to rely on my notes to record her answers.

Does this program capture the decision making process?

To the extent that the program is designed to provide an orderly and logical process for identifying and prioritizing multimedia facilities, yes. The system does captures this process, but perhaps not everything that might be involved in the process. There may be additional relevant information on a discharger that is not in any of the databases and therefore not in the MOPS database. This could be subjective information, that is known by the people who work with the facility, but is not specifically input into the database. However, looking at this information is not part of the function of the MOPS program.

Criteria

Are the criteria used appropriate?
Yes, as far as I can tell, I thought they were fine.

Ranking

Are the ranking methods chosen appropriate for this decision making process?
Yes, the various methods of ranking were useful and as far as I can see the ranking methods are fine.

Do the weighted ranking methods capture important information not available in the other methods?
Yes.

Will the user have confidence in the prioritized lists of facilities produced?
I can't see why they wouldn't. I think this will be viewed as one more tool that can be used to process and validate data.

Would this program be useful to you in your decision making process?

Yes, I am excited about the program - I think it is great.

Does the program provide the functions listed above?
Yes, I think the program will help target the multimedia facilities for inspections. I think the program does what it sets out to do. However, of all of the functions mentioned, I think generating a paper trail ranks lowest. There could be a possible problem with this because of the possibility of information escaping. If a hard copy of the rankings and the information used to arrive at those rankings gets out to the regulated community, they could tear it apart in a court. I would not like to see the rankings available in hard copy where they could be obtained by the public or the regulated community.

Are these functions helpful to the decision maker?
Yes.

Are there other functions the program could fulfill?
It would be useful to have access to the file or person who knew the complete history of the facility - if warning letters were sent, when they were sent, what the response was, etc. Could MOPS reference where you would need to go to get the hard copy of the history of everything that has occured with the facility? Since this information, it not always in the databases, it would generally not be possible to put it on the database information screen.

How can the program be improved?

Criteria

How could the criteria be improved?
One concern about the compliance history criteria, was that the program could get former problem-makers, and perhaps not put enough emphasis on the current bad actors or violators. Barbara felt that care should be taken not to put too much emphasis on history.

She also felt it would be useful to have the last date an inpsection was made show up on the screen under violation history. With this date, the user could tell the age of the information being shown and if someone had looked at the facility since the last violations shown.

Format

Is the format of the program clear and easy to follow?
It looked clear and user-friendly.

What would be necessary to make this program a useful working system at EPA?

It is very important to have good input of data - regular, systematic, brutal data input. The system can only be as good as the quality of the data going into it.

What would be the hinderances to completing the tool?
Would the lack of complete and accurate information in the databases be a serious problem?
Yes, the quality and accuracy of the data could be a serious problem. The idea of using this program to motivate the states to improve the quality of their data input is an outstanding idea. The system must be marketed to the states carefully by EPA.

Other hinderances?
The quality of the information could be a problem, as mentioned before. Coordinating the databases could also present a serious problem. Care must be taken that the correct people know that the program exists and use it.

What would be the institution hinderances to using this tool?
Access to computers?
The program doesn't need to have bread and butter availability. Barbara thought we would NOT

want it put on the LAN and that access to it should be limited to the few people who really needed to use it for security reasons.

General acceptance of DSS?
Barbara couldn't imagine that this would be a problem.

Other hinderances?
Barbara felt that it was very important to have a tool that is consistent and universally applied.

She was also concerned that the ranking information would have printer capability. She felt that printer capability on the ranking data was not good. Information used in the system is public information, but information on how the data is manipulated is not and should not be public information.

Would additional training be necessary to use this program or is the program self-explainatory?
Yes, she felt that some training would be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
Barbara felt that the lead should come from ESD. She sees the Office of Enforcement also as an advocate, and felt that the system might be used by a committee made up of herself and someone from ESD. She felt that the Office of Enforcement would do most of the work on outreach to the states while ESD could do the work on the in house utilization.

Rick Martin
Interview Summary
July 16, 1991

Rick is not directly involved in Multimedia decision making, but worked as a provider of integrated data to access the raw material for people to make the cross-media decisions.

Does this program capture the decision making process?

Rick Martin felt that he could not answer this question because he does not know the process completely. He felt that he could trust the opionions of Barbara Lither and Ray Peterson and they had seemed to think that the program did capture the decision making process.

Will the user have confidence in the prioritized lists of facilities produced?

More than six facilities must be ranked. Rick felt that as more facilities are included, the confidence in the system will grow. Though EPA data is far from perfect, it is better than that of any other nation and as the data is aggregated, it gets better.

Would this program be useful to you in your decision making process?

No, he isn't involved in these decisions directly.

Functions of the program.
The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Do you think the program can provide these fucntions?

Yes. There are some interesting issues raised. It does the first quite well. It does the second very nicely. However, the third and fourth functions may get in the way of Barbara's desire for consistency. Barbara wants some confidentiality and she would like very few people to be able to use the program. Functions 4 and 5 show something very interesting. It seems that there is a fair amount of confusion about how this program would be used. If it is widely used, how many new employees are really going to need to do this? If it is only going to be used by a few people, a few times a year than its use as a tutorial might be even more questionable.

Are these functions helpful to the decision maker?

Yes. Rick thinks there is real value to them.

Are there other functions the program could fulfill?

Rick felt he really couldn't say.

How can the program be improved?

Rick felt that people are going to want to see the back up data. He expressed concern that this program is being looked at as an end in itself rather than as part of the process. At some point people are going to want to know how the backup data was used to get the answers.

Databases

Is the information in the databases relevant? How could it be more relevant?
Some information isn't anywhere, except in people's heads and is difficult to access.

Format

Is the format of the program clear and easy to follow?
The overall format was very easy to use.

What would be necessary to make this program a useful working system at EPA?

To be hard-nosed or the devil's advocate let me say that it is a nice and a creative way to solve a problem which is centered around the decision points or rules. The rules can be extremely difficult to make. You can put as pretty a front end on it as you want, but if you can't get agreement on the rules, we're right back where we started from. The reason people are off doing their own thing is because they can't or won't agree what the rules are. It seems that there has been a lot of thinking about what the program looks like and very little thinking about the rules and how to build a decision process that will be built on rules. What are the rule and how are the rules determined? This question doesn't seem to have been asked directely. People are all busy focusing on the tool as opposed to the management process that gets the guts of the thing.

The connection to the data is also a key piece and you are going to have to map EPA data to MOPS data. This is a detailed and messy process, but an absolute neccessity if you are going to have data going from one to the other.

The platform is also very important. Rick felt that wide availability is the key to use and to make the program widely available requires that it come over the LAN. The more use the better, if you want managers, chiefs and staff of each of the media using the program. If you just need one stand alone machine for one person to use, Rick wondered why a computer was needed. Rays comment that it could be on a UNIX box is another possibility.

Would the lack of complete and accurate information in the databases be a serious problem?
Yes, very much so. However, only through use will you be able to get over this problem. As people see the use of the information they will become more accurate and complete in their data input. For too long, data has been collected for some kind of bean counting purposes, and people have not seen the real use or need for the data.

If this software is to be used at the state level, there are a number of problems that come to mind. States make EPA look very advanced in their computer usage. Some of the states are very limited in their computer availability. Most of the people using the computers at the state level are data entry people. They would not be able to use the MOPS program. Also, there are VERY few 386 or 486 machines at the state level, and unless the agency was to give each state a computer to run

this on, a platform might be a serious obstacle.

On the other hand, the way to get better data input is to push this program down to the data collecttion and input level so people can seen the uses of the data they input. Most of the data comes from the states.

Would the integration and downloading of the EPA databases be a substantial obstacle?
Based on what I've seen, no. It is a piece of work, but I don't see any main obstacles to doing it. I think is absolutely must be done. MOPS cannot have a separate database because this would again make it inconsistent and the current databases would not be used.

What would be the institution hinderances to using this tool?
I don't see any hindrances or roadblocks, but I do see a lot of work that needs to be done. Another thing that scares me is that there is information sited in the program that isn't anywhere. That could be a roadblock. Where the information will come from is a good question. Traditionally, environmental information management has been left to information managers rather than environmental professionals. "I'm an engineer, I don't collect data". So the work has been handed off to clerks. Some of the information needed is difficult to collect. Getting the technical data beyond what is in the systems could be really tough. Rick thought GIS applications and data layers, would be a good idea.

Access to computers?
The availability of 386 and 486 machines is small. Region 10 is within 100 machines of being a one-to-one ratio of people to computers. People want these computer applications now and they want to be able to go to a tool box and get all the tools they need (including MOPS). There are VERY few 486 machines in the region offices. There hasn't even been a way for these machines to be bought.

General acceptance of DSS?
Acceptance of DSS is growing. Management has to lead and it sounds like they are here. Bill Schmidt and Bob Corson seem to have some knowledge of the information quality and computer issues.

There probably will be a problem at the staff level and acceptance. "You are what you were when." Unless the program captures their fancy, there will always be some resistance to change. People feel they got along without the tool before, why should they change now. However, you can get around this by having a combination of a good product and management support.

Would additional training be necessary to use this program or is the program self-explainatory?
Yes, some training would be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
The DRA would be an excellent source of support. Supposedly the deputy administrator saw it and liked it so that would be a good way to keep it in front of people. There is also the Office of Enforcement, though I'm not sure how they will fit in. However, it worries me that Barbara would see this as I have seen other attorneys and its use will immediately be restricted because she will

only want one person to look at it because of confidentiality. My hunch is that she would worry about enforcement sensistive stuff.

Ray Peterson
Interview Summary
July 18, 1991

I interveiwed Ray Peterson and Bill Schmidt on April 4 about possible GIS applications for this program. At that time I was also informed of Ray's ideas about possible other criteria so some of the information to answer these questions can be found in the previous interview.

Does this program capture the decision making process?

I haven't sat in on the enforcement targetting committee meetings so I don't know all that they consider. Personally, I would say the program probably doesn't capture the decision making process and that there are other areas of data out there that could be incorporated in the overall ranking process. But I don't think the managers have thought about how to incorporate this data such as some of the targetting and vulnerability information, risk assessment, population densitys we talked about in the earlier interview. No one has sought out this information yet or thought about how to use it, but from a personal standpoint, I would want to see it included.

Criteria

Are the criteria used appropriate?

If you are going to use this as a screening tool, it is necessary to think about it in terms of data layers because it is very difficult to determine the true risk at a sight without requiring more data than you would have available. We're targeting for risk and vulnerability and hazard potential. Its really more of a crossed over screening device.

Other things that could be added could be population density and demographics. This could also come into use under the human health criteria. I'm not sure if we looked at recreation very much. For example, if the problem site was near a reservoir where people spent a lot of time. I think we need to revisit how we're going to think about human health and the vulnerability and what were going to include and still keep the program in a form that can be useful for screening and not too complex.

I don't think we talked about grazing the state programs. The states carry out some of the federal programs and they may have facilities that EPA does not track. For example, EPA only tracks major sources in the water branch, while a state might track minor facilities as well. This would not necessarily be relevant since this tool will be used to rank EPA facilities. However, the need for taking this to the state level and getting their support has also been discussed and the fact that the states may have more facilities than EPA must be considered in that light. Another potential of the program is to guide overall environmental policy and at this level, the states would also need to be considered.

So you can always add a number of things to the program, but there is always the question of how much will it cost to add another data layer and what will the benefits of the additional layer be. You also need to be careful that you don't get too detailed in one area and overlook another area.

Are there other aspects of performance that are not captured in these criteria?

In the interview on April 4, Ray suggested 3 other criteria that could be added. These were 1) the vulnerability of the setting, 2) a hazard potential criteria, and 3) a management criteria to

incorporate some of the subjective and political issues of managers. Please see the previous interview for more information.

Evaluation

Is the database information shown appropriate?
Other information would be necessary if the states were to use this program.

Is there other information used in the decision making process that is not shown?
Ray suggested a criteria to capture the subjective information used in decision making. He stated that he had seen other screening tools that had had different catagories for capturing subjective information. This criteria could state whether the ranking made was backed up by data, whether it was a professional judgement, or if it was a quess.

Ranking

Are the ranking methods chosen appropriate for this decision making process?
There are a million ways to rank things. If this is what the committe likes, I would guess it is fine.

Do the weighted ranking methods capture important information not available in the other methods?
I think this showed a good way to compare the importance of the criteria and showed how changing the weights of the criteria could change the rankings. I think this is useful. However, if you talk to 10 different people you could come up with 10 different ways of weighting things. I quess the test would be the administrative ranking system that Barbara Lither was talking about. If it passed whatever those tests are, that would be a good measure of success.

Would this program be useful to you in your decision making process?

I am not directly involved in the multimedia decision making process, but it is a tool we could use in showing people different ways of doing things. We show different programs additional ways of doing things and we could probably take some elements out of the program.

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Does the program provide the functions listed above?
I think that it does most of those functions. I'm not sure that it encourages the user to examine their own decision making process because I think some people are fixed in the way they do things. I think one of the more important things it does is provide a structure and generate a paper trail of the logic used to make a decision. I think it also would serve as a tutorial for new employees and explain to them what the decisions are based on.

Are these functions helpful to the decision maker?
Yes, I think these functions are helpful to a decision maker.

Are there other functions the program could fulfill?
There probably are other functions the program could fulfill, but they would probably be more down at the technical level which the manager might not be so concerned about. Other features could be added that aid the technical people in their day to day work, but then, that may be too resource intensive to justify.

How can the program be improved?

I quess I would mention what Bill Schmidt talked about: that there might be too much latitude for some users. I think you would probably have to have a two user type system. One system could be used for the final process where people would not be allowed to change the weights and the other system would be for a more sophisticated user where the weights could be changed. For people who are not familar with the facilities, it may mean very little to them that the weights can be changed and this affects the ranking. For someone who is familiar with the facilities on the other hand, they may already have in their mind what the order should be and may be more confident in the weighting schemes that come out the way they expect. It would be interesting if you had a variety of technical people who are familiar with the facilities go through the ranking processes and see if you can come up with some kind of consensus on what the best or most appropriate ranking process would be for the region.

<u>Format</u>
Is the format of the program clear and easy to follow?
I thought the format of the program was very easy to understand and follow.

What would be necessary to make this program a useful working system at EPA?

What would be the hinderances to completing the tool?
One of the main hinderances would be the lack of communication between the databases. However, people are working on that. Other hinderances would be the poor quality of the data, the lack of management committment, and the lack of the dedication of resources to improve the databases. The managers are more concerned with their current tasks than with going back and correcting bad information.

Would the lack of complete and accurate information in the databases be a serious problem?
Yes, see next question.

Would the integration and downloading of the EPA databases be a substantial obstacle?
IDEAS is the headquarters program that does something similar to our program. If IDEAS works, that should simplify the downloading process. On the other hand, we may find that the quality of the information we're downloading is terrible and that will be a stumbling block. We are fixing the FINS numbers right now. We still have cases of multiple FINS numbers for the same facility. A check was done and it was found that the zip codes did not match the latitude/longitude readings for 25-30% of the facilities.

For Region X this is a lesser problem because we are not talking about as many facilities. I don't know what they do in the eastern regions.

What would be the institution hinderances to using this tool?
Access to computers?
Access to computers is good. We have about 95% coverage with computers. I don't see that capacity or storage would be a problem. There still seem to be two classes of people with regard to computers: those who use computers and like using them, and those who don't know very much about computers and don't want to get involved with them. However, this is changing too.

Access to 486 and 386 machines would be a problem today, but if this tool was decided to be important, that would not be a significant problem because we have a significant number of 386 SXs that for a minimum price could be upgraded in memory to make them run windows application. You would just need a manager to make this a priority and put the money into upgrading the work stations.

General acceptance of DSS?
I think people are pretty much over the hump of accepting desision support tools and I see acceptance of the tools in general.

Other hinderances?
There maybe a legal hurdle in having this accepted as an administrative ranking tool. We may have some troubles on the sensitivity of the data and what would be defensible. For myself, I would like to see this tool sitting in the library. I think citizens should be able to come in here and use it. It is my view that the more visible the information is, the better the overall decision made is. People are forced to put stuff on the table whether or not it is comfortable.

I've also found that the visibility of information can improve the quality of it. The facilities will not want to be misrepresented and will try to make sure you have the right information. My slogan is that "visibility drives accountability".

Would additional training be necessary to use this program or is the program self-explainatory?
I think you would need to do training for a certain group.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
It has been found that to really be successful you need your champion to be a top guy, because all the mid level guys start listening to him. So it is necesarry to have the DRA behind it. When Habbock was out here he seemed to like the program. However, a lot of the top management may be the people who are not as familiar with computers. Also the division directors might see the program as taking away some of their power to decide on the facilities to be inspected. The program could put their thought processes on the line and they might be somewhat threatened by the program. I think the branch chiefs are supportive of it and even the section leaders. Probably the division directors will be the most resistent. Most of the section chiefs come up through the technical ranks and are engineers whereas most of the division directors are managers.

Ann Pontius
Chief, Air Compliance
Interview Summary
July 2, 1991

Ann was going out of town for two weeks the day after our interview. She had graciously, but somewhat reluctantly agreed to squeeze time to talk to me in her busy afternoon before she left. However, she was anxious to get back to her other work, and I wanted to inconvenience her as little as possible, so this interview is probably not as thorough as some of the others.

Does this program capture the decision making process?

Yes, Ann thinks it does. She was impressed with the presentation and how the databases were combined.

Criteria

Are the criteria used appropriate?
Yes, she thought they were appropriate from her interpretation of their meaning in the air program.

Are there other aspects of performance that are not captured in these criteria?
Not that she could identify.

Evaluation

Is the database information shown appropriate?
She suggested I talk to Betty Swan to get more specific database information. (Betty is on vacation now. I will talk to her when she returns.)

Is there other information used in the decision making process that is not shown?
Same as above.

Is the process of choosing scores for different criteria appropriate for this decision making process?
She didn't know how else it could be done. The scale could be different, say one to five rather than zero to nine, but she thought it was fine as it was.

Ranking

Are the ranking methods chosen appropriate for this decision making process?
Ann thought that the different ranking methods provided different perspectives on the facility rankings. She liked the fact that different ranking methods could be compared and thought that it was interesting to see how the facility rankings changed depending on the weighting factors used.

Do the weighted ranking methods capture important information not available in the other methods?
Yes.

Will the user have confidence in the prioritized lists of facilities produced?
It was felt that the confidence in the lists produced would correlate highly with the results of some test cases run. She suggested we compare the results obtained from the program with the results obtained by experts from intuition and thinking about the facilities. She suggested a good test case could be the "Industrial Section" for Washington state which oversees 22 facilities, all of which would be multimedia dischargers.

Ann felt that in terms of process, the program looked objective and should give an accurate answer.

Are there elements of the decision making process that are not captured?
It was felt that the program should be objective and shouldn't try to capture the political situation. The political issues are a level above this process and should stay there.

Would this program be useful to you in your decision making process?

Yes.

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Ann liked the exercise of ranking the functions of the program in the questionniare. It made her think about which function is the most important. She thinks we will get a wide variety of answers on this question. She stated that it was difficult to rank the functions 6 or 7 because she still felt they were important, but must be ranked lower than the others.

Does the program provide the functions listed above?
Yes, as far as she could tell.

Are these functions helpful to the decision maker?
Yes, see ranking in questionnaire.

Are there other functions the program could fulfill?
She couldn't think of any.

How can the program be improved?

She did not have any suggestions at this time.

Databases

Is the information in the databases relevant? How could it be more relevant?
Could the information in the databases be more comprehensive?
Are there other sources of information that should be cited?
Ann stressed that the quality of the data is crucial. Most of the data for the air program is input by the states. Often it is not input at all or if it does get in the system, it is not put in the right place and is difficult to retrieve. Compliance history data is particularly a problem. Work is being done to improve this situation, however, for this program if the compliance history information is in the system at all it is probably in the comments section rather than in a field where it could be retrieved.

Criteria selection

How could the criteria be improved?
She thought that the criteria presented captured the process pretty well.

Should other criteria be added?
She could not think of any.

Should these criteria be removed? (for lack of information or other reasons)
No.

Ranking Schemes

Are all of the ranking schemes appropriate?
Yes, she thought it was interesting to see the results of the different ranking schemes.

Are there other ways of ranking the facilities?
Not that she could suggest.

Is the ranking process easy to understand and follow?
Yes, she didn't have any problems with it.

Are the different ranking methods displayed appropriately?
Yes, but she was concerned that the program might get crowded and complex if many more facilities were ranked.

Format

Is the format of the program clear and easy to follow?
What would improve the format of the program?
She thought someone could learn to work through the program quickly.

What would be necessary to make this program a useful working system at EPA?

To make the program successful, it must have someone in charge who cares about its success. Ann suggested that a leader might come from the Office of Enforcement. Ann stated that coordination among the programs can be spotty at times and that a central person was needed to sheperd the program, to be the expert, and to care about it.

What would be the hinderances to completing the tool?
Data quality would again be a serious problem.

Would the lack of complete and accurate information in the databases be a serious problem?
See above.

Other hinderances?
Another problem could be the timeliness of the input of information by the states. At present the information comes from the states on a quarterly basis. EPA is trying to get it on a monthly basis, but often doesn't.

What would be the institution hinderances to using this tool?
Ann sees the greatest institutional hinderance in people's resistance to change. Some people believe that things have "always" been done in a certain way. Each program has made their own independent evaluations. The idea of a multimedia enforcement office is not new. They have had such an office on and off for a long time, but there has been some strong resistance. The programs have been autonomous and some of the people feel that multimedia will mean that someone is trying to micro-manage them.

Other hinderances?
This program must be sold to the states. If the states see a benefit in it for themselves, they may make a greater effort to put information in the databases more quickly and accurately. Ann thinks this is a great program and expects that the states will want copies of it to use in their own programs. However, the program must be sold to the states to be successful. It can't just be shoved down their throats. It must be shown that the program will make their job easier.

Would additional training be necessary to use this program or is the program self-explainatory?
Probably some training would be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
Ann felt that if Bob Corson was behind the program, it should go fine. She feels that he is a powerful person that could "champion" the program.

Ann also suggested that an individual in charge of multimedia enforcement would be a good "champion". Barbara Lither is the head of the Office of Enforcement, and Ann suggested that Ellen Peterson, on Barbara's staff is very good with computers and would be an obvious choice.

Bill Schmidt
Interview Summary
July 13, 1991

Does this program capture the decision making process?

Yes, I think it does. (Though my opinion is biased as I have been involved in the development of it.) It captures all of the things we wanted to do initially and that is to look at the data and target the data we think is necessary to make a decision. It includes the violation and compliance history data, and the ecological and health considerations I think this program captures all of these things. However, down the road I think we will need to separate the facility from the setting that it is in and look at these two aspects independently. In the current program I think the person using the system can take both of these things into account: the nature of the waste and the nature of the environment it is going into. However, it might be easier for the uninitiated if we were to separate these two ideas.

Criteria

Are the criteria used appropriate?

On one hand there is the hazardous potential of the source and on the other hand there is the setting that the source is in. I think the important thing is to try using the program as it is and see how useful it is and after we get some experience to go back and take a look at it again. I think that eventually this will be adopted by the agency and used nationally. Habbock was pleased when he was out here. The key will be how this can be integrated together with the rest of the programs going on in multimedia.

Ranking

Are the ranking methods chosen appropriate for this decision making process?

Yes. I couldn't think of other ways to look at it or present it. Right now it is a thousand times better that what we do right now which is to set a number of people down in a room and say "What do you think?" In fact we're doing the last multimedia inspection for this year and we have only found one facility we could refer to the Department of Justice. I think this a reflection of picking the sources on the basis of what one thinks rather than looking at the databases.

I think the six ranking schemes cover the range of possiblities. If you have one source come up on all of the rankings or four of them, you could feel pretty confident that that source should be looked at.

Do the weighted ranking methods capture important information not available in the other methods?

Yes. I can't think of any better way to do it right now.

Would this program be useful to you in your decision making process?

Well, most people you interviewed were responsible for a specific program and they have different marching orders from headquarters than I do. From a multimedia standpoint, which is where ESD gets more involved, I don't know of a better way to make a decision. Most programs are required to come up with a neutral inspection scheme. If you could put as much pre-decision making as possible into the system you might be able to come up with a system that would satisfy

the criteria of being a neutral inspection scheme. Barbara Lither says that you only need a process to be considered a neutral inspection process. If that is the case, the expert system can be used by all of the programs for what they need, and will definitely help ESD in making decision from a multimedia standpoint. I think the longterm value of this in not in inspections, but in writing permits, because I think what will come out is that it will show that if a facility is evaluated on the basis of its permit, they are not violating very much, but if you look at them in terms of the harm done to the environment, they may come out very high so the permit would need to be rewritten. I think it is very valuable as a decision making tool, but I feel the greater use of it will be how to write permits rather than where the inspections should be done.
Headquarters looks at the referalls because the Department of Justice wants to do the work. They want to be the ones to take these companies to court and get the credit for it. Today the emphasis is on referalls, hopefully tomorrow it will be on how much of the environment you are cleaning up.

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Does the program provide these functions?
Are these functions helpful to the decision maker?
Function 1: I think automating parts of the decision making process is very important. I think we have already proved that. Right now people make decisions based on the information in their head, but with this program, they will be able to use the database information and the more you can get this information out to the decision makers, the better your decisions will be.

Funcition 2: There is no question that it provides a structure for decision making and that this is helpful.

Function 3: The paper trail already exists to some extent, but what this program does is organize the paper trail. It organizes what the thought process is and makes it easier to finish the paper trail. With this system you have all of the information in front of you: we make the decision based on this data, using this kind of an evaluation, and therefore we are going to do this. It organizes the paper trail and makes the process easier to document.

Function 4: It definitely standardizes the decision making process for multimedia decisions. If each of the programs used it for their own decisions, it could also standardize that. I think in the future, the program will standaridize the way we do business. I think that right now, it may not.

Function 5: It would be good for new employees to go through the whole process and see how we make decisions. However, I think it is more of a management tool, than a tool for new employees. It could be a teaching tool for managers in decision making.

Function 6: Yes, its easy to say we want to inspect Boise Cascade because they've been a problem in the past. But looking at the data and going through this process, will encourage the user to examine their reasoning.

There is one disconnect because in general the person who sits down and uses the tool will probably be an employee of the decision maker rather than the decision maker him/herself. The employee will go through the process on the computer and come up with a list and the decision maker will look at it and say "Yes, lets go with that facility". I don't know if it will encourage the decision maker to examine their process, but it will surely make the system as a whole look at what goes into a decision.

Function 7: Yes it does as long as its used in conjunction with the other databases. I don't know if it provides access to the information because the information is already in the other databases, but it organizes the information you need to make the decision.

Are there other functions the program could fulfill?
I would like to see the program eventually set up as a template so you could add other programs if you wanted to. For example, you could add a module on pollution prevention and perhaps the facility would be ranked lower because of what they are doing in terms of pollution prevention. Also, TOSCA information could be add, or information on underground storage tanks. For this to be a long term program, we would need that flexibility and be able to add other things.

How can the program be improved?

Bill suggested we listen to Ray Peterson and Barbara Lither.

What would be necessary to make this program a useful working system at EPA?

Top leadership support. This is always the case. To get the resources to develop something, you must have top leadership support. Right now the leadership is behind it. However, because multimedia inspections are a major resource drain, people are beginning to question the cost/benefit of doing them and trying to do multimedia inspections that cost less. Right now EPA is being asked to show that they are gaining more out of doing multimedia inspections, than they would be by doing single media inspections. If the end result is that it is not cost effective to do multimedia inspections, then top management support dwindles and this thing dies. Management support both outside and inside the region is important. Barbara Lither will be the driving force here. The job in Region X is to show that multimedia inspections are cost effective and that we do need a decision making tool.

Would the lack of complete and accurate information in the databases be a serious problem?
Data is always going to be an obstacle. It is always an obstacle, but it will be less of an obstacle in this region, than in others. GIS is helping to gather the data and look at the setting of the facilities, the environmental resource data, layers of supporting information such as population densities, where the ground water aquifers are, etc. are being gathered in this region so this information will be available. We're also working on the risk assessment aspect and gathering that data. So the obstacles are still here in this region, but less than in other regions. E-map is a way to evaluate the state of the environment nationally by a statistical analysis of the whole country divided into grids.

Studies are done in each of the grids to determine the impacts on the biota, the purity of the air, etc. Someday, this information will be available and then it could be used in this program too.

What would be the institution hinderances to using this tool?
I don't see any at this time, If we get away from the multimedia perspective, we may go back to the old single media method of inspections. Or EPA may lose all of its responsibility for inspections and the programs may go back to the states. One of our goals as we figure out how this system works, is to get the states involved in doing it the same way. This is going to be a hard sell in many cases. Institutionally, there will be some hinderances. We can not sell this to the states unless we can show them that it will save them work because they can't take on any more work than they already have. Most of the inspections are done by the states and most of the information comes from the states so their desire to buy into this is important.

Access to computers?
This place has gone computer crazy. The problem is that most people are hooked up to the LAN system. To give them something more sophisticated may not work too well. On the other hand, the scientific types go far beyond this. Right now we only have two 486 machines.

I think it is expected that ESD will probably use this system along with the Office of Enforcement. I would like to move a lot of the responsibility to the Office of Enforcement because they have more control. The other branches give ESD resources and we work for them, but we can't tell them what to do.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
The Office of Enforcement is directly under the deputy regional administor who has control of everyone. That is the right focal point. My boss, Bob Corson may disaggree with that, but I think that is where this will need to be in the long run.

Dan Tangarone
Interview Summary
July 17, 1991

Dan is a member of the multimedia targetting committee. He came up with the first list of multimedia facilities that could be possible candidates for multimedia inspections.

Does this program capture the decision making process?

Dan didn't feel like he really knew from the demonstration what went into the ranking process and how the numbers were manipulated and he didn't feel he could answer this question.

He didn't feel he knew what the program does and he didn't know that you could standardize the decision making process across programs. He was also not sure that all the important programs were represented in the model. Why aren't the other programs with a regulatory mandate such as TOSCA or Drinking Water included?

Criteria

Are the criteria used appropriate?

He felt that he really don't know. He could say that knowledge about those criteria would be necessary to come up with a ranking, but whether or not the criteria can be used to prioritize the facilities, he didn't know. He felt he didn't understand the reasoning that goes from the criteria to the rankings. The potential for health hazards he didn't think would have much bearing. The purpose of doing the multimedia inspections is to produce referrals. Management wants to get a lot of enforcement actions from the process. Dan didn't know that our system would actually be able to identify the best sources for referral or enforcement actions.

Ranking

Are the ranking methods chosen appropriate for this decision making process?

He thought they seemed to be reasonable.

Do the weighted ranking methods capture important information not available in the other methods?

Yes, it is valuable to be able to change the weights of the critieria..

Will the user have confidence in the prioritized lists of facilities produced?

They would have to be able to understand easily how the program works and what they are doing when they use it. Documentation is a key here. Who is going to be using the tool? Is it something that many people will use or only a few people a few times a year?

Would this program be useful to you in your decision making process?

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Does the program provide the functions listed above?

In regard to function 1 Dan stated: "This will never happen. The program will be run and they will come up with a list of sources and will then make a decision based on political considerations. I think this will be a useful tool, but it will not automate the decision making process. We haven't had anything like this around here for a long time. What worries me about this system is how is it going to get tweaked in the future. How are the people here going to understand it to the extent that the original programmers do."

Dan felt that we should not limit the universe to the facilities that have violations in two or more media. He felt that we should really be looking at all of the facilities that discharge into more than one media. Dan felt that all of the facilities that have multiple SIC codes should be considered. Any facility that is regulated under more than one environmental law or mandate.

Dan stated that if management was going to spend all of the money and resources on a multimedia inspection, they wanted to be able to nail the people for violations - they wanted referrals for enforceent actions. He felt that our program should identify the people that have a large probability of having many violations right now.

Are these functions helpful to the decision maker?

Yes, Dan thinks this could be a good tool for people to use in prioritizing the facilities. But everyone who uses it is going to ask "how does this work?, how does it get its information?, what does it look at and what does it disregard?" Dan felt that good documentation was going to be crucial.

Dan felt that the sixth function of encouraging the user to examine their own decision making process, was the most important function and that the tool could be very useful in that way. He felt that it would NOT automate the decision process at all. He felt that the second function of providng structure, was applicable, but he didn't see the use in generating a paper trail. He liked the way the sixth function was worded and felt that the third function could come under that.

Are there other functions the program could fulfill?

Dan felt that one of the most useful functions of the program would be to bring up or point out a number of facilities that would not necessarily be thought of by the people knowledgable of the most well known "bad actors". He felt that he could quickly and easily generate a list of potential candidates for multimedia inspections, but maybe because of the speed of computers, we could

come up with a more complete list than he could make. He felt that for credibility, we must look at the whole universe.

What would be necessary to make this program a useful working system at EPA?

First of all it has to be simple, easily understood, and it has to demonstrate that it is based on intuitive thinking. And it has to be easy enough to run that you can do it with out someone looking over your shoulder. If a program is to complex, it will never be used. The things that stay around are the applications that have a simple function and the application where users can understand how the tool is working and the value of the software.

What would be the hinderances to completing the tool?
Would the lack of complete and accurate information in the databases be a serious problem?
Data quality is definitely something to consider and could be a real problem. Right now a lot of information sits in file folders that no one can get access to and that is not used.

What would be the institutional hinderances to using this tool?
I don't see any problems. But they haven't done much of this in the past. I think that the idea of an expert system helping you solve a problem is a good idea, but you have to be into it and understand the program to know its a good deal.

Would additional training be necessary to use this program or is the program self-explainatory?
Training would be needed. A fool proof manual is also necessary.

David Teta
RCRA Chief
Interview Summary
July 8, 1991

Does this program capture the decision making process?

David thinks it could. He is not sure what all the bounds of the program are, but assumes that ultimately the universe of all facilities in the program would be available in the system. He thinks it does capture the decision making process, but that it over emphasizes some things. For example, for the human health and ecological impact critieria, there is always going to be a scant database so the program perhaps over emphasizes those criteria

Criteria

Are the criteria used appropriate?

David thinks the criteria are appropriate, but that there isn't enough information in the database for human health and ecological impacts for these criteria to be regularly useful. Perhaps the question is not whether or not they are appropriate, but rather do you have the data to be able to affectively evaluate this criteria? David agreed that all the criteria are important and perhaps the inclusion of the human health and ecological effects criteria in a system such as this could drive the inclusion of the necessary information in the databases.

It was suggested that the weighting of the criteria be looked at from a different perspective. It is not how important the criteria is, but the amount of information available that should be used to choose the weighting factors. The Human Health Impacts and Ecolological Effects are obviously important criteria and perhaps should even be driving the whole process, but if there is little information to support the scores chosen, perhaps the criteria should be given a lower emphasis. He suggested we change the weighting process and weight the criteria on the availability of the supporting data rather than on the importance of the criteria.

David saw the purpose of the program to be making sense out of the decision making process and doing it more systematically. It is not necessarily done this way currently. Decisions are made on a much more subjective level and this program will help make the process more systematic.

Are there other aspects of performance that are not captured in these criteria?

If the main purpose is to screen out the higher priority facilities, David thinks the program does a good job in capturing that. He felt that he wouldn't want to add anything else and complicate the system more and that the system should be kept to the basics as much as possible.

Evaluation

Is the database information shown appropriate?

David suggested that violation magnitude criteria should relate if the facility is in or out of compliance, and if out, how far out of compliance based on what is happening today. The compliance history criteria, on the other hand, could tell you historically how the facility has behaved. He suggested the last entry in the database such as the last inspection date and whether the facility has a Class I violation right now and if they are a high priority violator should be the

inforamtion displayed under

violation magnitude. There could also be a category of violations such as whether there is a ground water problem etc. The category would sometimes indicate the seriousness of the violation too. In the violation magnitude criteria, David felt that the emphasis should be on whether the facility is in or out of compliance right now.

He suggested that the information we have listed under violation magnitude currently be put under compliance history. The compliance history criteria would contain information about violations and EPA actions that occured in the past and violation magnitude would concern the present status of the facility. The information currently in compliance history would remain as well.

David suggested that for the criteria Human Health Impacts and Ecological Effects, information such as if the hazardous release has affected ground water could be pulled out of the database and might be useful. However, this information would not necessarily be distinguished between the Human Health Impacts and Ecological Effects criteria because it could be used for both.

Is there other information used in the decision making process that is not shown?
No, not really. He can't think of anything else that should be taken into consideration. There are probably things that are sometimes thought about like state relations, but these don't get factored in systematically and shouldn't be included in the system. In terms of narrowing down the universe of facilities, he felt that the key elements had been covered.

Is the process of choosing scores for different criteria appropriate for this decision making process?
Yes.

Ranking
Are the ranking methods chosen appropriate for this decision making process?
Yes, the ranking method options given are appropriate. He felt that he would probably have to play with the system to figure which method is more useful. He thinks Bill's point about developing some kind of consensus as to what the default ranking method should be was a good suggestsion. This would improve consistency.

Will the user have confidence in the prioritized lists of facilities produced?
The biggest hole is still going to be the lack of human health effects and ecological impacts data in the databases you are drawing from. This system may not capture the facilities for which there are high environmental or human health risks because you just don't have the data. It will capture the facilities that have the high violation magnitude or compliance history problems, but not the others. Often the people doing the inspections might know of the human health risks or environmental impacts and these might be included in the RAF or closure plans. Facilities may have unregulated units which don't appear in the database, but are still environmentally hazardous. However, there is no way to get this information through the RCRIS database and it is not determined objectively, but subjectively. People who are responsible for the sites would know this information, but it is not easy to gather the information and get it back to a central point where it could be evaluated. Until this information can be obtained, there would not be a lot of confidence in the system because of the lack of data. However, there is an RAF score which is based on a judgement call that gives the site an environmental ranking that is in a different database. However, this database only deals with TSD facilities and does not separate human health and environmental impacts. Dawnee Dahn, would be the person in charge this database (called the Corrective Action database).

Would this program be useful to you in your decision making process?

David thinks the program would be useful as a multimedia process if it can help the media program chiefs arrive at some consensus as to what the top multimedia facilities are. He believes it will be useful once the database information can be downloaded.

Functions of the program.

The program will:

1) **automate portions of the decision making process**
2) **provide a structure for decision making**
3) **generate a paper trail**
4) **standardize the decision making process**
5) **serve as a tutorial for new employees**
6) **encourage the user to examine their own decision making process.**

Does the program provide the functions listed above?

I'm not sure how much of a tutorial it would serve as. It could be used to familiarize new employees with the multimedia process and how decisions can be made, however, most of the people working on multimedia issues are in the management level. It is complex enough trying to get the media program chiefs to coordinate efforts and work together without worrying about coordinating their staff.

Are these functions helpful to the decision maker?

Yes.

Are there other functions the program could fulfill?

No, I can't think of any.

How can the program be improved?

Factoring in the lack of information in the weighting process was suggested. This is discussed in the criteria appropriateness question.

Format

Is the format of the program clear and easy to follow?

David was confused on the difference between compliance history and violation magnitude, but didn't think we should change the names. The help sections are probably adequate to explain the differences.

What would improve the format of the program?

It seemed pretty good. He can't think of how he would improve it.

What would be necessary to make this program a useful working system at EPA?

*Getting the data downloaded would be crucial. Realistically you will need someone, not one of the section chiefs, but who works maybe in the office of enforcement, to do this system. Someone like Ellen Peterson in the Office of Enforcement. Ellen works for Barabara Lither.

What would be the hinderances to completing the tool?
The fact that you have to have the states maintain most of the data. The quality of information is always an issue. It should be recognized that a few facilities will be missed due to the lack of data, but this system would organize the data available and the lack of accurate and complete data is a problem with or without this system.

Would the lack of complete and accurate information in the databases be a serious problem?
Yes.

Would the integration and downloading of the EPA databases be a substantial obstacle?
No idea!

What would be the institution hinderances to using this tool?
The fact that there are four different programs. David thinks the program needs to be done from a central program.

General acceptance of DSS?
Most people recognize the garbage-in/garbage-out problem of any computer system so he would expect some reluctance to accepting the system. To the extent that the section chiefs have to work with it, there will be reluctance. David stated that if he was expected to use the system and he knew there were problems with it, it would bother him a lot more than if someone else, such as a central person used the system. He would be willing to accept the results of the system of someone else did the work. The central person would perhaps be needed to teach the person how to evaluate the facilities in each of the different programs.

Would additional training be necessary to use this program or is the program self-explainatory?
Some training would probably be necessary.

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?
See above at *.

Appendix D

Responses to the Questionnaire for MOPS

Responses to the
Questionnaire for MOPS:
the Multi-Objective Prioritization System

(Please circle the appropriate number or briefly describe as necessary.)

Ease of learning

1. **How difficult would it be to learn to use this tool?**

very difficult		somewhat difficult		not difficult
1	2	3	4	5
		3	6	1

2. **Do you think training sessions would be necessary to learn to use this tool?**

definitely necessary		maybe necessary		probably not necessary
1	2	3	4	5
3	3	4		

Perceived Usefulness

3. **Would this program be useful to you in its present state?**

very useful		somewhat useful		not useful at all
1	2	3	4	5
2	4	3	1	

4. **For what purposes would you use this tool? (How would you use it?)**
Please describe briefly.

Gil Haselberger - Not clear at this point how applicable it would be due to nature of TSCA and PCB regulations.

Dan Tangarone - Provide list of sources where inspections (if conducted) would provide higher probability of resulting in an enforcement action.

Greg Kellogg - Determining the universe of facilities with multi-media violations/rankings.

Ann Pontius - Ranking for enforcement actions and which sources to inspect or request information from.

David Teta - To get a list of priority multimedia inspection sites.

Ray Peterson - To our GIS section, some usefulness in demonstrating technological tools to aid decision making.

Bill Schmidt - To evaluate facilities for multimedia inspections and/or for prioritizing permit modifications.

Barbara Lither - Inspection targetting.

5. **How confident would you be in the prioritized lists of facilities produced by this program?**

very confident		somewhat confident		not confident
1	2	3	4	5
1	3	4	1	

6. **What would make you more confident in the list of facilities produced by this program?**

Paul Boys - Knowing more about what information base was used and how the program does the rankings.

Gil Haselberger - Clearer understanding of methodologies for ranking human health and environmental factors.

Dan Tangarone - Knowing the data that was analyzed would increase my confidence. All sources for which data is available should be included.

Greg Kellog - GI/GO. The quality of the national databases used to feed this system will always be suspect.

Ann Pontius - Confidence level is built on the qualtiy of data going in, so until I'm confident of our database, I won't be very confident. The system is fine.

David Teta - Better environmental and health info.

Ray Peterson - QA of data, sensitivity analysis of factors.

Bill Schmidt - Better knowledge of environmental impact and knowledge that the existing permits really reflect environmental considerations.

Barbara Lither - Quality of input data.

Rick Martin - If I knew there were agreed upon rules.

Functions of the program

6. **Which of the following functions would you find the most useful in your work? Please rank them.** (1 - most useful, 7 - least useful)

Average	The functions of the program are:
4.2	2 3 3 4 4 4 5 6 7 - to automate portions of the decision making process
2.2	1 1 2 2 2 3 3 3 3 - to provide a structure for decision making
4.8	2 3 4 5 5 6 6 6 7 - to generate a paper trail
2.6	1 1 1 1 2 4 4 5 5 - to standardize the decision making process
6.4	6 6 6 6 6 7 7 7 7 - to serve as a tutorial for new employees
4.3	1 2 4 4 4 4 5 5 7 7 - to encourage the user to examine their own decision making process
3.2 database	1 1 2 2 3 3 5 5 7 - to make pertinent information from the easily accesible.

7. **Are there other functions the program could fulfill?**
   Please describe briefly.

Greg Kellogg - Trend analysis eg. singling out an industry type based on information in database.

Bill Schmidt - To evaluate permit conditions; to determine where to focus environmental studies.

8. **Does the program provide the functions listed above?**

How well does the program:

1) automate portions of the decision making process? No answer

very well		somewhat		not at all
1	2	3	4	5
2	6	1	1	

2) provide a structure for decision making?

very well		somewhat		not at all	
1	2	3	4	5	
5	3	1			1

3) generate a paper trail?

very well		somewhat		not at all	
1	2	3	4	5	
4	3	2			1

4) standardize the decision making process?

very well		somewhat		not at all	
1	2	3	4	5	
1	5	2	1		1

5) serve as a tutorial for new employees?

very well		somewhat		not at all	
1	2	3	4	5	
1	2	4	1	1	1

6) encourage the user to examine their own decision making process?

very well		somewhat		not at all
1	2	3	4	5
3	3	2	2	

7) make pertinent information from the database easily accesible?

very well		somewhat		not at all	
1	2	3	4	5	
1	5	3			1

Ability to model the decision making process

9. **In general, does this program capture the multimedia enforcement decision making process?**

very well		somewhat		not at all	no answer
1	2	3	4	5	
1	3	2	1		3

10. **Are there elements of the decision making process that are not captured?**

definitely		maybe		not that I kow of
1	2	3	4	5
3	3			2

11. **What elements of the decision making process are not captured in this program?**
Please describe briefly.

Gil Haselberger - Program does not address other factors that must be considered like: political aspects; '"hot" information which exists outside of existing records (like a tip or complaint).

Greg Kellog - Enforcement discretion based on human review of inanimate data.

David Teta - Information on health and env., community concerns, state concerns.

Bill Schmidt - Political realities; Pollution prevention measures by facilities; Other current compliance programs like TSCA and any future compliance programs.

Barbara Lither - Subjective elements - such as geographic or other national initiatives; Also, info. obtained about other media viols. at a site, or info. that is very current and not in the database, or obtained by informants.

Appropriateness of criteria

12. **Are the criteria used appropriate?**

	very appropriate			not appropriate		no answer
Violation Magnitude	1	2	3	4	5	
	5	2	1			2
Compliance History	1	2	3	4	5	
	6	1	1			2
Ecological Impacts	1	2	3	4	5	
	2	2	2	1		3
Human Health Impacts	1	2	3	4	5	
	2	2	2	1		3

13. **Are there other aspects of performance that are not captured in these criteria?** Please list other potential criteria.

Paul Boys - Potential for environemntal impact i.e. TRI emissions, storage/use of large quantities of toxic chemicals.

Bill Schmidt - Eventually separate the potential ecological and health impacts related to the source and the sensitivity of the environment where the source is located.

14. **What would be necessary to make the program into a useful working program at EPA?**

Paul Boys - It already appears to be a useful program. I am not familiar enough with it, however, to identify deficiencies or features to add.

Gil Haselberger - Top managment exposure and commitment to it; Establishment of policy/procedures to implement its use; Assurance of enough computer capability to make it available widely; Training

Dan Tangarone - Access; Reliability (demonstrated); Ease of use; Detailed documentaion; Ability to select sources

Greg Kellog - I think we can use it as it is. We are not interested in a program that eliminates discretion. Plus I am concerned that once created, any deviations may be considered "arbitrary and capricious" by a court.

Ann Pontius - Getting each program to make sure the data entered is of good qulatiy. Also, we would probably need to have one office have responsibility for ensuring the program is routinely run for multimedia.

Ray Peterson - On LAN; Auto download of info from main frame.

Bill Schmidt - Integrate it into other databases which supply it the inforamtion it needs; To sell it and prove it as a good tool for decision makers; Provide training on its use.

Barbara Lither - You're on the right track; Get bugs out of system; Run it by EPA to troubleshoot; Market and training.

Rick Martin - Nail down the rules; Determine data needed for MOPS from national data systems; Determine to what extent its use is Region "policy".

15. **If you could change one aspect/feature/concept of this program, what would you change?**

Paul Boys - I don't know enough about using it to comment on this yet.

Ray Peterson - Add other databases and state information.

Bill Schmidt - Provide flexibility to add more criteria and more media program modules.

Barbara Lither - More available on EPA equipment.

Rick Martin - Make it LAN compatable with Region 10 architecture.

Appendix E

Interview Questions

Interview Questions for Phase III
of Multimedia Enforcement Project

Does this program capture the decision making process?

What elements does it capture?

Criteria

Are the criteria used appropriate?

Are there other aspects of performance that are not captured in these criteria?

Evaluation

Is the database information shown appropriate?

Is there other information used in the decision making process that is not shown?

Is the process of choosing scores for different criteria appropriate for this decision making process?

Ranking

Are the ranking methods chosen appropriate for this decision making process?

Do the weighted ranking methods capture important information not available in the other methods?

Will the user have confidence int he prioritized lists of facilities produced?

Would this program be useful to you in your decision making process?

Functions of the program.

The program will:

1) automate portions of the decision making process

2) provide a structure for decision making

3) generate a paper trail

4) standardize the decision making process

5) serve as a tutorial for new employees

6) encourage the user to examine their own decision making process.

Questions

Does the program provide the functions listed above?

Are these functions helpful to the decision maker?

Are there other functions the program could fulfill?

How can the program be improved?

Databases
Is the information in the databases relevant? How could it be more relevant?

Could the information in the databases be more comprehensive?

Are there other sources of information that should be cited?

Criteria selection
How could the criteria be improved?

Should other criteria be added?

Should these criteria be removed? (for lack of information or other reasons)

Ranking Schemes
Are all of the ranking schemes appropriate?

Are there other ways of ranking the facilities?

Is the ranking process easy to understand and follow?

Are the different ranking methods displayed appropriately?

Format
Is the format of the program clear and easy to follow?

What would improve the format of the program?

What would be necessary to make this program a useful working system at EPA?

What would be the hinderances to completing the tool?

Would the lack of complete and accurate information in the databases be a serious problem?

Would the integration and downloading of the EPA databases be a substantial obstacle?

Other hinderances?

What would be the institution hinderances to using this tool?

Access to computers?

General acceptance of DSS?

Knowledge and experience of managers and staff with DSS?

Other hinderances?

Would additional training be necessary to use this program or is the program self-explainatory?

Can you identify a "champion" in each media program who would be responsible for disseminating the information on the program, educating people to the uses of the program, and defending the program?