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Los Alamos National Laboratory
1999 Environmental Restoration Project

MEETING THE 2006 VISION

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1.0 INTRODUCTION

The Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project, in concert with the U.S. Department of Energy (DOE), recently engaged in a "roadmapping" analysis to optimize a path to complete environmental restoration work at LANL by 2006. This roadmapping analysis was the culmination of a year and a half of management improvement activities that were undertaken to put the ER Project on a better-directed path to success. Because the path to completion that the ER Project and DOE have elected to follow represents a fundamental shift in approach from the way in which the ER Project has operated for the past ten years, this document was developed to describe the key elements of the new approach. It also describes the progress made to date in implementing the new approach, outlines the ER Project's future activities and, perhaps most importantly, identifies important issues on which the ER Project, the DOE, the NMED, and other stakeholders must work collaboratively to achieve success.

The ER Project and the DOE identified three potential strategies that could be followed to complete environmental restoration work at LANL. These strategies were evaluated on the basis of cost, schedule, and uncertainties, to determine which one would best facilitate effective and efficient completion of the project. Each strategy is described briefly below.

- Strategy 1: most similar to current ER Project practices, this strategy places high priority on conducting work on a site-by-site basis and submitting "no further action" (NFA) requests for potential release sites (PRSs) to the DOE and the NMED. This strategy incorporates expected gains in efficiency from consolidation of PRSs.
- Strategy 2: represents a significant shift in priorities, placing more emphasis on both risk reduction and early resolution of technical and regulatory uncertainties. This strategy increases proactive interaction with regulators and stakeholders, and real-time review of work by NMED.
- Strategy 3: similar to Strategy 2, but minimizes regulatory uncertainties by waiting for explicit regulatory agency approval before proceeding with characterization and remediation.

Strategy 2 was determined by the ER Project and the DOE to be the least-cost, least-duration, and least-uncertain approach, and to best meet stakeholder expectations for emphasizing risk reduction and quick resolution of technical uncertainties. Results of the recommended path forward must now be discussed in detail with regulatory agencies and with stakeholders.

The remainder of this document presents the key elements of the recommended path forward and the ER Project progress to date in implementing the new strategy. In addition, Section 4 presents future key strategic commitments in a

bullet format. These commitments are necessary – on behalf of not only the ER Project, but also the NMED -- to assure successful completion of the project.

ER Project Organization – Adapting to the Recommended Path Forward

Because Strategy 2 represents a fundamental shift from the characterization of 2124 distinct PRSs, to the holistic characterization of watersheds (and the PRSs that they contain), a brief discussion is warranted on how the ER Project organization will adapt itself to the new approach. What follows is a brief description of the existing organizational structure.

The ER Project recently organized into five focus areas designed to integrate regulatory and technical analysis functions with field operations and to organize the field operations around like technical work. The ER Program Manager, who reports to the Division Director of the Environmental Management Division, has overall responsibility for the ER Project. The ER Program Manager is directly supported by five project leaders who are responsible for managing project focus areas: Regulatory Compliance, Analysis and Assessment, Remedial Action, Canyons, and Material Disposal Areas (MDAs). As the LANL ER Project operated in the past, the three project leaders responsible for the "operational" focus areas (MDAs, Canyons, and Remedial Actions) would conduct the characterization and remediation work within their purview independently of one another. The Regulatory Compliance and Analysis and Assessment project leaders provide the support required for decision-making to each of the operational project leaders. Under the recommended path forward, there will be substantially more integration of work across focus areas, culminating in the submittal of reports that address the characterization and remediation activities undertaken within a watershed by all focus areas.

2.0 THE FOUR CORNERSTONES OF THE ROADMAP

The recommended path forward is composed of four key elements that must all be implemented to successfully complete environmental restoration activities at LANL. These key elements are:

- More effective regulatory interaction, assuring that two-way lines of communication are open and frequent enough to allow for proactive decision-making, and to minimize inadequate understandings.
- A holistic approach to characterization, in which the nature and extent of contamination, and contaminant migration, is assessed over an entire watershed, rather than being assessed independently at each PRS.
- A integrated risk-based approach to support remediation decisions, that takes into account not only human health-based risks, but also ecological risks and other regulatory drivers.

- A basis for prioritizing the ER Project work, based on nine prioritization criteria developed jointly by the ER Project and the DOE. In general, priority is given to activities that will minimize risk and Project uncertainties. The prioritization process should minimize the inefficiencies in cost and schedule that result when work priorities shift unexpectedly.

Figure 2.1 presents the overall ER Roadmap to Completion, and identifies the activities that must be accomplished under each of the four key elements to assure successful completion of the ER Project. In this figure, the activity bars with a gray shadow illustrate those activities where the NMED or other stakeholder participation is required to achieve progress. For each of the four elements, the activities that comprise them, and the ER Project, the DOE and the NMED roles related to those activities, are described in detail in Sections 2.1 through 2.4.

2.1 REGULATORY INTERACTION

The first cornerstone of the ER Project roadmap strategy is compliance. The Project approach to compliance centers on emphasizing regulatory interaction and working closely and efficiently with the administrative authority.[1] This approach to regulatory interaction will minimize ER costs and accelerate project completion without compromising the goal of minimizing risk. There are five important activities for the ER Project to undertake that are components of the overall regulatory interaction strategy. These activities are presented below.

ER/NMED Interaction Strategy

The ER Project regulatory strategy will be accomplished in part by continuing to work towards consistent and focused interactions with the NMED and EPA. The ER Project will involve the NMED early in all regulatory-related areas of the Project. The ER Project will continue the positive interactions with the NMED, including monthly regular meetings, to discuss policy and site-specific issues. These interactions will also focus on key strategic issues, such as those described below under "Critical Policies and Guidance."

Additionally, the Project has begun to implement a new interaction strategy with the NMED. The purpose of this strategy is to ensure that the NMED understands and generally sees no barriers to the technical and regulatory approaches to the work ER is proposing. An annual management work planning meeting with the NMED will be held to discuss, at a high level, the work the ER Project is planning for the upcoming year. The meeting will discuss the NMED anticipated level of

[1] The administrative authority for Hazardous and Solid Waste Amendments [HSWA] PRSs is the New Mexico Environment Department (NMED). The DOE is the administrative authority for non-HSWA PRSs. The U.S. Environmental Protection Agency (EPA) also serves as the administrative authority for certain statutory and regulatory requirements.

involvement in specific proposed ER Project activities. Outcomes of these discussions are expected to include a range of issue-specific recommendations from forming high performing teams to little or no involvement by the NMED. This interaction should generally result in complex and representative sites receiving more attention from the NMED.

The annual management work planning meeting will engage the ER Project and the NMED Hazardous and Radioactive Materials Bureau (HRMB) in joint strategic planning that should benefit both parties and the public. It will allow the HRMB to plan the LANL work for the year and help move the HRMB review of the ER Project submittals to a "real-time review." Periodic follow-up management meetings (generally on a quarterly basis as appropriate) with the NMED will address the progress LANL has made on ER Project work and the progress the NMED has made in reviewing ER Project submittals. Moving towards real-time review combined with more effective interactions will help minimize risk and uncertainty. In contrast, the ER Project's previous approach to regulatory interaction allowed such interaction to lag for months behind the technical work being done to support decision-making; as a consequence, work routinely had to be redone to satisfy the regulatory authority, resulting in increased costs and delays in schedule. We believe that real-time regulatory interaction and review will result in substantial cost savings, and will keep technical work schedules on track.

Critical Policies and Guidance

An underpinning to all of these interactions with the NMED is that the ER Project will understand and comply with all applicable statutory and regulatory requirements. The ER Project will also adhere to legally appropriate federal and state written policy and guidance when available. To comply with these requirements the ER Project anticipates needing policies or regulatory guidance from the NMED on the following topics:

- Definition of a variety of items, including extent of contamination and level of documentation required to support risk-based decisions, and cleanup requirements for constituents where background exceeds risk-based levels;

- Definition of acceptable cleanup levels for Polychlorinated Biphenyls (PCBs);

- Description of an acceptable process for conducting focused Corrective Measures Study/Corrective Measure Implementations (CMS/CMIs);

- Agreement on a process for addressing groundwater within the Resource Conservation and Recovery Act (RCRA) Corrective Action Process. For example, in some situation it may be appropriate to decouple groundwater from surface PRSs so that surface remedies can be pursued and recommendations for NFAs approved;

- Definition of the sufficiency requirements for groundwater data to determine whether groundwater impacts have occurred and the extent of such impacts;

- Definition of the process to address active sites which are also currently designated as PRSs;

- Definition and description of a model for assessing ecological risk;

- Description of the process for factoring stakeholder input; and

- Definition of acceptable "end states," including long-term monitoring requirements, institutional controls, engineering controls, and liability.

In the absence of a clear regulatory framework or guidance on these and other such issues, the ER Project will work with the administrative authorities to negotiate, develop, and document an acceptable approach. The Project will evaluate each issue and develop a proposed position and course of action. The ER Project will then seek concurrence from the NMED on the proposed direction. The direction will adhere to applicable written NMED and/or EPA guidance and/or policy, if available.

If the ER Project cannot obtain clarification from the NMED on an ambiguous regulatory issue, the ER Project will draft documentation justifying its position. This justification will adhere to and cite applicable written NMED, other state, and/or EPA guidance or policy. The Project will then follow its written position and proceed. Potential consequence of having to follow such a course without *a priori* concurrence from the NMED is that project costs may increase and schedules may extend.

Regulatory Strategies: Workoff

Over the past few years, the ER Project has presented approximately 820 proposals for no further action (NFA) for specific PRSs to the DOE, and an additional 586 such proposals to the NMED. These were generally presented in RCRA Facility Investigation (RFI) Work Plans, RFI Reports and Voluntary Corrective Action (VCA) Reports. Many of these NFA recommendations remain outstanding. Some were based only on human health risk evaluations, because evaluations of ecological risk, surface water, groundwater and underground storage tanks were not yet being performed. Other NFA recommendations have not yet been reviewed by the NMED. On others, the administrative authority did not concur primarily due to the perceived deficiency in information necessary to support the NFA recommendation.

A determination by the administrative authority that a site has not met NFA criteria and needs further investigation does not necessarily mean that remedial action is required. It can indicate that more information or further evaluation is needed. The results of any additional investigation may potentially lead to

another proposal of no further action (workoff), a remedial action, a corrective measures study, or other appropriate actions.

The ER Project is currently re-evaluating these sites in order to determine if they meet the current standards for NFA. This workoff process involves some level of evaluation of each PRS with respect to human health risk, ecological risk and surface water, groundwater and underground storage tanks criteria and whether the NFA recommendation is still valid based upon current NFA criteria. Based on the results of these evaluations either the justification for NFA is validated and resubmitted to the administrative authority for approval, or the PRS is referred to the field Focus Areas for further characterization or remedial action. The recommendation of workoff sites for NFA is an indication of continued progress towards the completion of sites and their removal from the HSWA module of the LANL Hazardous Waste Facility Permit.

Consolidation

The ER Project Regulatory Compliance Focus Area has worked with the NMED to develop criteria to consolidate sites for the purpose of investigation, assessment, stabilization and remediation. Consolidation allows for a more efficient characterization approach to corrective action sites, the evaluation of cumulative risk from certain adjacent PRSs, and the efficient determination of nature and extent of releases. The consolidation effort also meets the NMED call for information to support an annual unit audit (AUA). The ER Project anticipates about a 20 percent reduction in the 1098 PRSs (SWMUs) currently listed on Module VIII of the LANL RCRA Permit as a result of the consolidation effort, which will translate directly into a cost savings from the annual HSWA Module fee.

Permit Renewal and Modifications

In November of 1989, the New Mexico Environmental Improvement Division issued jointly to the DOE and to the University of California (UC) a Hazardous Waste Facility Permit (NM0890010515) under RCRA for the Laboratory. In addition, in March of 1990, the EPA issued a HSWA section to the permit, known as the HSWA Module or Module VIII. This Module became effective on May 23, 1990. The HSWA Module establishes the procedural requirements for assessing and remediating Solid Waste Management Units (SWMUs).

In January of 1996, EPA granted authority for corrective action to the NMED. The Laboratory RCRA permit expires in November of 1999 and the NMED and Laboratory personnel are negotiating the renewal during the FY 99/00 timeframe. The ER Project will recommend the removal of PRSs, in this case SWMUs, from the HSWA Module by submitting a Permit Modification to the NMED. The Project will submit Permit Modifications that present NFA proposals in manageable numbers, and expects to submit one or two such Modifications per fiscal year.

2.2 CHARACTERIZATION APPROACH

Aggregation of PRSs

When the ER Project began nearly 10 years ago, the consensus between the ER Project, the DOE and the regulators was that corrective actions would be undertaken if the risk to human health was deemed sufficiently high to warrant action. At that time regulatory guidance for ecological risk was being developed and had not been issued. Today, the ER Project must consider ecological risk as well as human health risk, and must also consider the potential for surface and groundwater contamination as a result of contamination at a PRS. As a consequence, the original approach of the ER Project, which was to characterize and, if necessary, remediate individual PRSs, is no longer efficient. While human health risk can be evaluated on the basis of a relatively small area, ecological risk assessment requires an understanding of the nature and extent of contamination across much larger areas. Similarly, an understanding of the presence of, and movement of, contamination within an entire watershed is necessary to fully understand the potential for groundwater and surface water contamination to exist or arise.

As a result, the ER Project proposes to shift its focus from the characterization of individual PRSs to the characterization of these PRSs in the context of entire watersheds. Eight major watersheds cross LANL boundaries and drain into the Rio Grande. The northernmost of these watersheds is the LA/Pueblo watershed, which includes Guaje, Rendija, Barrancas, Bayo, and DP canyons. The watershed progression to the south is Sandia; Mortandad, which includes Mortandad, Ten-Site, and Cedro canyons, as well as Cañada del Buey; Pajarito, which includes Two-Mile and Three-Mile canyons; Water/Canon de Valle, which includes S-Site, Potrillo, Fence, and Indio canyons; Ancho, which includes North and South Ancho canyons; Chaquehui; and Frijoles. Figure 2.2 illustrates the specific locations of these watersheds, and the canyon drainages that are encompassed.

These eight watersheds represent the environmental systems through which any surface or near-surface PRS-related contamination may migrate in sediments, surface water, soils, and alluvial groundwater. Evaluating a watershed holistically facilitates an understanding of how contamination from an individual source or combination of sources migrates, and provides an appropriate framework for risk-based cleanup decisions at individual PRSs. It assures that nature and extent of contamination will be defined for each PRS within an appropriate and complete context. It also provides an appropriate framework for evaluating the cumulative impacts of contamination on surface water quality, alluvial groundwater quality, human health, and the ecosystem.

The ER Project proposes to use a delineation of LANL watersheds that is identical to those presented in the institutional watershed management plan. This delineation has been concurred on by NMED.

The ER Project will schedule characterization of the deep groundwater in concert with other remedial activities in the same watershed. However, potential contamination issues will be evaluated outside of the watershed framework unless groundwater contamination is found to exist as a result of an individual PRS. If this is the case, the ER Project will assess the extent of such contamination under the standard regulatory framework. The ER Project proposes to evaluate groundwater in general, in accordance with the LANL hydrogeologic work plan, which has received concurrence from the NMED.

The value of aggregation of PRSs into watersheds, or subsections of watersheds called "aggregates," is multifold. As a systemic approach to characterization and remediation, it:

- Allows timely and integrated assessment of risk holistically, and at an appropriate scale;
- Allows a "big picture" assessment of contaminant fate and transport;
- Reduces the "what if..." questions and the "we'll get back to you when we know more" answers that arise in projects that are conducted in too small a scale;
- Is a good way to show clear progress (i.e., areas that are "done");
- Creates efficiencies that result in cost savings, because it is no longer necessary to develop a detailed understanding of the nature and extent of contamination at individual PRSs, unless required for the evaluation of remedial alternatives; and
- Creates operational efficiencies and consistency, because characterization and remediation work within a watershed will be integrated so that all three operational Focus Areas conduct their portions of the work in concert with one another.

2.3 REMEDIATION APPROACH

The ER Project follows an efficient and expedited RCRA corrective action process to first characterize PRSs for nature and extent of contamination, then assess the ecological and human health risk associated with the contamination, reporting these results in a RFI report, and finally evaluate and implement corrective measures to ensure acceptable risk through voluntary corrective action, application of presumptive remedies, or a focused CMS/CMI process. Other regulatory drivers (such as water quality standards) are also considered in remediation decisions. Corrective actions at PRSs vary in cost, scope, and duration relative to their complexity in terms of either characterization or remediation approach, or both. Especially for more complex sites, which may

require a focused CMS/CMI, efficiencies can be achieved through consistent and compatible approaches to characterization, assessment, and remediation (where necessary) of similar sites. Whenever possible, corrective measures will be identified early in the corrective-action process, and used to narrow the scope of RFIs to address only critical information needs necessary to evaluate the protectiveness of the preferred remedy. Ultimately, the adequacy of characterization and corrective measures undertaken for MDAs, Canyons, and Remedial Action Focus Area sites will be evaluated at scales of watersheds, airsheds, and the regional water supply aquifer. Several activities are proposed to address technical issues that will affect corrective-action completion at these larger spatial scales, aimed at ensuring acceptable cumulative risk.

Specific core ER Project activities, developed to achieve technical and cost efficiencies in the remediation approach, are described below:

Integrated Technical Strategy

In the past, the ER Project has made decisions based on individual PRSs, and by data evaluation criteria focused on human health risk, ecological risk or surface water characteristics. When decision criteria needed to be combined, site data and decisions were revised and reevaluated, requiring additional field work and data.

Starting in FY2000, ER will use a watershed/aggregate approach. The ER Project will group PRSs and PRS data to undertake characterization and remediation in a contiguous area within a watershed: an aggregate. Final action decisions will be made after consideration of all relevant environmental pathways and cumulative risk.

Inventory calculations for contaminants at PRSs for which there is a potential for contaminant mobilization by surface water runoff and erosion will be retained for effective management of surface water quality under the umbrella of the LANL Watershed Management Plan.

The Integrated Technical Strategy Plan (ITSP) will provide a technical path to completion of PRSs. The ITSP will include the following elements:

- Decision framework to focus data collection on an watershed/aggregate basis, combining ecological and human health risk assessment and groundwater and surface water evaluations;
- Criteria to focus the sampling of soil, sediment, water, biota, and air for an aggregate;
- Integrated data set requirements and development of a method for calculating contaminant inventories; and
- Integrated database requirements, quality procedures, and management for surface water and groundwater analytical data and hydrological parameters.

The ITSP will define how contaminant sampling, data analysis, and risk assessment will occur at the aggregate level, across the MDAs, Canyons, and Remedial Action Focus Areas. Such a plan will be developed in FY99, and implemented throughout the ER Project lifetime. In a sense, the ITSP will be an implementation plan for the ER Project baseline, tailored to Strategy 2 of the ER Project Roadmap. The ITSP will elucidate the technical and regulatory rationale for proposing final actions for a single PRS, an aggregate of PRSs, and watersheds comprising multiple aggregates, integrating contributions from all sources that have a potential to adversely impact common receptors, both human and ecological. The ITSP will also identify how the ER Project will integrate corrective actions and long-term compliance monitoring with LANL institutional environmental programs. The ITSP will be used to describe how the operational focus areas will proceed, with specific details provided for watershed aggregates prioritized for a given two-year planning window.

The ER Project will submit a draft ITSP to the DOE for review and concurrence in June 1999. The ITSP will also be submitted to NMED for review. After the ITSP is finalized and implemented, progress will be reported annually and the ITSP will be updated for each planning window, or as necessary to reflect significant technical or policy changes.

Integrated Sampling and Analysis Plan: The TA-35 Pilot

The ITSP approach is piloted through the process of writing an Integrated Sampling and Analysis Plan (SAP) at TA-35, which lies within the Middle Mortandad/Ten Site aggregate in the Mortandad Watershed. In order to evaluate data quality and completeness, TA-35 has been divided into subaggregates as appropriate for human and ecological receptors: mesa-top, canyon-sides and canyon bottoms. Figure 2.3 shows subaggregates at TA-35.

The integrated SAP will focus data collection as necessary to reduce uncertainties in risk assessments of PRSs within these subaggregates. The PRSs within a subaggregate will be evaluated as a cumulative source in risk assessments, and the SAP will be focused on data needed to ensure a high degree of confidence in the outcome of the risk assessments. The specific approach for the PRSs at TA-35 will be generalized as required and included in the ITSP.

Corrective Measures Study / Corrective Measures Implementation Approach: The 260 Outfall Example

The ER Project contains certain PRSs that will require CMS/CMI. The CMS/CMI process will be streamlined or focused in coordination with the administrative authority. We assume that only a few, complex PRSs will go through a CMS/CMI, and the liquid-effluent outfall associated with Building 260 at the TA-16 high-explosive production facility [PRS 16-021 (c), the "260 Outfall"] is a PRS for which a CMS has been proposed. This PRS, therefore, is the test case for the

ER Project's proposed approach for a CMS/CMI. A CMS Plan for the 260 Outfall was written and submitted to NMED for comment in FY98. It addresses several far-reaching technical issues, including multi-pathway contaminant transport (including both surface and groundwater), and multiple risk-assessment endpoints. When approved, this CMS Plan could serve as a model for other complex sites requiring a CMS.

MDA Technical Approach: The MDA Core Document

The MDAs are a group of complex sites for which the ER Project requires a consistent corrective action strategy. The MDA corrective action strategy assumes that several of the larger, well-characterized MDAs (including MDAs A, B, G, H, L, B, U, and AB) will require a CMS/CMI. It also assumes that, for MDAs that are comparable in terms of characterization, assessment, and remediation approaches, a standardized and streamlined RFI/CMS is justified. The purpose of the MDA Core Document is to lay out an approach for conducting streamlined RFI/CMSs. This strategy will be documented in the MDA Core Document, which will be submitted to the DOE in August of this year, and will be submitted to NMED for review in September.

The streamlined approach will focus on the optimization of site-specific data and fate and transport modeling, to evaluate future risk to ecological and human receptors under the "as is" condition of the MDA and under a proposed capping alternative. RFI activities will be focused on meeting specific information needs through application of quantitative data quality objectives, with capping being the proposed corrective measure. Assuming that capping is determined to be an acceptable final remedy, the CMS will be limited to optimizing the design of the cap, designing appropriate auxiliary measures (such as in situ stabilization enhancements), and developing an appropriate monitoring program, if necessary. If capping is not determined to be an acceptable final remedy, then the MDA will undergo more robust CMS/CMI, which will incorporate lessons learned from the 260 Outfall CMS/CMI process.

Beginning in FY2000, the ER Project will execute its work at all MDAs following the watershed/aggregate approach, which will assure that this work is integrated with other field projects in a timely and efficient manner.

Canyons Technical Approach

The Canyons Focus Area is responsible for investigation of canyon bottom surface soils and sediments, surface water, and alluvial and regional ground water. The approach to these investigations is presented in the Core Document for Canyons Investigations (1997) which has been approved by the NMED. Investigations of these media will be conducted in an integrated manner to facilitate the development of detailed conceptual models for each canyon system. Canyons data will be used iteratively to develop/refine water flow and contaminant transport modeling. Schedules will be organized in a manner that

promotes completion of the characterization within canyons comprising individual watersheds. The characterization data and the refined conceptual models describing spatial distribution and fate and transport of contaminants will directly support characterization efforts for PRS aggregates because it provides data useful for discussions of nature and extent, fate and transport, and relative contaminant inventories. The combined Canyons and PRS aggregate data also provides the optimal framework for remediation decisions in the canyons and at PRSs.

Water Flow and Contaminant Transport Modeling

Concurrent with ongoing field data collection activities in canyons reach investigations, MDA and complex site RFI investigations and regional well installation, the ER Project is developing models to simulate contaminant fate and transport via surface water and groundwater. Models are being developed to simulate water flow and contaminant transport on and within representative mesas, catchments, and canyons. The first subsurface model is being developed for LA Canyon from existing surface water, Regional well, reach sediment, and contaminant inventory data. A configuration management system for compiling, qualifying, documenting, and accessing modeling data is being developed. Ultimately, an optimal balance of model results and field data can be used to support decisions in the corrective-action process with a high degree of confidence. Modeling conducted in the canyons, in conjunction with complex site remediation, will be used to support watershed aggregate decisions and to optimize the number and location of characterization boreholes. Use of these tools is only envisioned to support final decisions for a small, but complex, subgroup of LANL PRSs.

2.4 SITE PRIORITIZATION BASIS

The following nine prioritization criteria will be used to prioritize all ER Project work, including planning, field work, and document preparation. These criteria are consistent with the ER Project mission and with the prioritization criteria listed in the *"FY2000 Environmental Restoration (ER) Project Lifecycle Baseline Requirements Document"* (February 5, 1999). The key elements of each criterion are described below, in descending order of priority.

Infrastructure – Regardless of the level of field operations, a minimum level of the ER Project infrastructure must be maintained to protect records; maintain a core of key personnel; meet contracting, financial, and project control requirements; ensure efficient and cost-effective operations; plan and prioritize work; keep stakeholders informed; interact with the regulatory agencies; protect the public by securing, maintaining, and monitoring contaminated sites; and ensure worker safety. Thus, infrastructure represents a minimum, fixed cost plus (depending on the level of project activity) additional variable costs.

Mandatory Items – Work elements related to this criterion correspond to documented mandates (e.g., compliance orders, groundwater and surface water orders, Notices of Deficiency, and permit provisions, including work schedule activities and closure plans) on which the ER Project must act within a defined period or risk adverse financial or programmatic consequences.

Performance measures contained in the DOE-UC contract are derived from the baseline and become mandatory work after finalization and joint approval by the DOE-Los Alamos Area Office (LAAO) and LANL.

Any work element necessary to fulfill legal or documented commitments to organizations such as the DOE, Congress; state, county, or federal agencies; Native American tribes; or other stakeholders should be given high priority in relation to this criterion.

High Risk – The fundamental goal of the ER Project is to reduce unacceptable risks to human and ecological receptors from environmental contaminants. Work elements that would receive a high score for this criterion are those that would result in significant risk reduction. Work elements in this category include work to prevent, control, or mitigate human health and ecological risks. Factors considered in identifying high-risk areas are areas with (1) a high source-term or contaminant inventory; (2) high transport likelihood; or (3) high potential for receptor exposure. This logic can be applied at the level of watersheds, aggregates within watersheds, potential release sites (PRSs), or any other logical geospatial unit. "High risk" must consider the time-critical nature of risks. Work in areas where immediate action is important should be given high priority regardless of the geospatial unit to which the area belongs.

Land Transfer – Public Law 105-119, enacted by Congress in November 1997, required the DOE to identify parcels of land at LANL that could be considered for transfer to either the Incorporated County of Los Alamos or the U.S. Department of Interior, in trust for the Pueblo of San Ildefonso. This land transfer initiative is being undertaken to assist the potential recipients in gaining economic self-sufficiency since financial support will no longer be provided under the Atomic Energy Communities Act.

Because Public Law 105-119 stipulates that all lands to be transferred must actually be transferred by November 2007, and because there is substantial support for the land transfer initiative at the Congressional, State, and local levels, the ER Project anticipates that work priorities will be driven in a substantial way by land transfer over the near-term; therefore, it is considered an important component of the 2006 vision.

Specifically, commitment has been made to transfer two to four parcels by November 2000.

Critical Path Elements – There are three types of critical path work elements. First are long-duration work elements that effect the time to complete the ER Project and transition to long-term monitoring and surveillance. Although these long-duration work elements can be anticipated (e.g., complex site characterization), the duration-based critical path largely will be determined through the baseline development process. The second type of critical path work is more strategic in nature and represents work needed to implement the ER strategy in the four key roadmap areas: regulatory strategy approaches to characterization, remediation, and prioritization. Work of this second type is especially important in (1) addressing key areas of uncertainty (such as land use, cleanup levels, and complex site characterization); and (2) ensuring cost-effective operations (e.g., through PRS aggregation by watershed). Third are work elements on the critical path with other (non-LANL) sites or DOE-EM projects.

Laboratory Mission – The ER Project must conduct ER activities in a manner that does not interfere with other LANL critical operations, construction, or maintenance activities. Many sites under the purview of the ER Project (e.g., PRSs within the firing site boundaries and MDAs at TA-54) are located at "mission-critical" facilities. This implies a level of necessary interaction with other LANL organizations, as well as periodic rearrangement of ER Project work to support the timing of other LANL activities. In addition, the ER Project is obligated to support the LANL mission of environmental stewardship while implementing corrective actions. Work elements that would score high against this criterion include those that must be completed within a specified period of time to avoid adverse impact to mission-critical activities, or that promote cooperation between facility and program management and the ER Project.

External Expectations – The ER Project must respond to a variety of preferences and expectations from non-ER Project groups (e.g., the four Accord Tribes and the additional five northern Indian Pueblos, the Northern New Mexico Citizens' Advisory Board, and Los Alamos County). The ER Project also must respond to DOE directives. Therefore, high-priority work elements associated with this criterion correspond to DOE-approved and -funded commitments made in response to documented preferences, expectations, and directives. Such preferences, expectations, and directives should be consistent with the ER Project prioritization as defined in the Project baseline, and should be communicated to the ER Project in writing to ensure proper authorization.

Clear Measures of Progress – This criterion recognizes the importance of historic measures of progress on the ER Project, including submitting NFA requests to the Administrative Authority (DOE or NMED) and decontamination and decommissioning (D&D) of buildings. To the extent practicable and consistent with the implementation of the roadmap, high-priority work elements should include work that achieves clear and timely progress in NFAs and D&D. Clear measures of progress also include mortgage reduction (defined as reducing building or facility costs consisting of, but not limited to, utilities,

security, maintenance, surveillance, and inspections). Finally, clear measures of progress include completion of work within a watershed aggregate.

Development and Implementation of Efficient Technologies – This category recognizes the importance of continuing to examine the role of technologies to aid environmental restoration by reducing the remaining costs to completion, reducing risks associated with remediation activities, and reducing the duration of remediation projects. High-priority activities in this category should include the implementation of technologies that have a high probability of success in meeting most or all of the three key elements listed above. An analysis of the potential for successful implementation of a technology should include both a technical evaluation of previous pilot projects and results of bench-scale studies, and a regulatory analysis to assure that there are no statutory, regulatory, or permit-related issues that could impede implementation.

Initial prioritization results will be reviewed and approved internally. A revised prioritization will be based not only on initial prioritization results but also on the Program Manager's judgment and consideration of all other relevant factors (e.g., benefits to other DOE sites or facilities, operational efficiencies, short-term opportunities), which will be documented. Final prioritization will be approved by DOE, in consultation with NMED and other Stakeholders.

3.0 PROGRESS TO DATE ON THE ROADMAP CONCEPT

3.1 REGULATORY INTERACTION

ER/NMED Interaction Strategy

The ER Project has continued its monthly meetings with the NMED. The ER Project and the NMED management and staff have worked together to focus these meetings on key policy and strategic issues. They have also addressed site-specific issues that will serve as representative sites for the resolution of a number of widely applicable issues.

The ER Project and the NMED have also held their first annual management work planning meeting. This meeting occurred in December 1998. The ER Project continued to discuss the progress of its work with the NMED on a regular basis and in a follow-up management work planning meeting in April 1999. This increased interaction has already resulted in benefits to both the ER Project and the NMED. The ER Project is aware of what issues and sites are of the most concern to the NMED and the NMED is aware of what issues are critical to the progress of the ER Project. The ER Project and the NMED have focused many of their meetings on these issues. Additionally, the NMED is aware of what work, including fieldwork, the ER Project is planning for the year, and they can plan their regulatory review and involvement in a manner they believe to be most

appropriate and efficient. On April 8, 1999, the NMED approved the ER Project Work Schedule for FY99 – FY2003.

During these meetings, the ER Project and the NMED have also agreed on a prioritization of key documents submitted to the NMED for review. Both parties are now aware of the status of the review of these documents, moving the relationship closer to the goal of "real-time review."

Critical Policy and Guidance

The ER Project is currently working on a team with EPA and NMED to discuss PCB cleanup levels. It is hoped that this team will develop a PCB policy. It is essential for agreement to be reached on a PCB policy within FY99, so the ER Project can be undertaking several field projects in 1999 where PCBs are the primary contaminant of concern.

The ER Project is early in the process of developing a policy on nature and extent of contamination, in conjunction with the NMED. This policy must be finalized as quickly as possible, for Project work to proceed with minimal uncertainties and risks of having work redone.

Finally, the ER Project is evaluating the EPA Region 6 Draft Risk Management Strategy (December 1998) to determine the impacts this draft strategy might have on the ER Project path forward. If appropriate, this draft guidance will be incorporated into the ITSP.

Regulatory Strategies: Workoff

To date, the ER Project has evaluated 202 workoff sites. Of these PRSs, the Project has recommended 142 workoff PRSs for NFA. Forty-six of these PRSs are SWMUs contained within the HSWA Module of the LANL Hazardous Waste Facility Permit, and 96 are administered by the DOE. The remaining PRSs will be worked through a peer review process to determine if any additional scope is required to meet today's NFA criteria, including ecological risk.

Finally, the ER Project is in the process of evaluating 488 additional workoff PRSs. The primary issue associated with these sites is whether there is a need for an ecological risk evaluation of these sites.

Permit Renewal and Modifications

The Regulatory Compliance Focus Area is providing direction for the renewal of the HWSA Module of the Hazardous Waste Facility Permit and is coordinating with the Laboratory on the renewal of the LANL Permit.

Following the successful removal of 99 PRS from the LANL Hazardous Waste Facility Permit early in FY99, the ER Project currently has 46 workoff PRSs

which it intends to incorporate into a Permit Modification. This modification would propose the removal of these PRSs from the LANL Hazardous Waste Facility Permit.

Consolidation

The ER Project evaluated all PRSs, and those which were in the same geographic proximity with similar contaminant types and migration pathways were combined under one PRS number. This consolidation did not result in the elimination of any PRS area, but merely combined multiple PRSs under one new number.

This consolidation effort resulted in the combining of 397 PRSs from the HSWA Module and 91 PRSs which are not currently on the HSWA Module into 93 new PRSs. All of these consolidated PRSs will be on the HSWA Module. The consolidation effort also identified one HSWA PRS that required separation into 22 separate HSWA PRSs of which 15 were subsequently consolidated and seven remained discrete. In addition, 18 HSWA PRSs were identified that are or should be administered under other regulatory authority such as the Toxic Substances Control Act (TSCA) and should not be assessed an annual HSWA Module fee. The ER Project conducted this effort in conjunction with the HRMB as part of the Annual Unit Audit (AUA) required under the new NMED RCRA fee regulations. This effort may reduce the annual business fee to be paid by the ER Project to the NMED.

3.2 CHARACTERIZATION APPROACH

A team of ER Project members and DOE representatives was convened to undertake the process of defining aggregates. Aggregation team members included team leaders from the Remedial Actions, MDAs, and Canyons focus areas, to provide insight on the issues associated with the PRSs, MDAs, and canyon reaches in each watershed; the risk assessment team leader from the Analysis and Assessment focus area, to assess the reasonableness of aggregate delineation from the standpoint of human health and ecological risk assessment; representatives from Regulatory Compliance, to provide perspective on programmatic and PRS-specific regulatory issues, and land transfer issues of high priority to the DOE, San Ildefonso Pueblo, Los Alamos County, and the public.

Criteria was developed and used to identify logical delineation of aggregates within watersheds. This criteria is described in detail below, in no specific order.

- Geomorphology: Recognized the importance of defining aggregate boundaries in the context of subdrainage confluences; appropriate cutoff points within major trunks; and surface water pathways. For example, preferentially defined boundaries of aggregates just above the confluences of

subdrainages, so that the contaminant contribution of each subdrainage could be clearly characterized.

- Number and Spatial Distribution of Known or Potential Sources: Included review of historical and existing sources that could potentially contribute to contamination in the aggregate. Recognized the importance of grouping spatially related sources with similar contaminants in the same aggregate; and taking into consideration source term differences when establishing aggregate boundaries.
- Watershed Management Plan Monitoring Stations: Included a review of the proposed placement of LANL surface water monitoring stations per the draft watershed management plan. Recognized the importance of compartmentalizing basins to allow optimal interpretation of data and, therefore, defined aggregate boundaries at the location of surface water monitoring stations where appropriate.
- Aggregate Complexity: Recognized the importance of defining aggregates in manageable sizes (from the standpoint of number of PRSs to be investigated, types and complexity of sites, and project budgets);
- Land Transfer: Included a review of the location of the ten parcels preliminarily identified for potential transfer by the DOE to either Los Alamos County or San Ildefonso Pueblo by no later than 2007, and as soon as possible within that time frame.

No single criterion provided a suitable basis for dividing watersheds into aggregates. Using a combination of the criteria listed above, twenty six aggregates were initially identified within the eight watershed systems. The NMED reviewed the proposed aggregates and, in a letter dated March 23, 1999, concurred with the conceptual approach and recommended an additional aggregate be added to the LA/Pueblo watershed. The ER Project accepted this recommendation, and there are now a total of 27 aggregates within the eight watersheds. All aggregates are wholly contained within a single watershed. Within each watershed, subdrainages usually furnished a basis for identification of an aggregate, and a confluence with another drainage typically bounds the lower, or down-stream, end of the aggregate and provides a logical monitoring point for surface water. Surface water gauging and monitoring stations already exist at many of these confluences.

Secondarily, certain large drainages, usually the main trunk of the watershed, were divided into aggregates at locations other than major confluences. These locations were chosen because of existing (or planned) surface water gauging or monitoring stations; the perceived need to further isolate certain potentially important contributing PRSs or influences; data from investigations of canyons reaches; the relationship between parcels of land that are potentially subject to transfer, and the PRSs or drainages that are adjacent to or contained within these parcels; and the need to plan work within a manageable framework. Figures 3.1 through 3.8 show the proposed aggregate boundaries within each of the eight watersheds.

3.3 REMEDIATION APPROACH

Integrated Technical Strategy

The Integrated Technical Strategy Team was formed and consists of members of all five Focus Areas of the ER Project, led by the Analysis and Assessment Focus Area. To date, the Team has developed and annotated an outline for the Integrated Technical Strategy Plan, due to DOE in June 1999. Development of the Outline and the Plan has kept pace with the development of the FY2000 baseline, ensuring that the Plan will be consistent with emerging consolidation, aggregation, and prioritization strategies, and will also document policy and guidance specific to implementing these strategies. The team has also worked to ensure compatibility and consistency between ER Project strategies and LANL programs, including those documented in the Watershed Management Plan (draft), the Hydrogeologic Workplan, and the Habitat Management Plan.

In addition to the Outline, the Integrated Team has drafted several technical components: standard scenarios for human-health risk assessment (due September 1999), the ecotoxicity database of parameters used in ecological risk evaluations (first version to DOE, September 1999), contaminant-data management requirements (draft complete summer FY2000), and modeling-data management specifications (draft complete summer FY2000).

Integrated SAP for TA-35

The Integrated SAP for TA-35 is being drafted. It will be delivered to the NMED in September 1999.

260 CMS/CMI Approach

PRS 16-021(c) is the first site at which LANL has initiated the CMS/CMI process. The CMS Plan (LA-UR 98-3918) was submitted to NMED during September 1998, a request for supplemental information (RSI) on that document was received in March 1999 and was responded to in April 1999. LANL met regularly (every 1-2 months) with HRMB during development of the CMS Plan to formalize an approved outline and to ensure that the CMS Plan fulfilled HRMB's needs. The 260 outfall CMS Plan will be used as a template for other complex-site CMS Plans that are produced within the ER Project. The CMS Plan: (1) proposes several bench and pilot studies which are currently being completed in collaboration with Pantex through the Innovative Treatment Remediation Demonstration (ITRD) project; (2) outlines additional hydrologic studies to better constrain pathways for the site-specific risk assessments (SSRA) and 3) proposes to remove the most highly contaminated soils in the outfall in an Interim Measure to limit contaminant transport from the source area. The Interim Measure Plan is scheduled for completion by September 1999 (pending resolution of waste-treatment issues) and implementation of the Interim Measure

will be completed early during fiscal year 2000. Data from sampling following the Interim Measure will be combined with data from the hydrologic investigations and with data from the RFI Phase I (LANL 1996, 55077) and RFI Phase II (LANL 1998, 98-4101) investigations in both human and ecological risk assessments to be completed concurrently with the CMS Report. The SSRA and CMS Reports are currently scheduled for completion during the first half of fiscal year 2001. The CMI will begin upon review of the CMS Report and issuance of the statement of basis by HRMB.

LANL currently anticipates that CMS/CMI investigations of the HE-contaminated deep groundwaters at TA-16 will be completed following the investigations and remediation of shallower media. The deep groundwater system must be investigated at a scale larger than the TA-16-260 investigations. Environmental Restoration Project deep-groundwater investigations will build on and be closely coordinated with the hydrogeologic workplan groundwater investigations currently scheduled for the western portions of the Laboratory.

MDA Core Document

The corrective action strategy portion of the MDA Core Document is being piloted at MDAs G, H, and L at TA-54 this year. MDA G is being assessed as a bounding case for the other MDAs at TA-54. A detailed all-pathways risk assessment will be performed for MDA G. A quantitative sensitivity analysis will be performed to identify the critical risk-limiting parameters at MDA G. Decision rules for sensitive parameters will then be developed and used to compare specific information from the other MDAs with those same parameters at MDA G. The comparison will be objective and quantitative, ensuring a high degree of confidence in interpolating risk calculations from MDA G to the others. The analysis will either identify (1) a proposed presumptive remedy (expedited CMS) or (2) the need for the collection of additional site data (Phase 2 RFI). The outcome depends on the quality and quantity of the information about the subject MDA, the comparability between that MDA and MDA G, and the risk projected for the MDA. If a full RFI/CMS is deemed necessary, it will be developed following the approach developed for the 260 Outfall CMS. The MDA Core Dcoument will be submitted to DOE in August 1999.

Canyons Technical Approach

Work Plans

To date, workplans for LA/Pueblo, Mortandad, and Pajarito Canyons have been written and submitted to the NMED. The LA/Pueblo Workplan has been approved by the NMED, and the Mortandad and Pajarito Canyon Workplans are under review. The Sandia Canyon Workplan will be completed by September 1999.

Sediment Investigations

Sediment investigations have been conducted in nine reaches in LA/Pueblo Canyon. Three Reach Reports were written for the LA/Pueblo Canyon sediment investigation and submitted to the NMED in FY98 and are undergoing review. The reports presented results of the human health and ecological risk evaluations and recommendations for additional characterization work scheduled for completion in FY00. A sediment and alluvial groundwater investigation has also been conducted in DP Canyon and a report is scheduled for completion in August 1999. Additional reach investigations are currently underway in Mortandad, Canada del Buey, and Sandia Canyons.

Alluvial Well Investigations

The completion of the installations of all of the alluvial monitoring wells specified in the LA/Pueblo Canyons Work Plan was accomplished during the first quarter of FY99. This includes a total of 11 wells in Los Alamos Canyon (including the upper, middle, and lower canyon portions) and 7 wells in Pueblo Canyon (all portions). Three nested piezometers specified in the workplan will be installed in FY-00. Some related activities such as well development and groundwater sampling remain pending for a few wells (one well in Los Alamos Canyon and five wells in Pueblo Canyon) because of persistent low water table conditions. Of these wells, the one in Los Alamos Canyon and at least one of the wells in Pueblo Canyon may be permanently dry.

Two of the eight alluvial wells specified in the Mortandad Canyon Workplan were installed in FY-99. The remaining Mortandad Canyon alluvial wells are scheduled for installation in FY-00.

Deep Wells Investigations

The ER Project is scheduled to drill 16 of 32 deep wells to the regional aquifer as part of the Hydrogeologic Workplan. Regional aquifer wells R-9 and R-12 in Los Alamos and Sandia Canyons, respectively, were drilled in FY-98. Both wells penetrated the regional aquifer and groundwater samples and core/cuttings were collected and analyzed for both boreholes. Temporary wells were installed at R-9 and R-12 to allow additional data to be collected for water chemistry and groundwater levels. A permanent well will be installed in R-9 during FY-99, and a permanent well is scheduled for completion at R-12 during FY-00.

Drilling operations for regional aquifer well R-15 have been started in Mortandad Canyon. This well was drilled to a depth of 410 feet using a hollow-stem auger drill rig, and surface conductor casing was set to a depth of 120 feet. R-15 is scheduled to be drilled to a depth of approximately 1250 feet and will be completed in FY-99 when the Barber dual-rotary drill rig is released from R-25 at TA-16.

Water Flow and Contaminant Transport Modeling

Ongoing groundwater flow and transport modeling activities occur at three levels: site-specific, local models of saturated flow and transport at the scale of a mesa-top site or canyon, vadose zone modeling at the canyon scale, incorporating multiple water and contaminant source terms, and plateau-wide models of the regional aquifer.

In FY99, model performance is being tested in LA Canyon before model application to all canyons. Specific modeling components being developed for LA Canyon include geologic conceptual model, numerical grid based on geologic data, fluid flow based on hydrologic data, and 3-D flow and transport model incorporating contaminant information. In addition to Plateau-wide surface water and borehole data, hydrogeologic data from the deep well in LA Canyon, R-9, are being used. Implications of LA Canyon model results for data needs and decisions at other sites will be documented by September of 1999.

Groundwater flow and transport models are currently being developed for several mesa-top sites at TA-54 and TA-49. Regional aquifer models are being developed by LANL supported, in part, by the ER Project.

Complimentary to the groundwater flow and contaminant transport models are surface water flow and sediment transport/erosion models. Two such models have been calibrated to site-specific data during the first two quarters of FY99, one to simulate surface water flow on the scale of a watershed, and another to simulate water erosion as a pathway for contaminated-sediment transport and for buried-contaminant exposure.

Watersheds

The ER Project is currently revising the FY2000 Life-Cycle Baseline to incorporate the watershed/aggregate approach. All planned work assumes that subsequent to remedial action recommendations for aggregates, the watershed is evaluated by assessing the combined data set—canyons sediments, alluvial water, PRS contaminant inventory, where applicable, and MDA contribution—and developing a monitoring plan or, if necessary, an action plan for the watershed. All surface water data, relevant groundwater data, and cumulative risk on contaminant inventory are included in the assessment of the Watershed. Data analysis and final actions, including a long-term monitoring and surveillance plan if needed, are recommended in a Watershed Completion Report.

3.4 SITE PRIORITIZATION BASIS

The aggregation team conducted a preliminary prioritization between watersheds on the basis of the prioritization criteria used across the ER Project. These criteria were applied with equal weight. They include:

- Infrastructure (i.e., work in progress);
- Critical path (i.e., duration of activities within a watershed);
- Human health risk (includes contaminant inventory, concentration, and toxicity; and potential for human exposure, via both access to an area, and the potential for contaminant migration);
- Ecological risk (incorporating the same elements as human health risk);
- Regulatory issues (e.g., compliance orders, RCRA closures, LANL commitments to regulators, regulator priorities such as the "hot 13");
- LANL mission;
- Stakeholder issues (including land transfer, potential for offsite migration, potential for contaminant release or presence on non-LANL land, DOE directives, and CAB inquiries).

The results of the preliminary prioritization of the watersheds, from highest to lowest priority, and incorporating input from DOE and NMED, were as follows: LA/Pueblo, Mortandad, Water/Canon de Valle, Sandia, Pajarito, Ancho, Chaquehui, and Frijoles.

After prioritizing watersheds, the next step was to prioritize the aggregates within and, if appropriate, across each watershed. The prioritization criteria used for the aggregates were identical to those used to prioritize the watersheds. The results of the prioritization are presented in Table 3.4.1, which summarizes the most current thinking of the LANL, DOE and NMED on the priority of watersheds, and of aggregates across watersheds. It is important to note, however, that the NMED priorities diverge from the DOE priorities in one important area -- land transfer. Specifically, in a letter dated March 23, 1999, the NMED states a position that "the RCRA Permits Management Program believes that land transfer issues should not be a major factor influencing prioritization of the aggregates and watersheds."

4.0 WHERE DO WE GO FROM HERE? KEY STRATEGIC ROADMAP COMMITMENTS TO ASSURE SUCCESSFUL PROJECT COMPLETION

4.1 REGULATORY INTERACTION

ER/NMED Interaction Strategy

The interactions between the ER Project and the NMED are working well. The ER Project does not anticipate significant changes to the ER/NMED working relationship.

- Continue monthly ER/NMED meetings and focus on key policy and strategic issues.
- Continue annual and periodic (generally quarterly as appropriate) ER/NMED management work planning meetings.

- Continue the ER/NMED review of status and priority of ER documents awaiting HRMB review. Determine which are still appropriate for review (many have been overcome by events).
- Revise the ER Project Work Schedule to reflect the watershed/aggregation approach.

Critical Policy and Guidance

- The ER Project will develop policy and/or guidance on all issues listed in Section 2.1 by the end of FY2000.
- The ER Project will initiate collaborative discussions with the NMED on all of these issues during FY99.
- The ER Project requests that the NMED address these subject areas and issue policy and/or technical guidance on them as soon as possible, but in any event before the end of FY2000.

Regulatory Strategies:

Workoff

- The ER Project will complete the evaluation of all 488 additional PRSs which are potential workoff sites.

Consolidation

- The ER Project will conduct an annual review of the LANL PRSs to determine if additional consolidation is appropriate.
- The ER Project will present additional consolidated proposals to NMED during the Annual Unit Audit.
- The ER Project requests that the NMED also annually review LANL PRSs and present additional consolidation proposals during the Annual Unit Audit.

Permit Renewal and Modifications

- The ER Project will submit appropriate renewal information regarding the HSWA Module of the LANL Hazardous Waste Facility Permit to the NMED during FY99.
- The ER Project requests that the NMED commit to renewing the HSWA Module of the Permit in a timely manner.
- The ER Project will submit permit modification to the NMED on a regular basis (approximately two per year beginning in FY2000).
- The ER Project requests that the NMED prioritize these permit modifications in its document review.

4.2 CHARACTERIZATION APPROACH

Aggregation of PRSs

On the basis of input received to date from the NMED, DOE, San Ildefonso, and the Santa Clara Pueblos, it appears that most, if not all, of the aggregates that lie within the LA/Pueblo watershed will be prioritized for ER activity in the near-term. Work within each aggregate will proceed with canyons investigations occurring first, followed by characterization of the MDAs and PRSs within the aggregate. The technical approach for work to be performed in each aggregate will be formalized in an integrated SAP, using the lessons learned from the "pilot" integrated SAP being prepared for TA-35. The characterization data collected by the Canyons, MDAs, and Remedial Actions Focus Areas will be analyzed collectively, and used for decision-making about remediation.

4.3 REMEDIATION APPROACH

Beginning in FY2000, all ER Project work will be conducted in accordance with the watershed/aggregate approach. Specific core ER Project milestones in remediation include:

Integrated Technical Strategy

The ITSP, complete in June 1999, will be revised and further development to include:

- Water sampling guidelines (Complete FY2000).
- Guidelines for how data sets for modeling are assembled (Completed FY2000).
- Participation in development of an institutional integrated database for water data. ER Project will begin preparing ER data sets for inclusion in the database in FY2000.
- Ecological risk assessment implementation guidelines (FY2000).
- Cumulative risk assessment methodology (FY2000).

Integrated SAP for TA-35

Final dates for implementation of the Integrated SAP for TA-35 will be determined after prioritization of the FY2000 Life Cycle Baselining, completed August 1999. Implementation will include:

- Review by NMED and revision to address NMED comments.
- Field work to gather environmental data for final remedial decisions for PRSs within the TA-35 Aggregate.
- Data analysis and integrated ecological/human health and surface water analysis.

- Data and decisions documented in comprehensive RFI Report.

Beginning in the fall of 1999, other RCRA Corrective Actions sites will follow the Integrated Technical Strategy approach and begin to write integrated Sampling and Analysis Plans for Aggregates within the highest priority Watersheds.

260 CMS/CMI Approach

The 260 CSM/CMI focuses on limiting risk to human health and the environment by using a phased approach to characterization and cleanup. RFI and CMS/CMI activities are pursued in parallel rather than in series. LANL has been able to use such an approach because of the close formal and informal collaborations with both the DOE-OB and HRMB on this site. LANL had initiated the CMS/CMI investigations even though the full nature and extent of contamination at the site are still being characterized. In addition, LANL has aggressively implemented best management practices at the site, in coordination with DOE-OB and the NMED surface water bureau.

The following activities are planned for the 260 CMS/CMI, dates given are contingent upon funding and Life-Cycle Baseline prioritization:

- BMP installation and maintenance – FY99 through project completion
- Near-surface hydrogeologic investigations and initiation of a monitoring program – FY99 through FY2003
- Bench & Pilot studies for HE-contaminated soil treatment – FY99 and FY2000
- Bench & Pilot studies for HE-contaminated water treatment – FY99 and FY2000
- Interim Measure soil removal and verification sampling– FY99 and FY2000
- Site Specific human and ecological risk assessments (the ecological risk assessment is a pilot for the ecological risk assessment methodology) – FY99 through FY2001
- Deep groundwater characterization in coordination with hydrogeologic workplan investigations (hydrologic workplan boreholes west of TA-16 are scheduled for completion in FY2005) – FY2000 through FY2005
- Hydrologic modeling of deep groundwater – FY2001 through FY2005
- CMS Report – FY2000 through FY2001
- CMI – FY2001 through FY2003 (CMI for deep groundwater will extend beyond this date)
- Contaminant monitoring program – FY2003 through project completion
- CMI – operations and maintenance – FY2003 through project completion

Final MDA Core Document

When the TA-54 RFI Report is approved by the DOE, it will be the model for MDAs at TA-49 and TA-21, and other lower-priority MDAs. The approach will be implemented within the watershed/aggregate framework.

Canyons Technical Approach

Over the Life-Cycle, the Canyons Focus Area will write reports as follows:

- For the LA Canyon watershed, one RFI report will include Los Alamos, Pueblo, and DP Canyons, and another will address Rendija, Bayo, and Guaje Canyons.
- For the Mortandad Canyon watershed, one report will include Mortandad, Ten Site, and Cedro Canyons, and another report will address Canada del Buey.
- For the Water Canyon watershed, one report will include Water Canyon and Cañon de Valle.
- Another RFI report will address Fence and Potrillo Canyons.
- A well completion report will be prepared upon completion of each deep groundwater well.

The well completion reports will provide the basis for a comprehensive groundwater report by watershed that updates the groundwater conceptual model, evaluates risk, and makes recommendations for further work and/or groundwater monitoring as necessary. The groundwater reports will feed a final site-wide report for the Hydrogeologic Workplan that summarizes groundwater conditions beneath the Pajarito Plateau and evaluates the need for additional groundwater monitoring at the Laboratory.

A key task for FY2000 is the development of decision logic for groundwater to describe how groundwater data will be used for final remedial decisions.

Water Flow and Contaminant Transport Models

FY2000 subsurface models will focus on Mortandad and Water Canyon /Canon de Valle. Integrated ER Project efforts in support of modeling include:

- Deep well data available in the fall of 1999 will be documented and used for model refinement.
- Methodology will be developed to integrate large source terms as necessary to support corrective actions at varying spatial and temporal scales.

- Bounding models will be developed for use in a quantitative decision-analytic context to inform decisions at many sites (e.g., wet and dry canyon systems and wet and dry mesa systems).
- Coupled surfacewater/groundwater models will be used to integrate contaminant fate and transport from mesa surfaces, hillsides and canyons at an aggregate scale.

Models will be used to optimize long-term monitoring and surveillance programs to ensure compliance and protectiveness.

Watershed

Work within each watershed and its aggregates will commence at various times in the out-years of the Project. The specific timetable is dependent on Project funding but, in general, work within watersheds will be undertaken in the order presented previously in Figure 2.1 and represented in Table 3.4.1. The Watershed Completion reports are currently scheduled to be completed by FY2006.

4.4 SITE PRIORITIZATION BASIS

The ER Project baseline, which will define all remaining project work and the schedule for its completion, will be submitted to DOE for validation by August 30, 1999, as part of FY2000 Baseline. All ER Project work will be prioritized in the baseline according to the nine criteria presented in Section 2.4.

Figure 2-1. ER Roadmap to 2006 Completion

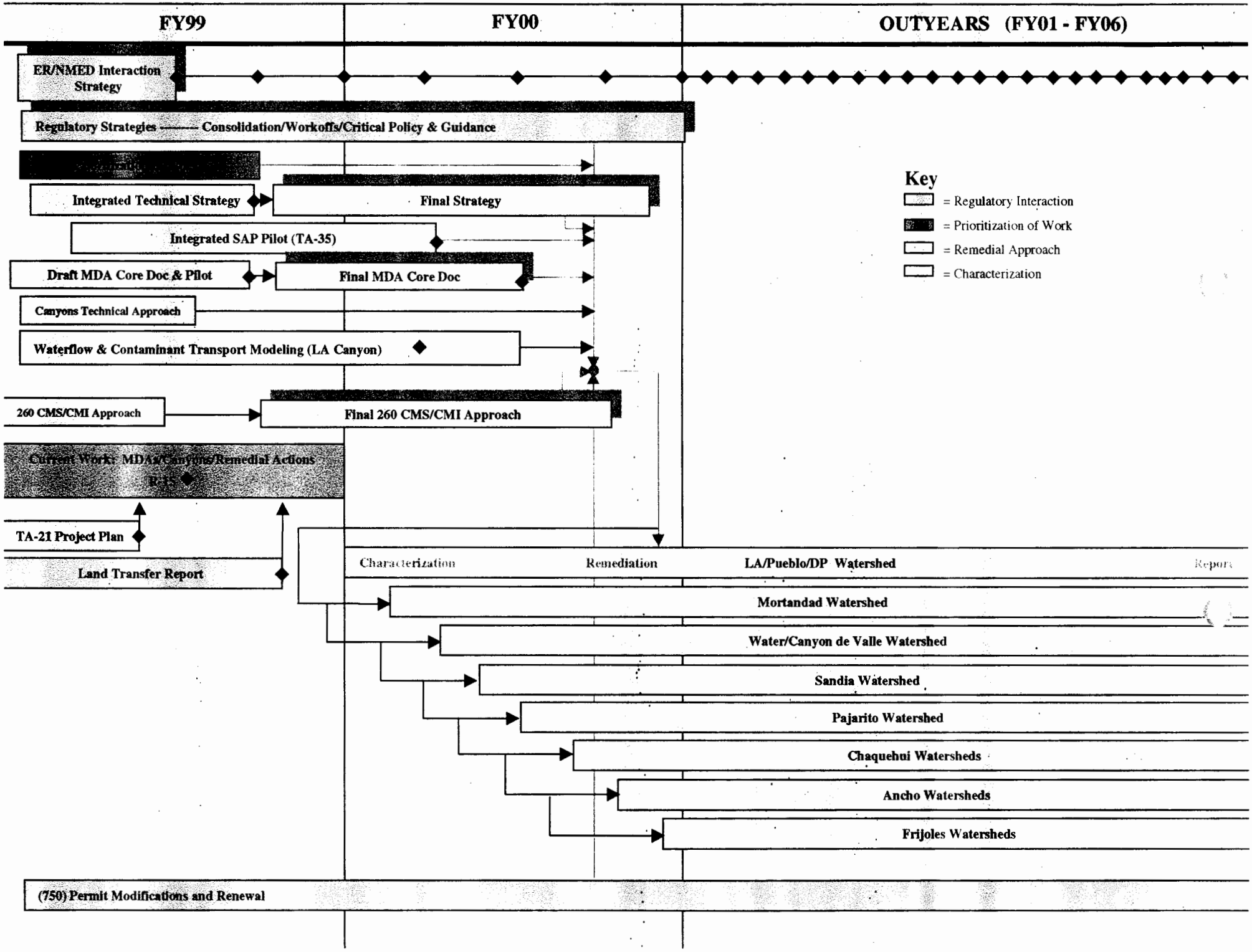


Figure 2.2: The Eight Watersheds that Traverse LANL

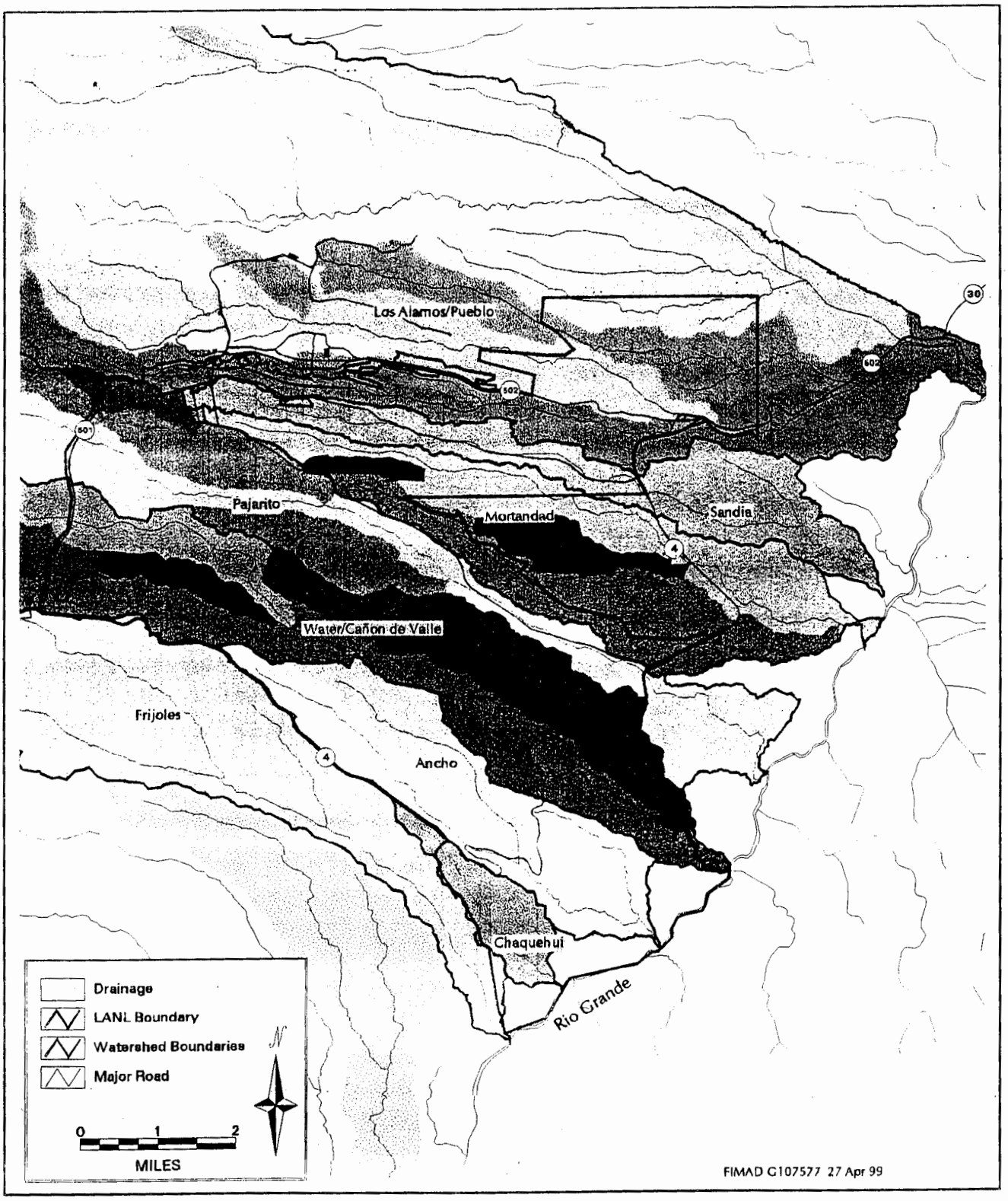
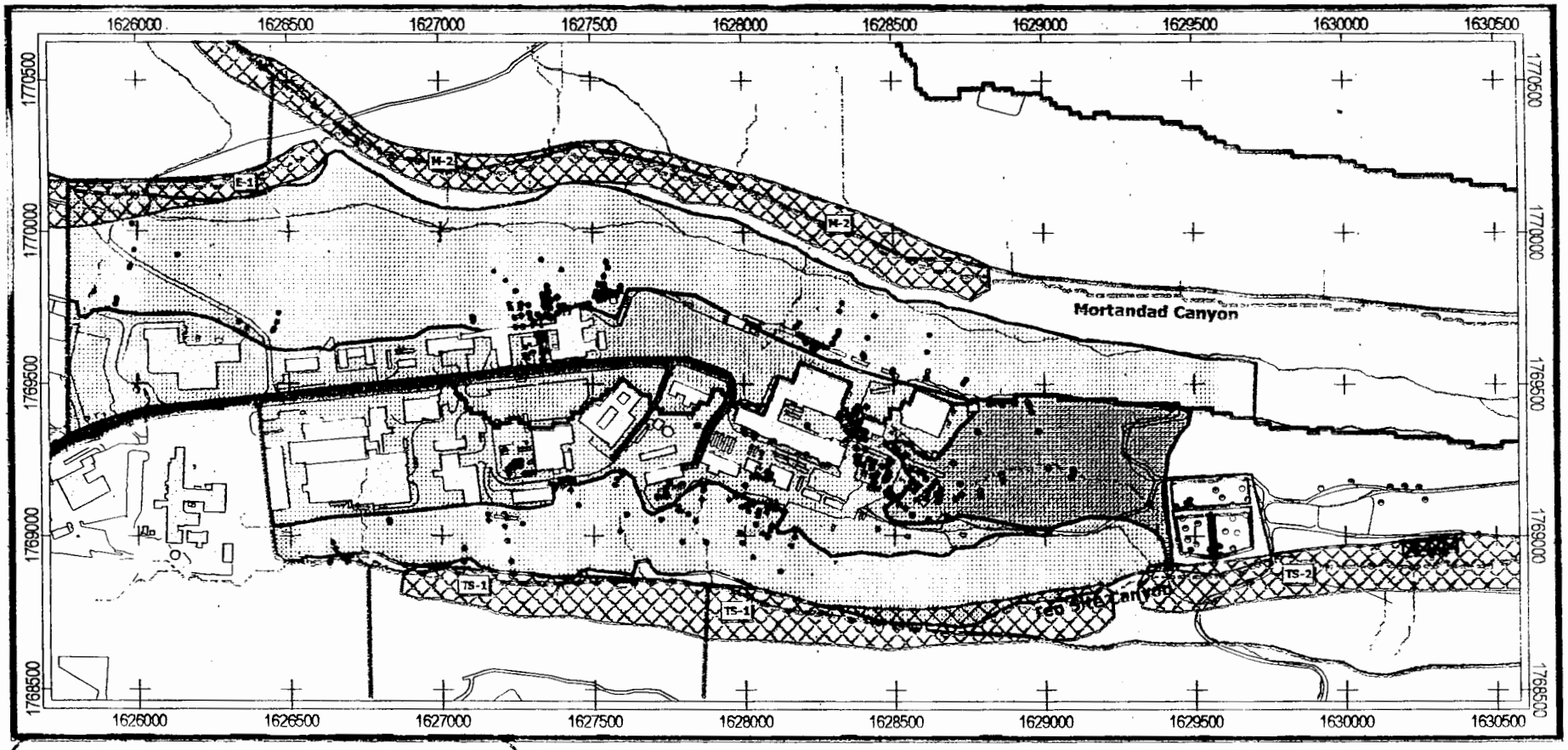


Figure 2-3. Aggregation of PRSs for TA-35 SAP



LEGEND

- Canyons Reach
- Watershed boundary
- ER Sample Location
- Permanent Building
- Temporary Building
- Former Building

Drainage

- Smallest
- Largest
- Paved Road

Aggregates

- Mortandad Mesa Top
- Mortandad Slope
- Pratt Canyon
- Ten Site Mesa Top
- Ten Site Slope

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04/12/99 - LATAREK - REV. 2

Figure 3.1: LA/Pueblo Watershed Aggregates

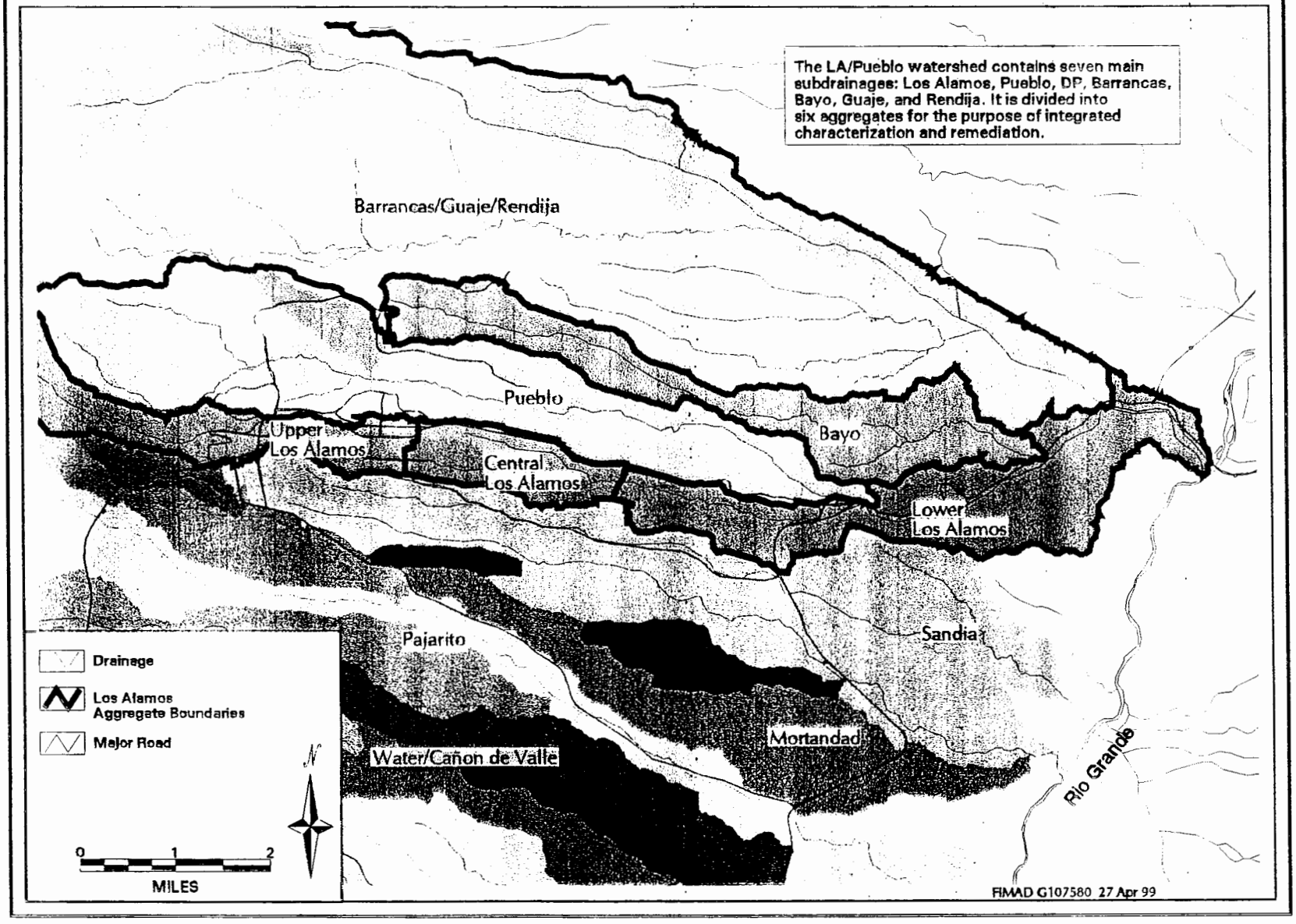

Figure 3.2: Mortandad Watershed Aggregates

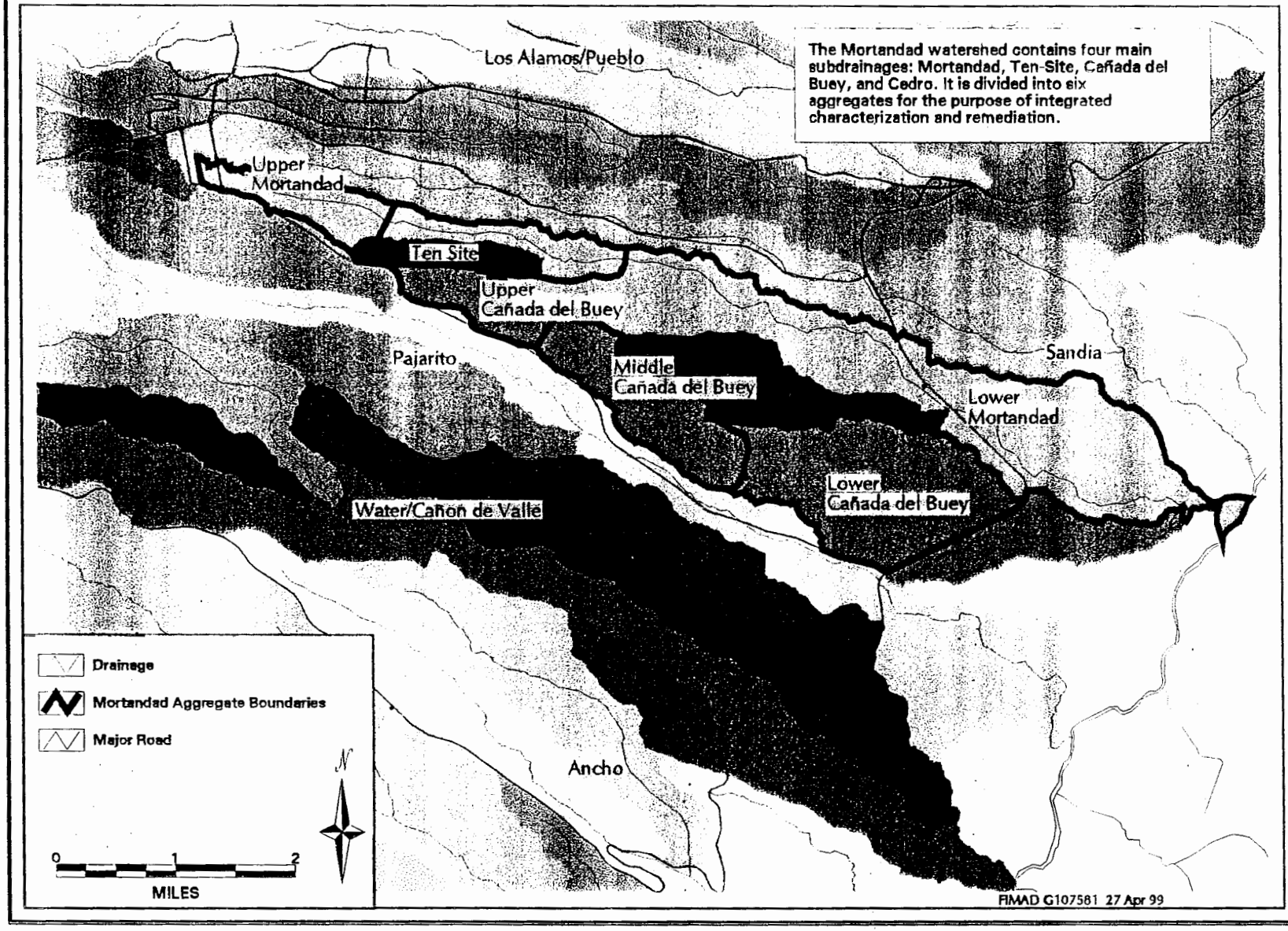

Figure 3.3: Water Canyon/Cañon de Valle Watershed Aggregates

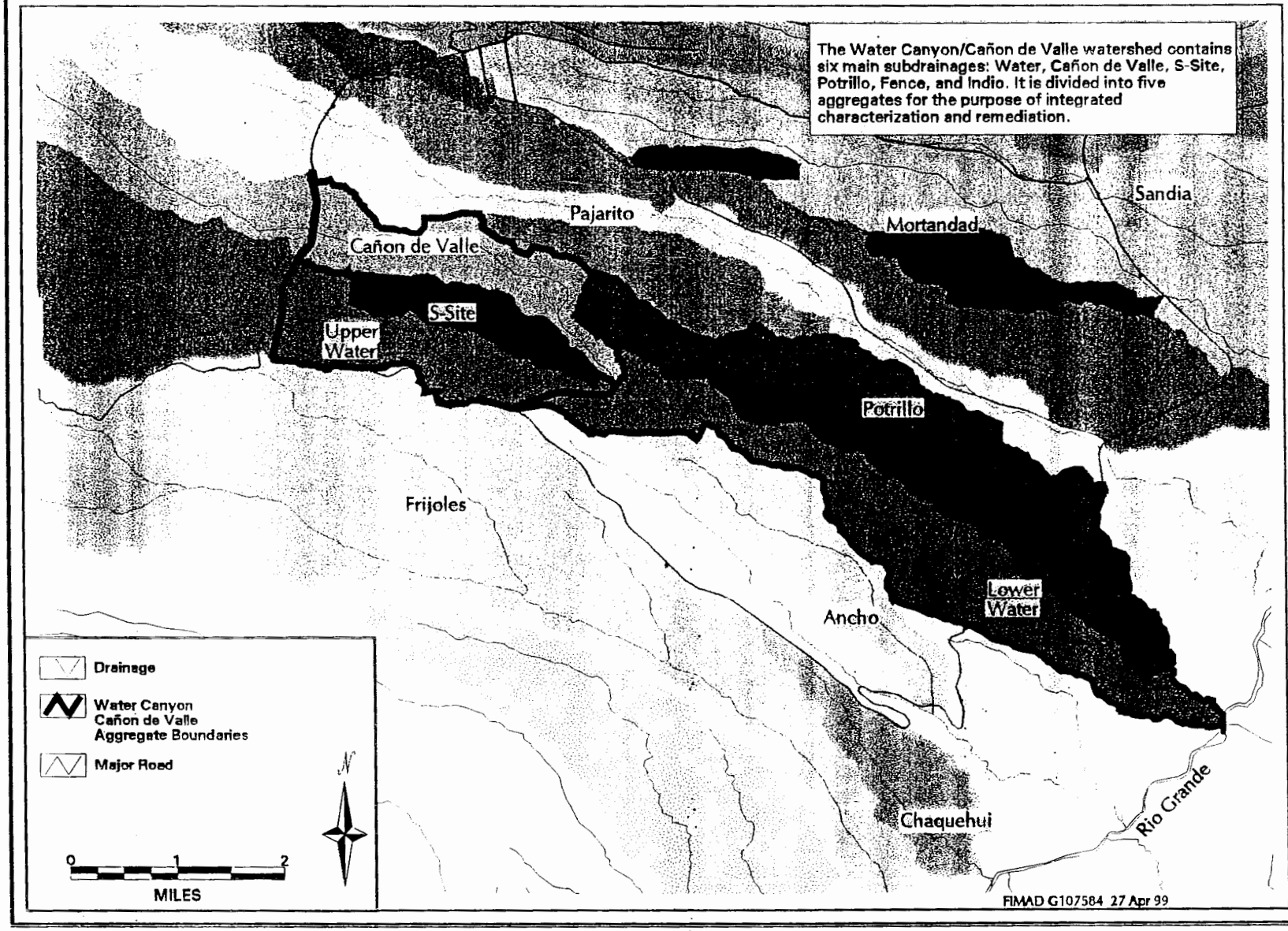

Figure 3.4: Sandia Watershed Aggregate

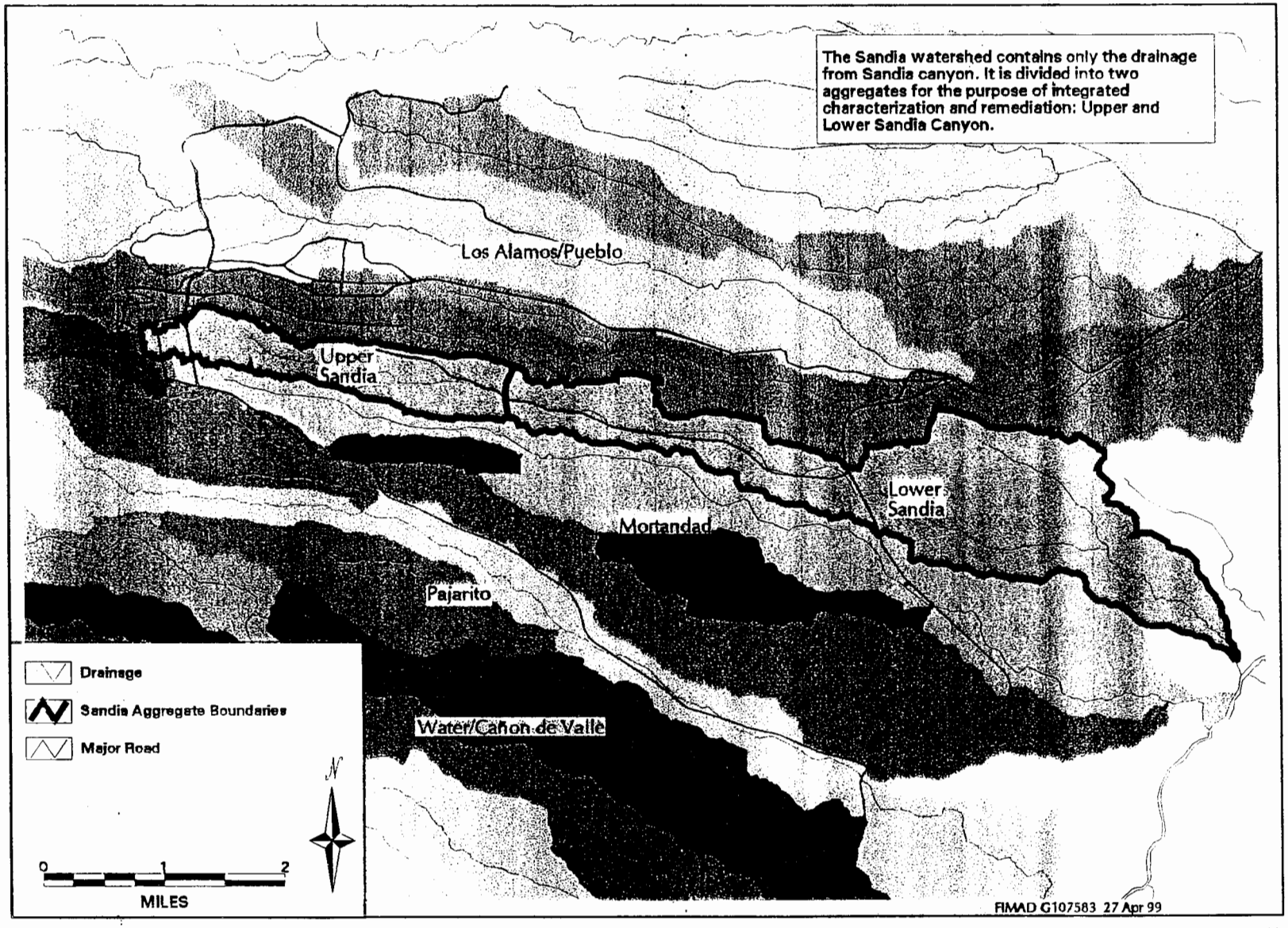

Figure 3.5: Pajarito Watershed Aggregates

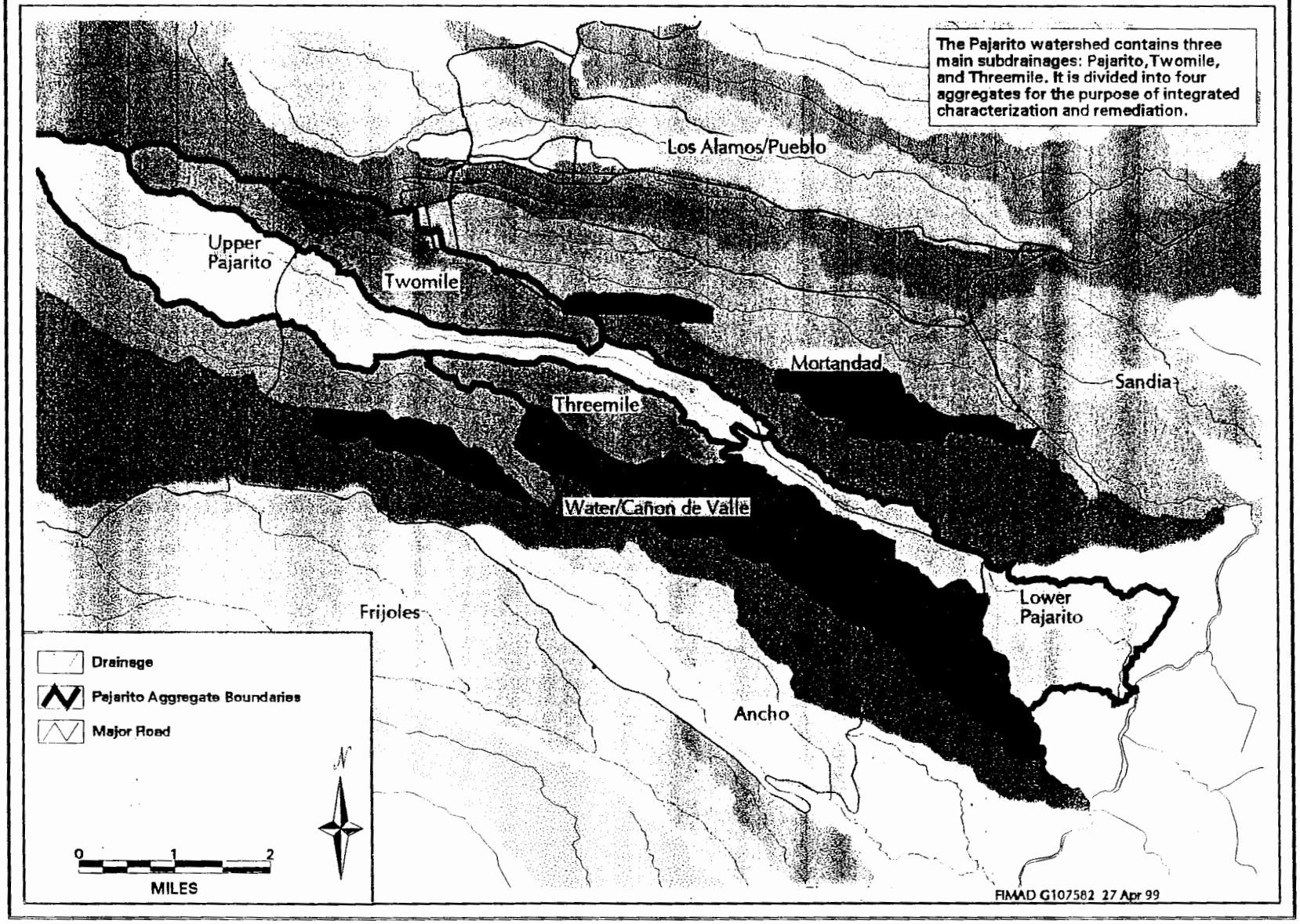

Figure 3.6: Ancho Watershed Aggregates

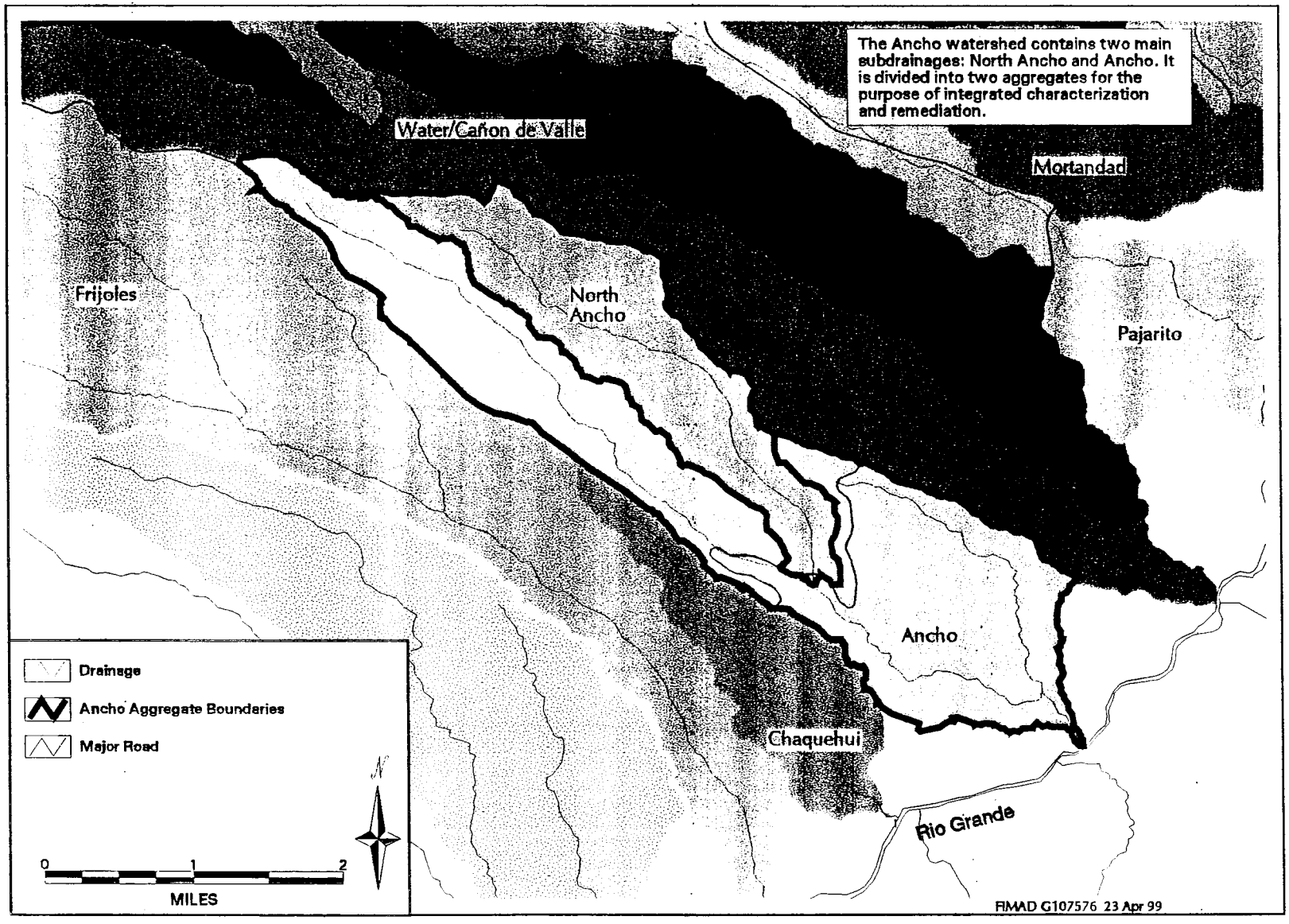

Figure 3.7: Chaquehui Watershed Aggregate

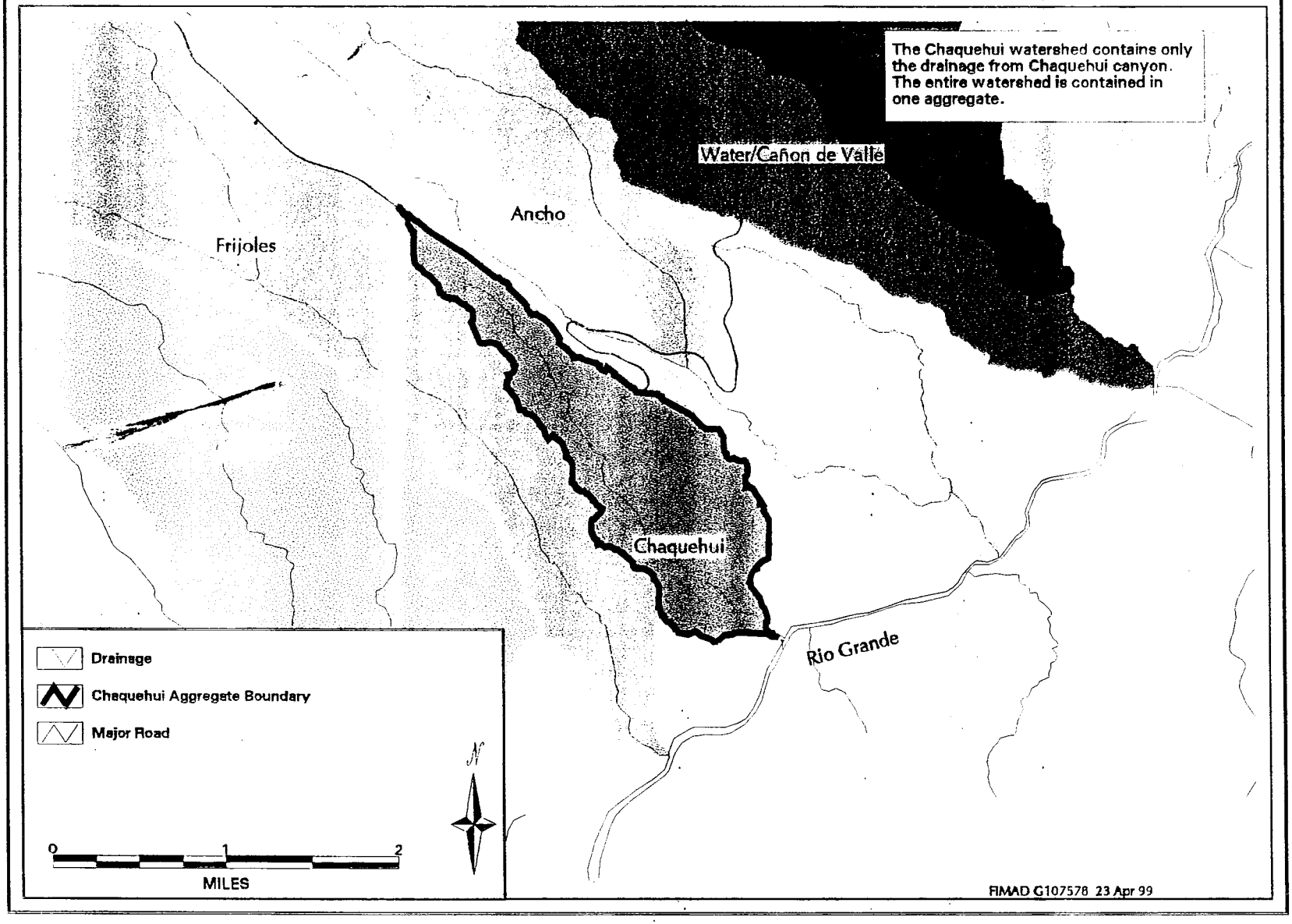

Figure 3.8: Frijoles Watershed Aggregate

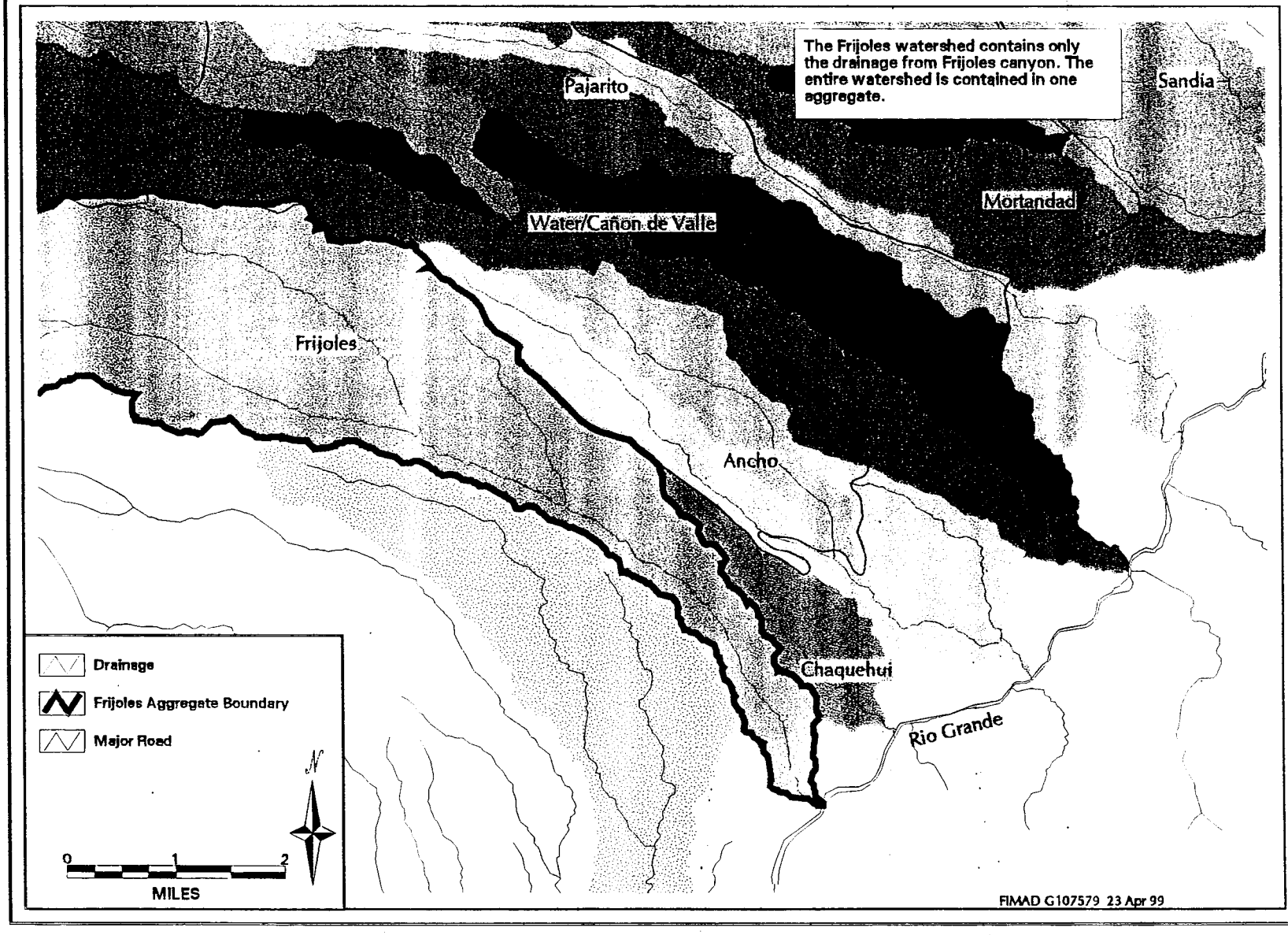

Table 3.4.1
SUMMARY OF WATERSHED AND AGGREGATE PRIOTITZATION
(with NMED Input on 03/05/99)

WS Rank	Prioritized Watersheds (with NMED)	Prioritized Aggregates (within watersheds)	Aggregate ID	Prioritized Aggregates (overall)	Agg Rank	Work in Progress	Portions of TA Included in Aggregate	Projected Duration of All Activities (years)
1	LA/Pueblo	Middle LA & DP	L-5	H	1	$5M in FY 99; DP tank farm	TA-02, 21	5-7
1	LA/Pueblo	Pueblo	L-3	H	2	Airport TA-73	TA-00, 73	5-6
2	Mortandad	Middle Mortandad/Ten-Site	M-2	H	3	Pilot for integration at TA-35	TA-04, 06, 35, 50	3-4 (MDA C)
3	Water/Valle	Canon de Valle	W-1	H	4	260 CMS; MDA R: Ponds	TA-14, 15, 16	6-7
1	LA/Pueblo	Upper Los Alamos	L-4	M	5	TAs-1 and 43 investigations	TA-01, 03, 41,43	2-3
1	LA/Pueblo	Bayo	L-2	M	6	No	TA-00, 10	1-2
2	Mortandad	Upper Mortandad	M-1	M	7	No	TA-3, 35, 42, 48, 55, 60, 63	2-3
2	Mortandad	Upper Canada del Buey	M-3	M	8	No	TA-46, 52, 66	3-4
2	Mortandad	Middle Canada del Buey	M-5	M	9	TA-54 RFI Report	TA-51, 54	4?
3	Water/Valle	S-Site (Martin)	W-2	M	10	CMS?; K-site	TA-11, 16, 37	2-3
3	Water/Valle	Potrillo/Fence	W-4	M	11	No	TA-15, 36	3-5
4	Sandia	Upper Sandia	S-1	M	12	3-056 PCB VCA	TA-03, 60, 61	3-4
5	Pajarito	Lower Pajarito	P-4	M	13	TA-18; TA-54 RFI, pore gas	TA-18, 54	2 (TA-18), 5 (TA-54)
5	Pajarito	Threemile	P-3	M	14	TA-12 VCA in FY 99	TA-14, 15, 36, 67	3-5
5	Pajarito	Starmer/Upper Pajarito	P-2	M	15	No	TA-08, 09, 22, 40, 51, 69	2
6	Ancho	North Ancho	A-1	M	16	TA-49 RFI	TA-39, 49	5-7
1	LA/Pueblo	Rendija/Barrancas/Guaje	L-1	L	17	No	TA-00, 74	<1w/o SC, 2-3 w/ SC
1	LA/Pueblo	Lower Los Alamos	L-6	L	18	Canyon Investigations	TA-53	?
2	Mortandad	Lower Mortandad/Canada del Buey	M-6	L	19	With Area G	TA-54	1-2
2	Mortandad	Lower Mortandad/Cedro	M-4	L	20	No	TA-05	1-2
3	Water/Valle	Upper Water	W-3	L	21	V-site Done	TA-16, 28, 37	2
3	Water/Valle	Lower Water/Indio	W-5	L	22	No	TA-15, 37, 49, 68	1
4	Sandia	Lower Sandia	S-2	L	23	TA-53 lagoons	TA-53	2-3
5	Pajarito	Twomile	P-1	L	24	No	TA-06, 08, 22, 58, 59, 62, 64	2
6	Ancho	South Ancho	A-2	L	25	No	TA-33, 49, 70	2
7	Chaquehui	Chaquehui	C-1	L	26	No	TA-33, 49, 70	1
8	Frijoles	Frijoles	F-1	L	27	No	TA-00	1-2