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USING MINED SPACE FOR LONG-TERM RETENTION OF NONRADIOACTIVE HAZARDOUS WASTE

VOLUME 1 - CONVENTIONAL MINES

by

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Contract No. 68-03-3191

Project Officer

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OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268**

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FOREWORD

The Environmental Protection Agency was created because of increasing public and governmental concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimonies to the deterioration of our natural environment. The complexity of the environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is the first necessary step in problem solution, and it involves defining the problem, measuring its impact, and searching for solutions. The Hazardous Waste Engineering Research Laboratory develops new and improved technology and systems to prevent, treat, and manage wastewater and the solid and hazardous waste pollutant discharges from municipal and community sources; to preserve and treat public drinking water supplies; and to minimize the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research and is a most vital communications link between the researcher and the user community.

The original studies of using mined space for long-term retention of non-radioactive hazardous waste were done 10 years ago. This report documents development of the concept since then. The assessment includes applicable regulations, permitting requirements, and technological advances that have expanded the definition of mined space to include solution-mined salt caverns as well as conventionally mined space. The use of mined space for retaining hazardous waste provides an environmentally acceptable alternative for storing untreatable and residual wastes that are difficult or expensive to manage with existing technology.

David G. Stephan, Director

ABSTRACT

This report is the first of a two-volume document that assesses the current status of using mined space for long-term retention of nonradioactive hazardous waste. This volume updates previous studies conducted in 1974 and examines, (1) recent literature published on the subject, (2) determines the involvement of government agencies, (3) reviews regulatory and permitting requirements, and (4) identifies existing mines for a potential demonstration project. Volume 2 expand the definition of "mined space" to include space created by solution mining in salt and investigates the use of such space for long-term retention of nonradioactive hazardous waste.

A search of 19 computerized data bases yielded relatively few articles or papers published in the past 9 years on the subject of hazardous waste storage in mines. This search was supplemented by data from in-house specialty publication data that were not in the computerized database.

A number of federal and state government agencies will be involved in the review and approval role of the siting process of any proposed hazardous waste facility. The number of such agencies and the extent of their involvement will vary, depending upon whether the facility is to be placed on private, or government-owned land.

Present regulatory and permitting requirements for hazardous waste facilities were found to be in accordance with the 1976 Resource Conservation and Recovery Act (RCRA), and 45 states have made application to assume primary control of the permitting process within their state.

Three mines were selected as meeting the specified criteria for a demonstration project. The most critical of the selection factors were owner interest and permitting requirements. If the owner was not interested in hosting the project the inquiry was discontinued.

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SECTION 1

INTRODUCTION

The continued health of an industrial society depends on its ability to remove, contain, and isolate the hazardous wastes it creates. This fact has been recognized for many years by government, environmental activists, and concerned industry. Concern over the issue is demonstrated by creation of the U.S. Environmental Protection Agency (EPA) and the enactment of numerous Federal laws and regulations.

The search for environmentally acceptable and economically viable methods for hazardous waste storage and disposal has been continuing, with much debate among legislators, industry, and environmentalists. A national waste management program was formed with enactment of the 1976 Resource Conservation and Recovery Act (RCRA) and the Hazardous Waste regulations promulgated under RCRA by EPA. Industry has attempted to comply with regulations, but has been hampered by the weaknesses of the existing technology.

The presently accepted methods of hazardous waste disposal are: deep well disposal, landfill in engineered pits, land treating of hazardous waste, and incineration.

The principal limitations of present disposal and storage methods are discussed as follows:

- o Deep Well Disposal - This method can handle only liquid wastes, and the direction and spread of the liquid is essentially controlled by the underground formation characteristics once it is injected. Though deep well disposal is widely used for liquid waste and brine disposal, present technology cannot assure that the practice will not pollute usable aquifers at some future date.
- o Landfill In Engineered Pits - Engineered landfill pits have been and are being used for disposal of hazardous sludges and liquids. This storage concept, in certain instances, and if properly utilized, can provide environmentally sound, long-term storage in many areas. However, a number of land fills for waste storage constructed in the past have encountered leakage, storm runoff, and high ground water problems. Review of past problems indicates that with appropriate and thorough engineering analysis and design, construction completed in accordance with that design and specific methods of landfill operations all performed under stringent quality assurance enforcement, past landfill problems can be controlled. Therefore, this method of hazardous waste disposal remains a viable option for certain wastes and certain suitable locations.

- o Land Treatment - In this method of disposal, the waste sludges or liquids are spread on tillable land. This method has limited applicability because of the large areas of land required and the slow process of biodegradation and assimilation of the sludges into the land. If not properly designed and operated, buildup of toxic materials in the soil and subsequent leaching of this material into surface and ground water may occur, in conflict with RCRA requirements.
- o Incineration - Though incineration is presently favored in the regulations, the use of incineration for waste disposal is limited by the types of waste that can be burned and by the production of air pollutants and ash which may contain toxic and harmful residues. This method can handle a large portion of the varied waste streams, but it is expensive and often requires the use of additional fuels to maintain combustion. Incineration cannot handle wastes containing heavy metals or noncombustibles.

After all present treatment and storage methods have been tried and found wanting in some respects the need remains for an ultimate disposal technique that can handle the residues from the other methods. When all of the chemical treatment, volume reduction, incineration, and other methods have been exhausted and waste can be reduced no further, a certain amount of toxic material will still remain for permanent disposal in an environmentally acceptable manner. The use of underground mined space appears to provide a technically and economically feasible method of permanent storage for untreatable wastes or the end products of hazardous waste treatment. The advantages of mined space for hazardous waste storage include the following:

- o Hazardous waste can be completely isolated from the surface environment.
- o Encapsulated, containerized or solidified wastes can be isolated from hydrological environment.
- o Security can be readily maintained.
- o Minimal or no continuing maintenance is required for sealed mines.
- o Conventionally excavated mines can be used as long-term underground warehouses if retrievability is desired. Mixed wastes in solution mined caverns cannot be retrieved.

The present concept of using mined space for hazardous waste storage originated in the United States with the Atomic Energy Commission in 1955 when they requested an advisory committee of the National Academy of Sciences - National Research Council (NAS-NRC) to identify geological formations in the United States that might be suitable for disposal of high level radioactive waste. In 1957, the NAS-NRC recommended that naturally occurring salt formations were possibly the best geological formations for this purpose. Field research was commenced in 1959 by Oak Ridge National Laboratories.

In the early 1960s the public was becoming aware of the consequences of industrial pollution and hazardous waste problems and legislation was introduced into the U.S. Congress to mitigate and control the problems. The 1970s saw a flood of legislation being passed to regulate and control the quality of air, water, and land contamination by pollution.

Europe, at the same time, was becoming aware of the pollution problem and in 1972 the first mine permit was issued to store hazardous chemical wastes. This mine was the Herfa-Neurode Potash Mine in Germany.

In 1974, the Environmental Protection Agency requested proposals for a study titled "Evaluation of Hazardous Wastes Emplacement in Mined Openings" and a contract was awarded to Fenix & Scisson, Inc. of Tulsa, Oklahoma. The conclusion of this study was that the storage and management of hazardous industrial waste in mined openings in salt, potash, and gypsum were both technically feasible and environmentally sound.

Purpose

The purposes of this project are to reflect activities which have occurred since related 1974-75 studies and to re-examine using mined space for the long-term retention of non-radioactive hazardous waste.

Approach

A three-phased approach was used in carrying out the project. The first phase included a review of the activities that have been conducted and changes that have occurred during the past 10 years in the use of mined space to retain hazardous waste. This review was based on a literature search to identify past and present research, government activities, activities associated with the development of commercial facilities, and foreign activities involved with the use of underground space for storing and disposing of wastes.

The second phase consisted of a review of federal and state regulatory requirements for obtaining a permit for an underground hazardous waste disposal facility.

Finally, the third phase addressed the selection of candidate mines for potential concept demonstration based on a review of past government and private client studies and reports. This assessment indicated a number of conventional mined spaces in limestone, salt, potash, and gypsum mines that might have a potential for hazardous waste storage. The literature search indicated that solution-mined storage caverns in salt offer additional storage possibilities.

Organization of Report

Each volume of this report addresses a separate aspect of the use of mined space. Volume 1 includes a search for suitable existing, conventional, mined space, in room and pillar salt and limestone mines for a demonstration of the concept of waste retention in mined space. This volume includes a literature review, an assessment of the involvement of government organizations, and a review of regulations and permitting requirements.

Volume 2 consists of a geological, geographical, and environmental assessment of the potential use of solution mined space in salt domes and salt beds for hazardous waste storage. This concept appears to offer an economical alternative for the permanent retention of hazardous liquids and slurries. The report includes a nationwide assessment of the occurrence of suitable salt deposits, the chemistry of the individual major deposits, a preliminary matching of the waste-generating regions to the salt deposits, the past history of the use of solution-mined space for hydrocarbon storage, a description of the solution mining process, a discussion of design and operating factors and recommendations for further research.

SECTION 2

CONCLUSIONS

1. Previous attempts to establish commercial hazardous waste storage in existing mines and solution mined salt caverns in the United States have not been successful.
2. The storage of hazardous wastes in mined space has been successfully demonstrated in the Herfa-Neurode facility in West Germany since 1972.
3. Hazardous wastes which ultimately must be disposed of, are often made up of a myriad of different chemicals and compounds, and occur in liquid, sludge, and solid forms. Research and study must be continued to arrive at suitable methods and techniques to safely handle and place these wastes in some stable form, isolated from the population and the environment.
4. Previous research, testing, and demonstrations conducted in support of the nuclear waste isolation program can be selectively used to expedite the planning, design, and preparation of a demonstration hazardous waste storage facility in existing mined space.
5. At this time local public opposition to any proposed hazardous waste storage site appears to be a greater obstacle to establishing a demonstration mine hazardous waste storage facility than technical and financial constraints.
6. Under the RCRA, EPA and states authorized to administer their own hazardous waste programs have developed relatively uniform technical regulations for hazardous waste facilities. The procedures for approving hazardous waste management sites and methods for assuring long-term financial responsibility, vary between states.
7. At this time, neither EPA nor any of the states have permitting or storage regulations specifically applicable to mined space for the storage of hazardous wastes.
8. Present EPA regulations appear to be sufficiently comprehensive that, by logical interpretation or extension, these regulations may be adequate to administer and control hazardous waste facility development and storage in mines. Under the RCRA, EPA appears to have adequate authority to promulgate any additional regulations deemed necessary to regulate hazardous waste storage in mines.

9. Three existing salt mines in the U.S. appear to have the best potential for developing a demonstration hazardous waste storage facility in mine space.
10. An existing limestone mine has virtually equal rank with salt mines as a potential demonstration site.

SECTION 3

RECOMMENDATIONS

1. Research should continue to develop permanent and economical waste encapsulation or containerization methods for transportation to and storage of hazardous wastes in mined space.
2. Continuing research should be supported for methods and procedures to determine the compatibility of hazardous wastes with other wastes and with potential mine host rock. Continuation or expansion of the hazardous waste compatibility studies, initiated by the ASTM through its Committee D-34, appear to be extremely worthwhile. This type of study and research could develop a computerized data base to evaluate potential disposal or storage facilities by both the government and private waste management.
3. Because of the extreme variety of wastes and host rocks plus the complexity of their analysis, a national computer and data processing center should be established to determine acceptable final treatments and compatibility of wastes if mixed, and compatibility of wastes with each other and with the mine storage environment.
4. Current operations of the Herfa-Neurode Waste Storage Facility in West Germany should be examined. The 12 years of operating experience proves the applicability of mined space for the storage of hazardous wastes. Their proven systems and methods should provide an excellent base for developing U.S. facilities. One approach would be to make a documentary film of their operation for U.S. viewing.
5. The following activities should be initiated to develop a mine storage demonstration facility:
 - (a) Develop a conceptual design of a demonstration project to establish the scope, time, and cost. This conceptual design should include descriptions of permitting efforts, facilities needed, duration of the project, manpower required, facility alterations, equipment needed and a closure plan.
 - (b) Select the demonstration mine.
 - (c) Seek agreements with candidate mine owners to allow further investigation of mine configuration and stability plus sampling of host rock.

- (d) Initiate action to obtain regulatory or possible legislative authority or relief for siting the temporary demonstration mine storage facility.
 - (e) Secure an option or agreement with the Owner for use of the selected mine.
 - (f) Develop detailed design and demonstration plans for a mine waste storage facility.
6. Efforts should be expanded to educate the public and their legislators of the possible effects hazardous waste will have in the U.S. if current treatment and storage practices are continued with no final treatment or permanent storage facilities.

SECTION 4

LITERATURE REVIEW AND UPDATE OF PROJECT ACTIVITIES

Recent Commercial Activities - U.S.

Louisiana - Empak, Inc. of Houston, Texas applied to the Louisiana Department of Conservation for a permit to build a hazardous waste facility on the Vinton Salt Dome in Southwest Louisiana. This project envisioned using solution mined caverns in the salt dome as final storage for hazardous waste (1). After this project was announced, a state law was passed (in 1983) forbidding emplacement of hazardous waste in salt domes for a period of two years. This was intended to allow the state time to evaluate the proposed use prior to issuance of a permit.

Texas - United Resource Recovery, Inc. of Houston submitted an application to the Texas Department of Water Resources for a permit to store hazardous waste in the Boling Salt Dome. This application was returned to the company for further elaboration and information, and has subsequently been resubmitted and is still pending (November 1984). This request, in turn, triggered a two-phase geological study to evaluate the acceptability of using salt domes in Texas for waste disposal, and to recommend guidelines for waste storage in domes. This study was performed by the Texas Bureau of Economic Geology (BEG) and was funded through October 1984.

Contract reports issued as a result of the study have defined the geological and technical issues involved with salt dome cavern hazardous waste storage. BEG has submitted a proposal for a continuing Phase III or second year of research. In their proposal, BEG indicates that the first year of study did not answer all critical questions, but that results did not disqualify salt domes as potential hosts for permanent isolation of toxic wastes (2).

Ohio - The proposed conversion of the PPG Industries, Inc., Barberton, Ohio Limestone mine to a waste storage facility in 1981/82 has been dropped. A public notice to this effect was issued by PPG Industries, Inc. on July 12, 1982. PPG cited "economic activities" as reason for discontinuing plans for this storage facility. However, based upon review of the public hearing records, it is assumed that the extreme public opposition to the proposed facility had a significant effect upon this decision (3).

Recent Activities - Foreign

Germany - The Herfa-Neurode facility continues to operate satisfactorily twelve years after its startup in 1972. Approximately 270,000 tons of

hazardous waste were placed in the mine in 10 years and the annual volume presently is running between 35,000 and 40,000 tons. Approximately 25% of this tonnage originates outside of Germany. The reuse of stored waste is possible and over 1,000 tons of waste has been retrieved by a waste producer and sent back to the originator for further use. The type of waste retrieved was not identified in the literature (4).

Other Countries

Two International Symposiums on subsurface storage in excavated rock caverns were held in Stockholm, Sweden in 1977 and 1980. These meetings, called "Rockstore 77" and "Rockstore 80," provided an international forum for technical discussion and interchange of the conceptual and technological advances in subsurface design and construction. General sessions during both Rockstore 77 and 80 covered environmental protection and the related use of mined space.

The majority of papers presented relative to the use of mined space for waste storage dealt with the safe disposal of nuclear wastes (5 and 6). Relatively few papers were concerned with other hazardous wastes. The West German representative discussed the Herfa-Neurode facility, which represented the only active mine storing hazardous waste. The representative from India indicated significant study in the use of existing and new caverns to reduce severe waste pollution in Central India (7).

The proceedings of Rockstore 77 and 80 indicate a large amount of research underway regarding geotechnical concerns and packaging and handling of radioactive wastes. It appears that some of this research may be applicable to the storage of other hazardous waste in mine space.

Recent Government Activities

Minnesota - The Minnesota Waste Management Board financed a study titled "Subsurface Isolation of Hazardous Wastes." This study was conducted by the University of Minnesota and was oriented to deep geologic waste disposal in crystalline bedrock, within the State of Minnesota. This work was completed in June of 1982. Following preparation of the report, the Waste Management Board made a survey to locate specific sites. They identified 18 mine study sites and anticipated reducing these to five sites for further investigation. The Minnesota Waste Management Board dropped the Crystalline Rock Concept from further consideration during a meeting on February 24, 1984. While having no documentation of the reasons for dismissing further mine storage study, private sources have indicated that they were not technical reasons and that public opposition to the tentative storage locations was intense.

The U.S. Environmental Protection Agency has sponsored studies and development projects in recent years covering the fields of encapsulation, containerization, and fixation technologies. The developments from these and related projects have provided valuable background information on containment which did not previously exist and would apply directly to the use of mined space for retention of hazardous waste (8).

In 1976, the Environmental Protection Agency requested proposals for a "Cost Assessment for the Emplacement of Hazardous Materials in a Salt Mine" and a contract was awarded to Bechtel Corp. of San Francisco, California. Work was completed on this contract in 1977 (9).

In 1982, a study was conducted by the Committee on Disposal of Hazardous Industrial Wastes, National Research Council of the National Academy of Science and was sponsored by the EPA and the American Institute of Chemical Engineers. This consisted of a comprehensive review of disposal technology. One of the committees conclusions was "that emplacement (of hazardous wastes) in salt domes or stratigraphic salt beds could be useful for certain waste types and deserves more attention than it has been given to date." This report was issued in 1983 (10).

In May of 1983, a Request for Proposal was issued by EPA titled "Assessment of Current Status of Using Mined Space for Long-Term Retention of Non-radioactive Hazardous Waste." A contract which resulted in this report was awarded to Fenix & Scisson, Inc. of Tulsa, Oklahoma.

The recent (fall 1984) reauthorization of the Resource Conservation and Recovery Act has a provision included in it which has banned bulk or non-containerized liquid hazardous waste disposal in solution caverns or underground mines constructed in dome or bedded salt bodies. This ban will remain in effect until the Environmental Protection Agency has determined through a series of findings, the feasibility of the concept and issued a permit for a specific facility. This new requirement has a direct impact upon and will delay the permitting of the proposed Louisiana and Texas facilities previously described.

Other Government Activities - Nuclear

In addition to EPA study and research, the Department of Energy (DOE) and its predecessor agencies, have sponsored research and testing for siting, designing, constructing, and maintenance of facilities for storing radioactive wastes in mined spaces. This research, administered by the Office of Nuclear Waste Isolation (ONWI) via various national laboratories (Battelle, Lawrence Livermore, and Oak Ridge), was initially directed at storage of such wastes in salt. Research has since been broadened to include other types of geological settings. Present studies, tests, and demonstrations for nuclear waste storage are continuing in salt, basalt, tuff, and crystalline rock geologic structures (11).

Though the dangers from "nuclear" waste and "hazardous" waste may be drastically different (i.e., radiation vs. toxicity), the requirements for long-term storage in mined space are similar in many areas. Therefore, a large amount of the research, study, and data that have been developed by the national nuclear waste program can be applied to the development of mined hazardous waste storage facilities. Those studies which relate to the geotechnical stability of mined openings and the potential hydrological and environmental effects of such storage appear to be directly applicable. Previous studies of encapsulation, containerization, solidification, handling, and transportation of nuclear wastes have potential for expediting study and design that must precede the demonstration of an underground hazardous waste

storage installation. Table 1 indicates a number of technological similarities and differences between radioactive waste storage and industrial hazardous waste storages.

Other Technical Activities

The American Society for Testing Materials (ASTM) through its Committee D-34 has been working on a "Guide for Determining the Compatibility of Hazardous Waste (12)." Due to the complexity and variability of the many hazardous waste streams throughout the country, this represents a massive effort and the committee is to be commended for bringing some order out of the chaos. While the basis for the system of determining compatibility uses only a pure chemical approach it does serve to indicate where incompatibility could exist and raises a warning flag that careful testing should be done when two potentially incompatible chemicals are to be stored together. No other recent literature describing recent studies or research relating to the compatibility of mixed hazardous wastes, or the compatibility of such wastes with mine host rock or salt was discovered. This lack of such literature indicates a need for more study in the area of waste compatibility if long-term storage of hazardous wastes is to be proven a viable waste disposal concept.

Public Reaction to Hazardous Waste Facilities

The press and the media have produced continuing commentary of activities associated with the generation, transportation, and storage of hazardous wastes. Thereby, the public has become increasingly aware of the potential for damage to all life forms from these wastes. This public awareness does not apparently include a general recognition of the national consequences if some type of final treatment or storage is not developed. Because of the near panic and political pressure which occur when a hazardous waste treatment or storage facility is publicized or proposed in a locality, under present site permitting procedures, it will be virtually impossible to obtain necessary site approvals in most parts of the U.S.

The intense public feelings that can be generated in opposition to hazardous waste activities can be described for numerous instances where facilities were forced to close or where treatment and storage projects were stopped by official action or withdrawn because of the heat of opposition.

Examples of public pressure which was instrumental in closing of a private storage facility, and causing withdrawal of a permit application for a mine storage facility are furnished in Appendix A of Volume 1. These two case histories are representative of the reactions and pressures which can be expected in attempts to establish a mined space hazardous waste storage facility.

Literature Search - U.S. and Foreign

A database literature search was the first step in the review of the literature as to the status of Nonradioactive Hazardous Waste Storage in Mined Space. Citations were retrieved for literature published since 1974. The database literature search was performed by the personnel at the Hazardous Materials Technical Center. The following 19 computerized databases were

TABLE 1
SOME SIMILARITIES AND DIFFERENCES BETWEEN
NUCLEAR AND HAZARDOUS WASTES

<u>Characteristic</u>	<u>Hazardous Waste</u>	<u>Radioactive Waste</u>
Requires Containerization or Encapsulation	Yes	Yes
Health Hazard	Lethal Toxicity	Lethal Radiation
Life of Health Hazard	Forever	10,000+ yr. Half Life
Heat Generation	*Possibly	Yes
Storage Density	No Limit Except Container Stacking Strength	Spaced for Heat Dissipation
Corrosive	*Possibly in Presence of Moisture	Yes-In Presence of Salt and Heat
Water Soluble	*Possibly-If Container Ruptured	Slightly if Container Ruptured
Retrievable	No Regulatory Requirements	For 50 Years
Explosive	*Possibly	No-If Correctly Spaced
Physical Volume to be Stored	Relatively Large Volume	Relatively Small Volume
Harmful Vapor Emission	*Possibly-If Container Ruptured	Radon Gas-Potentially Harmful in Confined Spaces
Handling Dangers	*Possibly-If Container Ruptured-Can Use Standard Material Handling Equipment	Radiation-Must Use Special Shielded Handling Systems

* Depends upon the characteristics of the specific waste or wastes to be stored.

searched: DROLS, NTIS, Arthur Little, Inc., BHRA Fluid Engineering, Chemical Industry Notes, CRGS, Compendex, DOE, EI Engineering Meetings, Energyline, Enviroline, ISMEC, Metadex, Pollution Abstracts, PTS Prompt, Trade and Industry Index, Tulsa, Apilit, and CA Search. The following key words appropriately truncated and combined according to Boolean logic were used: hazardous waste, mine, mines, mining, storage, retention, and disposal.

A copy of a bibliographic database search titled "Safety and Health Procedures at Hazardous Materials Storage Areas," was obtained and reviewed for pertinent references. This bibliography was also prepared and furnished by the Hazardous Materials Technical Center. In the computer search for this bibliography the following key words were appropriately truncated and used: hazardous material/substance, toxic material/substance, dangerous materials/substance, safety, handle/handling, accident, emergency, protective, storage, warehouse, shed, exposure, ventilate, inhalation, workplace, industrial hygiene, occupational hygiene, occupational health, and respirator.

Other databases searched included the following: Enviroline, Chemical Industry Notes, Comprehensive Dissertation Abstracts, NTIS, PTS Prompt, Management Contents, Conference Papers Index, Standards and Specifications, TRIS, World Aluminum Abstracts, Electric Power Database, Paperchem, Surface Coatings Abstracts, Textile Technology Index, Metadex, Apilit, Chemical Regulations and Guidelines, and Toxline.

Citations of articles that appeared to be relevant were obtained on interlibrary loan or by purchase. Libraries cooperating in the interlibrary loan service included Tulsa City/County Library, Tulsa University Library, Oklahoma State University, University of Oklahoma Library, Engineering Societies Library, Linda Hall Library, and the Geological Survey Library. Other sources for publications included NTIS, Bureau of Mines, U.S. Government Printing Office, and the U.S. Environmental Protection Agency.

The computerized database searches were supplemented by in-house technical library specialty publications which did not appear in the computer databases.

The bibliography listing the literature reviewed is found in Appendix B, Volume I.

SECTION 5

INVOLVEMENT OF GOVERNMENT AGENCIES

General

Every phase of a hazardous waste storage facility, from conception to closure, will require the involvement of government agencies of all levels; Federal, State, and local. The agencies involved, and the extent of their involvement, will vary with location, and with time, as new legislation is passed and programs put into effect. The major reason for government involvement is the protection of the public primarily through implementation of RCRA. The administration of RCRA will be discussed in this section.

Administration of RCRA

The hazardous waste management program established under Subtitle C of the Resource Conservation and Recovery Act (RCRA) of 1976 consists of five major directives:

1. Define which wastes are hazardous.
2. Track these wastes from generator to waste disposal/storage facilities.
3. Assure that all hazardous waste management facilities meet minimum national design, performance, and operating standards through a permitting process.
4. Assure that facilities will be maintained properly after closure.
5. Assure that facility operators are financially responsible for accidents occurring at their facility, and for continued safe maintenance of stored wastes.

The Act directed the U.S. Environmental Protection Agency (EPA) to issue comprehensive regulations which would serve as minimum national standards, and to administer the programs when required. However, Congress intended the states to develop and implement hazardous waste regulatory programs consistent with the Federal requirements.

As directed under Section 3006(a) of RCRA, the EPA issued regulations governing the authorization of State hazardous waste programs (40 CFR Part 271) in lieu of a Federally administered program. For a State to receive

final authorization, an application must be submitted to the EPA that demonstrates that the proposed program is equivalent to the Federal program and provides adequate enforcement measures.

The EPA grants authorization of State administered programs in two phases: Phase I, for interim authorization, requires a program which includes:

- o The identification and listing of hazardous wastes
- o Regulations for generators and transporters of hazardous wastes
- o Preliminary standards for hazardous waste treatment, storage, and disposal (TSD) facility.

Phase II, for full authorization, is divided into three components, A, B, and C; each of which authorizes a state to administer a permit program for specific types of TSD facilities which require RCRA permits.

- o Component A governs regulations for tanks, container storage facilities, waste piles, and surface storage impoundments.
- o Component B governs hazardous waste incinerator facilities.
- o Component C regulates landfills, land treatment units, and waste piles and surface impoundments not covered by Component A.

A typical mine storage facility would most probably be classified under Component A since the waste will be stored either in containers or waste piles. A solution mined salt cavern facility does not appear to fit the 3 present categories, since the waste must be introduced into the cavern as a liquid or a slurry and either stored as a fluid or later solidified. If the salt cavern itself can be considered a container, as it is in the storage of petrochemical products, Component A could again apply.

Table 2 presents a complete listing of the status of EPA authorized State Hazardous Waste Management Plans through August 1984. As of August 24, 1984, only 9 of the 54 States and Territories had not obtained Phase I authorization. Twenty had received only Phase I authorization, and 25 had received various components of Phase II authorization. Fifteen states had been granted full interim authorization.

Appendix C contains brief summaries of representative State Hazardous Waste Management Laws. The summaries furnished are for Ohio, Michigan, and New York.

Federal Government Agencies

Appendix D, of this Volume, contains a list of Federal Government Agencies which could be involved, and therefore be considered in the permitting and regulation of a hazardous waste facility in a mine.

Status of EPA-Authorized State Hazardous Waste Management Programs

STATE	PHASE I AUTHORIZATION GRANTED	PHASE II AUTHORIZATION		APPLICATION DEADLINE FOR FINAL AUTHORIZATION	FINAL AUTHORIZATION GRANTED
		COMPONENTS A&B	COMPONENTS C		
		Authorization Granted	Authorization Granted		
ALABAMA	02/25/81			7/84	***
ALASKA				7/84	
ARIZONA	08/18/82			1/26/85	
ARKANSAS	11/16/80	04/19/82	1/24/84	6/84	
CALIFORNIA	06/4/81	01/11/83*		1/26/85	
COLORADO					8/06/84 T
CONNECTICUT	04/21/82	06/29/83	06/29/83		
DELAWARE	02/25/81				6/22/84
DISTRICT OF COLUMBIA	11/22/83	11/22/83		8/26/84	
FLORIDA	05/07/82	12/29/83	02/24/84	7/01/84	
GEORGIA	02/03/81	05/21/82	11/04/83		8/21/84
GUAM	05/16/83			1/26/85	
HAWAII					
IDaho					
ILLINOIS	05/17/82			5/84	
INDIANA	08/18/82			9/84	
IOWA	01/30/81			7/26/84	
KANSAS	09/09/81			6/30/84	
KENTUCKY	04/01/81	01/28/83	02/29/84	7/84	
LOUISIANA	12/19/80	01/24/84	01/24/84	7/12/84	
MAINE	03/18/81	09/26/83	09/26/83		
MARYLAND	07/06/81	11/23/83*	07/09/84**		07/24/84 T
MASSACHUSETTS	02/25/81	07/20/84	07/20/84	7/01/84	
MICHIGAN					
MINNESOTA					
MISSISSIPPI	01/07/81	08/31/82	04/26/83		06/27/84
MISSOURI	11/08/83			7/26/84	
MONTANA	02/16/82			1/22/84	07/25/84
NEBRASKA	05/14/82			4/30/84	
NEVADA	07/19/83	07/19/83		1/26/85	
NEW HAMPSHIRE	11/03/81	03/31/83		7/01/84	
NEW JERSEY	02/02/83	04/06/84		5/84	
NEW MEXICO	09/30/83	09/30/83		7/26/84	
NEW YORK	12/27/83				
NORTH CAROLINA	12/18/80	03/26/82	02/06/84	2/84	
NORTH DAKOTA	12/12/80			1/22/84	07/10/84 T
OHIO	07/15/83			5/84	
OKLAHOMA	01/14/81	12/13/82	06/24/83		
OREGON	07/16/81			6/84	
PENNSYLVANIA	05/26/81			8/84	
PURETO RICO	10/14/82			5/84	
RHODE ISLAND	05/29/81	05/29/84*		5/01/84	
SOUTH CAROLINA	02/25/81	11/03/82	12/06/83		
SOUTH DAKOTA					07/10/84 T
TENNISSEL	07/16/81			5/84	
TEXAS	12/24/80	03/23/82	09/01/83		
UTAH	12/12/80				07/06/84 T
VERMONT	01/15/81	01/24/84	01/24/84	7/01/84	
VIRGINIA	11/03/81	08/17/83		6/26/84	07/20/84 T
VIRGIN ISLANDS					
WASHINGTON	08/02/83	08/02/83		6/84	
WEST VIRGINIA	03/28/84	03/28/84		1/26/85	
WISCONSIN	01/15/82			6/84	
WYOMING					

* Component A only. ** Plus Component B *** Authorization withdrawn T- TENTATIVE APPROVAL

SOURCE: HAZARDOUS WASTE TECHNICAL CENTER
VOLUME 3 NO. 4, OCTOBER 1984

Table 2

The Appendix also contains addresses, phone numbers, a brief description of the Agency's function, and an index of various subjects with which the agencies could be involved, i.e., rural projects, transportation, and data centers.

State and Local Agencies

The involvement of various state and local agencies with hazardous waste storage facilities is in a stage of flux as state programs are being developed and responsibilities defined. Most states have now assigned responsibility for administration of state hazardous waste problems either to a new or an existing state department or agency. Appendix E lists the current state agencies that have primary responsibility for hazardous waste. Because of the present variations in individual state legislation, administrative, and regulatory authorities, the number and type of other state and local agencies that may be involved in the permitting and regulation of hazardous waste facilities varies greatly between states. Therefore, regulatory procedures and authorities must be researched for each and every specific site prior to permit preparation and application.

The states of Louisiana and Texas have received applications for permits to construct hazardous waste storage facilities in solution mined space. To date no such permits have been issued. Up to the present in the U.S., no formal applications to construct hazardous waste storage in mine space have been submitted. A number of the states have studied or are studying various aspects of underground hazardous waste storage, however, to date, no specific regulations regarding the siting, design, construction, and operation of underground waste storage in mined space have been promulgated.

Involvement and Interaction of Government Agencies

The involvement of federal, state, and local agencies in the process of developing a proposed mine hazardous waste storage facility is defined by each agency's charter, regulations, and location jurisdictions. This multiple agency involvement, and the necessary interactions, obviously will require considerable planning and coordination in order to process such a storage facility from permitting to operation. Because precise regulations are not in place for underground storage, plans and strategies must be developed, prioritized, and scheduled in order to gain the necessary approvals to construct and operate such a facility in a practical time frame.

The following Table 3 indicates agencies that would probably be involved in the permitting, construction, and operation of hazardous waste mine storage facility. The table indicates regulatory involvement by initial "R," and advisory participation by symbol "A." Agency involvement if storage site is on public land is indicated by asterisk.

TABLE 3
GOVERNMENT AGENCIES INVOLVED IN A PROPOSED MINE
HAZARDOUS WASTE STORAGE PROJECT

<u>Agency</u>	<u>Participation</u>
<u>Federal Government</u>	
Environmental Protection Agency	R
Department of Defense Corps of Engineers	R
Department of Transportation Coast Guard	R
Federal Highway Administration	R
National Highway Safety Administration	A
Department of Agriculture Soil Conservation Service	A
*Forest Service	R
Department of Interior Bureau of Mines	R
*Bureau of Land Management	R
Fish and Wildlife Service	R
*National Park Service	R
Geological Survey	A
Department of Labor OSHA	R
MSHA	R
Federal Emergency Management Agency	A
<u>State Government</u>	
Waste Management Control Agency	R
Health and Welfare Agency	R
Mining Authority	R
Environmental Protection Authority	R
Transportation Authority	R
Archeological and Antiquities Authority	R
Corporation Commission	R
<u>Local Government</u>	
Building Permitting Authority	R
Public Health Department	R
Road or Transportation Authority	R
Land Use Zoning Authority	R

SECTION 6

REGULATION AND PERMITTING ASSESSMENT

Introduction

The 1976 RCRA required that the EPA establish regulations, setting standards to protect the public from the generation, transportation, treatment, storage, and disposal of hazardous waste. In May 1980, the EPA published regulations in accordance with Subtitle C of the 1976 RCRA, as amended, to protect human health and the environment from the improper management of hazardous waste (40 CFR - Parts 122 to 124 and 260 to 267). These regulations include provisions whereby a State agency may be authorized by EPA to administer a hazardous waste program in that state, in lieu of a Federally administered program. For a state to receive final authorization, its hazardous waste management program must be at least equivalent to and be consistent with the Federal Program under RCRA.

Many of the states have opted to develop and manage their own hazardous waste program under EPA regulatory guidelines. For these states, legislatures have authorized responsible agencies, funding, and controlling regulations. A few states have not developed or are lagging in development of their hazardous waste management plans and EPA is now administering their programs. The result is that a reasonably uniform hazardous waste management program is being conducted throughout the United States. Major regulatory differences between state-to-state regulations and administration appear to be in siting requirements, in methods of assuring financial responsibility for waste facility closure, and in accommodations for local specialized industry.

At this time, neither EPA nor any of the states have developed regulations specifically pertaining to hazardous waste storage in mined space. Therefore, initial mine hazardous waste facilities including demonstration facilities will have to be designed, sited, and evaluated by interpretation of intent of existing regulations, with ultimate regulations to be developed if feasibility of mined storage is demonstrated.

Current Applicable RCRA Permitting Requirements

The EPA regulation governing permitting of new hazardous waste facilities is presented in 40 CFR 270. This regulation requires preparation and submittal of a two-part application for approval of proposed facilities.

The present permitting regulations do not include specific terms related to waste storage in mined space. However, the general format and requirements of present regulations appear to be comprehensive and broad enough to

provide the basis for evaluation of a mined hazardous waste storage facility permit application.

1. Part A Permit Application Requirements.

Completion of Form 3 RCRA, plus information attachments. Part A Permit Application provides information describing in general terms the type of facility, location, owner, and operator.

2. Part B General Information Permit Requirements.

In Part B, the applicant presents a comprehensive description of the proposed Hazardous Waste facility, including the waste or wastes to be handled, the methods and facilities for handling/storing wastes, methods of quality assurance that wastes do not enter the environment, closure plans, and methods of assuring post-closure, long-term financing responsibility.

Other Federal Requirements

1. General.

The 1976 RCRA requires consistency with other Federal laws. The following statutes are listed:

- The Clean Air Act
- Federal Water Pollution Act
- Federal Insecticide, Fungicide and Rodenticide Act
- Safe Drinking Water Act
- Marine Protection, Research and Sanctuaries Act
- Such other acts as grant regulatory authority to the Administrator (EPA).

The EPA permitting regulations specify the conditions under which permits issued for hazardous waste management facilities will comply with the above laws as well as the following statutes:

- Wild and Scenic Rivers Act
- National Historic Preservation Act of 1966
- Endangered Species Act
- Coastal Zone Management Act
- Fish and Wildlife Coordination Act

2. Facilities on Federal Lands.

Hazardous waste facilities proposed for siting on Federal lands will probably require permits or land use agreements from the controlling agency. Such siting could require agreements, permits and/or further regulation from the following agencies:

- Bureau of Land Management
- Department of Defense
- Department of Energy

National Park Service
Corps of Engineers

3. Federal Safety, Health, and Mining Regulations.

Inasmuch as no mineral is being mined for sale, safety regulations for mine and facilities development, treatment of hazardous waste, the movement of this waste to the mined storage area and the maintenance of the storage area appear to be under OSHA safety regulations and enforcement. In cases where OSHA regulations do not cover the construction or development (as for mined space), by inter-agency agreement, MSHA regulations may be applied. If this is the case, in order to store toxic waste, certain waivers or modifications of MSHA regulations will be required. As an example 30 CFR 55.6 and 57.5 bar the use or storage of 16 toxic materials in a mine "except under laboratory conditions."

State Hazardous Waste Permitting Requirements

For those states authorized by EPA to administer a hazardous waste program, permitting regulations have been developed and are presently being employed. For states without such EPA authorization, EPA regulations are being employed.

In general, all authorized states now have regulations and permitting practices which conform to EPA hazardous waste management regulations and administrative criteria. Differences in storage regulation and permitting procedures do not appear to be major. At this date, none of the authorized states have regulations which specifically relate to the storage of hazardous waste in subsurface mined space.

Major differences between states do exist in methods of storage siting and financial assurances. The 1976 RCRA does not prescribe requirements for the siting of new hazardous waste management facilities. Present policies consider this the responsibility of the State.

In the past, many state legislatures gave authority to various agencies for permitting new hazardous waste facilities proposed by industry. After analyzing the applications and conducting public hearings, the state would rule on the permit. However, public opposition to new facilities resulted in very few approved facility permits. In response to these problems, a majority of the states have developed siting programs that specify the process to be followed in selecting a hazardous waste storage site, provide for public participation, and establish the responsibility of state and local agencies.

Specific issues addressed by these laws are: Representation of all affected parties in the siting decision process, resolution of impasses, public participation, financial responsibility, assurances of safety, and provisions for incentives.

Table 4 presents a synopsis of siting procedures for the 28 states that had enacted siting laws as of the end of the 1982 legislative year.

STATES WITH HAZARDOUS WASTE FACILITY SITING LAWS

	AZ	CO	CT	FL	GA	IL	IN	IA	KS	KY	ME	MO	MA	MI	MN	NE	NH	NJ	NY	NC	OH	OR	PA	RI	TN	UT	VA	WI
<u>Siting Procedures</u>																												
<u>Siting Process Initiated by</u>																												
State	X				X					X		X			X											X	X	
Developer		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
<u>Siting Decision by</u>																												
Existing Agency	X									X						X						X			X		X	X
Siting Board			X	X	X		X	X	X	X	X	X		X	X			X	X	X	X		X		X	X		
Local Group		X				X				X			X			X							X					
<u>Permit Approval by</u>																												
Existing Agency	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Siting Board			X		X					X															X			
Local Group		X																										
<u>Siting Impasse Resolved through</u>																												
State Preemption	X		X	X		X	X	X	X	X		X		X	X		X	X		X	X	X	X			X	X	
Mediation/Arbitration													X											X				X
Local Veto		X								X						X			X									
<u>Public Participation</u>																												
Local Representatives Sit on Siting Board			X	X			X	X	X	X	X	X		X	X		X	X	X	X	X					X		
Local Review Board			X							X			X		X			X					X					X
Notice of Permit Application given Affected Parties		X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hearings	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Citizen Suits											X											X						
Other	X					X				X			X		X			X	X				X	X		X		X
<u>Financial Assurances</u>																												
Trust Funds	X		X	X					X	X			X							X	X	X	X		X			X
Financial Responsibility Mechanisms		X	X	X	X		X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
Other				X				X		X																		
<u>Non-Financial Assurances</u>																												
Inspections	X	X	X	X		X			X	X		X	X	X				X			X	X	X	X	X		X	X
State Ownership	X									X		X									X							X
Contingency Plans		X		X			X			X		X	X	X				X					X	X				X
Restrictions on Future Users	X	X	X				X		X	X			X	X				X		X	X	X	X	X				X
<u>Incentives and Compensation</u>																												
Local Taxes or Receipt of Fees		X	X		X		X			X	X		X				X	X		X				X				X
Tax Prepayments													X															
Other			X				X						X					X			X			X				

SOURCE: "A NATIONAL SURVEY OF STATE LEGISLATURES 1982"

Table 4 States with Hazardous Waste Facility Siting Laws

At this date, all states have assigned solid or hazardous waste management responsibility to a specific group or agency. Because of differing state government organization and legal structures, approval, permits or licenses may be required from a variety of state agencies other than the particular hazardous waste management agency.

SECTION 7

SELECT CANDIDATE MINES

Introduction

The concept of storage of hazardous waste in mined openings is not new, but except for one known instance in Germany, has not been utilized. A study conducted by Fenix & Scisson, Inc. in 1974 concluded the concept was valid and environmentally acceptable, provided recommended site selection and waste management procedures were followed.

Because mined space is expensive to construct and a demonstration of the technique is needed, a viable alternate to construction of new mined space is to utilize existing mined space. The earlier study concluded that salt, potash, and gypsum mines offer the most suitable containment with respect to environmental, stability, and other factors.

Studies conducted for the Department of Energy - Strategic Petroleum Reserve and private clients since the 1974 effort have revealed that gypsum mines may not be as acceptable as originally thought, due to water leakage and occasional flooding. Each mine history would have to be reviewed in detail to determine its acceptability. The use of potash mines, while being utilized in Europe for this purpose, is questionable in the U.S. due to the method of mining which has allowed the extraction of approximately 90% of the ore. This, in turn, has allowed the mine roof's to settle and reduce the storage space to a very small amount.

These previous studies did reveal that in specific instances there are limestone mines which are comparable to salt mines in acceptability and would meet the geotechnical criteria. Four of the limestone mines which were studied for the Department of Energy - Strategic Petroleum Reserve Program are included for evaluation for hazardous waste storage.

Purpose

The purpose of this task was to select three candidate mines that have good potential for use as a demonstration facility for retention of non-radioactive hazardous waste.

Criteria

The basic criteria specified by EPA were that:

- o The preferred candidates were to be salt mines, but other mines were not ruled out.
- o The mine should have been mined by the room and pillar method.
- o The mine should be close to an industrial waste source.
- o Existing engineering, geology, and other information should indicate that the mine is suitable for the purpose.
- o An industrial organization willing to cooperate in a limited demonstration of the concept must exist.

Further criteria developed were:

- o Hazardous wastes to be stored must be containerized, encapsulated or solidified, non-reactive, dry, non-combustible, and untreatable by current technology or the end product of current treatment technology.
- o F&S elected to include limestone mines, mined by the room and pillar method in this report. Limestone mines are presently being used to store foods and other perishable merchandise.

Approach

The approach utilized in selecting three candidate mines for a demonstration project consisted of:

- o Identification
- o Analysis
- o Preliminary Screening
- o Geographical Screening
- o Rating Remaining Mines

Identification

A list and status of all the known salt mines in the United States was compiled from various records and sources. In addition, four limestone mines were listed. These had recently been studied as possible storage sites for the Department of Energy Strategic Petroleum Reserve Program. This listing was in turn subdivided into Operating and Shutdown Mines.

Table 5 lists the operating salt mines and their locations.

Table 6 lists the shutdown salt mines, their location, and status.

Table 7 lists four recently studied limestone mines and their location.

Gypsum mines were excluded from further consideration because of the possibility of flooding; plus the owners expressed no interest in participating in the earlier Strategic Petroleum Reserve Program. Potash mines were excluded from further consideration due to their being mined to 90% extraction, roof problems and remoteness from hazardous waste generating centers.

TABLE 5
OPERATING SALT MINE

<u>Location</u>	<u>Name</u>	<u>Owner</u>
Kansas, Hutchinson	Hutchinson Mine	Carey Salt Co.
Kansas, Kanopolis	Kanopolis Mine	Independent Salt Co.
Kansas, Lyons	American Mine	American Salt Co.
Louisiana, Avery Island	Avery Island Mine	International Salt
Louisiana, New Iberia	Cote Blanche Mine	Domtar, Inc.
Louisiana, Weeks Island	Weeks Island (New) Mine	Morton Salt Co.
New York, Myers	Cayuga Mine	Cargill, Inc.
New York, Retsof	Retsof Mine	International Salt
Ohio, Cleveland	Cleveland Mine	International Salt
Ohio, Painesville	Fairport Mine	Morton Salt Co.
Texas, Grand Saline	Grand Saline Mine	Morton Salt Co.
Texas, Hockley	Hockley Mine	United Salt Co.
Utah, Sevier	Sevier Mines	Unknown

TABLE 6
SHUTDOWN SALT MINES

<u>Location</u>	<u>Name</u>	<u>Owner</u>	<u>Status</u>
Kansas, Kanopolis	Crystal Mine	Unknown	Inaccessible
Kansas, Kanopolis	Royal Mine	Unknown	Inaccessible
Kansas, Kingman	Kingman Mine	Unknown	Flooded
Kansas, Little River	Little River Mine	Unknown	Propane Storage
Kansas, Lyons	Lyons (North) Mine	Rickano Corp.	Available
Louisiana, Jefferson Island	Jefferson Island Mine	Diamond Crystal Salt Co.	Flooded
Louisiana, Weeks Island	Weeks Island (Old) Mine	Department of Energy	Crude Oil Storage
Louisiana, Winnfield	Winnfield Mine	Unknown	Flooded
Louisiana, Belle Isle	Belle Isle	Cargill Inc.	Shut Down, 1984
Michigan, Detroit	Detroit Mine	International Salt Co.	Shut Down, 1982 On Standby
New York, Leroy	Leroy Mine	Unknown	Flooded
New York, Livonia	Livonia Mine	Unknown	Flooded
New York, Penn Yan	Seneca Lake Mine	Morton Salt Co.	Available but Inaccessible

TABLE 7
SHUTDOWN LIMESTONE MINES

<u>Location</u>	<u>Name</u>	<u>Owner</u>
California, Crestmore	Riverside Mine	Riverside Cement Co.
Kentucky, Lexington	Central Rock Mine	Central Rock Products
Ohio, Barberton	Barberton Mine	PPG Industries, Inc.
Ohio, Ironton	Ironton Mine	Alpha-Portland Cement

Analysis

The selection of candidate mines required consideration of a multiplicity of factors. The method used in the selection process consisted of:

- o A Preliminary Screening of potential mines for storage use to eliminate obviously unsuitable candidates (Such as flooded or inaccessible).
- o Geographical - The mines were located geographically and their location matched to the EPA Regions where hazardous waste is generated. Mines that fell outside the boundary of a major EPA waste generating region were removed from consideration.
- o The surviving mines were then rated in the next step of the analysis.

Preliminary Screening - Salt Mines

From Table 6 the following mines are known to be flooded thus removing them from the list of possible candidates:

- o Kingman Mine - Kingman, Kansas
- o Jefferson Island Mine - Jefferson Island, Louisiana
- o Winnfield Mine - Winnfield, Louisiana
- o Leroy Mine - Leroy, New York
- o Livonia Mine - Livonia, New York

The following mines are presently being used for storage of petroleum products and are not available.

- o Little River Mine - Little River, Kansas - Propane Storage
- o Weeks Island Mine - Weeks Island, Louisiana - Crude Oil Storage

The following mines are presently inaccessible. Their shafts are plugged or capped and would require a substantial investment to reopen them for a demonstration project.

- o Crystal Mine - Kanopolis, Kansas - Plugged
- o Royal Mine - Kanopolis, Kansas - Plugged
- o Seneca Lake Mine - Penn Yan, New York - Capped

The following mine was shut down due to "stability" problems in 1984.

- o Belle Isle Mine - Patterson, Louisiana

The following mine was eliminated because it is a newly opened mine with very limited amount of unused space available for storage.

- o Weeks Island (New) Mine - Weeks Island, Louisiana

From Table 6, two mines survive as candidates for the next step of the analysis.

- o Lyons (North) Mine - Lyons, Kansas - Maintained Accessible
- o Detroit Mine - Detroit, Michigan - Maintained Accessible

Geographical Screening

Figure 1 shows the geographical location of the remaining 15 mines and the EPA Hazardous Waste Reporting Regions. Table 8 shows the volumes of hazardous waste estimated as being generated in a given region. Two of the highest volume regions as reported by EPA are Region V and VI. These regions will provide adequate volumes of "mine acceptable" hazardous waste for a demonstration project and are located over major salt deposits. The character of wastes generated in Region V is anticipated to be predominantly manufacturing waste from the concentrated automobile industry in the Cleveland, Toledo, and Detroit areas. The character of the wastes generated in Region VI is anticipated to be predominantly petrochemical wastes from the concentration of oil-related industry in this region.

By choosing these two Regions (V and VI) the following mines were removed from consideration due to their remoteness from waste generating sources.

Hutchinson Mine	- Hutchinson, Kansas
Kanopolis Mine	- Kanopolis, Kansas
American Mine	- Lyons, Kansas
Lyons (North) Mine	- Lyons, Kansas
Cayuga Mine	- Myers, New York
Retsof Mine	- Retsof, New York
Sevier Mines	- Sevier, Utah

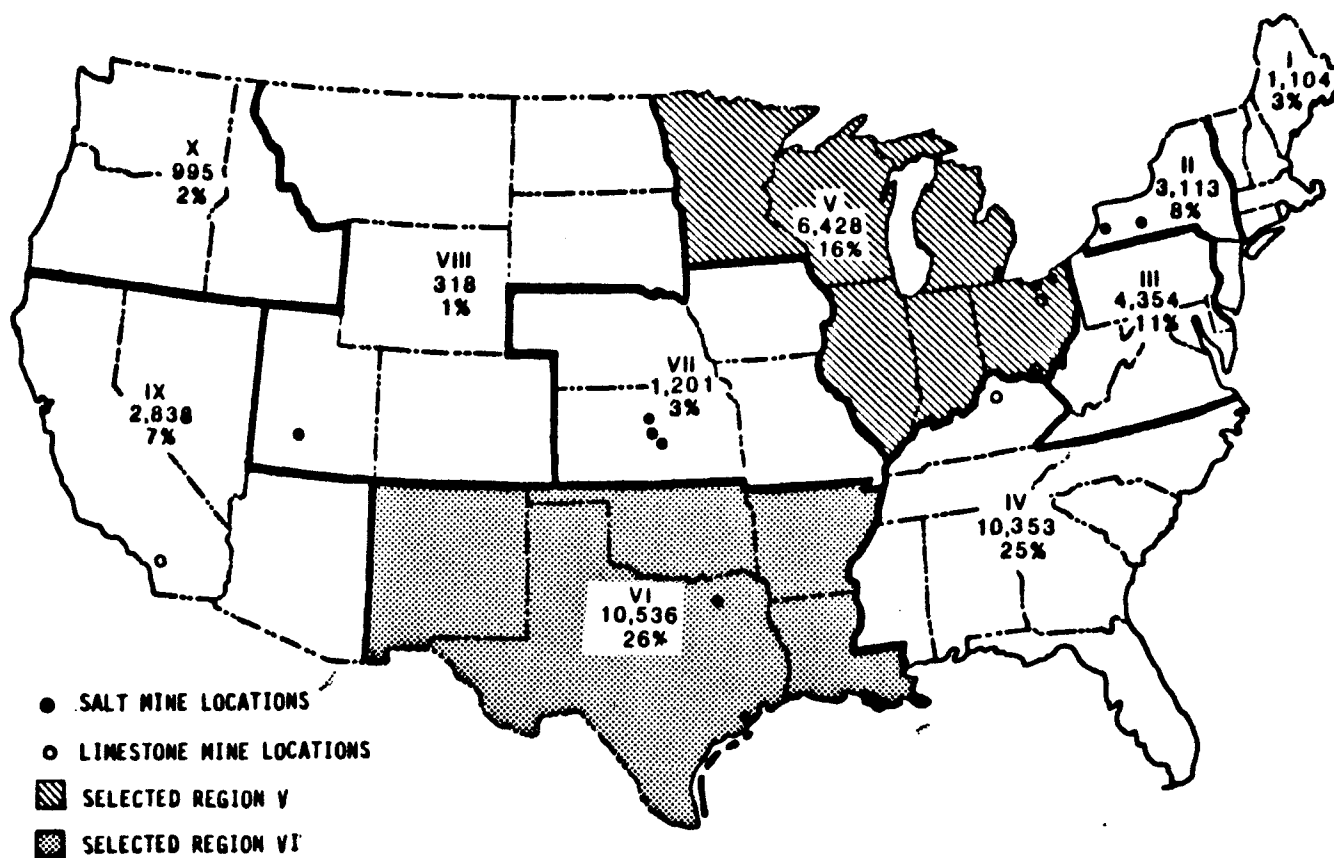
From Table 5 and 6 seven mines survive as candidates for the rating step of the analysis.

Rating Remaining Mines

The third step in identifying candidate demonstration mines was a rating of the surviving seven mines located within EPA Regions V and VI. The rating method used was subjective and included the following considerations.

- o Geological
- o Hydrological
- o Marketing Factors
- o Sociopolitical
- o Accessibility
- o Location
- o Previous Studies
- o Owner Interest.

Geological - Assigned highest rank to formation with massive continuous bedding without faulting and in an area of low seismicity.



SOURCE: PUTNAM, HAYES & BARTLETT

Figure 1 1980 Industrial Hazardous Waste Generation Within Each EPA Region
(Thousand WMT and Percent of Total Nationwide)

REGION	1980			1981			
	TOTAL	OFFSITE	UNKNOWN	TOTAL	OFFSITE	UNKNOWN	MOST PROBABLE
I	1,104	299	368	1,131	303	385	580
II	3,113	652	540	3,216	673	564	1,022
III	4,354	604	470	4,507	622	492	922
IV	10,353	913	674	10,697	940	706	1,358
V	6,428	1,330	1,537	6,611	1,368	1,604	2,517
VI	10,536	1,029	524	11,025	1,059	549	1,346
VII	1,201	252	233	1,231	257	243	440
VIII	318	106	61	325	108	62	154
IX	2,838	535	511	2,925	552	534	896
X	995	348	241	1,023	357	249	503
TOTAL	41,235	6,069	5,159	42,694	6,251	5,395	9,738

NOTE: DETAIL MAY NOT ADD TO TOTAL BECAUSE OF ROUNDING.

SOURCE: PUTNAM, HAYES & BARTLETT

Table 8 1980 and 1981 Industrial Hazardous Waste Generation
and Most Probable Off-Site Disposal, by EPA Region
(Thousand Wet Metric Tons)

Hydrological - Assigned highest rank to site with least potential for catastrophic flooding of the mine due to inflow of surface water or rupture of a prolific aquifer.

Marketing Factors - The presence of large quantities of hazardous waste in the area will make marketing of the concept much easier. Conversely low quantities will make marketing of the concept much harder.

Sociopolitical - Based upon review of past attempts at permitting a facility, a judgment is made as to whether the public will accept a facility and whether the permitting authority is receptive to new applications for different concepts.

Accessibility - Is judged by the varied types of transportation which can access the facility (i.e., rail, barge, truck) and the types of highway adjacent to the facility (i.e., 2 lane road, interstate highway).

Location - The location of the facility in relation to the generators, transportation and population centers is assessed. The criteria being the closer to the center of a generating area the better due to transportation hazard exposure. Population density near the facility location was considered less important than the transportation hazard exposure.

Previous Studies - Probable availability of previous studies which would reduce the effort required for a demonstration project and which provide readily available information on a particular site.

Owner Interest - This rating is based on past studies and current contacts with the various owners or operators of the facilities. Owner and operator are to be considered separate entities not necessarily the same.

A numerical rating for each of the mines was made by equating the degree of acceptability to a number. When the above considerations had been assessed for each mine and rating numbers were assigned, the numbers were added together and a ranking obtained. The subjective ratings for this analysis were:

Excellent	1
Good	2
Fair	3
Poor	4
Not Acceptable	5

Salt Mines

The seven mines surviving for the rating analysis are:

Avery Island Mine, Louisiana
Cote Blanche Mine, Louisiana

Detroit Mine, Michigan
Cleveland Mine, Ohio
Fairport Mine, Ohio
Grand Saline Mine, Texas
Hockley Mine, Texas

Limestone Mines

The selection of Regions V and VI due to the anticipated high volume of waste generated and the proximity to existing mined space eliminates two of the four limestone mines from Table 7. These are:

- o Riverside Mine, California
- o Central Rock Mine, Kentucky

The remaining mines will be rated on the same basis as the salt mines. These mines are:

- o Barberton Mine, Ohio
- o Ironton Mine, Ohio

Mine Rating Worksheets

The Mine Rating Worksheets shown in Appendix F of this Volume, treat each mine separately and provide brief comments on the major consideration leading to the numerical ratings given to the mine. During this rating analysis, the other mines were kept in mind so that the ratings were in essence a comparison of all the various factors for all the mines.

Table 9 summarizes the results of the mine rating.

Selected Mines

Three potential candidate salt mines and one limestone mine (an alternate) were selected for further study as possible hosts for a demonstration site for the storage of hazardous non-radioactive waste based upon the previous rating and ranking method.

<u>Mine Designation</u>		<u>Rating Points</u>	<u>Rank</u>
Salt	"C"	17	1
	"D"	20	2
	"G"	21	3
Limestone	"H"	17	(1)*

* This limestone mine has been included (as an alternate) due to its high rating.

Additional Investigation

The three candidate salt mines are located in Michigan, Ohio, and Texas. The alternate (limestone mine) is in Ohio.

MINE DESIGNATION	RATING CRITERIA									
	GEOLOGICAL	HYDROLOGICAL	MARKETING FACTORS	SOCIO-POLITICAL	ACCESSIBILITY	LOCATION	PREVIOUS STUDIES	OWNER INTEREST	TOTAL	RATING
SALT MINES										
A	2	3	4	4	2	3	2	3	23	6
B	2	3	4	4	3	3	1	4	24	7
C	2	2	1	4	2	4	1	1	17	1
D	2	2	1	4	2	4	3	2	20	2
E	2	2	1	4	2	3	3	5	22	4
F	2	3	4	3	2	3	3	2	22	5
G	2	2	3	3	2	2	3	4	21	3
LIMESTONE MINES										
H	1	2	4	2	4	2	1	1	17	(1)
I	1	2	2	4	2	4	1	4	22	(4)

Table 9 Mine Rating Matrix

The next step of the selection process was to visit each of the facilities and discuss the proposed scope of the demonstration with the respective owners/operators of the facility.

Mine "G" was withdrawn from further consideration when the operators indicated "it was not in their best interest" to participate in the project.

Mine "D" was investigated and was withdrawn from consideration because of the adverse public reaction which recently blocked attempts by the owner to establish a commercial hazardous waste storage facility in an existing limestone mine in this vicinity. Trying to set up a demonstration project immediately after the previous effort would only stiffen public resistance and make the probability of obtaining a state permit for the facility all the more difficult.

Mine "C" was the highest ranked of the original three candidates and the owner has indicated willingness to participate in a demonstration. The next step in the process was to determine what problems would be encountered from state permitting agencies in establishing a hazardous waste demonstration project. It was found that the state has jurisdiction for hazardous waste facility siting and that their regulations are equal to, or more stringent than, those required by the 1976 RCRA. There is no provision in any of the existing state or federal laws or regulations for Research and Development efforts, such as a demonstration facility, and the proposed facility would have to go through permitting procedures under the existing state regulations as any other hazardous waste facility.

Mine "H," the alternate limestone mine was ranked numerically at the top of the list and illustrates the possibility of utilizing mines in types of rock other than salt. This particular mine has been shut down for many years and would require a hoisting system be installed prior to any use or inspection. As a hoisting system is expensive to acquire and install and the salt mine having an equal rating and an operating hoisting system for access, the limestone mine was not considered further.

Mine "C" is the best candidate for a demonstration Hazardous Waste Storage Facility.

Conclusions

The most expeditious approach to obtain a permit for the proposed demonstration would be to seek legislative/ regulatory relief for such projects. This legislation should allow for Research and Development projects, including demonstration projects, to be permitted by executive consent as long as the environment and public were protected. All current regulations would have to be followed in the operation of a demonstration project as well as the cleanup and deactivation requirements which are a part of present regulations.

The requirements for permitting a facility are discussed in Section 6 of this report. An assessment of the cost and time required to prepare and obtain a permit for a modest, limited time, demonstration facility indicates costs on the order of several hundred thousands of dollars and a time requirement of 6 months to 1 year would be required, with no guarantee that a permit would be obtained after the expenditure of time and money.

SECTION 8

REFERENCES

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- (10) Committee on Disposal of Hazardous Wastes, National Research Council, National Academy of Science, "Review of Hazardous Waste Disposal Technology," 1982 - EPA & AICE.

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APPENDIX A

CASE HISTORIES OF EFFECTS OF PUBLIC ON HAZARDOUS WASTE DISPOSAL FACILITIES

"The Earthline Facility" - Wilsonville, Illinois

This facility was constructed and operated by Boston's SCA Services through its Chem-Trol Pollution Services Subsidiary. The facility is on the site of a former coal strip mine and was designed to receive solid, semisolid, and liquid hazardous wastes from industrial plants within a 300-mile radius of Metropolitan St. Louis.

The design of the facility used accepted technology of the 1976 period and basically was a clay lined pit of 130 acres which was fully fenced. An additional 270 acres was optioned for future expansion. [Waste Age - May 1977]

The SCA Services' Earthline Facility was ordered closed as a public nuisance by the Illinois Supreme Court in 1981. This was a result of a citizens suit filed by the residents of Wilsonville in county circuit court on 4-18-77. Their specific objections were:

- o Site created dust and offensive odors
- o Trucks using the main street of the town constituted a transportation hazard.

After the suit was filed it was learned that SCA has buried soil that was heavily contaminated with PCB's.

The states attorney general charged that:

- o Chemicals were leaking from the trucks
- o The site was not large enough to handle future waste volumes.

Experts for the plaintiffs charged that:

- o The site was built over an abandoned peat mine and subsidence could be expected which would breach the clay barrier and contaminate the groundwater.

The states attorney general concurred with the common-law-of-nuisance charges and the high court ruled the site closed.

SCA was now charged with removing the wastes from the site. [Chemical Week 7-22-81]

PPG Industries - Norton, Ohio

PPG Industries' Norton, Ohio limestone mine also known as the Barberton Mine was proposed as a chemical waste storage facility in December of 1981. D'Appolonia Engineers conducted an extensive study of the technical concept and concluded it was technically feasible.

The mine is 2,300 feet deep in massive limestone and is 1,500 feet below the nearest water table. Wastes proposed to be stored would include any material that could be handled in an approved conventional landfill. [Chemical Market Report 12-7-81]

A hearing was conducted by the United States House Committee on Energy and Commerce on August 31, 1982 with Congressman James J. Florio, presiding. This hearing which was titled "Disposal of Hazardous Wastes in Mines, A Case Study at Norton, Ohio," was called in relation to the reauthorization of the RCRA act. The purpose was to determine whether additional legislation was needed to further the concept.

There was organized opposition from local residents and several significant points of opposition were made which ultimately affected the future of the proposed project.

- o The site was located in an industrial zone surrounded by residences. Owners felt this type of facility would degrade real estate values due to the potential for spills and possible periodic evacuations.
- o As this would be a prototype facility and the operating hazards were unknown it was suggested that the facility should be remote from populated areas.
- o The proposed use of the facility in lieu of a conventional landfill was questioned as most felt that other appropriate technologies should be utilized for much of the waste and only the most difficult to treat should be stored in the mine.
- o The EPA administrator for Region V testified that the legislation currently in force was adequate to handle mine storage regulation. Possibly some additional regulations would be required but the authority to promulgate, review, and implement the necessary regulations already exists in the present RCRA law.
- o CODE (Citizens Opposed to the Destruction of Our Environment) advocated the adoption of a model set of rules and regulations as set forth in Executive Order B-8881 of the State of California as modified herein:
 - o There should be no inground or onground disposal of hazardous toxic chemicals unless or until the following criteria are met:
 - The waste is unable to be recycled.

- The waste is unable to be reclaimed.
- The waste is unable to be destroyed by incineration or biological agents.
- The waste is unable to be neutralized and rendered harmless.
- The waste has been reduced to its lowest levels of toxicity and its lowest bulk form.
- The waste has been completely encapsulated by a protective coating that effectively eliminates its leaching potential.

A press release by PPG Industries dated July 12, 1982 suspended further action due to "economic conditions." A permit application was not made.

APPENDIX B

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APPENDIX C

EXAMPLES OF STATE LAWS AND PROCEDURES FOR SITING HAZARDOUS WASTE FACILITIES

State: Ohio

Effective Date: 10/09/80

Citation: SB 269, amending and creating
Subsections of Sec. 3734 of the
Revised Code to provide for the
management of Hazardous Waste;
as amended by Sub. S.B. No. 57
(1981-1982)

Sponsor: Meshel, Malott, et.
al.

Title: _____

SCOPE OF LAW

I. Approach:

- o Ohio Environmental Protection Agency (EPA) to issue facility installation and operation permits, subject to approval by 9-member Hazardous Waste Facility (HWF) Approval Board composed of the EPA Director, who shall serve as chairperson; the Natural Resources Director; the Chairperson of the Ohio Water Development Authority; a chemical engineer; and a geologist employed by a state university and appointed by the Governor, with the advice and consent of the Senate. For individual siting decisions, 4 temporary members are appointed to the board. These members are appointed by the affected municipal and county governments.
- o EPA to adopt rules and regulations substantially equivalent to RCRA, including lists of wastes and performance standards for facilities. Standards to be consistent with degrees of hazard posed by different wastes and/or categories of wastes.
- o EPA to conduct 1-year study of facilities, including identification of suitable areas in state for various types of facilities, feasibility and need for direct state involvement, and feasibility and availability of detoxification techniques minimizing use of landfilling. EPA to periodically assess market potential for waste exchange and resource recovery and may grant exemptions from regulations to encourage same. Plants utilizing hazardous wastes as raw materials exempted from regulations.

II. Override:

- o Waste facilities approved by HWF Approval Board not subject to local regulation or land-use ordinances.

III. Public Participation:

- o HWF Approval Board to hold public hearing following notice prior to action on facility permit applications.
- o HWF Approval Board to hold adjudication hearing to resolve disputed issues between parties. Parties to include developer, EPA staff, host county Board of Commissioners, host municipality chief executive, and aggrieved persons petitioning for inclusion in proceedings.
- o EPA to hold public hearing prior to action on variances.

IV. Financial Assurances:

- o EPA to set annual fee of up to \$1,000 for permitted facilities.
- o EPA to require applicants to provide bond or other surety to cover closure and long-term care costs.
- o HWF Management Special Account established, funded by surcharges on disposal costs collected by operators at facilities. Expenditures from account to be approved by controlling Board, except for repayments on debts to Water Development Authority. Account to be used for EPA administrative inspection and study costs.

V. Non-Financial Assurances:

- o Developer to include description of closure and post-closure clean-up and care plans in permit application. Inspection and specific requirements for closure.
- o EPA authorized to declare emergency in case of imminent and substantial threat to health or environment, exercise state powers to abate pollution and hazards. Powers include revoking permits, seizing property.
- o EPA may attach restrictive covenants to sites regulating future use.

VI. Incentives and Compensation:

- o EPA authorized to expend up to \$500,000 over 3 years from HWF Management Special Account in the form of grants to local governments for their use in encouraging the location of hazardous waste facilities in their areas.

State: Michigan

Effective Date: 01/01/80

Citation: Act 64 of 1979

Sponsor: Rep. Tombaulian

Title: Hazardous Waste Management Act

SCOPE OF LAW

I. Approach:

- o Nine-member Site Approval Board to act on each site construction permit application recommended for approval by Department of Natural Resources. Board composed of 5 permanent members, including 3 state government representatives appointed by department directors and 2 state university faculty scientists appointed by Governor; and 4 temporary members, including 2 representatives of host county and 2 representatives of host municipality appointed by their respective local governments.
- o Fourteen-member Hazardous Waste Management Planning Committee, appointed by Governor and representing diverse geographical areas of state, to prepare within 2 years a state hazardous waste management plan. Plan to provide geographic distribution of facilities; inventory general locations for future facilities; and explore state ownership of facilities. Department to adopt plan with advice of Commission of Natural Resources, and the Health Department Committee to review plan every 5 years.
- o Department to encourage local health departments to engage in administration of portions of waste program.

II. Override:

- o Site Approval Board shall review and grant final approval for each site construction permit application recommended by Department. The Board shall, to the fullest extent practicable, integrate by stipulation the provisions of local ordinances, permits, or requirements.
- o Department shall make final decision on operating license application. Local ordinances, permits, or other requirements shall not prohibit the operation of a licensed disposal facility.

III. Public Participation:

- o Each Site Approval Board contains representatives of host community.
- o Board to hold public hearing, following notice in newspaper, in host community.
- o HWM Planning Committee to hold 3 public hearings across state prior to submission of plan to Department.

- o Department to notify local governments in host community of permit applications, as well as the Soil Erosion Agency, regional planning agency, and local newspapers.
- o Department to hold 3 public hearings across state prior to proposing formal rules or siting process and criteria to legislature.

IV. Financial Assurances:

- o Developer to provide bond or other surety to cover closure costs and 15 years of post-closure monitoring and maintenance costs.
- o Disposal Facility Trust Fund, containing \$20 million - \$30 million, funded by surcharges on facilities, to cover state costs in long-term care after assumption of site responsibilities.
- o Hazardous Waste Service Fund, containing \$1,000,000 in legislative appropriations, created to finance emergency actions taken by state.

V. Non-Financial Assurances:

- o Developer to include emergency contingency plans in application.
- o Developer to execute covenant restricting future use of site without approval of Department.
- o Health Department may declare state of imminent and substantial hazard to health if it suspects dangers in any facility operation. Empowers Department to undertake precautionary measures, including facility close-down, waste removal, environmental clean-up.
- o Developer to provide right of search and seizure without warrant by officials of Department.
- o Department to issue operation permit after construction and prior to commencement of facility operations. Permit issued only after certification that construction meets specifications approved in construction permit issued by Board and after formal inspection of facility by Department.

VI. Incentives and Compensation:

- o Not specified in Act.

State: New York

Effective Date: 09/01/78

Citation: S-9557, A-12770, Ch. 639, 1978;
"Industrial Hazardous Waste
Management Act" as amended by
Ch. 853, 1982

Sponsor: Sen. B. C. Smith
Speaker S. Steingut

Title: Title II - Industrial Siting Hazardous Waste Facilities

SCOPE OF LAW

I. Approach:

- o Certificates of environmental safety and public necessity required for operation of facilities, issued by 8-member temporary siting board. Board composed of Secretary of State; 4 state commissioners; and 3 ad hoc non-elected members appointed by Governor, 2 of whom must reside in host judicial district. Applications submitted to Department of Environmental Conservation for analysis and technical review.
- o Department to promulgate siting criteria and application requirements, including mandate to include analysis of alternative sites.
- o Does not apply to on-site treatment or storage, non-major facilities, or those located at existing sites that are similar to existing facilities.

II. Override:

- o Siting board must deny license if facility is contrary to local zoning or land-use ordinances in effect on date of application.

III. Public Participation:

- o Local representatives sit on siting board.
- o Department to publish notice of application in environmental bulletin, 2 newspapers serving host community and contiguous areas, and notify chief executive officers of host communities, as well as property owners within 300 feet of proposed site. Department may require developer to publish similar notices and accept public comment.
- o Public hearing to be held before hearing officer, following notice and prior to determination on issuance of certificate.
- o Board to notify all parties of hearing of decision on certificate.
- o Adjudicatory hearing held on the permit application.

IV. Financial Assurances:

- o Not specified in Act. Department to include in regulations.

V. Non-Financial Assurances:

o Not specified in Act. Department to include in regulations.

VI. Incentives and Compensation:

o Not specified in Act.

APPENDIX D

FEDERAL GOVERNMENT AGENCIES THAT COULD BE INVOLVED WITH A HAZARDOUS WASTE FACILITY IN A MINE

FEDERAL GOVERNMENT AGENCIES

Council on Environmental Quality (CEQ)

Function: Develops and recommends to the President national policies concerning environmental issues; analyzes national trends, reviews federal programs and conducts studies concerning the environment.

Address: 722 Jackson Place NW
Washington, D.C. 20006

Phone: 202/395-5700

Department of Agriculture (USDA)

USDA agencies which may be involved with a hazardous waste facility are listed below.

Address: Fourteenth Street and Independence Avenue, SW
Washington, D.C. 20250

Phone: 202/447-2791

Farmers Home Administration (FHA)

Function: Provides credit for those in rural areas who are unable to get credit from other sources at reasonable rates and terms. FHA provides financial and management assistance through a number of types of loans, one of which is the Business and Industry Loan. Under this program the agency is authorized to make grants for projects to improve water, waste disposal, and industrial site facilities in rural areas.

Address: Farmers Home Administration
Department of Agriculture
Washington, D.C. 20250

Phone: 202/447-4323

Office of Rural Development Policy (ORDP)

Function: Assists the Under Secretary for Small Community and Rural Development in carrying out responsibilities for rural development leadership, coordination, and strategy preparation and implementation.

Address: Office of the Director
Office of Rural Development Policy
Department of Agriculture
Washington, D.C. 20250

Phone: 202/382-0044

Agricultural Research Service (ARS)

Function: Administers research programs in animal and plant protection and production; the use and improvement of soil, water, and air; the processing, storage, and distribution of farm products; and human nutrition.

Address: Agricultural Research Service
Department of Agriculture
Washington, D.C. 20250

Phone: 202/447-3998

ARS Regional Offices

<u>Region</u>	<u>Address</u>
Northeastern	Building 003 Agricultural Research Center Beltsville, MD 20705
North Central	2000 W. Pioneer Parkway Peioria, Illinois 61614
Southern	P. O. Box 53326 New Orleans, LA 70153
Western	1333 Broadway Oakland, California 94612

Cooperative State Research Services (CSRS)

Function: Administers acts of congress that authorize Federal appropriations for agricultural research carried on by the state agricultural experiment stations of the states and U.S. territories.

Cooperative State Research Services (CSRS) cont'd.

Address: Office of Administration
Cooperative State Research Service
Department of Agriculture
Washington, D.C. 20250

Phone: 202/447-4423

U.S. Forest Service

Function: Manages the national forest system for multiple use and sustained yield. USFS also provides assistance to states in conservation and forest management. In particular, the USFS would be involved with administering mining claims and lease management for projects in the national forest system.

Address: Forest Service
Department of Agriculture
P. O. Box 2417
Washington, D.C. 20013

Phone: 202/447-3760

Forest Service Field Offices

<u>Region</u>	<u>Address</u>
Northern	Federal Building Missoula, Montana 59807
Rocky Mountain	11177 W. 8th Ave. (P.O. Box 25127) Lakewood, Colorado 80025
Southwestern	517 Gold Avenue, SW Albuquerque, New Mexico 87102
Intermountain	324 25th Street Ogden, Utah 84401
Pacific Southwest	630 Sansome Street San Francisco, California 94111
Pacific Northwest	319 SW Pine Street (P.O. Box 3623) Portland, Oregon 97208
Southern	1720 Peachtree Road, NW Atlanta, Georgia 30309

Forest Service Field Offices
(Continued)

<u>Region</u>	<u>Address</u>
Eastern	6333 W. Wisconsin Avenue Milwaukee, Wisconsin 53203
Alaska	Federal Office Building (P.O. Box 1628) Juneau, Alaska 99802

Soil Conservation Service (SCS)

Function: Develops and oversees national soil and water conservation programs. The SCS also assists in agricultural pollution control, environmental improvement, and rural community development.

Address: Soil Conservation Service
Department of Agriculture
P. O. Box 2890
Washington, D.C. 20013

Phone: 202/447-4543

Department of Commerce

Function: Under RCRA the DOC is responsible for programs promoting the recycling of waste material. Department of Commerce agencies which may be involved with a hazardous waste facility are listed below.

Address: 14th and E Streets, SW
Washington, D.C. 20230

Phone: 202/377-2000

National Oceanic and Atmospheric Administration (NOAA)

Function: Monitors, reports, and predicts conditions in the atmosphere, oceans, sun, and space environments; and develops beneficial methods of environmental modification and assesses the consequences of inadvertent environmental modification over scales of time. Pertinent tasks include establishing and operating a national environmental satellite system and conducting a program of research relating to the atmosphere, waterways, space, and earth environments. NOAA also acquires, stores, and disseminates worldwide environmental data.

National Oceanic and Atmospheric Administration (NOAA) cont'd.

Address: National Oceanic and Atmospheric Administration
Department of Commerce
Washington, D.C. 20230

Phone: 202/377-4190

Department of Defense (DOD)

DOD agencies which may be involved in a hazardous waste facility are listed below.

Address: The Pentagon
Washington, D.C. 20301

Phone: 202/545-6700

U.S. Army Corps of Engineers (CGUSACE)

Function: Manages U.S. Army property; manages and executes engineering, construction, and real estate programs for the Army and Air Force. The Corps manages and executes Civil Works Programs which include research, design, construction, operation and maintenance, and administration of laws concerning navigable waters and wetlands.

U.S. Army Corps of Engineers
Division and District Offices

<u>Division/District</u>	<u>Address</u>
Huntsville Division	P. O. Box 1600 Huntsville, Alabama 35807
Lower Mississippi Valley Division	P. O. Box 80 Vicksburg, Mississippi 39180
Memphis District	668 Clifford Drive Federal Building Memphis, Tennessee 38103
New Orleans District	P. O. Box 60267 New Orleans, Louisiana 70160
St. Louis District	210 Tucker Blvd., North St. Louis, Missouri 63101

U.S. Army Corps of Engineers
Division and District Offices
(Continued)

<u>Division/District</u>	<u>Address</u>
Vicksburg District	P. O. Box 60 Vicksburg, Mississippi 39180
Middle East Division	P. O. Box 2250 Winchester, Virginia 22601
Missouri River Division	P. O. Box 103, Downtown Station Omaha, Nebraska 68101
Kansas City District	700 Federal Building Kansas City, Missouri 64106
Omaha District	6014 USPO & Courthouse Omaha, Nebraska 68102
New England Division	424 Trapelo Road Waltham, Massachusetts 02254
North Atlantic Division	90 Church Street New York, New York 10007
Baltimore District	P. O. Box 1715 Baltimore, Maryland 21203
New York District	26 Federal Plaza New York, New York 10278
Norfolk District	803 Front Street Norfolk, Virginia 23510
Philadelphia District	US Custom House 2nd & Chestnut Streets Philadelphia, PA 19106
North Central Division	536 S. Clark Street Chicago, Illinois 60605
Buffalo District	1776 Niagara Street Buffalo, New York 14207
Chicago District	219 S. Dearborn Street Chicago, Illinois 60604

U.S. Army Corps of Engineers
Division and District Offices
(Continued)

<u>Division/District</u>	<u>Address</u>
Detroit District	P. O. Box 1027 Detroit, Michigan 48231
Rock Island District	Clock Tower Building Rock Island, Illinois 61201
St. Paul District	1135 USPO & Custom House St. Paul, Minnesota 55101
North Pacific Division	P. O. Box 2870 Portland, Oregon 97208
Alaska District	P. O. Box 7002 Anchorage, Alaska 99510
Portland District	P. O. Box 2946 Portland, Oregon 97208
Seattle District	P. O. Box C-3755 Seattle, Washington 98124
Walla Walla District	Bldg. 602, City-County Airport Walla Walla, Washington 99362
Ohio River Division	P. O. Box 1159 Cincinnati, Ohio 45201
Huntington District	502 Eighth Street Huntington, West Virginia 25701
Louisville District	P. O. Box 59 Louisville, Kentucky 40201
Nashville District	P. O. Box 1070 Nashville, Tennessee 37202
Pittsburgh District	William S. Moorhead Fed Bldg. Pittsburgh, Pennsylvania 15222
Pacific Ocean Division	Building 230 Fort Shafter, Hawaii 96858

U.S. Army Corps of Engineers
Division and District Offices
(Continued)

<u>Division/District</u>	<u>Address</u>
South Atlantic Division	510 Title Building 30 Pryor Street, SW Atlanta, Georgia 30303
Charleston District	P. O. Box 919 Charleston, South Carolina 29402
Jacksonville District	P. O. Box 4970 Jacksonville, Florida 32232
Mobile District	P. O. Box 2283 Mobile, Alabama 36628
Savannah District	P. O. Box 889 Savannah, Georgia 31402
Wilmington District	P. O. Box 1890 Wilmington, North Carolina 28402
South Pacific Division	630 Sansome Street, Room 1216 San Francisco, California 94111
Los Angeles District	P. O. Box 2711 Los Angeles, California 90053
Sacramento District	650 Capital Mall Sacramento, California 95814
San Francisco District	211 Main Street San Francisco, California 94105
Southwestern Division	1114 Commerce Street Dallas, Texas 75242
Albuquerque District	P. O. Box 1580 Albuquerque, New Mexico 87103
Fort Worth District	P. O. Box 17300 Fort Worth, Texas 76102
Galveston District	P. O. Box 1229 Galveston, Texas 77553

U.S. Army Corps of Engineers
Division and District Offices
(Continued)

<u>Division/District</u>	<u>Address</u>
Little Rock District	P. O. Box 867 Little Rock, Arkansas 72203
Tulsa District	P. O. Box 61 Tulsa, Oklahoma 74121

Defense Advanced Research Projects Agency (DARPA)

Function: Manages high-risk, high-payoff basic research and applied technology programs in projects designated by the Secretary of Defense.

Address: 1400 Wilson Boulevard
Arlington, Virginia 22209

Phone: 202/694-3007

Defense Logistics Agency (DLA)

Function: Provides support to the military services, DOD agencies, Federal, and civil agencies for assigned material commodities and items of supply, logistics services, and other support services. The DLA administers the operation of various DOD programs one of which is the DOD Hazardous Material Data System.

Address: Cameron Station
Alexandria, Virginia 22314

Phone: 202/274-6001

Department of Energy (DOE)

Function: Administers programs for long-term, high-risk research and development for energy technology, marketing of Federal power, energy conservation, nuclear weapons, and energy data collection and analysis. The Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness is responsible for assuring that DOE programs comply with environmental safety and health regulations and coordinates the department's responsibilities under the National Environmental Policy Act of 1969.

Department of Energy (DOE) cont'd.

Address: James Forrestal Building
1000 Independence Avenue, SW
Washington, D.C. 20585

Phone: 202/252-5000

Department of Health and Human Services (HHS)

HHS agencies which may be involved with a hazardous waste facility are listed below.

Address: 200 Independence Avenue, SW
Washington, D.C. 20201

Phone: 202/245-6296

Public Health Service (PHS)

Function: Manages national health related organizations such as Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA); Centers for Disease Control (CDC); Food and Drug Administration (FDA); Health Resources Administration (HRA); Health, Services Administration (HSA); and National Institutes of Health (NIH). PHS sub-organization which may be involved with a hazardous waste facility are: The National Center for Toxicological Research under the FDA; the National Institute of Environmental Health Science and the Division of Research Services under the NIH, all of which conduct research programs and provide support for such programs.

Address: 200 Independence Avenue, SW
Washington, D.C. 20201

Phone: 202/245-6867

Public Health Service
Regional Offices

Region

1

Address/Phone

JFK Federal Building
Boston, MA 02200
617/233-6827

Public Health Service
Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
2	26 Federal Plaza New York, NY 10278 212/264-2560
3	3535 Market Street Philadelphia, PA 19101 215/596-6637
4	101 Marietta Tower Atlanta, GA 30323 404/221-2316
5	300 S. Wacker Drive Chicago, IL 60606 312/353-1385
6	Main Tower Building Dallas, TX 75202 214/767-3879
7	601 E. 21st Street Kansas City, MO 64106 816/374-3291
8	1961 Stout Street Denver, CO 80294 303/837-4461
9	50 United National Plaza San Francisco, CA 94102 415/556-5810
10	1312 Second Avenue Seattle, WA 98101 206/442-0430

Department of Housing and Urban Development

Function: The Assistant Secretary has the responsibility of implementing policies and procedures concerning environmental quality pursuant to the National Environmental Policy Act of 1969 and the

Department of Housing and Urban Development cont'd.

Housing and Community Development Act of 1974. Environmental activities include development of standards, policies, and procedures for environmental assessments and impact statements; historic preservation reviews; insuring compliance with laws on archeology, flood plains, wet lands, aquifers, and endangered species; development and administration of strategies for the improvement of environmental problems such as natural and man-made hazards and air and noise pollution.

Emphasis is placed on technical assistance for helping communities in environmental and land use planning and environmental management practices.

Address: 451 Seventh St., SW
Washington, D.C. 20410

Phone: 202/755-6420

Department of Housing & Urban Development
Regional Offices

<u>Region</u>	<u>Address/Phone</u>
1	JFK Federal Building Boston, MA 02203 617/233-4066
2	26 Federal Plaza New York, NY 10278 212/264-8068
3	Sixth & Walnut Streets Philadelphia, PA 19106 215/597-2560
4	RB Russell Federal Building Atlanta, GA 30303 404/221-5136
5	300 S. Wacker Drive Chicago, IL 60606 312/353-5680

Department of Housing & Urban Development
Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
6	221 W. Lancaster Avenue Ft. Worth, TX 76113 817/870-5401
7	1103 Grand Street Kansas City, MO 64106 816/374-2651
8	1405 Curtis Street Denver, CO 80202 303/837-4513
9	450 Golden Gate Avenue San Francisco, CA 94102 415/556-4752
10	1321 Second Avenue Seattle, WA 98101 206/442-5414

Department of the Interior (DOI)

Function: Manages most of our nationally owned public lands. Other DOI responsibilities include management of Indian reservations; conservation and development of mineral, water, fish, and wildlife resources; coordination of Federal and state recreation programs; administration of National historic areas, operation of Job Corps Conservation centers. DOI agencies which may be involved with a hazardous waste facility are listed below.

Address: C & 19th Streets, NW
Washington, D.C. 20240

Phone: 202/343-3171

Office of Water Research and Technology (OWRT)

Function: Conducts research and development activities for the purpose of solving or mitigating existing and projected state, regional, and nation-wide water resource problems.

DOI Agencies

Office of Water Research and Technology (OWRT) cont'd.

Address: Office of Water Research and Technology
Department of the Interior
Washington, D.C. 20240

Phone: 202/343-4607

United States Fish and Wildlife Service

Function: Administers programs concerning conservation, protection, and enhancement of fish and wildlife and their habitats. Some relevant service activities include: biological monitoring; surveillance of pesticides, heavy metals, and thermal pollution; ecological studies; environmental impact assessment through river basin studies, including hydroelectric dams, nuclear power sites, stream channelization, dredge and fill permits; and environmental impact statement review.

Address: U.S. Fish and Wildlife Service
Department of the Interior
Washington, D.C. 20240

Phone: 202/343-5634

U.S. Fish and Wildlife Service Regional Offices

<u>Region</u>	<u>Address/Phone</u>
Albuquerque Office	500 Gold Ave., SW Albuquerque, NM 87103 505/766-2321
Anchorage Office	1011 E. Tudor Road Anchorage, AK 99503 907/276-3800
Atlanta Office	75 Spring St., SW Atlanta, GA 30303 404/221-3594
Denver Office	134 Union Blvd. Lakewood, CO 80228 303/234-2209

U.S. Fish and Wildlife Service
Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
Newton Corner Office	One Gateway Center Newton Corner, MA 02158 617/965-5100
Portland Office	500 NE Multnomah Street Portland, OR 97232 503/231-6118
Twin Cities Office	Federal Bldg. Fort Snelling Twin Cities, MN 55111 612/725-3500

National Park Service (NPS)

Function: Administers the system of national parks, monuments, historic sites, and recreation areas.

Pertinent activities include mineral validity determinations and patent examinations pertaining to mining claims, and participation in management of mining leases of NPS land.

Address: National Park Service
Department of the Interior
Washington, D.C. 20240

Phone: 202/343-7394

National Park Service
Regional Offices

<u>Region</u>	<u>Address/Phone</u>
Alaska Region	540 W. Fifth Avenue Anchorage, AK 99501 907/271-4226
Mid-Atlantic Region	143 S. Third Street Philadelphia, PA 19106 215/597-3679
Midwest Region	1709 Jackson Street Omaha, NE 68102 402/221-3472

National Park Service
Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
National Capital Region	1100 Ohio Drive SW Washington, D.C. 20242 202/426-6700
North Atlantic Region	15 State Street Boston, MA 02109 617/223-3793
Pacific Northwestern Region	2001 Sixth Seattle, WA 98101 206/442-4830
Rocky Mountain Region	655 Parfet Street Denver, CO 80225 303/234-3095
Southeastern Region	75 Spring Street SW Atlanta, GA 30303 404/221-4998
Southwestern Region	Box 728 Santa Fe, NM 87501 505/988-6375
Western Region	450 Golden Gate Avenue San Francisco, CA 94102 415/556-5186

Bureau of Mines (BOM)

Function: Manages research programs dealing with various aspects of the mining industry, such as the use of domestic low grade ores and minerals, recycling of solid wastes, mine health and safety, and environmental problems associated with mining and minerals.

Address: Bureau of Mines
Department of the Interior
2401 E Street, NW
Washington, D.C. 20241

Phone: 202/634-1004

Geological Survey (USGS)

Function: Performs surveys, investigations, and research concerning topography, geology, and the mineral and water resources; classifies land as to mineral character and water and power resources; enforces departmental regulations applicable to oil, gas, and other mining leases, permits, licenses, and development contracts.

Address: Geological Survey
Department of Interior
National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

Phone: 703/860-7444

Bureau of Land Management (BLM)

Function: Manages and administers 341 million acres of public lands and subsurface resources for an additional 169 million acres where mineral rights have been reserved to the Federal government.

Some pertinent activities include administering sales of BLM land to individuals, organizations, or local or other Federal agencies when in the public interest; issuing right-of-way for crossing Federal land, surveying of Federal lands and maintaining public land records and records of mining claims.

Address: Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Phone: 202/343-5717

Bureau of Land Management Field Offices

<u>Office</u>	<u>Address/Phone</u>
Alexandria Office	350 Pickett Street Alexandria, VA 22304 703/235-2833
Anchorage Office	701 C Street Anchorage, AK 99513 907/271-5076

Bureau of Land Management
Field Offices
(Continued)

<u>Office</u>	<u>Address/Phone</u>
Billings Office	222 North 32nd Street Billings, MT 59107 406/657-6461
Boise Office	Federal Building Boise, ID 83724 208/334-1401
Cheyenne Office	2515 Warren Avenue Cheyenne, WY 82001 307/778-2220
Denver Office	2000 Arapahoe Denver, CO 80202 303/837-4325
Phoenix Office	2400 Valley Bank Center Phoenix, AZ 85073 602/261-3873
Portland Office	729 NE Oregon Street Portland, OR 97208 503/231-6251
Reno Office	Federal Building Reno, NV 89520 702/784-5451
Sacramento Office	2800 Cottage Way Sacramento, CA 95825 916/484-4676
Salt Lake City Office	136 E South Temple Salt Lake City, UT 84111 801/524-5311
Santa Fe Office	Federal Building Santa Fe, NM 87501 505/988-6217

Department of Justice

Department of Justice agencies which may be involved with a hazardous waste facility are listed below.

Address: Tenth St. & Constitution Ave. NW
Washington, D.C. 20530

Phone: 202/633-2007

Land and Natural Resources Division

Function: Conducts lawsuits, both in Federal and State courts, relating not only to the assertion and protection of interests in specific real property and natural resources owned or sought to be acquired by the Federal Government, but relating also to the protection of the American environment, generally.

In particular, the Division defends suits against Government offices arising out of the National Environmental Policy Act, and represents the EPA in suits involving judicial review of the Administrator's actions.

Address: Tenth St. & Constitution Ave. NW
Washington, D.C. 20530

Phone: 202/633-2701

Department of Labor

Department of Labor agencies which may be involved in a hazardous waste facility are listed below.

Address: 200 Constitution Avenue, NW
Washington, D.C. 20210

Phone: 202/523-8165

Occupational Safety and Health Administration (OSHA)

Function: Develops and promulgates occupational safety and health standards; develops and issues regulations; conducts investigations and inspections to determine compliance with the regulations; and issues citations and proposes penalties for non-compliance.

Occupational Safety and Health Administration (OSHA) cont'd.

Address: Occupational Safety and Health Administration
200 Constitution Avenue, NW
Washington, D.C. 20210

Phone: 202/523-6901

OSHA Regional Offices

<u>Region</u>	<u>Address/Phone</u>
1	One Dock Square Bldg. Boston, MA 02109 617/233-6710
2	1515 Broadway New York, NY 10036 212/944-3426
3	3535 Market Street Philadelphia, PA 19104 215/596-1201
4	1375 Peachtree St. NE Atlanta, GA 30367 404/881-3573
5	230 S. Dearborn St. Chicago, IL 60604 312/353-2220
6	555 Griffin Square Bldg. Dallas, TX 75202 214/767-4731
7	911 Walnut St. Kansas City, MO 64106 816/374-5861
8	1961 Stout St. Denver, CO 80294 303/837-3883
9	450 Golden Gate Ave. San Francisco, CA 94102 415/556-0586

OSHA Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
10	909 First Ave. Seattle, WA 96174 206/442-5930

Mine Safety and Health Administration

Function: Develops and promulgates mandatory safety and health standards for the mining industry, ensures compliance with such standards; assess penalties for violations; investigates accidents; aids in the development of state programs.

Address: Mine Safety and Health Administration
4015 Wilson Blvd.
Arlington, VA 22205

Phone: 703/235-1452

MSHA Field Offices

<u>Office</u>	<u>Address/Phone</u>
Albany Office	1450 W. Queen Ave. Albany, OR 97321 503/926-5213
Beckley Office	Drawer J Beckley, WV 25801 304/255-1479
Birmingham Office	228 W. Valley Ave. Birmingham, AL 35209 205/254-1513
Dallas Office	Old Post Office Bldg. Dallas, TX 75221 214/767-5362
Lakewood Office	730 Simms St. Lakewood, CO 80215 303/234-2800
Lexington Office	340 Legion Dr. Lexington, KY 40504 606/253-2820

MSHA Field Offices
(Continued)

<u>Office</u>	<u>Address/Phone</u>
Norton Office	Post Office Bldg. Norton, VA 24273 703/679-4430
Phoenix Office	522 N. Central Ave. Phoenix, AZ 85004 602/261-4905
Pittsburgh Office	4 Parkway Center Pittsburgh, PA 15220 412/621-4500
Vincennes Office	2602 N. Sixth St. Vincennes, IN 47591 812/882-6307

Department of Transportation (DOT)

DOT Agencies which may be involved with a hazardous waste facility are listed below.

Address: 400 Seventh St. SW
Washington, D.C. 20590

Phone: 202/426-4321

DOT Regional Offices

<u>Region</u>	<u>Address/Phone</u>
3	434 Walnut St. Philadelphia, PA 19106 215/597-9430
4	1720 Peachtree Rd. NW Atlanta, GA 30309 404/881-3738
5	300 S. Wacker Dr. Chicago, IL 60606 312/353-4000

DOT Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
6	819 Taylor St. Ft. Worth, TX 76102 817/334-2725
7	601 E. 12th St. Kansas City, MO 64106 816/374-5801
8	2 Embarcadero Center San Francisco, CA 94111 415/556-5961

United States Coast Guard

Function: Functions and activities include search and rescue operations, Maritime Law Enforcement, Commercial Vessel, and Boating Safety, aids to Navigation. Under the Marine Environmental Response and the Port and Environmental Safety programs the Coast Guard performs such functions as boarding tank vessels, monitoring transfer operations, inspecting liquid bulk facilities, supervising cargo transfer operations of special interest vessels, and providing a response capability in the event of a major pollution incident.

Address: U.S. Coast Guard
2100 Second St., SW
Washington, D.C. 20593

Phone: 202/426-1587

Districts and Field Organizations -
United States Coast Guard

<u>Organization</u>	<u>Address</u>
1st District: ME, MA, NH, RI, VT	150 Causeway St. Boston, MA 02114
2nd District: AR, CO, IL, IN, IA, KS, KT, MN, MO, NE, ND, OH, OK, western PA, SD, TN, WV, WI, WY	1430 Olive St., St. Louis, MO 63103
3rd District: CT, DE, NJ, eastern NY, eastern PA	Governors Island New York, NY 10004

Districts and Field Organizations -
United States Coast Guard
 (Continued)

<u>Organization</u>	<u>Address</u>
5th District: DC, MD, NC VA	Federal Bldg. 431 Crawford St. Portsmouth, VA 23705
7th District: FL, GA, PR, SC, VI	Federal Bldg. 51 SW., 1st Ave. Miami, FL 33130
8th District: AL, LA, MS, NM, LA, TX	Hale Boggs Federal Bldg. 500 Camp St. New Orleans, LA 70130
9th District: Great Lakes area	1240 E. 9th St. Cleveland, OH 44199
PACIFIC AREA	630 Sansome St. San Francisco, CA 94126
11th District: AZ, southern CA	Union Bank Bldg. 400 Oceangate Blvd. Long Beach, CA 90822
12th District: northern CA, NV, UT	630 Sansome St. San Francisco, CA 94126
13th District: OR, ID, MT, WA	Federal Bldg. 915 2nd Avenue Seattle, WA 98174
14th District: American Samoa, GU, HI Pacific Islands	9th Floor, Prince Kalaniana'ole Federal Bldg. 300 Ala Moana Blvd. Honolulu, HI 96850
17th District: AK	P.O. Box 3-5000 Juneau, AK 99802
U.S. COAST GUARD ACADEMY SUPERINTENDENT	New London, CT 06320

Federal Highway Administration (FHWA)

Function: Administers highway transportation programs concerned with the total operation and environment of highway systems. Under the

Federal Highway Administration (FHWA) cont'd.

Highway Safety Programs the FHWA has jurisdiction over the movement of dangerous cargoes, such as hazardous wastes.

Address: Federal Highway Administration
400 Seventh SW
Washington, D.C. 20590

Phone: 202/426-0677

FHWA Regional Offices

<u>Region</u>	<u>Address/Phone</u>
1	Clinton Ave. & N. Pearl St. Albany, NY 12207 518/472-6476
3	31 Hopkins Plaza Baltimore, MD 21201 301/962-2361
4	1720 Peachtree Rd. NW Atlanta, GA 30309 404/881-4078
5	18209 Dixie Hwy. Homewood, IL 60430 312/370-9300
6	819 Taylor St. Ft. Worth, TX 76102 817/334-3221
7	6301 Rockhill Rd. Kansas City, MO 64141 816/926-7563
8	Denver Federal Center Denver, CO 80225 303/234-4051
9	2 Embarcadero Center San Francisco, CA 94111 415/556-3850
10	222 SW Morrison St. Portland, OR 97204 503/221-2053

FHWA Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
15	1000 N. Glebe Rd. Arlington, VA 22201 703/557-9070

Material Transportation Bureau (MTB)

Function: Coordinates DOT's responsibilities concerning hazardous materials transportation and pipeline safety. Activities include developing, issuing, and enforcing regulations for transportation of hazardous materials.

Address: Materials Transportation Bureau
400 Seventh St. SW
Washington, D.C.

Phone: 202/755-9260

MTB - Field Offices

<u>Region</u>	<u>Address</u>
EASTERN - CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT, VA, WV, PR	Room 7117, 400 7th St. SW Washington, DC 20590
SOUTHERN - AL, FL, GA, KY, MS, NC, SC, TN	1568 Willingham Dr. Atlanta, GA 30337
CENTRAL - IL, IN, IA, KS, MI, MN, MO, NE, OH, WI	Room 1802, 911 Walnut St. Kansas City, MO 64106
SOUTHWEST - AR, LA, NM, OK, TX	6622 Homwood Dr. Houston, TX 77074
WESTERN - AZ, CA, CO, ID, MT, NV, ND, OR, SD, UT, WA, WY, AK, HI	831 Mitten Rd. Burlingame, CA 94010

Environmental Protection Agency (EPA)

Function: Develops national programs, technical policies and regulations, enforces standards, conducts research, and coordinates efforts of state and local government agencies, private organizations, and other Federal agencies for the purpose of controlling and abating environmental pollution.

Environmental Protection Agency (EPA) cont'd.

Function: Specific Activities Include: Air, Noise, and Radiation Programs; Water Programs; Solid Waste Emergency Response Programs; Pesticides and Toxic Substances Programs; Legal and Enforcement Counsel, and Research and Development.

Address: 401 M Street SW
Washington, D.C. 20460

Phone: 202/382-2090

EPA - Regional Office

<u>Region</u>	<u>Address/Phone</u>
1	JFK Federal Bldg. Boston, MA 02203 617/223-7210
2	26 Federal Plaza New York, NY 10278 212/264-2525
3	Curtis Bldg. Philadelphia, PA 19106 215/597-9814
4	345 Courtland St. NE Atlanta, GA 30308 404/881-4727
5	230 S. Dearborn St. Chicago, IL 60604 312/353-2000
6	First Intl. Bldg. Dallas, TX 75270 214/767-2600
7	324 E. 11th St. Kansas City, MO 64106 816/374-5493
8	1860 Lincoln St. Denver, CO 80295 303/837-3895

EPA - Regional Office
(Continued)

<u>Region</u>	<u>Address/Phone</u>
9	215 Fremont St. San Francisco, CA 94105 415/974-8071
10	1200 Sixth Ave. Seattle, WA 98101 206/442-1220

Federal Emergency Management Agency (FEMA)

Function: Provides a single point of accountability for all Federal emergency preparedness, mitigation, and response activities. Coordinates efforts of Federal, State, and local levels of government in preparing for and responding to the full range of emergencies - natural, man-made, and nuclear.

Address: 500 C. Street SW
Washington, D.C. 20472

Phone: 202/287-0330

FEMA - Regional Offices

<u>Region</u>	<u>Address/Phone</u>
1	443 JW McCormack Federal Bldg. Boston, MA 02109 617/223-4741
2	26 Federal Plaza New York, NY 10278 212/264-8980
3	Sixth & Walnut Sts. Philadelphia, PA 19106 215/597-9416
4	1375 Peachtree St. NE Atlanta, GA 30309 404/881-2400
5	One N. Dearborn St. Chicago, IL 60602 312/353-1500

FEMA - Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
6	Federal Regional Center Denton, TX 76201 817/387-5811
7	911 Walnut St. Kansas City, MO 64106 816/374-5912
8	Denver Federal Center Denver, CO 80225 303/234-2553
9	211 Main St. San Francisco, CA 94105 415/556-8794
10	Federal Regional Center Bothell, WA 98011 206/481-8800

Interstate Commerce Commission (ICC)

Function: Regulates interstate surface transportation - trains, trucks, buses, inland waterway and coastal shipping, and freight forwarders.

Address: 12th Street & Constitution Ave. NW
Washington, D.C. 20460

Phone: 202/275-7252

ICC Regional Offices

<u>Region</u>	<u>Address/Phone</u>
1	150 Causeway St. Boston, MA 02144 617/223-2372
2	101 N. Seventh St. Philadelphia, PA 19106 215/597-4449

ICC Regional Offices
(Continued)

<u>Region</u>	<u>Address/Phone</u>
3	1776 W. Peachtree St. SW Atlanta, GA 30309 404/881-4371
4	219 S. Dearborn St. Chicago, IL 60604 312/353-6204
5	411 W. Seventh St. Ft. Worth, TX 76102 817/334-3101
6	211 Main St. San Francisco, CA 94105 415/974-7011

National Transportation Safety Board (NTSB)

Function: Investigates accidents, conducts studies, and makes recommendations to Government agencies and industry on safety measures and practice. Pertinent activities include: review or appeal of action on any DOT issued certificate or license; and evaluating the adequacy of safeguards and procedures concerning the transportation of hazardous materials and the performance of Government agencies responsible for the safe transportation of such materials.

Address: Independence Ave. SW
Washington, D.C. 20594

Phone: 202/382-6600

Nuclear Regulatory Commission (NRC)

Function: Licenses and regulates the uses of nuclear energy to protect the public health and safety and the environment. Pertinent activities include licensing and regulation of transport, handling, and disposal of nuclear materials.

Address: 1717 H Street NW
Washington, D.C. 20555

Phone: 301/492-7000

APPENDIX E
STATE AGENCIES DEALING WITH HAZARDOUS WASTES

Alabama - Environmental Health Administration
Solid and Hazardous Waste Division
328 State Office Building
Montgomery, AL 36130
(205) 834-1303

Alaska - Department of Environmental Conservation
Environmental Quality Management Section
Solid Waste Management Section
Pouch O
Juneau, AK 99811
(907) 465-2667

Arizona - Department of Health Services
Division of Environmental Health Services
Bureau of Waste Management
1740 West Adams
Phoenix, AZ 85007
(602) 255-1170

Arkansas - Department of Pollution Control and Ecology
Solid Waste Division
P. O. Box 9583
Little Rock, AR 72219
(916) 562-7444

California - Solid Waste Management Board
1020 9th Street, Suite 300
Sacramento, CA 95841
(916) 322-3330

Colorado - Department of Health
Office of Health and Environmental Protection
4210 East 11th Avenue
Denver, CO 80220
(303) 320-8333

Connecticut - Department of Environmental Protection
Division of Environmental Quality
Solid Waste Management Unit
State Office Building
165 Capitol Avenue
Hartford, CT 06115
(203) 566-5847

Delaware -	Department of Natural Resources and Environmental Control Division of Environmental Control Solid Waste/Hazardous Waste Section Edward Tatnall Building P. O. Box 1401 Dover, DE 19901 (302) 736-4781
District of Columbia -	Department of Environmental Services Solid Waste Management Association/ Hazardous Waste Division 500 Overlook Avenue, S.W. Washington, DC 20032 (202) 767-8176/767-8422
Florida -	Department of Environmental Regulation Division of Environmental Programs 2600 Blainstone Road Tallahassee, FL 32301 (904) 487-1855
Georgia -	Department of Natural Resources Environmental Protection Division Land Protection Branch 270 Washington Street, S.W. Atlanta, GA 30334 (404) 650-2833
Hawaii -	Department of Health Environmental Protection and Health Services Division P. O. Box 3378 1250 Punchbowl Street Honolulu, HI 96801 (808) 548-4139
Idaho -	Department of Health and Welfare Division of Environment Statehouse Boise, ID 83720 (208) 334-4059
Illinois -	Environmental Protection Agency Land Pollution Control Division 2200 Churchill Road Springfield, IL 62706 (217) 782-6760

Indiana - Environmental Management Board
P. O. Box 1964
1330 Michigan Street
Indianapolis, IN 46206
(317) 633-0170

Iowa - Department of Environmental Quality
Air and Land Quality Division
Henry A. Wallace Building
900 East Grand Avenue
Des Moines, IA 50319
(515) 281-5851

Kansas - Department of Health and Environment
Solid Waste Management Division
740 Forbes Building
Topeka, KS 66620
(913) 862-9360

Kentucky - Bureau of Environmental Protection
Waste Management Division
Fort Boone Plaza
18 Reilly Road
Frankfort, KY 40601
(502) 564-6716

Louisiana - Department of Natural Resources
Solid Waste/Hazardous Waste Division
P. O. Box 44066
Baton Rouge, LA 70804
(504) 342-1216/342-1227

Maine - Department of Environmental Protection
Solid Waste/Hazardous Materials Division
State House, Station 17
Augusta, ME 04333
(207) 289-2111/289-2251

Maryland - Department of Health and Mental Hygiene
Waste Management Division
201 West Preston Street
Baltimore, MD 21201
(301) 383-3123

Massachusetts - Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Solid and Hazardous Waste Division
One Winter Street
Boston, MA 02108
(617) 292-5589

Michigan - Bureau of Environmental Protection
Hazardous Waste Management Office
P. O. Box 30038
Lansing, MI 48909
(517) 373-8114

Minnesota - Health Department
Environmental Health Division
717 Delaware Street SE
Minneapolis, MN 55440
(612) 296-5320

Mississippi - Department of Natural Resources
Bureau of Pollution Control
P. O. Box 10385
Jackson, MS 39209
(601) 961-5202

Missouri - Department of Natural Resources
Division of Environmental Quality
Solid Waste Management Program
P. O. Box 1368
Missouri Boulevard
Jefferson City, MO 65102
(314) 751-3241

Montana - Department of Health and Environmental Sciences
Environmental Sciences Division
Solid Waste Management Bureau
Cogswell Building
Helena, MT 59620
(406) 449-2821

Nebraska - Department of Environmental Control
P. O. Box 94877
State Office Building
Lincoln, NE 68509
(402) 471-2186

Nevada - Department of Conservation and National Resources
Division of Environmental Protection
201 South Fall Street, Capitol Complex
Carson City, NV 89710
(702) 885-4670

New Hampshire - Department of Health and Welfare
Bureau of Solid Waste Management/
Hazardous Waste Management
Hazen Drive
Concord, NH 03301
(603) 271-4586/271-4608

New Jersey - Department of Environmental Protection
Solid Waste Division/Hazardous Waste Bureau
CN 402
Trenton, NJ 08625
(609) 292-9120/292-9877

New Mexico - Health and Environmental Department
Environmental Improvement Division
P. O. Box 968
Santa Fe, NM 87503
(505) 827-5271

New York - Department of Environmental Conservation
Solid Waste Management Division/
Bureau of Hazardous Waste
50 Wolf Road
Albany, NY 12233
(518) 457-5861/457-3254

North Carolina - Department of Human Resources
Division of Health Services
Solid and Hazardous Waste Management Branch
P. O. Box 2091
225 North McDowell Street
Raleigh, NC 27602
(919) 733-2178

North Dakota - Health Department
Environmental and Waste Management Research Division
1200 Missouri Avenue
Bismarck, ND 58505
(701) 224-2382

Ohio - Environmental Protection Agency
Office of Land Pollution Control
P. O. Box 1049
361 East Broad Street
Columbus, OH 43216
(614) 466-8934

Oklahoma - Oklahoma State Department of Health (OSDH)
P. O. Box 53551
Oklahoma City, OK 73152
(405) 271-5338

Oregon - Department of Environmental Quality
Solid Waste Division
522 SW 5th Street
Portland, OR 97204
(503) 229-5336

Pennsylvania - Department of Environmental Resources
Office of Environmental Protection
Bureau of Solid Waste Management
Fulton Building, P. O. Box 2063
Harrisburg, PA 17120
(717) 787-9870

Rhode Island - Department of Environmental Management
Division of Land Resources
75 Davis Street
Providence, RI 02908
(401) 277-6820

South Carolina - Board of Health and Environmental Control
Bureau of Solid and Hazardous Waste
2600 Bull Street
Columbia, SC 29201
(803) 758-5544

South Dakota - Department of Water and Natural Resources
Environmental Health Division
Joe Foss Building
Pierre, SD 57501
(605) 773-3329

Tennessee - Department of Public Health
Bureau of Environmental Health Services
Solid Waste Management Division
Cordell Hull Building
Nashville, TN 37129
(615) 741-3424

Texas - Texas Department of Health (TDH)
1100 West 49th Street
Austin, TX 78756
(512) 458-7271
Dallas Area - (214) 460-3032

Utah - Department of Health
Division of Environmental Health
Bureau of Solid Waste Management
150 North Temple Street
P. O. Box 2500
Salt Lake City, UT 84110
(801) 533-4145

Vermont - Environmental Conservation Agency
Air and Solid Waste Division
State Office Building
Montpelier, VT 05602
(802) 828-3395

Virginia - Department of Health
Division of Solid and Hazardous Waste Management
109 Governor Street
Richmond, VA 23219
(804) 786-5271

Washington - Department of Ecology
Solid Waste Management Division/Hazardous Waste Section
P. O. Box 829
Olympia, WA 98501
(206) 459-6273/459-6301

West Virginia - Department of Health
Office of Environmental Health
1800 Washington Street East
Charleston, WV 26505
(304) 348-2987

Wisconsin - Department of Natural Resources
Bureau of Solid Waste Management
101 South Webster Street
Madison, WI 53707
(609) 266-1327

Wyoming - Environmental Quality
Solid Waste Management Program
401 West 19th Street
Cheyenne, WY 82002
(307) 777-7753

APPENDIX F MINE RATING WORKSHEET

<u>MINE DESIGNATION - "A"</u>	<u>RATING</u>
<u>Geological</u>	
Salt Dome would provide excellent containment-large high rooms, could not be fully utilized.	Good-2
<u>Hydrological</u>	
Water and brine in aquifers over the top of the dome. Potentially a source of water for flooding if breeched.	Fair-3
<u>Marketing Factors</u>	
"Mine acceptable" wastes are not generated in the immediate vicinity. 125 miles and 85 miles to nearest sources. Use of the mine would incur high transportation cost.	Poor-4
<u>Sociopolitical</u>	
The State of Louisiana currently has a 2 year legislative moratorium on waste disposal in salt domes.	Poor-4
<u>Accessibility</u>	
Accessible by rail, barge, and highway.	Good-2
<u>Location</u>	
Located in rural South Louisiana.	Fair-3
<u>Previous Studies</u>	
Several studies have been conducted about and in the mine in conjunction with the Nuclear Waste Program and the Strategic Petroleum Reserve.	Good-2
<u>Owner Interest</u>	
Operator has expressed corporate interest in the program, but not specifically for this mine. Owner has a history of opposing other development.	Fair-3

MINE RATING WORKSHEET

MINE DESIGNATION - "B"

RATING

Geological

Salt Dome would provide excellent containment-large high rooms, could not be fully utilized.

Good-2

Hydrological

Water and brine in aquifers over the top of the dome. Potentially a source of water for flooding if breeched.

Fair-3

Marketing Factors

"Mine acceptable" wastes are not generated in the immediate vicinity. 125 miles to nearest source.

Poor-4

Sociopolitical

The State currently (1983) has a 2 year legislative moratorium on waste disposal in salt domes.

Poor-4

Accessibility

Located on an island, accessible by barge or ferryboat only.

Fair-3

Location

Located in rural area, isolated by the Intracoastal Waterway.

Fair-3

Previous Studies

Several studies have been conducted about and in the mine in conjunction with the Nuclear Waste Program and the Strategic Petroleum Reserve and for a private client interested in waste storage.

Excellent-1

Owner Interest

Owner is not interested in Waste Storage at this time.

Poor-4

MINE RATING WORKSHEET

MINE DESIGNATION - "C"

RATING

Geological

Bedded salt will provide excellent containment-22-foot high x 60-foot wide rooms are ideal for storage.

Good-2

Hydrological

Water in aquifers above the salt zone in small quantities easily controlled.

Good-2

Marketing Factors

"Mine acceptable" wastes are generated in large quantities in the immediate area. Several licensed land fill operators in the area.

Excellent-1

Sociopolitical

Permits are granted by a state board without a local veto. Mine is located in an industrial area surrounded by mixture of heavy and light industry and blue collar residential land use.

Poor-4

Accessibility

The mine is accessible by rail and interstate highway within one mile.

Good-2

Location

Site is located in a heavily industrialized area. Location may present an unacceptable transportation hazard.

Poor-4

Previous Studies

The site was studied as a possible site for the Strategic Petroleum Reserve Crude Oil Storage Program. This mine was used as a model for a previous EPA study.

Excellent-1

Owner Interest

The owner has expressed interest in utilizing this mine for a demonstration.

Excellent-1

MINE RATING WORKSHEET

MINE DESIGNATION - "D"

RATING

Geological

Bedded salt will provide excellent containment-18-foot high x 45-foot wide rooms are ideal for storage.

Good-2

Hydrological

Water in aquifers above the salt zone in moderate quantities easily controlled.

Good-2

Marketing Factors

"Mine acceptable" wastes are generated in large quantities in the immediate area.

Excellent-1

Sociopolitical

Permits are granted by a state board without a local veto. Previous attempts to establish a facility in the area have met strong local and political opposition.

Poor-4

Accessibility

The mine is accessible by water, rail, and interstate highway within one mile.

Good-2

Location

The mine is located within one mile of a major metropolitan city. The location may present an unacceptable transportation hazard.

Poor-4

Previous Studies

The mine was rejected for the Strategic Petroleum Reserve Program due to its location. Only general information is available.

Fair-3

Owner Interest

The owner (operator) has not expressed corporate interest.

Not
Acceptable 5

MINE RATING WORKSHEET

MINE DESIGNATION - "E"

RATING

Geological

Bedded salt will provide excellent containment-17-foot high x 40-foot wide rooms are ideal for storage.

Good-2

Hydrological

Water in aquifers above the salt zone in moderate quantities easily controlled.

Good-2

Marketing Factors

"Mine acceptable" wastes are generated in large quantities in the immediate area.

Excellent-1

Sociopolitical

Permits are granted by a state board without a local veto. Previous attempts to establish a facility in the area have met strong local and political opposition.

Poor-4

Accessibility

The mine is accessible by water, rail, and interstate highway within one mile.

Good-2

Location

The mine is located near Lake Erie in an industrial area. The location may present an unacceptable transportation hazard.

Fair-3

Previous Studies

The mine was rejected for the Strategic Petroleum Reserve Program due to its location. Only general information is available.

Fair-3

Owner Interest

Owner has rejected the proposed demonstration

Not
Acceptable 5

MINE RATING WORKSHEET

MINE DESIGNATION - "F"

RATING

Geological

Salt dome will provide excellent containment- 65-foot wide x 85-foot high rooms could not be fully utilized.

Good-2

Hydrological

Water and brine in aquifers over the top of the dome. Potentially a source of water for flooding if breeched.

Fair-3

Marketing Factors

"Mine acceptable" wastes are not generated in the immediate vicinity. Eighty miles to nearest source. Use of the mine would require high transportation costs.

Poor-4

Sociopolitical

Facilities are permitted by the Department of Water Resources and the Department of Health. Press reports indicate a Hazardous Waste Siting Board has been created.

Fair-3

Accessibility

Mine is accessible by rail and road

Good-2

Location

Site is located 80 miles east of a major metropolitan area.

Fair-3

Previous Studies

The site was studied as a possible site for the Strategic Petroleum Reserve Crude Oil Storage Program.

Fair-3

Owner Interest

Owner has expressed corporate interest, but not in this particular mine.

Good-2

MINE RATING WORKSHEET

MINE DESIGNATION - "G"

RATING

Geological

Salt dome will provide excellent containment large high rooms could not be fully utilized.

Good-2

Hydrological

Water and brine in aquifers over the top of the dome are potentially a source of water for flooding if breeched.

Good-2

Marketing Factors

A large metropolitan area is a source of much waste, but the amount of mine acceptable waste could be of a moderate amount. Several waste operators are in the area.

Fair-3

Sociopolitical

Permits are granted by the State Dept. of Health and by the Dept. of Water Resources - Press reports indicate a Hazardous Waste Siting Board has been created.

Fair-3

Accessibility

Mine is accessible by rail and road

Good-2

Location

Site is 30 miles northwest of a large metropolitan area development. Setting around the site is rural.

Good-2

Previous Studies

Site was studied as a possible site for the Strategic Petroleum Reserve Crude Oil Storage Program. Rejected because it was too small.

Fair-3

Owner Interest

Owner has not been amenable to expansion or changes in the facility.

Poor-4

MINE RATING WORKSHEET

MINE DESIGNATION - "H"

RATING

Geological

Bedded limestone, will provide excellent containment rooms are adequately sized and could be fully utilized.

Excellent-1

Hydrological

Water in aquifer above the mining zone in moderate quantities and is easily controlled. Mine is dry except for shaft leakage.

Good-2

Marketing Factors

"Mine Acceptable" wastes are generated in large quantities in the area.

Good-2

Sociopolitical

The owner tried to promote this mine as a waste storage facility in 1981. Due to its location under a city it generated a high level of adverse public reaction. (Application was not filed.)

Poor-4

Accessibility

Mine is accessible by rail and interstate highway.

Good-2

Location

Mine is located in a metropolitan area. Mine is under residential neighborhood and a city-owned recreational lake.

Poor-4

Previous Studies

Owner financed a definitive study oriented to hazardous waste storage by D'Appolonia Engrs. in 1981.

Excellent-1

Owner Interest

Owner was interested but after the adverse public reaction has started search for alternate uses.

Poor-4

MINE RATING WORKSHEET

MINE DESIGNATION - "I"

RATING

Geological

Bedded limestone, will provide excellent containment rooms, are adequately sized and could be fully utilized.

Excellent-1

Hydrological

Water in aquifer above the mining zone in moderate quantities and is easily controlled. Mine is dry except for shaft leakage.

Good-2

Marketing Factors

"Mine Acceptable" wastes are not generated in the immediate area. High transportation costs would be necessary.

Poor-4

Sociopolitical

Mine has been studied for crude oil storage, propane storage, compressed air storage, and pumped hydro storage. No adverse reaction has been generated.

Good-2

Accessibility

Mine is accessible by rail, highway, and water. Shafts are capped.

Poor-4

Location

The mine is located on a major River. Mine location is rural, adjacent to a small city.

Good-2

Previous Studies

Mine has been studied for oil storage, pumped hydro, propane storage and compressed air storage.

Excellent-1

Owner Interest

Owner is interested in converting the mine to any acceptable use.

Excellent-1