TECHNICAL, POLITICAL AND INSTITUTIONAL CHALLENGES ASSOCIATED WITH THE URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

W. John Arthur, III
Uranium Mill Tailings Remedial Action Project
U.S. Department of Energy
Albuquerque, New Mexico

ABSTRACT

The Uranium Mill Tailings Remedial Action (UMTRA) Project was created in 1978 with passage of the Uranium Mill Tailings Radiation Control Act (Public Law 95-604), which required cleanup of twenty-four inactive uranium processing sites and an estimated 5,000 vicinity properties containing residual radioactive materials from the processing sites. Remedial action planning and implementation have been carried out in a complex interrelationship of technical, political and institutional issues. It is the objective of this presentation to provide a summary of the types of issues confronting the remedial action program, and the various ways the Department of Energy (DOE) and its contractors have closely worked with the numerous federal, state and Indian tribal agencies and the public to successfully implement the remedial action program.

BACKGROUND

The 24 UMTRA sites are located in ten western states and on two Indian tribal lands and are prioritized based on population distribution and the relative health hazards associated with the site. In March 1983 the Environmental Protection Agency (EPA) promulgated standards (40 CFR 192) for cleanup associated with inactive mill tailings sites. The standards were established in three key areas: stabilization and control of the tailings piles, cleanup of contaminated open lands and structures, and groundwater protection. The standard associated with stabilization and control of the tailings piles required a 1,000 year design life for the disposal cells, and a radon flux design standard of 20 pCi/m^2-second averaged over the top of the disposal cell. Standards for cleanup of contaminated open lands were set at 5 and 15 pCi/g Radium 226 (including background) averaged over 100 square meters in surface and subsurface layers, respectively, for areas to be released for unrestricted use. The groundwater protection standards, as established in March 1983, issued specific guidance for coordinating with the respective states and Indian tribes on a site-by-site basis to determine any necessary groundwater protection measures based on the existing contamination levels and projected future uses of the contaminated water. The EPA standards also provide for use of supplemental standards when removal of contamination would be hazardous to workers, detrimental to the environment, or would not result in derived health benefits.

Based on promulgation of the EPA standards in March 1983, the original project completion date was March 1990; however, due to the magnitude of vicinity property cleanup, increased numbers of site relocations and recent budget levelizations, DOE has requested a project extension through September 1994. DOE and the states cost-share all remedial action design, construction and land acquisition costs at a 90% federal/10% state ratio, except for sites located on Indian lands where the program is carried out at 100% federal funding. The total estimated cost of the UMTRA Project is $985 million.

The UMTRA Project is carried out with the concurrence of the Nuclear Regulatory Commission (NRC) and the affected states/tribes in the selection and performance of remedial actions. The DOE has entered into Cooperative Agreements with all affected states and two Indian nations to provide a structured framework for the necessary concurrences and interfaces involved in the remedial action, and to provide the necessary contract mechanism for cost-sharing. Additionally, the DOE and the NRC have established and implemented a Memorandum of Understanding for agency interfaces associated with the UMTRA Project. Because remedial action plans for some sites involve use of lands administered by the Bureau of Land Management (BLM), and the Bureau of Indian Affairs must be consulted about activities on Indian lands, the DOE also interfaces regularly with the Department of the Interior. It is frequently necessary for the DOE to consult the Department of Justice for legal determinations associated with the conduct of remedial actions. The program is carried out with an intensive public participation program in each community involved with the mill tailings project.

Key steps associated with conducting remedial actions are comprehensive site characterization, alternate site selection, site conceptual design, National Environmental Policy Act (NEPA) compliance, final design/engineering, land acquisition, remedial action construction, audit/inspection of construction, site certification, licensing by the NRC and long-term surveillance and maintenance of the disposal site (Fig. 1.) .

Key site disposal options include the following:

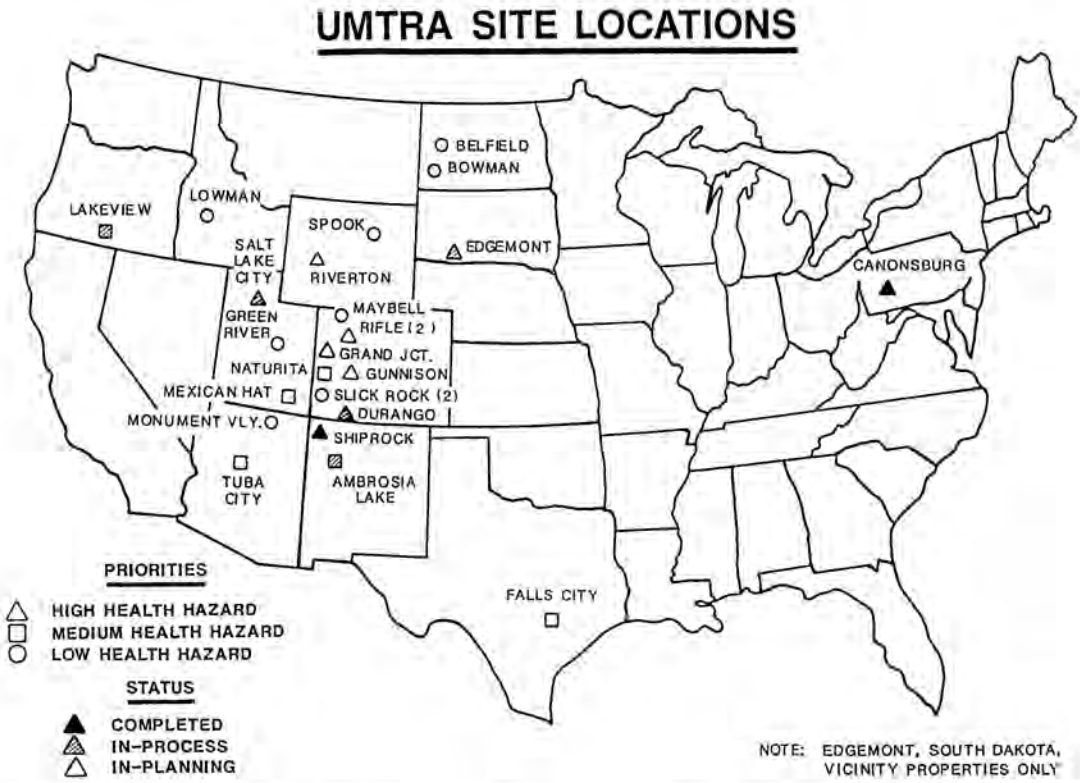

Fig. 1. Site Locations, Ranking Priority, and Construction Status of UMTRA Project Sites and Vicinity Properties Nationwide.

1) stabilization-in-place, whereby all surrounding contamination, (i.e., windblown surface soils, raffinate pond soils, etc.), are placed onto the pile and the pile is recontoured and stabilized;

2) stabilization-on-site, whereby the contamination is removed down to background levels, a natural earthen liner is placed, and all contamination is placed on top of the liner and the pile is stabilized; or

3) in cases where, for technical reasons, the site cannot be left in the same geographical area, the pile is relocated and stabilized at a remote site.

A typical cross-section for an UMTRA encapsulation cell would consist of a one- to two-foot compacted natural earthen liner at the bottom of the disposal cell, followed by placement of the mill tailings and other contaminated material, a one- to three-foot impermeable natural earthen radon barrier, a layer of bedding material and 6 to 24 inches of large rock for long-term erosion protection (Fig.2).

Three areas of challenges/accomplishments are presented: technical, political, and institutional. Time will not permit discussion of all issues that have been addressed on the project; however, key areas are categorized in Fig. 3.

Technical Issues

Technical issues include the major areas of design achievement, environmental compliance, remand of UMTRA groundwater standards, verifying quantities of contamination, non-radiological element cleanup, and accurately estimating the number of vicinity properties. Technical areas are defined for purposes of this paper as areas where various challenges have occurred which required specific design modeling, development of new models and design parameters, implementation of technical standards and criteria, development of specific testing equipment and protocols, or implementing specific programs to comply with applicable regulations.

The greatest technical issue currently facing the UMTRA Project involves a 1985 remand of the EPA groundwater standards (40 CFR 192) issued for UMTRA sites, and the immediate requirement for working closely with the EPA, NRC and involved states/tribes to assure that the standards are issued in a reasonable timeframe in order to minimize the impacts to current schedules for disposal cell construction. Draft groundwater standards were issued by EPA in Summer 1987 and the final standards are anticipated in Fall 1988. The draft standards presented specific numerical standards for uranium, molybdenum, and other key elements, established a point of compliance

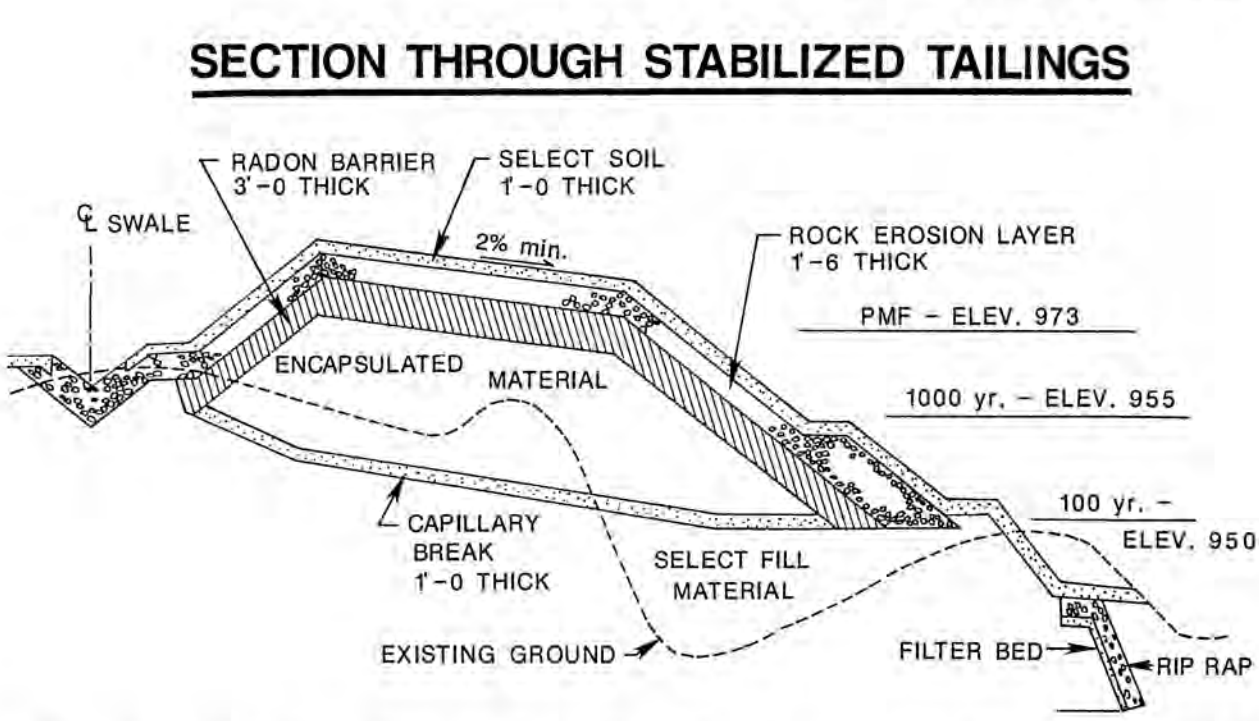

Fig. 2. Example of Typical Cross-Section for UMTRA Disposal Cell (Excluding Select Soil). Also Included are Estimated 100, 1000, and probable Maximum Flood Elevations.

TECHNICAL	POLITICAL	INSTITUTIONAL
o Design achievement	o Specific community desires	o Agency working agreements
o Environmental compliance	o Site relocation desires	o Management interface
o Non-radiological element cleanup	o Specific transportation method requests	o Applicability of local and state regulations
o Court remand of UMTRA groundwater standards	o State matching fund requirements	o Land acquisition issues
o Estimation of number of vicinity properties		
o Methodologies for identifying contamination/ radiological verification		

Fig. 3. Significant Technical, Political and Institutional Issues Critical to Successful Implementation of the UMTRA Project.

immediately below the disposal cell, and provided numerous requirements for application of alternate concentration limits in the event that the one or more numerical standards could not be achieved within certain timeframes. The DOE has issued a policy statement that no commitment for specific types of groundwater protection or aquifer restoration for the currently contaminated groundwater plumes will be made until the final standards are issued in Fall 1988; however, the project is currently evaluating the designs of disposal cells to assure that key enhancements are being made to meet the intent of the proposed standards. Areas under evaluation include development of more impermeable natural covers, collecting actual field data from previously completed disposal cells to determine the percent saturation in the radon/moisture cover, placement of asphalt emulsion or other materials within the radon cover to create a more impermeable moisture barrier, and development of a corrugated-type cover. Additionally, the DOE is revising the process by which alternate disposal sites are selected to assure that any potential disposal sites will have a good geotechnical strata which will prevent contamination of new groundwater sources. Currently, the project is developing characterization plans for the 24 UMTRA sites based on the contaminated groundwater plumes and will be closely working with the respective states and tribes to determine groundwater cleanup/protection requirements once the standards are finalized.

At several UMTRA Project sites, elevated concentrations of non-radiological elements (arsenic, molybdenum, etc.) have been found in soils after cleanup to meet the EPA radiological standards. With the remand of the groundwater standards and issuance of numerical groundwater standards by EPA for non-radiological elements, the DOE has developed a special task group to conduct pathways analysis models to determine elemental levels at which land can be released from restricted use and which would assure that no significant groundwater contamination will occur. Specific examples of areas where this situation occurs include Lakeview, Oregon, where arsenic concentrations ranging from 10 to 500 parts per million existed in soils after cleanup to radiological standards, and Belfield and Bowman, North Dakota, where windblown contamination levels of arsenic and molybdenum are present in surface soils outside the areas which will be cleaned up to meet the EPA standards for Radium-226 (Ra-226). In most cases it is felt that additional cleanup requirements for non-radiological elements would not result in significant costs, but would provide adequate assurance that no long-term contamination of groundwater will occur.

Very intensive environmental compliance programs have been developed for the UMTRA Project which encompass issues such as significant findings of Indian artifacts at proposed disposal areas, occurrence of historical sites in the specific locality of remedial actions, compliance with various wildlife and endangered species regulations, and other unique environmental considerations. The UMTRA environmental compliance program has resulted in frequent coordination with various local, state, and federal agencies regarding compliance with key environmental laws, and results in long-lead-time planning to assure that all compliances and mitigations are completed early enough to avoid construction delays. For example, one year prior to construction initiation in Shiprock, New Mexico, it was determined that an endangered species of cactus occurred in the areas where radon barrier material was to be excavated; therefore, the areas were specifically marked and fenced off to assure no resource damage occurred. In Durango, Colorado, eight significant Anasasi Indian sites occurred at the proposed disposal site. Coordination with the Colorado State Historic Preservation Office and the National Advisory Council on Historic Preservation resulted in removal of artifacts and placement in a local museum prior to start of construction. Also in Durango, Colorado, a 100-year old smelter stack from the original milling operations had to be removed because its location along the tailings transport road imposed a significant safety hazard. Another compliance issue arose when it was discovered that one of the Colorado disposal sites was located in deer and elk winter range. One year prior to initiation of remedial action, the DOE and the State of Colorado entered into an agreement to mitigate the impacts on wildlife through key facets such as payment for loss of wildlife habitat, speed restrictions on trucks going through the area and limitation on the length of the construction season. Development of a flexible environmental compliance program, specific interagency agreements with other state and federal agencies, and initiating coordination early enough to obtain the necessary clearances have resulted in minimal delays to remedial action.

Another key technical challenge has been the development of specific protocols and radiological monitoring techniques to obtain the most accurate and cost-efficient estimates of quantities of contamination and to verify that contamination has been removed to the EPA radiological standards after cleanup. Long-term in-growth of Ra-226 from residual Thorium (Th-230) in soils has resulted in development of models that are acceptable to the concurring agencies for verifying cleanup. Also, since the soil standards established by EPA for Ra-226 initially required intensive soil sampling to verify cleanup, UMTRA contractors have developed cost-effective methods for broad-scale soil gamma verification. One particular device resulted in a cost reduction to the program of approximately $2-5 million and has resulted in a reduction in requirements for soil sampling. Another key accomplishment has been development of an in-field radium analysis device which results in a reduction in reliance on off-site laboratory analysis and

allows construction to proceed within several hours of radiological sample collection.

Obtaining agency concurrences and developing standard design criteria have provided some of the greatest technical issues confronting the Project. In 1983, after issuance of the EPA standards, the DOE and cooperating agencies prepared a document titled "Implementation of the EPA Standards" which established generic plans for implementing the standards. This was followed in 1985 by the Technical Approach Document, which specified technical approaches and specific modeling requirements which, when used to design disposal cells, allow agencies to concur that the disposal cell design will meet the intent of the EPA standards. Since 1985, other technical issues have resulted in the NRC issuing several design criteria documents in the areas of rock erosion protection, quality control and awareness testing requirements. Some of the key factors addressed in these documents include models to ensure the best acceptable covers to assure minimum moisture infiltration, criteria for disposal of building rubble from original mill buildings, and criteria for testing and obtaining adequate sources of rock for erosion protection.

Because of the large number of vicinity properties, currently 4895, and the fact that approximately one-quarter of the UMTRA budget, $240 million, is associated with this type of construction, the DOE and its contractors are continually refining estimates of the number of vicinity properties to be remediated. Factors evaluated in determining confidence intervals on the total number of vicinity properties include contractor evaluations of previous radiological data bases, frequency of the number of properties that are included into the program versus the amount that are excluded (i.e., determined not to have radiological contamination which would require cleanup), establishing standard protocols for cutoff dates beyond which the DOE and the state would no longer be responsible for any cleanup of properties, and implementing extensive public information programs in communities to ensure that properties with potential contamination resulting from mill tailings have been identified and the necessary radiological evaluations are conducted.

Political Issues

Key political issues confronting the UMTRA Project have resulted from a high amount of public, state and congressional involvement to obtain various special considerations including disposal site relocation, specific transportation methods, specific local desires on the conduct of remedial action, and interfaces with other federal programs to handle multiple radioactive programs simultaneously.

The DOE's position has been to select permanent disposal sites and construct disposal cells that will meet the intent of the EPA standards in the most cost- effective manner. For each site an intensive characterization program occurs to determine whether the pile can be stabilized-in-place, stabilized-on-site, or must be relocated. There have been several examples to date of UMTRA sites where stabilization-in-place would meet the intent of the EPA standards; however, other desires have resulted in heavy pressures on the DOE to relocate the site. In those cases where stabilization-in-place is the most cost-effective, technically sound, disposal option, the DOE has entertained various cost-sharing options from states in order to pursue a more costly option. To date, all remedial actions have been cost-shared 90/10 up to the estimated cost of DOE's preferred option, with proposals by states for costs to be shared 75/25 for additional costs to implement the State's preferred alternative; a cost ceiling is also established above which the state will pay 100 percent. Requests for relocation have usually been initiated by strong local and public desires to have a pile relocated for aesthetic reasons, desires to have the existing site cleaned up for commercial and local uses, and wanting to co-locate multiple radioactive waste disposal areas in order to minimize long-term surveillance and maintenance.

Additionally, requests have come to the DOE to relocate tailings using various transportation options because of a perception of safety impacts to the community from truck haulage of contaminants. In Durango, Colorado, for example, desires were expressed to have the material relocated by conveyor and DOE agreed to bid the construction using both truck and conveyor transport. The bidding process resulted in award of the subcontract to a firm proposing truck transport which was the lowest responsive bidder. In that particular case, truck transportation costs were substantially lower than the conveyor transport option. The subcontractor has relocated large volumes of tailings without any radioactive releases or safety hazards and the community has been closely involved in the remedial actions; no concerns have been raised. In Grand Junction, Colorado, local concerns about perceived safety hazards and economic losses from truck transport of the tailings resulted in the community requesting that DOE evaluate both rail and slurry pipeline options to relocate materials. Cost estimates based on a conceptual design of a slurry pipeline transportation option indicated that this option would be $30-40 million higher than either rail or truck transport; therefore, it was removed from consideration. Currently, in Grand Junction, the DOE has committed to bid the remedial action by both truck and train. In Salt Lake City, Utah, both truck and rail transport options were bid and train transport was less costly. To date over three and one-half million cubic yards of materials have been relocated by train to the Clive disposal site, 85 miles west of Salt Lake City, very safely, with no accidents. The DOE has been flexible in evaluating various transportation options, and to date, rail and truck have each been the most cost effective

alternatives; however costs vary based on unique conditions present at the sites for which they were selected.

A large number of community desires have been expressed during activities associated with NEPA compliance, and have been communicated to DOE through formation of local task groups by the states and tribes. Such community input has included a suggestion to create a park on lands from which tailings are relocated, recommendations of specific haul routes, relocation of homes or businesses, rejection of alternate disposal sites, and public phobias about the hazards of radiation. A large degree of community concern has centered around safety, with concerns about potential truck spills, and windblown contamination during construction. All of the above concerns have been alleviated through intensive public information/education programs. Use of videos showing actual construction conditions at other sites has been very beneficial in demonstrating the effectiveness of dust control measures and showing mitigations, such as truck tarps, taken to prevent spillages during transportation. In addition, every attempt is made to accommodate local desires to the extent legally allowable under applicable federal regulations.

Each state must provide 10 percent of the estimated expenditures for remedial action activities in that state prior to initiation of remedial action construction. Due to high funding requirements for some states, DOE has received requests from states to extend the federally mandated completion date of March 1990, in order to minimize the impacts by spreading the total cost over a longer timeframe. As previously stated, the DOE has submitted a request to Congress to extend the project through September 1994. In order to assist states in obtaining funding, the DOE and the states have compiled statistics which show positive economic impacts resulting from UMTRA Project activities in affected states. These statistics, including local and state revenues generated and the number of jobs created by the project, are provided to state legislatures. The realization that the UMTRA Project has provided a very positive economic impact as well as being a major environmental cleanup project has been instrumental in obtaining the necessary funding and community support.

Institutional Issues

Institutional areas are defined as areas of coordination with various cooperating agencies in the UMTRA Project including NRC, EPA, and the states/tribes. Key areas discussed here include city, county and state interfaces and regulations, development of agency working agreements, and land acquisition issues.

Early in the UMTRA Project it was essential to obtain working agreements with the various agencies to clarify roles of key project participants and areas of coordination interface. One of the first key agreements was a DOE/NRC Memorandum of Understanding, which defined key responsibilities of the DOE and NRC for the UMTRA Project, defined key documents that would be prepared by DOE for review and comment or concurrence by the NRC, and designated timeframes for providing concurrences. To date, this MOU has resulted in an effective working relationship between the two agencies. As discussed previously, cooperative agreements are in place between the DOE and all affected states and tribal entities. Additionally, key agreements have been made between DOE and the BLM for various land use requirements. An agreement between the DOE and Colorado State Historic Preservation Office was necessary because of the large number of vicinity properties in Grand Junction; and the agreement assures effective coordination on historical and archaeological structures which may be affected by remedial actions. Through interagency development of project documents such as plans for implementation of EPA standards, technical design approaches, alternate site selection processes, and a vicinity property management implementation manual, standardized approaches have been established to maximize input from a multitude of agency expertise to assure that the project meets the intent of the EPA standards.

One critical interface which has recently resulted in significant impacts to UMTRA remedial actions has been the DOE/state interface on land acquisition issues. Under Public Law 95-604, the DOE must work with the state to acquire the processing site and/or disposal site prior to initiation of any remedial actions. To date, the acquisition process in most cases has taken from one to two years because of a very complex multitude of interests involving ownership of the properties, and difficulties encountered in reaching the proper agreements with the owners. DOE is currently reassessing real estate needs for acquiring processing and disposal sites and is setting up long-lead-time planning to coordinate with the states to assure that acquisitions are made in a timely fashion to minimize any construction delays.

A large amount of coordination has been necessary with city, county, and state agencies regarding applicability of various regulations which affect the implementation of the UMTRA Project. These areas range from applicability of state hazardous waste regulations to conditional use permit requirements imposed by counties. In Colorado, negotiations are currently ongoing between the DOE and the State of Colorado regarding the applicability of Colorado solid waste regulations to the UMTRA Project. There are significant differences between these regulations and the intent of Public Law 95-604, and the DOE is working with the state to negotiate a mutually acceptable position on implementation and applicability of the regulations. Additionally, in Grand Junction, Colorado, the DOE is applying for a county Conditional Use Permit. In this unique case, because of the issues involving transportation of the

radioactive waste and the community interest in transportation issues, the Conditional Use Permit will facilitate issue resolution. In the future, the DOE will rely heavily on the cooperative agreement process for the states to work with communities to determine the applicability of various regulations and for a method of assisting in timely resolution of these issues. The DOE and the states have worked closely to enhance these agreements and even closer interface will be required over the next few years.

SUMMARY

To date, remedial actions at UMTRA Project sites have been carried out in a very diverse environment of technical, political, and institutional issues. The previous sections have provided some of the major types of issues which have been confronted and the ways that DOE has worked with a multitude of agencies and local groups to overcome these challenges. Even though all areas could not be discussed, several "key lessons-learned" result from examination of the issues. These "lessons- learned" include a need for early establishment of strong agreements between DOE and the various agencies (in particular, the state and other concurring agencies) in order to assure clear delineation of agency responsibilities in areas of concurrences, and also to assure clear definition of the level of involvement of the agencies with the public. Another key need is to evaluate and properly plan for long-lead-time activities such as land acquisition to assure that once all the technical and agency concerns are resolved, the land is available to initiate remedial actions. Additionally, even though political concerns cannot always be defined early, it is important to develop and maintain a strong relationship between the states, other federal agencies and the public to make sure all key issues are raised at the earliest possible time in order to avoid affecting construction schedules.

To date, remedial actions have been completed at Canonsburg, Pennsylvania, and Shiprock, New Mexico, and remedial action construction is ongoing at Durango, Colorado, Lakeview, Oregon, Salt Lake City, Utah, and Tuba City, Arizona. Additionally, out of the estimated total of 4895 vicinity properties, 2000 have been initiated to date, and site remedial action starts are planned for 1988 in Grand Junction and Rifle, Colorado, Ambrosia Lake, New Mexico, Green River, Utah, and Riverton, Wyoming. Through proper planning and resolution of the previously mentioned issues, the UMTRA Project has been able to continue with a vigorous remedial action schedule and accommodate desires of a very diverse mix of governmental agencies and local communities.