WM-48

UMTRA-DOE/ALO-32

REMEDIAL ACTION CONCEPT PAPER

FOR THE

URANIUM MILL TAILINGS SITE

AT

DURANGO, COLORADO

August 1982

Uranium Mill Tailings Remedial Actions Project Office
DOE Albuquerque Operations Office
Albuquerque, NM 87115

Approved

State of Colorado
Director, Radiation Control Division
Colorado Department of Health

R. H. Campbell, Manager
UMTRA Project
Department of Energy

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

In November 1978, Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978" (UMTRCA). The Act authorizes the Department of Energy (DOE) to enter into cooperative agreements with the affected states and Indian tribes in order to establish assessment and remedial action programs at inactive uranium mill tailings sites. The Act stipulates that the DOE will meet the applicable radiation standards promulgated by the Environmental Protection Agency (EPA). It further states that the Nuclear Regulatory Commission (NRC) is to concur in all major decisions and to license the final disposal sites. The DOE is to provide 90 percent of the remedial action costs, with the affected states to pay the remaining costs. For those sites on Indian tribal lands, 100 percent of the remedial action costs will be borne by the Federal government.

Twenty-four sites, including the inactive millsite at Durango, Colorado, have been designated as eligible for remedial action. Also eligible for cleanup will be those commercial and residential structures or open lands contaminated with mill tailings that are in the vicinity of the Durango site and have been designated by the DOE. These structures and open lands will subsequently be referred to as vicinity properties. The inactive uranium mill tailings sites will hereafter be referred to as millsites. For additional clarification, the term "disposal" site will be used to represent the final disposal location of both the tailings and the contaminated material removed from designated vicinity properties and the millsite.

A cooperative agreement establishing the guidelines, responsibilities, and conditions for remedial action at Durango was signed by Colorado and the DOE, concurred in by the NRC, and became effective on October 19, 1981.

The remedial action for the Durango site will be managed by the DOE through the Uranium Mill Tailings Remedial Action (UMTRA) Project Office, in consultation with the Department of Health of the State of Colorado, and with concurrence by the NRC in certain major decisions.

The purpose of this Remedial Action Concept Paper (RACP) is to identify the reasonable alternatives, discuss the significant factors affecting the remedial action decision, and describe the remedial action options that appear to be the most feasible at this time.

The RACP does not represent decisions or commitments concerning specific actions. Such actions can be decided only after sufficient information has been obtained and analyzed, the requirements of the National Environmental Policy Act (NEPA) have been met, and definitive plans have been prepared. However, since the RACP does define the boundaries around an ultimate remedial action decision, it serves as a scoping document that provides a conceptual basis for the preparation of environmental documentation required by NEPA.

This RACP has been prepared by the DOE UMTRA Project Office and has been concurred in by the Colorado Department of Health and the U.S. Nuclear Regulatory Commission (NRC). A final remedial action plan will be prepared after the NEPA process is completed, but will not be implemented until it has been

concurred in by the State of Colorado and the NRC.

2. SITE DESCRIPTION

The Durango (Figure 1) inactive millsite is located just outside the city limits of Durango, La Plata County, in southwest Colorado. The site is bordered on the east by the Animas River, on the north by Lightner Creek, and on the southwest by Smelter Mountain. The entire site covers about 107 acres and includes two tailings piles. The large pile, covering 14 acres, is about 230 feet high and contains about 1,230,000 tons of tailings. The small pile, covering 7 acres, is about 90 feet high and contains about 325,000 tons of tailings. It is located slightly north of the large pile. The millsite and the ore-storage area, directly southeast of the large pile, cover about 8 acres. The raffinate pond area, nearly half a mile southeast of the large pile, covers about 45 acres.

The United States Vanadium Corporation (USV) built the mill in 1941 on the site of an old lead smelter. It furnished vanadium to the Metals Reserve Company, a company set up by the Federal government for the purchase of strategic materials needed during World War II. In 1943 USV began reprocessing the vanadium tailings for the recovery of uranium for the Manhattan Project. The mill operated until 1946 and was then shut down until 1949, when the Vanadium Corporation of America (VCA) contracted to sell uranium to the U.S. Atomic Energy Commission. The VCA leased the property and later purchased it.

By 1956 the initial milling capacity of about 175 tons of ore per day was expanded to 430 tons per day and by 1958 milling capacity was further expanded to 750 tons per day. During the 14-year period of operations when uranium was processed for the AEC (1949-1963), about 1.6 million tons of ore were processed. Ore averaging 0.29% uranium oxide and 1.60% vanadium oxide was delivered to the Durango mill from mines of the Uravan Mineral Belt, Dry Valley Carrizo, Cove Mesa, Placerville, Hermosa Creek, Lightner Creek, and Monument Valley. The company also purchased ore from independent operators and processed ore and upgrader products from company-controlled properties. All feed material was hauled to the Durango mill by truck.

In March 1963, the mill was shut down permanently. The VCA retained ownership of the millsite and adjoining property until 1967, when VCA was merged into the Foote Mineral Company. In 1976 and 1977, the Ranchers Exploration and Development Corporation, the current owner, purchased the entire site except for two small parcels that were deeded to the Colorado Highway Department and the La Plata Electric Co.

3. REMEDIAL ACTION OBJECTIVES

The mission of the UMTRA project at Durango is to carry out a cleanup program according to EPA standards for the disposal of tailings and the cleanup of open lands and structures. The interim and proposed standards are dis-

cussed in Section 4. Final standards are expected to be issued by January 1983. The objective of the Project is to combine at one location the radioactive materials, the contaminated soils, and the other contaminated materials from the site and the vicinity properties. The final disposal site will be owned by the Federal government and licensed by the NRC. By combining and stabilizing all tailings and contaminated materials at one disposal site, potential health effects caused by exposure to the tailings will be minimized, and all other presently contaminated areas will be cleaned up sufficiently to be released for unrestricted use.

Another aspect of the Project which must be addressed is the economic and technical feasibility of reprocessing the tailings for the recovery of residual uranium or vanadium. The DOE, with the concurrence of the NRC and as licensed by Colorado, may permit the recovery of such minerals if it is consistent with remedial action. Such a feasibility analysis must be carried out to comply with Public Law 95-604, and the results of the study may have a significant impact on the selection of the disposal site since a heap leach operation at the final disposal site appears to be the most economical method of reprocessing mill tailings.

Under exceptional circumstances when the EPA standards cannot be fully met, the DOE may select and perform remedial actions that come as close to meeting the EPA standard to which the exception applies as is reasonable. NRC concurrence in the approval of any such exceptions from fully meeting EPA standards will be obtained on an individual basis.

4. STANDARDS, LICENSING, AND EVALUATION CRITERIA

4.1 EPA Standards

Under Public Law 95-604, no remedial action may begin until final cleanup standards have been promulgated. The final standards have not yet been issued. However, in order to permit remedial action to begin at contaminated vicinity properties, the EPA has issued interim standards (45 FR 27366-27368, April 22, 1980) for open lands and structures in which elevated radiation levels occur because of the presence of residual radioactive materials from a designated inactive processing site. The numerical criteria are outlined in Table 1.

The EPA has also proposed standards governing the disposal of residual radioactive materials from inactive uranium millsites (46 FR 2556-2563, January 9, 1981). These standards (Table 2) place limits on the amounts of certain elements and substances that may be released from the final disposal site. In addition, the disposal of the radioactive material must be carried

Table 1. EPA Interim Standards for the Remedial Action Cleanup of Open Lands and Structures

Type of radiation	Remedial Action (RA) standards
External gamma radiation (EGR) in dwellings	RA required if EGR greater than 0.02 mR/hr above background
Radon daughter concentration (RDC) in dwellings	RA required if RDC greater than 0.015 WL including background (annual average)
Ra-226 concentration on open lands	RA required if Ra-226 greater than 5 pCi/gm above background

Legend

mR/hr = milliroentgen per hour

WL = working level, or RDC per liter of air that results in eventual emission of 1.3×10^5 MeV of alpha energy

pCi/gm = picocuries per gram

out in such a manner that there is a reasonable expectation that the limits in the proposed standards will be maintained for at least 1000 years. The standards impose the following limits:

1. The average annual release of radon-222 at the surface of the site is limited to values less than or equal to 2 picocuries/meter^2-second plus the radon emissions expected from the materials covering the tailings.

2. Concentrations of the elements in underground sources of drinking water are limited to the values shown in Table 2. Material released from a disposal site is neither to cause the concentrations of the specified elements in underground drinking water to exceed the levels in Table 2 nor to result in any increase in their concentrations in water that exceeded those levels before the remedial actions for causes other than residual radioactive materials. These limitations apply to underground drinking water beyond 1.0 kilometer from a disposal site that was an inactive processing site and beyond 0.1 kilometer from a new disposal site.

3. Materials released from disposal sites should not cause an increase in the concentration of any toxic substance in any surface waters. In general, "surface waters" means any bodies of water on the earth's surface that the public may traverse or enter or from which food may be taken.

Table 2. EPA Proposed Standards for Tailings Disposal

ELEMENT CONCENTRATION IN SOURCES OF UNDERGROUND DRINKING WATER		
Element	Maximum permissible concentration in ground water	
Arsenic	0.05	milligram/liter
Barium	1.0	milligram liter
Cadmium	0.01	milligram/liter
Chromium	0.05	milligram/liter
Lead	0.05	milligram/liter
Mercury	0.002	milligram/liter
Molybdenum	0.05	milligram/liter
Nitrate nitrogen	10.0	milligram/liter
Selenium	0.01	milligram/liter
Silver	0.05	milligram/liter
Combined radium-226 and radium-228	5.0	pCi/liter
Gross alpha particle activity including radium-226 (but excluding radon and uranium)	15.0	pCi/liter
Uranium	10.0	pCi/liter
RADON FLUX LIMIT FROM DISPOSAL SITE		
Maximum permissible radon flux emitted from residual radioactive materials emplaced at the disposal site	2	pCi/m^2-second (annual average)

Legend

pCi = picocuries
m^2 = $(meter)^2$

4.2 NRC Licensing

The NRC has not issued and does not intend to issue regulations that apply to the cleanup and disposal of residual radioactive materials at the UMTRCA Title I inactive uranium processing sites. In conformance with UMTRCA, NRC concurrence in proposed remedial actions and determinations as to the licensability of disposal sites for such materials will be to assure compliance with the final EPA standards discussed in Section 4.1. On October 3, 1980, however, the NRC did issue regulations governing disposal of tailings from active uranium milling operations. These regulations (45 FR 65533-65536) are not applicable to UMTRAP remedial actions, but do contain technical criteria, primarily in the form of performance objectives, for disposal of uranium mill tailings. Though they will not be applied by the NRC to the inactive sites, NRC technical criteria embody considerations that are relevant to the evaluation of remedial action alternatives for an UMTRCA Title I inactive site.

4.3 Factors Affecting Evaluation

Many factors must be considered in the evaluation process used for determining the preferred option, most of which directly relate to meeting the requirements of the EPA standards. Generally these factors may be classified in four principal groups, although some factors appear in more than one group. The evaluation of the effects of these factors is a major element in the analytic process called for in the EIS. The use of the evaluation factors at this early stage contributes to a more rational choice of the option that seems most feasible.

The four groups of factors that will be used to evaluate each option are the following:

1. Physical and technical factors. This group of factors concerns the ability of the potential disposal site to resist natural processes that might disturb the tailings after the remedial actions are completed. The factors in this group evaluate the vulnerability of the site to catastrophic natural phenomena (seismic disturbance, floods, land or rock slides, avalanches, extreme erosion, mine subsidence, etc.). Among the factors are the characteristic of the hydrologic system in the area that includes the disposal site, e.g., depth of ground-water table, proximity to acquifers and streams, ground-water flow rates, quality of ground water, and potential for flowing artesian wells; the chemical and physical characteristics of the surrounding soils and rocks; the type and condition of underlying strata and bedrock; the climate at the site; and the topography of the area.

2. Environmental factors. In this group the factors involve such things as the potential health effects from the transport and disposal of the tailings; the noise generated by the remedial actions; the short- and long-term effects on flora and fauna in the area; and the effects on underground sources of drinking water.

3. Economic factors. These factors relate to the economics of the decontamination, transportation, and stabilization. They include costs for site acquisition, rights of way, construction, transportation, impoundment system, cover materials, etc.

4. Social factors. These factors include the present and forecasted population density surrounding the potential disposal site; the potential use of the site for other activities (mineral recovery, agriculture, industrial development, wildlife refuge, transportation corridor, etc.); and the effects on the social and economic well-being of the affected population.

5. REMEDIAL ACTION OPTIONS

The major options considered for Durango are to take no action, to stabilize the tailings at their present location, and to transport the tailings to a new disposal site and decontaminate the former processing site. This last option can further be broken down into disposal with or without reprocessing.

In all the options except no action, the effort would begin by decontaminating the local vicinity properties now contaminated with tailings and consolidating the offsite contaminated materials at the Durango millsite after access to that property is acquired by the State of Colorado. The vicinity properties include all open lands, homes, businesses, and other places at or near Durango where radiation levels are higher than the EPA standards because tailings or other radioactive materials from the processing site are present.

Under the provisions of Public Law 95-604, an expression of interest in reprocessing was requested from the owner of the property. Similar requests for expressions of interest were also sought by notices issued in the Federal Register, in the Commerce Business Daily, and in a public press release. For the Durango site, several expressions of interest in reprocessing were received.

The remainder of this section provides background information concerning the three options and discusses each of them.

Background Information on the Options

The selection process for a new disposal site, should it ultimately be required, began in 1980 when the Colorado Department of Natural Resources entered into an agreement with the Colorado Department of Health to cooperate in the evaluation of candidate areas for the disposal of the Durango uranium mill tailings. The initial site screening and evaluation was performed by the Colorado Geological Survey and its consultants. The Colorado Geological Survey identified nine potential disposal sites for the State Site Selection Com-

mittee in December of 1980. These nine sites, located within a 30-mile radius of the tailings pile, had been evaluated only on the basis of geotechnical considerations. It was the responsibility of the multi-disciplinary State Site Selection Committee to consider such additional factors as reclamation potential, transportation considerations, land use, land ownership, socio-economic impacts, environmental concerns, local opposition or support for particular sites, and the need for future maintenance. As a result of the Committee's review and evaluation, three of the nine sites were recommended to the DOE as candidate disposal sites. These candidate sites were identified in a Colorado Geological Survey report entitled, "Preliminary Report on Potential Sites Suitable for Relocation and/or Reprocessing of the Durango Uranium Mill Tailings Pile." All three of the sites were located on privately owned land. An additional site was identified by the Committee and included in its report for further study by the DOE.

Initial evaluation of the four sites by the DOE and Sandia National Laboratories eliminated one of the sites from further consideration. Additional information that was made available for this site after the issuance of the committee report indicated that the geologic setting, ground and surface water, resource potential, and economics all raised serious questions as to the suitability of the site. The DOE decided that it would be prudent to eliminate that site and concentrate the investigation on the remaining three candidate sites. The location of these three potential disposal sites is shown in Figure 2.

The decision for or against reprocessing will be important in selecting candidate disposal sites. The influence of this decision is discussed under each suboption.

Option 1: No Action

This option consists of performing no remedial action, i.e., allowing the present situation to continue with no corrective action.

Option 2: Stabilization in Place

In this option all tailings and contaminated materials would be stabilized at the Durango millsite. The buildings on the site would be demolished, and contaminated portions would be buried with the other materials.

Stabilization in place could include moving the small pile to the south of the large pile, recontouring and moving the upper portion of the large pile to the south, constructing a retention-dike system, emplacing a soil cover to reduce the radon flux to the prescribed EPA limit, and emplacing a rock cover for protection against erosion. Furthermore, additional engineered barriers may be required to prevent ground-water contamination. Alternately, all the tailings and the contaminated material could be moved to the raffinate pond area for disposal.

The Durango millsite would then become the disposal site and would remain under restricted access. Upon completion of the stabilization, the State of

Colorado would transfer the ownership of the site to the DOE, and the NRC would issue a license for the disposal site. All vicinity properties would become available for unrestricted use.

Option 3: Decontamination of the Durango Site and Transfer of the Tailings to a New Disposal Site

Under this option the disposal site is not the present Durango millsite. All contaminated materials and tailings at the vicinity properties and the Durango millsite would be transported by truck, slurry pipeline, or conveyor to a new disposal site. This new disposal site could be one of the locations discussed in suboptions 3A, 3B, and 3C below. In each of the suboptions, there are two potential avenues for obtaining access to the millsite. First, a right-of-entry could be negotiated for interim storage of tailings and other contaminated material removed from designated vicinity properties. This right-of-entry would remain in force during the removal and transfer of all tailings and other contaminated material to the new disposal site. Upon completion of the remedial action and site certification, the right-of-entry would expire, and the property would be returned to the control of the owner. The alternative is to acquire fee title to the Durango site. On the basis of a property value appraisal and other pertinent data, the DOE may determine that a consideration of "windfall profits" dictates fee title acquisition. The State of Colorado would then acquire both the millsite and the new disposal site.

The methods and procedures for transporting the tailings and other materials from Durango to the new disposal site would be selected on the basis of potential health effects, environmental and safety concerns, accessibility to the disposal site, and cost. Schedules and routes would be established to minimize their impact on the surrounding communities.

The impoundment system at the disposal site would be either partially or completely below grade. First, a liner consisting of natural soils, synthetic materials, or both would be used if the host rock material was not adequate by itself to minimize seepage and contaminant transport. Then a dike system would be constructed to retain that portion of the tailings located above grade. After the tailings had been emplaced in the impoundment, a cover would be installed. The cover would consist of soil, asphalt, rock, or a combination thereof to provide an efficient and economical cover system. The next step, for the long-term control of surface erosion, would consist of either revegetation or the installation of a rock cover. In the final step, use of the disposal site would be restricted. The State of Colorado would transfer ownership of the disposal site to the DOE, and the NRC would issue a license for the site.

Suboption 3A: Disposal Site at Bodo Canyon

This option would involve transfer of the Bodo Canyon land from the Colorado Division of Wildlife to the Colorado Department of Health; replacement and mitigation land would be furnished to the Division of Wildlife. This exchange process would require approval from the Nature Conservancy and the National Park Service. Whether this land exchange can take place is uncer-

tain; it may pose an obstacle to the disposal of the tailings in Bodo Canyon. The Bodo Canyon area is bordered by Smelter Mountain on the north, Carbon Mountain on the south, the Animas River to the east, and the drainage divide between Ridges Basin and Bodo Canyon on the west. The area is on the opposite side of Smelter Mountain from Durango and is about 2.5 road miles south-southwest of the Durango millsite.

Five potential disposal sites were initially identified in the Bodo Canyon area; however, only one site appears feasible, according to preliminary field work. This site was identified as Area E in the Colorado Geological Survey report. Limited geologic and hydrologic data are available for the Bodo Canyon site, and numerous geotechnical concerns must be evaluated. Areal and slope limitations, faulting, surface-water hydrology, and general geomorphology raise questions as to the suitability of the Bodo Canyon site for reprocessing, and they must be addressed during site characterization activities.

The Bodo Canyon area occupies a drainage basin that covers about 4 to 5 square miles and drains directly into the Animas River. Most of the area consists of fairly steep slopes that lead into small canyons or subbasins. Bedrock or thin soil over bedrock is found in most of the Bodo Canyon area; however, portions of the area are underlain by relatively thin deposits of mixed alluvium and colluvium. A number of bedrock formations crop out in the area; they include the Lewis Shale and the Cliff House Sandstone formations.

Trucks and conveyors appear to be feasible methods of transporting tailings to the potential disposal site. A dirt road leads southward from the tailings piles along the east side of Smelter Mountain. This road could be improved and used as the haul route to County Road 211, which leads into the Bodo Canyon but would have to be upgraded to support heavy truck traffic. Existing unimproved roads would have to be upgraded or new roads constructed to provide access from County Road 211 to the disposal site. A conveyor system could also be considered to transport the tailings to the Bodo Canyon area, but its cost must be carefully evaluated. The most likely route for such a system would parallel the dirt road and County Road 211. If the tailings were to be reprocessed, a slurry pipeline might be feasible, and this method of transporting the tailings would be evaluated.

Suboption 3B: Disposal at Long Hollow Site

This option would involve the acquisition of the Long Hollow Site by the State of Colorado. This site is on privately owned land and is located about 10 road miles southwest of the tailings pile. The area is presently used as a gathering and grazing area for sheep during the spring and fall.

The site, situated at the head of the Long Hollow drainage in La Plata County, slopes gently from east to west and from north to south. A relatively thin mantle of surficial materials blankets much of the site. Most of the surficial materials are alluvial or colluvial deposits and consist of clays with minor amounts of silt, sand, and gravel. About 600 to 800 feet of Lewis Shale underlie the entire Long Hollow Site. The Lewis Shale consists of thick sequences of laterally persistent dark gray to black shale interbedded with

thin, relatively sparse siltstone, limestone, and sandstone beds.

There are no major streams, lakes, springs, or irrigation ditches on the site. The creek that drains Long Hollow is intermittent within the site area. A small stock pond is present on the north end of the site, but it often dries up in late summer or fall. The Long Hollow drainage joins the La Plata river about 13.5 miles below the proposed site.

The Lewis Shale host rock can generally produce a minor amount of poor-quality water. Detailed site studies performed 3 years ago by the Ranchers Exploration and Development Corporation identified a shallow zone of perched water that occurs within a fractured zone in the Lewis Shale. The water-bearing zone is confined by weathered shale above and unfractured shale below and is thought to be present only during the wet seasons. This perched-water zone must be thoroughly evaluated during site characterization; it could present a problem for below-grade disposal.

The first underlying potential aquifer that may be an important source of water is the Cliff House Sandstone. This formation is about 600 to 800 feet below the ground surface. A test well drilled by Ranchers encountered only very minor amounts of water in the Cliff House Sandstone as well as the two underlying formations (Menefee and Point Lookout Sandstone). This scarcity of ground water, though beneficial from an environmental standpoint, might make reprocessing difficult.

The transport of the tailings to the site could be accomplished by one of three methods. First, a conveyor system could be used, but its cost may preclude its use. Second, if the tailings were to be reprocessed, a slurry pipeline could be an economical and efficient method. If the tailings were not to be reprocessed, it would be undesirable to increase their moisture content. The introduction of additional water to the tailings, although not detrimental to their safe disposal, would result in a more costly design and construction as well as a delay in project completion because of dewatering requirements.

The third method of transport is by truck along one of two possible haulage routes. One access route would be westerly 2 miles on Highway 160 to County Road 141, better known as the Wildcat Canyon road, then southwesterly about 8 miles on the County road. Total haul distance using this route is about 10 miles. The route through Wildcat Canyon is narrow and winding, and the added truck traffic could make the route fairly hazardous. An alternate route would be south 1 mile to County Road 211, then west about 6 miles through Ridges Basin to County Road 141, and then 3 miles southwest. Either route would have to be improved considerably to serve as a suitable transport route.

Suboption 3C: Disposal at Pine Ridge Site

This option would involve the acquisition of the Pine Ridge site by the State of Colorado. This site is privately owned and is located about 7 road miles southwest of the tailings pile. The area has been used primarily for sheep and cattle grazing; however, residential development within 1.5 miles of the site is planned for the near future.

The site occupies the valley floor of an intermittent stream at the head of the drainage into Wildcat Canyon. A thin layer of surficial materials, primarily alluvium and colluvium, blankets much of the site. Existing test-hole data and field examination indicate that the surficial materials are predominantly clay and slightly gravelly clay, occasionally interbedded with sand. The Pine Ridge site is underlain by about 50 to 100 feet of Lewis Shale. Although there are no testholes on the site, it is thought that less than 50 feet of Lewis Shale underly some portions of the site. The site is situated near the base of the formation and the Cliff House Sandstone and Menefee Formation are the next stratigraphic sections. Economically significant coal beds in the Menefee Formation probably underlie the site. These potential coal beds are shallow enough that subsidence could occur above future underground workings and disrupt the tailings repository. If the Pine Ridge site was selected for the disposal site, future extraction of underlying coal beds would probably be precluded. Other mineral resources in the area would not be affected by the site.

The size of the drainage basin above the site is about 1 to 2 square miles. Wildcat Canyon joins Lightner Creek about 4.5 miles below the site, and Lightner Creek merges with the Animas River about 2 miles downstream from that point. There are no major streams, lakes, or springs on or near the site. All drainages on the site are ephemeral. Two small stock ponds on the site would probably have to be moved for the project.

The first potentially important aquifer underlying the Pine Ridge site is the Cliff House Sandstone. Although no drill-hole or water-well data exist on the site to confirm the depth of this formation or its aquifer characteristics, it is estimated that the top of the Cliff House Sandstone ranges from 50 to 100 feet below the land surface. It is possible that the Cliff House Sandstone contains little or no water. Ground water may occur in the underlying Menefee Formation or Point Lookout Sandstone.

The tailings could be transported to the site by one of three methods. As at the Long Hollow site, conveyor transport is possible but may be economically impractical, and a slurry pipeline could be used if the tailings were to be reprocessed at the Pine Ridge site.

There are two possible routes for truck transport. One route is via Highway 160 2 miles west-southwest and then about 5 miles along County Road 141. This route through Wildcat Canyon is narrow and winding, and the truck traffic could make it fairly hazardous. An alternate route through Ridges Basin could be used. Access for this route would be south from the tailings pile about 1 mile to County Road 211, and then west about 6 miles through Ridges Basin to County Road 141. To be suitable, either route would have to be improved considerably.

6. EVALUATION OF THE OPTIONS

The evaluation of the remedial action options for the Durango tailings described in Section 5 is provided in this section. It should be emphasized that the assessment of each option is preliminary, and more detailed analysis

must be conducted and reported in the environmental impact statement before a final decision on the best option is made. The purpose of the evaluation that follows is to identify those options that seem to be feasible among all the options considered.

Option 1: No Action

This option involves no remedial action; however, radon exhalation and external gamma radiation at the Durango tailings piles currently exceed the proposed EPA standards, and Public Law 95-604 requires the completed remedial action at Durango to be in compliance with EPA standards. This option is thus unacceptable.

Option 2: Stabilization in Place

This option involves using the Durango millsite as the disposal site. The site is located in a populated area and the population within 3 miles of the pile is more than 12,000. Future development in the Bodo Industrial Park and general growth in the Durango area could result in a population of more than 20,000 within 10 years. Flooding of the Animas River, surface-water hydrology, and seepage from the pile must all be thoroughly analyzed to determine the long-term effect on the quality of surface waters. These concerns will be addressed during the studies for the environmental impact statement.

If stabilization in place is the remedial action option ultimately selected, an acceptable stabilization-in-place design would effectively preclude disruption of the tailings containment system and water-quality degredation. With on ite stabilization, reprocessing of the tailings might be infeasible because of insufficient land area.

Option 3: Decontamination of the Durango Site and Transfer of the Tailings to a New Disposal Site

This option includes the transfer of the tailings and other contaminated material from the inactive millsite and the vicinity properties to a specially engineered and designed disposal site. Following the remedial action, the Durango site would meet the EPA standards and would be available for unrestricted use. The potential for long-term adverse environmental and health impacts would be eliminated from the area. There would be short-term impacts, however, from demolition, excavation, and hauling. These include possible localized air-quality degradation from suspended particulates, an increase in radon gas released, noise from construction equipment, and increased truck traffic in the area. Care would be taken to mitigate such impacts through appropriate engineering and construction practices.

Careful site selection and the use of the latest engineering and construction methods would yield a high probability of meeting the EPA standards for at least 1000 years. The Bodo Canyon site, identified as Area E, may offer an economical and technically feasible disposal option. However, not enough information is currently available to the DOE to discuss reprocessing of the tailings in Bodo Canyon. As indicated earlier, the major

items requiring further study include geomorphologic processes, faulting, surface-water hydrology, limitations imposed by the available areas and slopes.

Long Hollow appears to be a suitable site for the reprocessing and disposal of the tailings; however, transportation costs, availability of water for reprocessing, and the extent of the perched water zone must be thoroughly investigated.

Any disposal site within the Pine Ridge area would be very close to existing and potential residential developments that could be adversely impacted by fugitive dust from transport and disposal activities. Existing and future residents are dependent on wells for domestic water supplies. Unplanned contammination of aquifers utilized for domestic water supplies would be a risk associated with the site's relatively thin Lewis Shale. The rural residential use planned for this site would be precluded by the disposal of tailings. Development as a residential area is incompatible with the criterion of siting tailings disposal areas remote from human populations.

Shallow perched ground-water exists in surficial geologic materials. Dewatering during development of the disposal system could affect more that the area of surface disturbance. In reclamation of the site, reestablishment of diverse vegetative communities paralleling those existing now would be difficult to achieve.

Construction of a disposal system at this site would be expensive because the surface is not immediately underlain with shale. Depending upon the exact site location, varying volumes of surficial materials would have to be moved and placed elsewhere. The underlying Lewis Shale is relatively thin compared to that at the Long Hollow site and no source of clay liner material is known within a short distance of the site.

Because of the concerns discussed above, additional expenditure of funds to further evaluate the Pine Ridge site does not appear, at this time, to be justified.

This assessment of options is based on preliminary data and may change as future investigations provide new information. Site characterization and related studies for the environmental impact statement will ensure that the final disposal of the tailings meets all applicable standards and criteria.

7. PROPOSED OPTION

This RACP attempts to identify the most viable options, but at this time, does not identify a proposed option. A proposed option will be selected as a result of the EIS process after EPA publishes its final standards and all environmental data and cost information have been developed and analyzed.

8. SCHEDULE AND COST ESTIMATE

Figure 3 contains a remedial action schedule that reflects current planning for the Durango site. The basis for this schedule is remedial action options 2 and 3. For purposes of scheduling, reprocessing is not considered. If reprocessing proves feasible, the schedule will be revised accordingly.

The preliminary cost estimates for the alternatives being considered for this project range from 18-37 million dollars. These estimates are in 1982 dollars. Of the total cost, about 70 percent is estimated to be for the remedial action itself. The remaining 30 percent covers the costs of environmental analysis, engineering, site acquisition, and maintenance and surveillance activities.

9. FUTURE ACTIVITIES

This Remedial Action Concept Paper for Durango is only a preliminary plan of action. The remainder of the paper describes the major activities to be performed and the costs and schedule of the project.

9.1 Designation of Vicinity Properties

DOE will conduct a ground-level radiological survey of the Durango area during 1982. Any properties in the vicinity found to be contaminated with residual radioactive material from the Durango site will be included for cleanup as part of the Durango remedial actions

9.2 Preparation of the EIS

An environmental impact statement (EIS) for the Durango tailings site is to be prepared by the DOE's Sandia National Laboratories, with the assistance of Dames & Moore. The final EIS cannot be issued until the final EPA standards have been promulgated.

A notice of intent to prepare the EIS and to hold public scoping meetings for remedial actions was published in the Federal Register on June 8, 1981, (46 FR 30383-30385). In this notice of intent, the DOE invited interested agencies, organizations, and members of the general public to submit comments or suggestions for consideration in connection with the preparation of the draft EIS. Public EIS scoping meetings were held, as announced in the Federal Register, in Durango on June 30 and July 1, 1981.

A draft EIS will be available for public comment in 1983. The remedial action schedule contained in Figure 3 assumes that the EPA standards will be made final by January 1983.

Detailed data (meteorological, seismic, hydrological, geochemical, physical, etc.) are required for the potential disposal sites. Contractors working for the DOE will gather and analyze the data necessary to evaluate and

make informed recommendations for selecting a disposal site. Some additional data are also required at the inactive site in Durango.

9.3 Site Acquisition

As discussed in Section 5, if the DOE determines, with NRC concurrence, that acquisition of fee title to the Durango millsite is required, the State of Colorado will acquire the site. The actual acquisition, if necessary, would be carried out in FY 1984. Option 2 definitely requires acquisition of the processing site. Under Option 3 acquisition may be required to prevent windfall profits. The final disposal site will be owned by the Federal government and licensed by the NRC.

9.4 Remedial Action Plan

A remedial action plan (RAP) consisting of conceptual engineering designs, performance standards, schedules, and cost estimates for the designated disposal site will be procured after completion of the EIS. The RAP will be issued in accordance with the cooperative agreement for final concurrence by the state and the NRC. The RAP will also be used to establish an estimate of the state's 10% share of the remedial action cost.

9.5 Engineering

A technical assistance contractor (TAC), Jacobs Engineering Group, has been selected by the DOE to assist the UMTRA Project Office in planning and managing remedial actions. The DOE will select a remedial action contractor (RAC) to provide architect-engineer and construction-management services by the end of 1982.

The TAC will prepare the RAP for the DOE. After concurrence, the RAC will prepare detailed engineering designs and issue subcontracts for carrying out the remedial actions. These designs will be based on the final EPA standards, information developed in the UMTRAP technology development program, the EIS, and the RAP.

The TAC will also be responsible for the surveillance and management of the final disposal site when the remedial actions have been completed.

9.6. Onsite Remedial Action

A schedule of the remedial action process at Durango is shown in Figure 3. It is expected that remedial actions will be started in 1984.

9.7 Certification

During the remedial work and following its completion, radiological

surveys will be performed to verify the effectiveness of the remedial actions and ensure that the sites meet the EPA standards and NRC licensing requirements. Certification will be carried out under the direction of the DOE Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness (ASEP).

9.8 Maintenance and Surveillance

Maintenance and monitoring procedures will be implemented by the DOE at the disposal site to ensure that the site remains environmentally sound. Conditions at the site must be maintained so that it continues to be in compliance with EPA standards and NRC license conditions.

10. RELATED DOCUMENTS

The following is a list of major documents that relate to the Durango remedial actions.

1. Colorado Geological Survey, Department of Natural Resources, March 1981. Preliminary Report on Potential Sites Suitable for Relocation and/or Reprocessing of the Durango Uranium Mill Tailings Site, Open File Report 81-1.

2. Dames & Moore, July 1981. Letter report to Sandia National Laboratories/ U.S. Department of Energy: Evaluation of Alternative Disposal Areas, Uranium Mill Tailings Remedial Action Plan (UMTRAP) Durango Site, La Plata County, Colorado.

3. Ford, Bacon & Davis, Utah, Inc., June 1981. A Summary of the Engineering Assessment of Inactive Uranium Mill Tailings, Durango Site, Durango, Colorado, DOE/UMT-01035, FBDU 360--06S UC 70.

4. Ford, Bacon & Davis, Utah, Inc., June 1981. Engineering Assessment of Inactive Uranium Mill Tailings, Durango Site, Durango, Colorado, DOE/UMT-0103, FBDU 360-06 UC 70.

5. Politech Corporation, June 1980. Durango, Colorado Site Information Handbook. Uranium Mill Tailings Remedial Action Program, Washington, D.C.

6. Sandia National Laboratories, June 1981. Contents of Environmental Impact Statements Prepared for the Uranium Mill Tailings Remedial Action Project, UMTRA-DOE/ALO-5, Albuquerque, New Mexico.

7. State of Colorado Rules and Regulations Pertaining to Radiation Control, 1978 as amended.

8. Transcript of Scoping Meeting, Durango Mill Tailings, June 30 and July 1, 1981.

9. United States Department of Energy, June 1980. Durango Information Book, UMTRA-DOE/ALO-1.

10. United States Environmental Protection Agency, December 1980. Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) EPA 520/4-80-011, Washington, D.C.

11. United States Environmental Protection Agency, April 1980. Interim Cleanup Standards for Inactive Uranium Processing Sites, 45 FR 27366, Washington, D.C.

12. United States Environmental Protection Agency, January 1981. Proposed Disposal Standards for Inactive Uranium Processing Sites; Proposed Rule and Extension of Comment Period, 46 FR 2556, Washington, D.C.

13. United States Nuclear Regulatory Commission, September 1980. Final Generic Environmental Impact Statement on Uranium Milling (NUREG-0706), 3 vols., Washington, D.C.

14. United States Nuclear Regulatory Commission, October 1980. Uranium Mill Licensing Requirements, 10 CFR 30, 40, 70, and 150, as modified by 45 FR 65521, Washington, D.C.

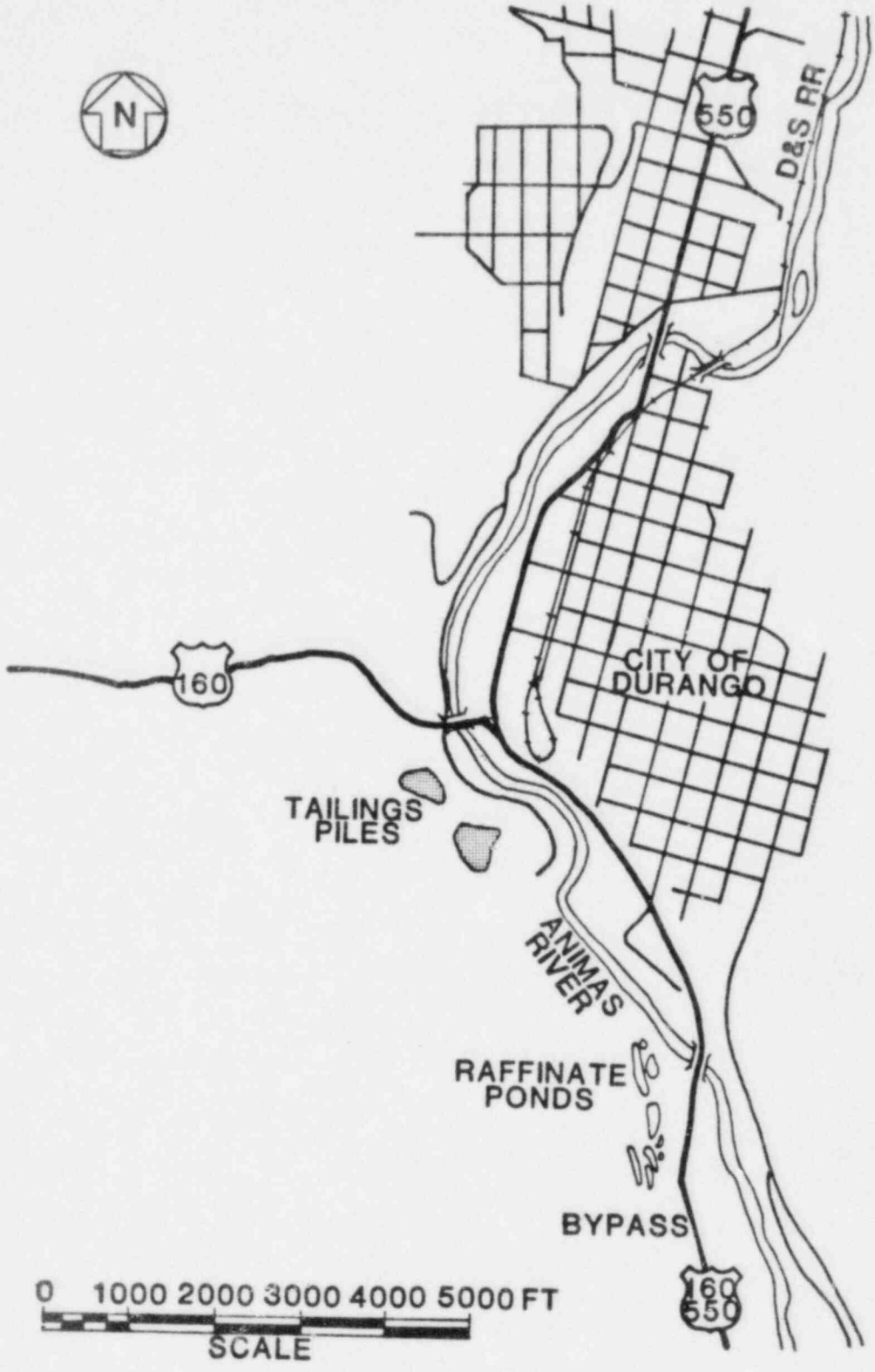
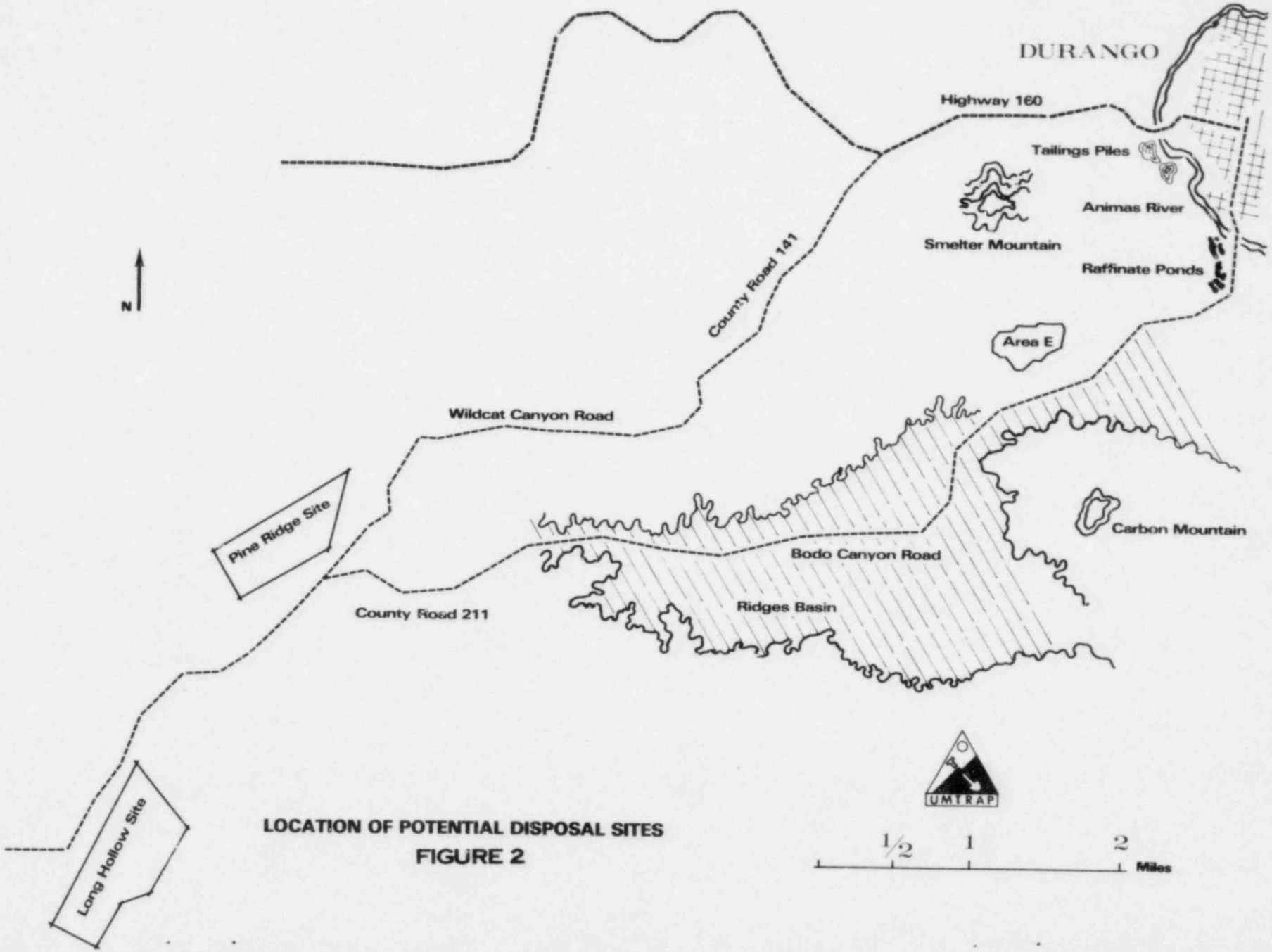


FIGURE 1 MAP OF DURANGO



LOCATION OF POTENTIAL DISPOSAL SITES

FIGURE 2

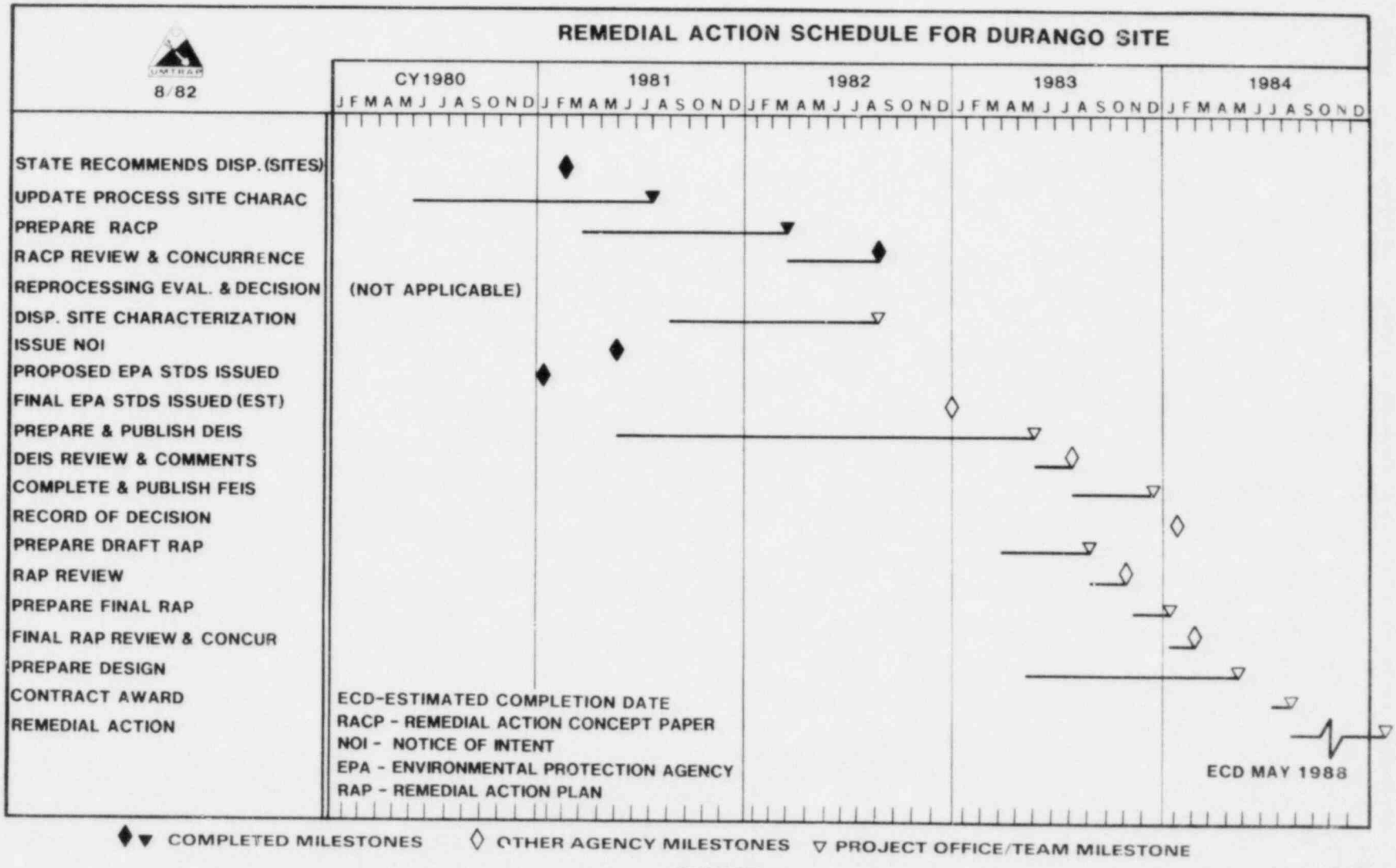

REMEDIAL ACTION SCHEDULE FOR DURANGO SITE
8/82
CY1980
1981
1982
1983
1984
J F M A M J J A S O N D
STATE RECOMMENDS DISP. (SITES)
UPDATE PROCESS SITE CHARAC
PREPARE RACP
RACP REVIEW & CONCURRENCE
REPROCESSING EVAL. & DECISION
(NOT APPLICABLE)
DISP. SITE CHARACTERIZATION
ISSUE NOI
PROPOSED EPA STDS ISSUED
FINAL EPA STDS ISSUED (EST)
PREPARE & PUBLISH DEIS
DEIS REVIEW & COMMENTS
COMPLETE & PUBLISH FEIS
RECORD OF DECISION
PREPARE DRAFT RAP
RAP REVIEW
PREPARE FINAL RAP
FINAL RAP REVIEW & CONCUR
PREPARE DESIGN
CONTRACT AWARD
REMEDIAL ACTION
ECD-ESTIMATED COMPLETION DATE
RACP - REMEDIAL ACTION CONCEPT PAPER
NOI - NOTICE OF INTENT
EPA - ENVIRONMENTAL PROTECTION AGENCY
RAP - REMEDIAL ACTION PLAN
ECD MAY 1988
COMPLETED MILESTONES
OTHER AGENCY MILESTONES
PROJECT OFFICE/TEAM MILESTONE

FIGURE 3

UMTRA-DOE/ALO-32

Uranium
Mill
Tailings
Remedial
Action
Project

United States
Department of Energy

REMEDIAL ACTION CONCEPT PAPER - DURANGO