APPENDIX F

IMPLEMENTATION

1.0 ROCKY FLATS TRANSFORMATION PLAN

The Rocky Flats Environmental Technology Site must undergo a transformation from being operations-based to being project-based. This transformation has many aspects, several of which are described below. ASAP Phase I began this transformation. ASAP Phase II and ASAP Phase III continue this process while expanding upon the details of how the transformation is likely to take place. While the recommended alternative is being selected in Phase III, the transformation must proceed to enable timely implementation of the recommended alternative. The Rocky Flats Transformation Plan will be issued in 1996 and will provide a roadmap for the FY97 activities. The Transformation Plan will discuss not only those actions necessary to implement the ASAP alternative chosen, but also how the workforce will be realigned to implement it as a project. While the details of this transformation are to be provided in Phase III, several areas of interest below discuss the first steps required to change the Site into a closure project.

2.0 DECISION-MAKING PROCESS

Decision-making logic is the process by which the preferred alternative will be selected. The decision-making logic will be developed in 1996 with full public participation. It will be essential that the stakeholders and regulators agree that the decision-making logic is the correct vehicle to use in determining the preferred technical path. The decision-making process will be based on the principles of decision science, which involve a specific process of problem solving based on a balanced approach of analytical and organizational focus. The analytical focus involves information exchange, modeling and unbiased evaluation. The organizational aspect involves leadership on issues, identification of needs and points of view, focus on a common vision, and effective management of resources. In addition, this logic must include milestones-to-decisions, contingency options and kick-outs to other paths when fundamental decisions are delayed or drastically differ from the assumed set of options. Public input on evaluative criteria will be sought and incorporated into the process.

3.0 THE SITE AS A ONE-TIME PROJECT

Rocky Flats has been managed as an ongoing operation for its entire lifetime. Historically, the Site's mission consisted of multiple, interrelated process operations conducted on an ongoing basis. Although some activities within the overall operation were managed as specific projects, they were more operational in nature. The new vision for Rocky Flats involves taking the entire Site to a decommissioned and cleaned-up end state and as such is more of a one-time project than an ongoing operation. Certain management strategies and procedures currently in place do not lend themselves to a projectized mission. The mission of cleaning up Rocky Flats is more like a construction project with a finite start and finish than a manufacturing operation.

3.1 The First-Look Approach

The first-look approach to managing the Site under the new vision calls for the DOE Team to come onto the Site as if for the first time, and face existing facilities and equipment and their associated risks. The Site, under this approach, has been abandoned with no staff or programs in place. The first-look approach asks how the project would be managed given no constraints other than doing the job safely and efficiently. Several questions are proposed below which illustrate the possible paradigm shifts that could occur under this approach. This concept is fundamental to the ASAP premise that the Site must be managed like a project. A discussion of several related issues relative to the new paradigm is presented.

- What is the skill mix (Subsection 3.2) and labor strategy (Subsection 3.3) which best supports the project?
- What is the best method of appropriating, apportioning and allotting funds from Congress to Headquarters to the Field? (Subsection 3.4)
- What is the optimum contract vehicle to motivate the contractor and maximize government return on the project investment? (Subsection 3.5)
- What work authorization programs maximize activities or the project while ensuring safety? (Subsection 3.6)
- What form and scope of regulatory agreement most effectively enables site stabilization and cleanup? (Subsection 3.7)

3.2 Skills Mix

It is likely that if a contractor came to an abandoned Rocky Flats today and could hire a workforce best suited to the mission, the skills mix would be drastically different than it is today. Rocky Flats would probably resemble a construction site more than an operating site. On a construction site, the workforce is normally built from the bottom up, maximizing the percentage of hourly workers actually performing work and keeping overhead to a minimum. Workers would be hired and laid off from the Union Hall as needs changed. Infrastructure would be minimized and as much work as possible would be contracted out, further reducing overhead. A solid, fair collective bargaining agreement would be put in place that protects worker and contractor rights while maximizing worker accountability reward and consensus and minimizing unproductive work rules. The entire workforce, hourly and salaried, would participate in an incentive program designed to reward everyone who contributed to the success of the team. A labor plan would be in place that predicts, as much as possible, how the workforce numbers would peak and then decline until project completion.

Realistically however, when the project is completed, everybody would be laid off or reassigned to the next project at a different location. That arrangement allows workers to look to the future and line up new work when the project ends. The end of the project is not a sudden surprise, but a goal toward which everyone works. In the near term, however, it will not be possible to achieve all of the above goals at Rocky Flats because of current conditions imposed by existing labor agreements and laws.

3.3 Labor Strategy

When the Kaiser-Hill Company (K-H) assumed management responsibility for Rocky Flats in July 1995, there were several existing labor agreements in place. In addition, the National Defense Authorization Act of Fiscal Year 1993, Section 3161 (commonly referred to as "3161") gives specific guidance to the Department of Energy on workforce restructuring.

Both 3161 and the Labor Agreements impact how both the Union and non-Union workforce will be managed at Rocky Flats.

3.3.1 Labor Agreements

The majority of union-related work onsite is conducted by the United Steelworkers of America (USWA), Local 8031, which entered into a three year agreement with EG&G Rocky Flats in October 1993. K-H took over that agreement as successor in July 1995.

Consistent with the Davis-Bacon Act, construction work is performed by the Colorado Building Construction Trades under a Project Labor Agreement that was entered into in 1973. Local Davis-Bacon determinations are made by an onsite DOE committee.

In response to USWA concerns about some language in Section 5 of the Draft Phase 1 ASAP Plan, K-H reaffirmed by letter in November 1995 its intention to contract out bargaining unit work only when absolutely necessary and in accordance with the Collective Bargaining Agreement.

3.3.2 National Defense Authorization Act, Section 3161

An annual Workforce Restructuring Plan is required by 3161. The latest plan was published in August 1995.

K-H will continue to comply with the requirements of 3161 regarding workforce restructuring and, as a matter of policy, will attempt to retrain and employ in the cleanup mission as many of the displaced defense workers as possible. K-H intends to retrain workers whenever possible and to enter into agreements which minimize the involuntary loss of Site labor skills and knowledge.

In the area of workforce restructuring, in order for the Site to comply with 3161 for the life of the project, certain funding impacts must be taken into account. Taking the Site workforce from over 4400 workers to less than 400 workers will incur 3161 costs at an average rate of about $22,000 per individual. This amounts to a total cost of about $100 million when escalated for inflation.

3.3.3 Kaiser Hill Company Labor Policy and ASAP

K-H recognizes that its greatest asset is the existing workforce and as a matter of policy will prefer to perform Site work with existing and former workers whenever practical.

The Company also recognizes that as a result of the voluntary separations and downsizing, critical skills are being lost. A manpower assessment is currently underway to determine the extent of the problem and to identify the probable impacts. Once the ASAP work scope is defined, strategies will be devised to ensure that the Site mission will be carried out with the necessary number of skilled employees.

The ASAP Phase I Draft Plan indicated that over the course of this multiphased project, several processes would be evaluated for their ability to reduce costs and improve productivity. Included among those cost and productivity items were labor leasing, privatization, subcontracting, and outsourcing. While all of these items may be considered during ASAP Phase III, it is not yet feasible to thoroughly evaluate any of them until a preferred technical alternative has been selected. Selection of a preferred alternative is expected to occur in 1996. Future budget and financing conditions remain unknown, further complicating any analysis of the merits of these possible cost options.

Regardless of the budget and technical alternatives under which ASAP may be eventually executed, and in spite of any inferences to the contrary in the Phase I Draft Plan, the basic labor policy of K-H is to:

- Comply with the Collective Bargaining Agreements.
- Maintain a trained workforce to accomplish the revised mission.
- Minimize the impact of the mission change and the resulting restructuring efforts on the workforce and surrounding communities.
- Expand the existing labor-leasing concept to the maximum extent possible relative to, and when subcontracting, outsourcing, and privatizing.

3.4 Funding

3.4.1 The Current Funding Process

The current federal funding process is highly restrictive and precludes the most efficient use of government funds at the Site. For example, capital and expense funds cannot be mixed. Capital appropriations can take many years to work their way through the system. Congress appropriates funds on an annual basis with no guarantee that, once started, a project will be funded to completion. Funds are further restricted by additional fences known as B&R codes, so that Environmental Restoration funds, for example, cannot be used for Waste Management. Finally, once funds are appropriated for a fiscal year it is nearly impossible to reprogram funding resources or obtain supplemental funding.

3.4.2 The Ideal Funding Process

Ideally, the project funding would be guaranteed for the life of the project. The use of funds would be unrestricted and field decision-makers would be able to determine when and how to obligate funds based on the flow of work and priorities. Appropriators would recognize that a peak-and-taper funding profile is actually much more efficient over the life cycle of a project than a flat profile. In order to support ASAP, several compromises must be made in this area. It is most likely that those restrictions within DOE's control will be the easiest to improve.

3.4.3 Single Source Funding

The most important funding improvement that could be made to support ASAP would be a single source of funds for the whole project. This would provide a significant enhancement in the ability of Site decision-makers to prioritize essential work to rapidly reduce the baseline costs. This has recently been accomplished at Fernald with the DOE Office of Environmental Restoration (EM-40).

3.4.4 Fiscal Years (FY) 1996 and 1997

The Phase III Project Plan must fully develop the strategy required to achieve the ASAP alternative chosen in the safest, fastest and most economical fashion. As in Phase I, several funding options will be considered in Phase III. It is expected that the project will require funding at a greater level than currently planned during the next several fiscal years. It is unlikely that sufficient support can be generated for such a request without credible forecasts and analysis. FY96 and FY97 budgets are already well advanced and any changes in these years will be difficult.

During FY96, the focus at the Site must be on reducing the mortgage (activities essential to keeping the Site in a minimally acceptable state) and conducting tangible risk reduction activities in order to build trust and credibility with decision-makers in DOE Headquarters (HQ) and Congress. This credibility is essential to achieve extra funding in the first several years of the project. It has already been made clear that the DOE, HQ response will rightly be, "Show me what you did with the last two years budgets and then we'll consider whether to augment it with additional funds." During the FY97 budget cycle as many of the ASAP principles as possible must be implemented within the constraints of the appropriation.

3.5 Contracting

When taking the first look approach, it is possible that a different fee structure, more in line with commercial construction, would be best. For example, the contractor could be paid according to progress; e.g., at 30 percent, 60 percent, 90 percent, and completion. The base fee could be paid for project delivery within a specific percentage of the baseline cost and/or schedule. For example, if the final project cost is a specific percentage below the agreed upon baseline cost, the fee could be increased to a specific percentage as a positive incentive. Conversely, if the final project cost comes in at more than a specific percentage above the baseline, the fee could be reduced.

3.6 Authorization Bases

A work-authorization basis program is being developed which has the following attributes as its foundation:

- Is supportive of project-based work execution
- Contains protective measures which recognize real risks to workers and the public
- Weighs the risks of not proceeding expeditiously against the risks of proceeding before protective measures are fully in place
- Allows for repetitive tasks which may be performed under standardized work-authorization processes
- Links the duration of a work task with the probability of an accident occurring in order to recognize that these are not 40 year life-cycle hazards
- Conducts hazard analyses with a consistent methodology that is accepted by regulators as being necessary and sufficient.

Currently at Rocky Flats there is an ongoing effort to achieve a significantly enhanced Authorization Basis Program. A process improvement team has been working on this issue for several months and the results of its work have been factored into this phase of ASAP planning.

3.7 Regulatory Integration and Alignment

3.7.1 National Environmental Policy Act (NEPA)

NEPA is primarily intended to provide notice to the public and an opportunity to comment on significant proposed federal actions and alternatives. At Rocky Flats, DOE issued a Sitewide Environmental Impact Statement (SWEIS) in 1979. Activities which were within the alternatives that the SWEIS analyzed for Rocky Flats operations were at that time considered to have satisfied NEPA requirements.

The change in Site mission from weapons production to environmental cleanup has created a need to update the SWEIS. In 1994, DOE held scoping hearings and subsequently, DOE has prepared draft alternatives for consideration in the updated SWEIS. At this point, the draft

SWEIS anticipates activities similar to those described in the ASAP; however, the timeline for completing the SWEIS activities is not as compressed as the more ambitious of the ASAP timelines. Therefore, using SWEIS assumptions, ASAP activities such as major decommissioning of facilities would fall outside the SWEIS' ten-year analysis window. Aligning the draft SWEIS with the ASAP is currently underway. The No Action alternative and other defined alternatives of the draft SWEIS are already developed and provide a good basis for comparison as required by NEPA. The path forward for aligning the SWEIS is to develop the new ASAP alternative(s) to be included in the analysis and then proceed with the existing schedule logic for the SWEIS draft publication, comment, revision, finding determination, and final publication.

3.7.2 Rocky Flats Cleanup Agreement (RFCA)

DOE, EPA, and CDPHE are currently negotiating a new RCRA/CERCLA Rocky Flat Cleanup Agreement (RFCA) to replace the existing Interagency Agreement (IAG) signed by these parties in 1991. Alignment between ASAP and the RFCA is essential. It is expected that this will be achieved by (1) aligning ASAP both with the RFCA vision and goal and with a description of what RFCA is designed to achieve, and (2) modifying the Site Strategic Plan to reflect that vision.

3.7.3 Defense Nuclear Facilities Safety Board (DNFSB)

DNFSB Recommendations 94-1 and 94-3 deal specifically with the stabilization and storage of special nuclear materials at Rocky Flats, including the uranium and plutonium liquids, metals, alloys, residues, and compounds. The ASAP has been designed to use the underlying messages of these two recommendations as the foundation for the nuclear materials path forward. The DNFSB has been briefed on ASAP and on the progress made to date in the implementation of 94-1 and 94-3.

4.0 ASAP PUBLIC INVOLVEMENT

The issues and options associated with closure of the Rocky Flats are numerous, complex, and interrelated on many levels. It is imperative that stakeholders and regulators are provided frequent and meaningful opportunities to understand the issues and to affect the key decisions made as the Site moves forward with closure activities. ASAP will continue to serve as a focus for discussions about these issues and decisions.

During Phase II of ASAP, stakeholders and regulators became involved in alternatives development and analysis at the macro level through large, general briefing and discussion sessions, and at the micro level through participation on work teams for six key technical areas. The broader discussions of ASAP held since the beginning of Phase II, (October 1, 1995) include the following:

Oct. 11	Briefing to the Rocky Flats Local Impacts Initiative
Oct. 25	Presentation and discussion at the Rocky Flats monthly public meeting
Nov. 9	Briefing and information session with technical work teams
Dec. 21	Stakeholder availability session with technical work teams

In addition, interested stakeholders and regulators have participated in numerous detailed options development and analysis activities with the six technical teams, including a series of five working sessions on alternatives development, waste management, facility decommissioning, environmental restoration, and SNM consolidation and stabilization. The Site, the stakeholders, and the regulators benefit from this interaction. The involved stakeholders and regulators are able to develop an increased understanding of the closure issues and can have a voice in how those issues are addressed. The Site staff receive the expertise and perspective of community members who have concerns about the potential impacts of decisions affecting the future of the Site.

Throughout these discussions, the Site has received valuable feedback from stakeholders and regulators in the form of suggestions, concerns, and probing questions. Major issues raised by task area are provided in Table F-1.

Also during Phase II of ASAP, DOE, EPA, and the State of Colorado released a Draft Conceptual Vision for the Site for review and comment. The Vision, which represents a big picture view of the Site's interim and final conditions, has been the focus of numerous stakeholder and regulator discussions since early November. The agencies will continue to solicit feedback through early 1996. Following the Rocky Flats Stakeholder Summit on January 19 and 20, 1996, the agencies will meet in early March to produce the next draft of the Vision and to draft a regulatory agreement for the Site, both of which are scheduled to go out for comment in March 1996.

Once the Vision is finalized, the stakeholders, regulators and decision-makers will begin a process to choose alternatives for implementation of the vision. The alternatives analysis completed in Phase II of ASAP will provide the risk and cost data necessary for Phase III consideration of the many implementation alternatives available. Opportunities for stakeholder/regulator review and input will be provided prior to any major decisions, including those related to waste management, SNM management, building disposition and environmental cleanup. Public involvement in ASAP will be ongoing and iterative, and as the decision-making process and schedule related to ASAP becomes better defined, that information will be communicated to stakeholders and regulators to facilitate their participation.

Table F-1
Draft Summary of ASAP Issues of Concern to the Public

SNM	Waste	Facility Decommissioning	Environmental Restoration
Credibility of final resolution concerning unaccounted for nuclear material and holdup material remaining in former process equipment	Lack of assurance that safe interim waste storage will not become permanent by default	Containment failure rates of any proposed decommissioning methods need close examination, especially concerning potential for airborne particulate releases	Not all alternatives being considered incorporate the FSUWG recommendation for eventual long-term cleanup to 10^{-6} residential use
Lack of assurance that safe interim SNM storage will not become permanent by default	Historical trends show many communities oppose nearby location of waste storage and disposal facilities	Levels of under-building contamination are unknown	Mobility of hazardous components under proposed caps needs evaluation and modeling of long-term migration potentials
Finalization of DOE standards concerning vault design and operating criteria, which have not been defined yet for the U.S.	DOE's track record with new construction projects is perceived as a weakness by some stakeholders when reviewing the proposed new facilities	Any use of bentonite for entombment presents technical difficulties due to the potential for its volume to change with moisture content	Potential natural resource damage and ecological impacts need to be reviewed
The degree of processing required for residue stabilization is highly dependent on the timing of offsite shipments impacting the level of technology necessary	Many stakeholders oppose onsite disposal of LL/LLM waste, and desire fully retrievable interim storage to support eventual removal of all waste from Site		Groundwater and surface water modeling is needed to evaluate the impact of the caps and the proposed depopulation of the site
Representative sampling techniques for residue characterization are still evolving	Strategy for dealing with dispersible waste forms needs further exploration		Determination of methods for durable warning markers of any capped areas for extreme time durations
			Mechanism and criteria for release of buffer zone acreage for alternative use(s) are not fully defined

Infrastructure	Cost/Schedule	Risk	Implementation
Adequacy of D&D and long-term monitoring, emergency response capability, and other protection for the public, the workers, and the environment	Projections of declining future budgets, HQ funding source restrictions, and limited funding opportunities to pursue meaningful risk reduction activities at the site	Disagreements exist on application of methodology and meaning of risk management techniques	Regulatory strategy needed. Also, contingency plans must be developed to accommodate changing implications of DNFSB recommendations
Job retention, skill mix and implications stemming from proposed changes to the site infrastructure have not been fully explored	Some stakeholders feel ASAP encourages acceptance of declining budgets without action	Lack of progress in establishing the authorization basis for operational activities impacts the level of uncertainties for risk assessment	Rapid evolution of vision concepts and compressed ASAP schedule present changes in integration, communication, levels of technologies, logistics, and levels of stakeholder and regulator involvement
Programmatic infrastructure and management processes to control the necessary cost reductions for infrastructure need further study	Impression that cost-cutting and performance incentives will lead to undesirable short-cuts	Further failure analysis of protective barrier technologies, including the impact of human intrusion, seismic events, and emergency response requirements is needed	The challenge of clearly understanding stakeholder and regulator issues, concerns, and values, and the difficulty in satisfying widely differing viewpoints
Adequate offsite/commercial laboratory capability does not exist to analyze and characterize TRU/TRM waste streams as required	Early payback activities providing risk reduction should be identified and accelerated where possible to facilitate additional risk reduction activities	Impact on the maximum credible accident analysis from the proposed increase in public access to the buffer zone must be studied	Mechanism and strategy for political and decision-making process are not developed
			Need exists for closure on consistent vision and cleanup standards
			Adequacy of alignment with strategy document having community acceptance (FSUWG Report, Summit principles, Quality Assurance Team Vision), and with SWEIS activities

APPENDIX G

COST ESTIMATES AND SCHEDULES

1.0 INTRODUCTION

The cost, schedule, and work scope of any project are interrelated. These interrelations are shown by means of a Work Breakdown Structure (WBS).

1.1 Work Breakdown Structure

The WBS provides a structure to divide the project into manageable pieces. This structure dissects the entire project into successive levels of detail until adequate management control is possible and until individual tasks can be defined, quantified, estimated and scheduled. The WBS structure provides the basis for work scope definition, cost estimating, schedule projections, and reporting.

The ASAP Phase II WBS is structured to reflect what would have to be done for each alternative to fulfill whichever Rocky Flats vision is chosen. The ASAP WBS reflects the total project including all work tasks to achieve the final end state.

The ASAP WBS is work-product oriented. The top two levels of the WBS represent the vision and the end states to be achieved by ASAP. The third level divides the work into cleanup zones to achieve the intermediate end state. Within a cleanup zone (fourth level), the work is divided by facility cluster, Individual Hazardous Substance Site (IHSS) cluster, capital project, or associated supporting work processes.

The ASAP WBS structure:

- Depicts the hierarchial relationship between work elements, reinforces mission-critical and integrating themes, and emphasizes areas for progress toward the Site of the future
- Supports crosscut reporting by program area, source of funds, DOE Activity Data Sheet, type of work, responsible organization, performing organization, and subcontractor
- Supports the network logic scheduling of the work and facilitates work planning for performance measures
- Facilitates communication with DOE on work progress, communication within the Kaiser-Hill team on work to be done, and communication with stakeholders and regulators on planned activities
- Supports the alternatives analyses required by ASAP Phase II planning, in providing same basis comparisons between alternatives

The WBS prepared for ASAP Phase II is attached at the end of this appendix (Figure G-1 a through e).

1.2 Cost Estimating

The cost figures included in this document are planning estimates. The *DOE Cost Guide*, Volume 6 states that a planning estimate has an accuracy range from -50 percent to + 100 percent. The cost estimates included in this document are as credible as possible for this stage of project definition. The cost estimating emphasis was placed on defining the cost differences between alternatives rather than refining the base costs that were the same in each alternative.

The total cost for each alternative was driven by the associated work scope. The time required to complete the alternative was also driven by the associated work scope. The funding availability drove the overall project duration. The additional costs associated with a stretch-out of the project were included in the cost estimate totals. The assumed maximum funding in any single fiscal year was $700 million except for Alternatives 1 and 2. This appendix addresses the methodology and approach used to develop the cost and schedule estimates for each alternative.

1.2.1 Cost Estimating Approach

The cost estimates contain direct costs, indirect support costs, escalation, and contingency. The approach used to estimate each category of cost is addressed in Sections 1.2.3 through 1.2.6 of this appendix respectively.

The cost estimates in this document have been developed by knowledgeable technical staff. Professional cost estimators assisted in the development of the cost estimates and provided an overall review for consistency and credibility.

To ensure that all costs were included but not duplicated, the cost estimates were developed at levels 5, 6, and 7 of the ASAP WBS which allowed the costs to be summarized as required for each alternative.

The cost estimates are based upon the assumptions of the technical groups that provided the data. These assumptions, technical details, and specific quantities are identified in Appendixes A through E.

Upon selection of the recommended alternative, the cost estimate will be updated as additional data become available. As the estimate begins to approach "budget quality," the estimating approach will be expanded to include a more thorough approach to addressing indirect rates, cost of money, and financing options. Economic analyses will be performed (such as time value of money, cash flow, and net worth) to frame decision making.

1.2.2 Cost Estimating System

The Cost Estimating System for the ASAP consists of a database with a cost estimate for each element of the WBS. These cost estimates are either annual operating costs or one-time costs. Putting the individual costs for each element into a database allows the costs to be sorted into any number of options and alternatives. The database provides the capability for summarizing the cost estimates for each WBS activity into a total cost estimate for each alternative for Phase II and any future estimating needs. The database provides a mechanism for reflecting and documenting changes as additional detail and information become available.

The cost estimate was summarized for each alternative after a determination of indirect support costs, escalation costs, contingency, and incorporation of proposed annual funding limits.

1.2.3 Direct Cost Estimates

Direct costs are those costs associated with each work activity. An example of a direct cost would be the cost required to fill a drum with waste. The direct cost is the cost of the labor hours, plus the incremental cost of equipment, and the price of the drum. The direct cost is the basis from which all other elements of cost are derived.

The direct costs were provided by the technical programs staff. For some areas (e,g., construction projects) detailed estimates have been developed as the basis of estimation (BOE). For other areas (e.g., facility decommissioning, environmental restoration), a detailed estimate was developed for an individual building or IHSS, and the costs were extrapolated for similar buildings or IHSSs.

Some of the cost estimates were entered into the database at WBS Level 7, while others were entered at Levels 4, 5, and 6. Where possible, the quantities and volumes of work were based on projections provided by the current operating programs. Where unit costs were used, they were a combination of historical averages, cost benchmarks, and estimator judgement.

1.2.4 Indirect Support Cost Estimates

The indirect support costs are defined as those costs that are necessary for the direct activities to be completed but which cannot be assigned to any single activity because of their general nature. Table G-1 presents the indirect support cost descriptions and cost drivers. The requirements for support costs will change throughout the time required to complete ASAP. Since the support costs will change over time, a simple percent of direct costs was used to estimate the support costs. A four-step process was used to estimate indirect support costs for ASAP:

1. Determine the indirect areas, descriptions, and the cost drivers
2. Develop rates for each category of indirect support cost
3. Develop fiscal year profiles for the indirect support cost drivers
4. Calculate the annual indirect support costs

The first step was to determine the drivers that influence the support costs after determining the indirect support activities to be estimated. The five cost drivers were: the head count, annual funding, number of facilities, and the regulatory requirements. Some support costs such as executive level management were relatively fixed. Each indirect support-cost line item was evaluated to determine which driver had the most impact.

The second step was to develop the rates for each area of indirect support cost. The current rates that are in effect for FY96 were adopted as the base.

The third step was to determine how the cost drivers will change over time. The head count produced a base number of 4400 site employees for FY96 and included only employees of Kaiser-Hill Team. The indirect support costs for lower-tier subcontractors were included in the direct costs. The assumption used for annual funding is $550 million in FY96, increasing in FY97 and the mid-years of the project to $700 million, and dropping in the outyears as the project is completed. The active facility count is approximately 500 buildings onsite. The count changes by alternative as facilities are eliminated and as new facilities are constructed. The regulatory drivers and assumptions are identified in the technical scope of each alternative.

Table G-1
Indirect Support Cost Drivers

Cost Driver	Description	Cost Driver	Description
1	Administrative Support	2	Media/Communications
1	Cafeteria	2	Procurement
1	Computer Support	2	Program Management
1	Copiers/Fax Machine	2	Reproduction
1	Education Reimbursement	2	Security and Safeguards
1	Facilities Management	2	Stakeholder Related Outreach
1	Health and Safety	2	Taxes-Other
1	Human Resources	2	Technology Development
1	Management (Exec.)	3	Property Management
1	Miscellaneous Office Supplies	3	Utilities
1	Miscellaneous Tools	4	Health and Safety
1	Payroll	4	Internal Audits
1	Relocation Costs	4	Medical
1	Telecommunications	4	Quality Assurance
2	Accounting	4	Records Management
2	Central Library	4	Regulatory Compliance
2	Construction Management	4	Standards and Assessment
2	Cost Estimating and Scheduling	4	Strategic Planning
2	Economic Development	5	Training
2	Engineering and Maintenance	5	Benefits (Fixed Retirement Cost)
2	Finance and Budgets	5	Executive Direction
2	Logistics Support	5	Legal
2	Media/Communications	5	Monitoring
2	Management Travel	5	RCT Support

Legend
1. Headcount
2. Annual funding
3. Number of facilities
4. Type of facilities
5. Regulatory requirements

The fourth step was to develop the fiscal year cost profiles and the actual calculation of the annual indirect costs based upon steps one through three. This information was derived from the funding profile charts. The indirect support costs were included in the cost estimate as a single line entry.

1.2.5 Escalation

Escalation is correction applied to cost estimates to account for the impact of inflation. All of the costs were estimated in FY96 dollars. The amount of escalation was based on the escalation percentages provided by the DOE Office of Field Management (FM50). The escalation was calculated using the DOE escalation percentages extended to the midpoint of each planned activity.

The yearly escalation rates used are as follows:

FY97	FY98	FY99	FY00	FY01 and beyond.
2.9%	3.0%	3.0%	3.1%	3.1%

1.2.6 Contingency

Contingency is a specific provision for unforeseeable elements of cost within a defined project scope. Contingency is used to cover costs resulting from incomplete design, unforeseen and unpredictable conditions, and uncertainties within the defined project scope. Contingency does not include provisions for out-of-scope work and baseline changes.

The application of a contingency cost covers the entire life-cycle of a project from the feasibility studies through execution, to close-out. This section provides the approach used to determine the contingency for the ASAP.

The *DOE Cost Estimating Guide*, Volume 6, provided guidance for the analysis and application of contingency for cost estimates prepared for the DOE. Although the Guide does not specifically address process engineering, operations, or maintenance, the general philosophy of the guide was appropriate for those items.

Therefore, the methodologies established for the analyses of contingency requirements for the ASAP cost estimates were as follows:

Construction Project costs - Construction project estimates have contingency costs added to cover potential cost increases due to incomplete design, unforeseeable and unpredictable conditions, or uncertainties within the defined project scope. The factors that were considered in determining the contingency for construction items are:

- Project complexity
- Design completeness
- Market conditions
- Special project or site conditions

Environmental Restoration (ER) costs - Estimates for ER activities cover two phases: the assessment phase and the remediation and cleanup phase. The method used to determine contingency cost was dependent on the phase. The assessment phase of an environmental restoration project had a high degree of uncertainty regarding the technical characteristics, legal circumstances, and level of stakeholder concern. As a result, the contingency was applied at a higher rate. The remediation/cleanup phase resembles a construction project and the same rates were applied.

Deactivation/Decommissioning costs - The contingency rate for facility deactivation and decommissioning was high because all of the cost factors could not be incorporated into the estimate. Contingency considered the following:

- Availability of technology to reach the desired end state
- Unknown levels and amounts of contamination to be removed before demolition
- Availability of waste treatment and disposal facilities
- Acceptable levels of contamination for materials to be left in place
- Uncertainty of schedules for deactivation and decommissioning

Operations and Maintenance - The cost estimates for operations and maintenance were based on historical costs for similar activities. Therefore, contingency was not applied.

Indirect Costs - Contingencies were considered for indirect cost items that were proportional to external causes and were commensurate with the external drivers.

Contingency Application - A contingency analysis was performed at the lowest level of the WBS to present a true indication of the monetary risk involved in the project. The contingency was applied as a single-line entry on the cost estimate summary spreadsheets.

1.2.7 Cost Drivers

The cost drivers vary with each alternative. The major cost drivers for each alternative are as follows:

Table G-2
Major Cost Drivers for ASAP Alternatives

Alternative	SNM	Waste Management	Facility Decon	Environmental Restoration	Infrastructure
1, Unrestricted	Processing solid residues to meet WIPP WAC Processing Pu solutions to produce solids which meet WIPP WAC New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Offsite transportation and disposal costs for LLW/LLMW Treatment of LLMW to LDR requirements New TRU storage facility New LLW and LLMW storage facility Offsite transportation and disposal costs for construction debris Offsite transportation and disposal costs for sanitary waste Unknown waste volumes from building foundations and under-building contamination	Offsite transportation and disposal costs for construction debris Decontamination of Pu/U buildings to releasable standards Total demolition of buildings Excavation of building foundations	Cleanup of IHSSs to residential standards Removal of under-building contamination Offsite transportation and disposal costs for remediation waste Ongoing groundwater management system	
2, BEMR I	Processing solid residues to meet WIPP WAC Processing Pu solutions to produce solids which meet WIPP WAC Building 371 upgrades for SNM interim storage Future transportation and disposal of SNM offsite and removal of B371	Offsite transportation and disposal costs for LLW and LLMW Treatment of LLMW to LDR requirements Facility modification costs for TRU and LLW storage Offsite transportation and disposal costs for construction debris Offsite transportation and disposal costs for sanitary waste Unknown waste volumes from building foundations and under-building contamination	Offsite transportation and disposal costs for construction debris Decontamination of Pu and U buildings to releasable standards Total demolition of buildings	Maintain groundwater management systems until 2040 Cleanup levels ranging from 10-4 to 10-5 latent lifetime cancer	B371 maintenance cost

Table G-2 (Continued)

Alternative	SNM	Waste Management	Facility Decon	Environmental Restoration	Infrastructure
3a, Phased Shipment	Processing solid residues to meet WIPP WAC Processing Pu solutions to produce solids which meet WIPP WAC New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Eventual transportation of TRU to WIPP Deferred LDR treatment costs New TRU storage facility New LLW and LLMW retrievable storage facility Delayed shipment of all LLW and LLMW offsite Offsite transportation and disposal costs for sanitary waste	Total Demolition of Buildings Foundations removal and storage Offsite transportation and disposal costs for construction debris	Removal of under-building contamination Three caps totaling 66 acres Indefinite maintenance of groundwater management systems	Additional groundwater monitoring
3b, Priority Shipment	Building 371 upgrades for SNM interim storage Schedule delay Eventual transportation and disposal of SNM offsite Processing solid residues to meet WIPP WAC Processing Pu solutions to produce solids which meet WIPP WAC	LLW and LLMW transportation & disposal costs Treatment of LLMW to LDR requirements Offsite disposal of LLW and LLMW New LLW and LLMW retrievable storage facility Offsite transportation and disposal costs for sanitary waste Eventual transportation and storage of TRU to WIPP Continued TRU waste generation during extended processing	Schedule delay	Cleanup of IHSSs to residential standards Schedule delay Three caps totaling 66 acres	
3c, Excavation	Processing solid residues to meet interim storage criteria (not necessarily WIPP WAC initially) Processing Pu solutions to produce solids which meet interim storage criteria (not necessarily WIPP WAC initially) New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Eventual transportation to WIPP Treatment of LLMW providing safe, long-term protection New TRU storage facility New LLW and LLMW retrievable storage facility Offsite transportation and disposal costs for sanitary waste	Total demolition of Buildings Removal and storage of foundations Offsite transportation and disposal costs for construction debris.	Three caps totaling 66 acres Indefinite maintenance of groundwater management systems	

Table G-2 (Continued)

Alternative	SNM	Waste Management	Facility Decon	Environmental Restoration	Infrastructure
3d, Leveled Buildings	Processing solid residues to meet interim storage criteria (not necessarily WIPP WAC initially) Processing Pu solutions to produce solids which meet interim storage criteria (not necessarily WIPP WAC initially) New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Eventual transportation and storage of TRU to WIPP Treatment of LLMW providing safe, long-term protection Treatment of LLMW for onsite disposal New TRU storage facility New LLW and LLMW storage facility Offsite transportation and disposal costs for sanitary waste	Offsite transportation and disposal costs for construction debris	Three caps totaling 66 acres Indefinite maintenance of groundwater management systems	
3e, Entombment and Landfill	Processing solid residues to meet interim storage criteria (not necessarily WIPP WAC initially) Processing Pu solutions to produce solids which meet interim storage criteria (not necessarily WIPP WAC initially) New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Eventual transportation and storage of TRU to WIPP Treatment of LLMW providing safe, long-term protection New TRU storage facility New LLW and LLMW storage facility Offsite transportation and disposal costs for sanitary waste LDR processing for high-risk waste	Partial dismantling of Pu and U buildings	Three caps totaling 66 acres Indefinite maintenance of groundwater management systems	
4, Mothball	Processing solid residues to meet interim storage criteria (not necessarily WIPP WAC initially) Processing Pu solutions to produce solids which meet interim storage criteria (not necessarily WIPP WAC initially) New SNM interim storage facility Eventual transportation and disposal of SNM offsite	Eventual transportation and storage of TRU to WIPP Treatment of LLMW providing safe, long-term protection	New TRU storage facility New LLW and LLMW retrievable storage facility Offsite transportation and disposal costs for sanitary waste	One cap covering 13 acres Indefinite maintenance of groundwater management systems	Additional groundwater monitoring Indefinite long-term controlled access and physical security

1.3 Scheduling Approach

Schedules were developed using the same scope identification technique as the cost estimates to ensure consistency between the estimates and schedules. The activities are the items defined at level 4, 5, 6 or 7 of the WBS to verify scope included in the schedules and to eliminate duplicate activities.

The scope of work associated with each building, area, or process was defined for each alternative and assigned a duration. A logical sequence for executing the activities within a building, area or process was developed to form a Critical Path Method schedule. The schedules were then linked to other schedules based upon dependencies created by work logic, resource constraints, or funding limitations required to meet the objectives of the alternative.

1.3.1 Cost/Schedule Integration and Resource Leveling

After the initial critical path schedule was produced, it was reviewed by senior scheduling staff and task team leaders to verify assumptions, basis of estimates, logic ties, activity duration, float, start and completion dates, and overall presentation. Changes were made to improve activity relationships and overall duration of the effort.

Next, resources (costs) were loaded into each schedule activity from the cost estimate. For each schedule activity, the cost was identified as either one-time (cost constant regardless of activity duration) or unit-based (cost increases or decreases as activity duration increases or decreases - usually expressed as cost per year).

After the schedule and cost estimates were integrated, an available funding profile was entered into the system. For the initial cost analysis, an assumed funding ceiling of $700 million per fiscal year was used except for Alternatives 1 and 2. Alternative 1 was unconstrained because of the high costs involved and the effects of inflation. Alternative 2 was leveled at $750-$850 million per year funding. Using the leveling capability of the system, activity start and completion dates were accelerated or delayed, and durations extended, until the alternative could be completed within the imposed limitation of funding. This resource-leveling step did not alter the basic logical structure of the schedule. In instances where the original cost and schedule profile had exceeded $700 million in any given year, the extension of work into the outyear(s), to accommodate the funding limitation had the effect of lengthening the overall completion time of the alternative.

1.4 Funding Strategies

The concept of ASAP is unconventional in the DOE world. The analysis of funding is further complicated by the necessity for large up-front cash flow requirements to preclude much larger outyear expenses under the current project execution strategy. Technically valid and defensible funding profile data are essential to achieving support from DOE. Without crisp data demonstrating long-term budget savings, it is unlikely that any additional funding will be made available to support ASAP, or even that current funding levels can be maintained.

At present, Site funding is being decreased at a rate of nearly five percent per quarter as DOE Headquarters attempts to redistribute Congressionally authorized funding across the nuclear weapons complex on a priority basis. The $700 million/year maximum funding profile used as the base funding case for the ASAP alternatives (other than the Alternative 1, Unrestricted and Alternative 2, BEMR I) is extremely aggressive, exceeding presently anticipated funding. The ASAP team believes, however, that the accelerated progress toward risk reduction and closure inherent in the ASAP will help to attract additional funding from

DOE, especially if near-term progress on the current baseline exceeds schedule while containing costs. If the site is not successful in performing work according to planning baseline in the near-term, then future erosion of the funding base may continue, a possibility in any event.

One of the incentives for increasing the site funding level to speed up work schedules is escalation. With a shortened schedule, further acceleration of work will save significantly (in the order of hundreds of millions of dollars) on the life-cycle costs. The escalation factor of the three percent used is very conservative. Historically, over such a long period of time, the actual rate could be in the range of five to seven percent, or more.

In decision-making processes based upon comparisons of costs involving inflation, care must be taken to reduce future cash flows to a set of single values which can be directly compared. The funding profiles for the various alternatives were developed by integrating the cost estimate inputs from the Technical Task Teams and applying escalation (inflation) and contingency to arrive at a total estimated cost. The cost estimating methodology and the time value of money concept are explained in detail in Appendix G. Resource leveling of cost (spreading costs out evenly) was performed by delaying the start of selected activities to the total did not exceed a self-imposed ceiling of $700 million per year.

Delaying early year allocations results in an extended and amplified funding profile in the later years. This is a result of funding infrastructure and safe operating costs at the expense of mortgage reduction. Mortgage reductions are activities which decrease the annual safe operating costs at the Site. The safe operating costs continue until the mortgage is paid off. If mortgage cost is reduced, additional money becomes available for desirable risk reduction and D&D/ER activities. The mortgage may never be paid off if early-year funding is reduced significantly or spread over too many years. This is similar to a negatively amortized mortgage where the monthly payment is insufficient to cover the monthly interest charge. As an example, in Alternative 1 the cumulative total estimated cost is $22.5 billion (escalated) through the year 2029, assuming unconstrained funding at approximately $2.0 billion/year. If a $700 million/year funding cap is assumed, then the project can never reach completion because the cost of escalation alone exceeds the available funding ($700 million/year).

The estimated cost and completion date for each alternative is shown in Table G-3. Estimated costs and completion dates are shown for both the interim end state and final end state, as applicable.

Table G-3
Estimated Total Alternative Cost

Alternative	Interim End State[1]		Final End State[2]		Annual O&M Cost[3]
	Date	Cost	Date	Cost	
1, Unrestricted*	N/A	N/A	2029	$22.50B	$5M
2, BEMR I**	N/A	N/A	2060	$22.1B	$10M
3a, Phased Shipment***	2009	$9.2B	2023	$14.6B	$14M
3b, Priority Shipment***	2010	$10.0B	2018	$12.8B	$14M
3c, Excavation***	2010	$8.9B	2015	$9.7B	$14M
3d, Leveled Buildings***	2010	$8.8B	2015	$9.6B	$14M
3e, Entombment and Landfill	2010	$9.0B	2015	$9.9B	$14M
4, Mothball***	2007	$6.1B	2015	$7.5B	$35M

1. All Work complete except offsite shipment of waste and SNM, D&D of new temporary facilities (if required), and final ER activities.
2. All work complete except long-term monitoring. Deferred liability costs for Alternatives 3c, 3d, 3e, and 4 not included (i.e., in 3c, 3d, 3e, and 4, waste remains onsite).
3. Annual O&M cost for Alternatives 1, 3a, 3c, 3d, and 3e are essentially the same when escalation is factored out. Alternative 4 O&M cost is approximately four times that of the other alternatives. Annual O&M costs begin on the date specified on the Final End State.

1.5 Summary

The overall approach to scheduling and cost estimating for ASAP Phase II was consistent with best industry practices. Schedules were prepared on a critical path basis using the precedence diagram method. Costs were estimated on an activity-based costing methodology, where appropriate. Both costs and schedules were consistent with the ASAP project Work Breakdown Structure, integrating costs and schedules. Escalation and contingency were applied to cost according to standard accounting principles and DOE guidelines. Cost and schedule drivers were identified through a systematic evaluation and review process.

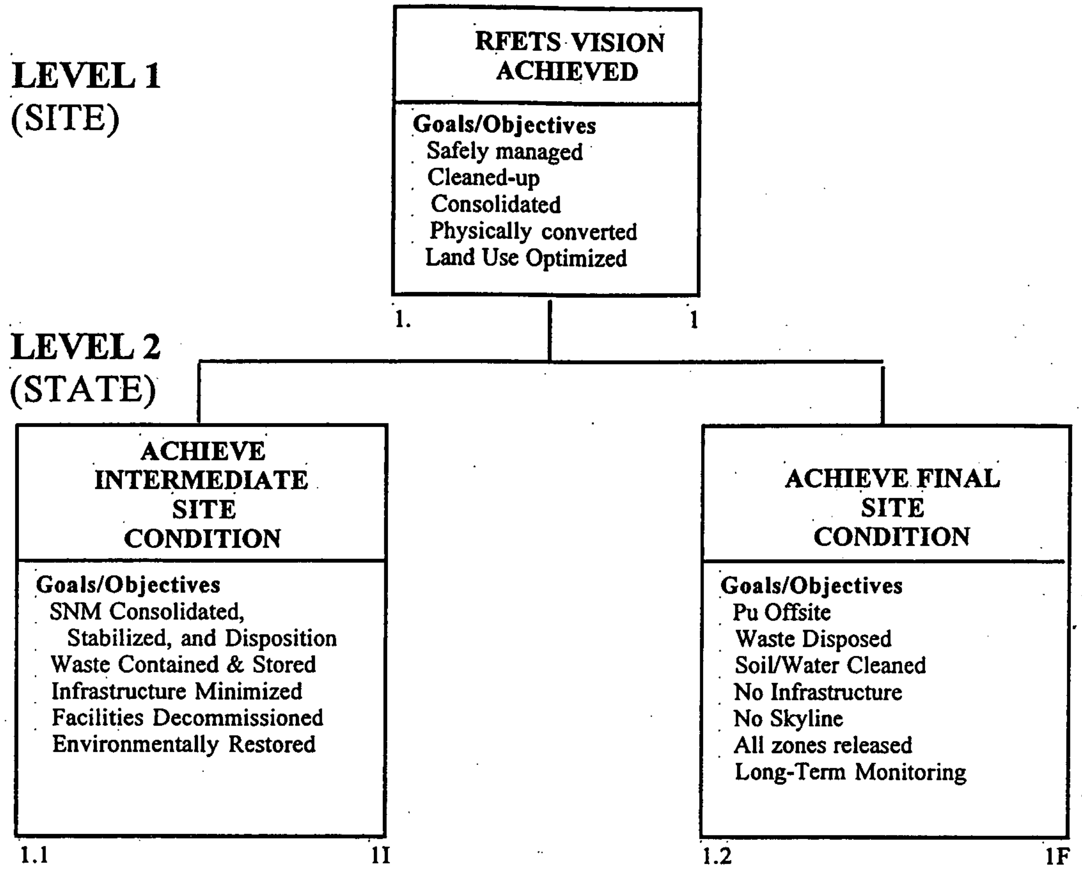


Figure G-1 (a) Work Breakdown Structure ASAP Phase II Plan

LEVEL 2
(STATE)

LEVEL 3
(ZONE)

ACHIEVE INTERMEDIATE SITE CONDITION

Goals/Objectives
- SNM Consolidated, Stabilized, & Dispositioned
- Waste Contained & Stored
- Infrastructure Minimized
- Facilities Decommissioned
- Environmentally Restored

1.1 II

RELEASE OUTER BUFFER ZONE

Goals/Objectives
- Unrestricted use
- Ready for release as soon as possible

Includes
- IHSS Clusters

1.1.1 IIOB

RELEASE CONTAMINATED BUFFER ZONE

Goals/Objectives
- Unoccupied open space
- Restricted use
- Ready for release as soon as possible

Includes
- IHSS Clusters

1.1.2 IICB

RELEASE INNER BUFFER ZONE

Goals/Objectives
- Unoccupied open space
- Ready for release as soon as possible

Includes
- IHSS Clusters
- H20 GND Cluster
- H20 SUR Cluster
- AIRMON Cluster
- Ponds
- Surface water conversion project
- Groundwater remediation project

1.1.3 IIIB

DEVELOP, OPERATE, & DISPOSITION WASTE AND SNM TREATMENT & STORAGE AND LANDFILLS

Goals/Objectives
- Closed to industry standards
- No migration of contaminants
- Treatment facilities operated to design authorization basis

Includes
- 219 Cluster
- New Landfill Line Item (219 new cluster)
- New LLW storage facility line item
- New TRU storage facility line item
- New closure CAP line item
- Offsite disposal
- Waste mgmt projects
- Treated waste pkging
- SNM Treatment
- SNM Packaging
- New Pu storage facility line item
- SNM offsite shipment

1.1.4 IILS

Figure G-1 (b) WBS

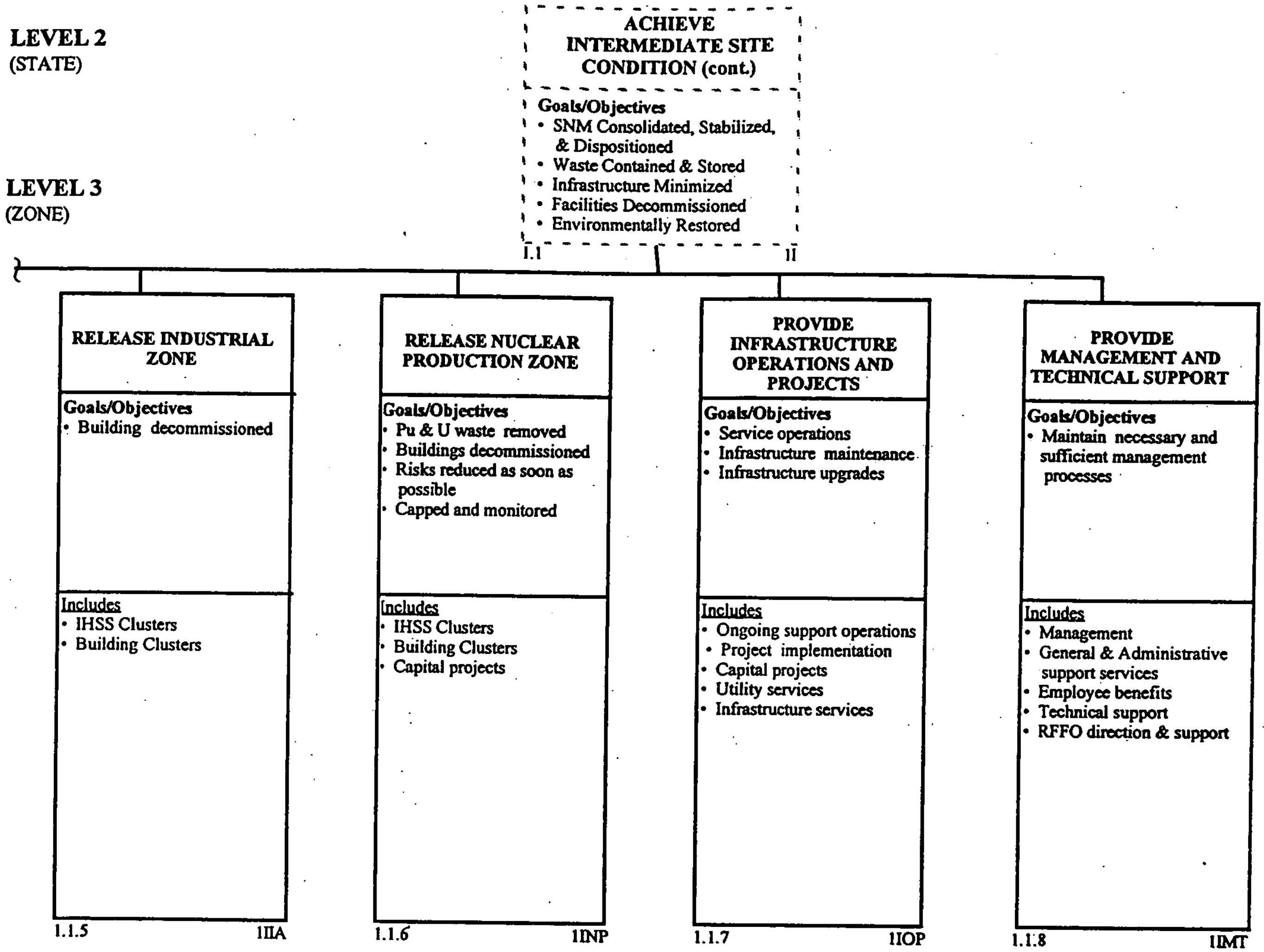


Figure G-1 (c) WBS

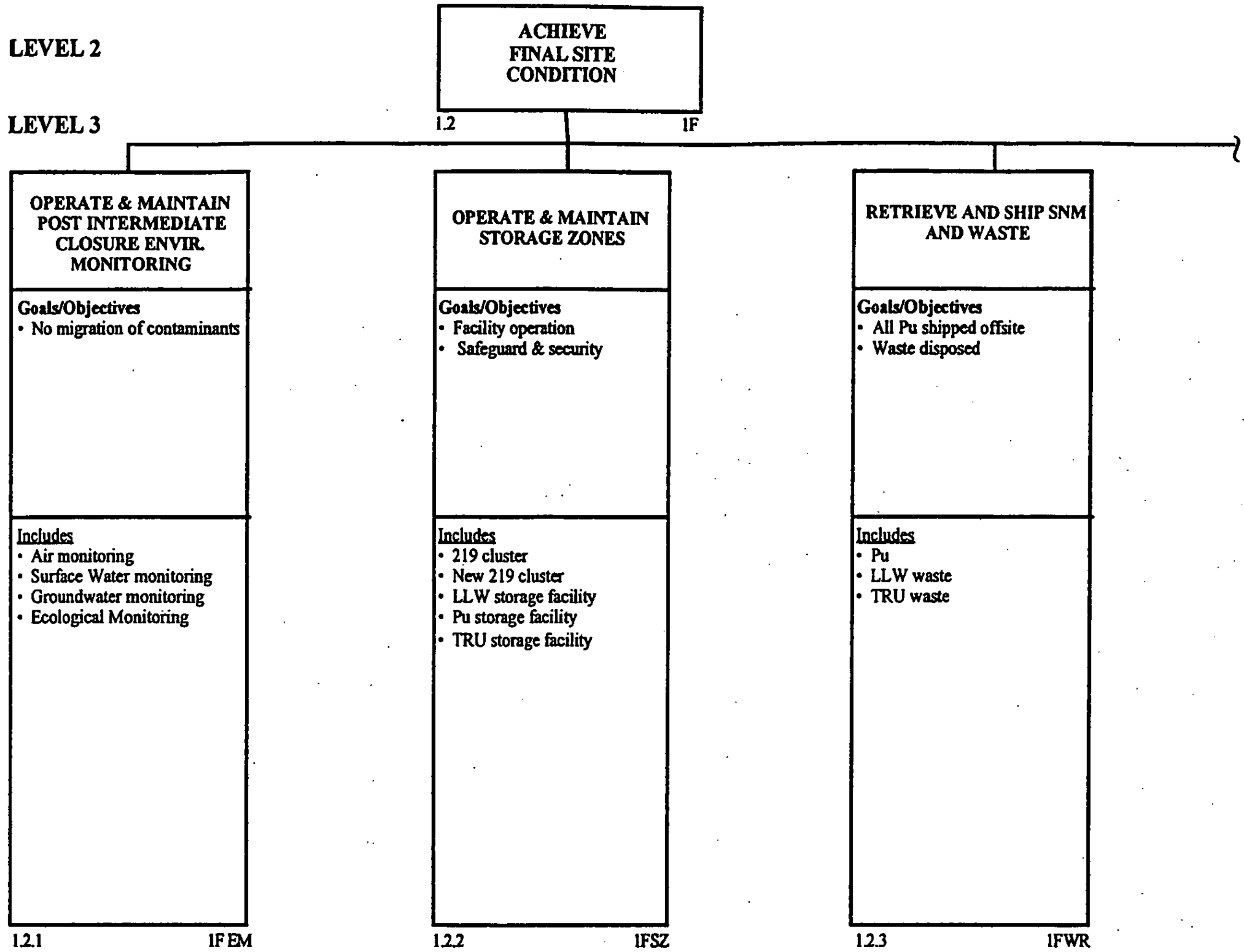


Figure G-1 (d) WBS

LEVEL 2

ACHIEVE FINAL SITE CONDITION (cont)

1.2 1F

LEVEL 3

DECOMMISSION STORAGE ZONES

Goals/Objectives
- Facility deactivation
- Facility decommissioning
- Hazard removal
- Waste operations
- Soil cleaned
- Remediate
- Close

Includes
- 219 Cluster, INFLFO Cluster
- New 219 Cluster, INFLFN Cluster
- LLW storage facilities, INFLLS cluster
- Pu storage facilities, INFPUS Cluster
- TRU storage facilities, INFTRS Cluster

1.2.4 1FDD

PROVIDE MANAGEMENT & TECHNICAL SUPPORT

Goals/Objectives
- Maintain necessary and sufficient management processes

Includes
- Management
- General & Administrative support services
- Technical support services
- RFFO direction & support

1.2.5 1FD

OPERATE POST INTERMEDIATE AND POST FINAL CLOSURE CARE

Goals/Objectives
- Post closure monitoring
- No migration of contaminates

Includes
- Air monitoring
- Surface water monitoring
- Groundwater monitoring
- Final covers and Caps maintenance
- Ecological Monitoring

1.2.6 1FCC

Figure G-1 (e) WBS

APPENDIX H

RISK ASSESSMENT METHODOLOGY

1.0 INTRODUCTION

This appendix describes the approach used to assess the risks associated with each of the alternatives postulated for this phase of the ASAP. Subsection 1 of this Appendix provides background, Subsection 2 describes the methodology, Subsection 3 delineates general assumptions employed for the assessment, and Subsection 4 contains details of the assessment which support Sections 1 to 4 of the main document and the risk discussion in Appendix I. The results of the assessment are qualitative; a detailed quantitative assessment is planned for ASAP Phase III.

1.1 Task Description

A health and safety risk assessment was performed for each alternative. These assessments were completed to provide a comparison of the risks associated with each alternative. The comparison considered factors such as cost, schedule, and risk.

1.2 Scope/Purpose

Among the factors considered for each alternative under assessment was risk. Risk can take many forms including health and safety (for both the public and worker sectors), environmental, financial, compliance (regulations, standards), security, and political and public acceptance. Rocky Flats has a number of potential health and safety risks and other liabilities associated with maintaining the Site in a safe, secure, and environmentally acceptable manner. The purpose of the risk assessment task for ASAP Phase II was to identify the major risk factors associated with each of the alternatives, and then provide qualitative indicators of the risks. Those indicators could be used as discriminators between the different alternatives, and serve as input for the decision analysis to be performed when an alternative is recommended for implementation.

The scope of the risk assessment performed for this Phase II document included health and safety risks to the public and the worker population. Each possible sequence of events in which a harmful event could occur, or a harmful substance could reach humans, has a certain risk associated with it. This risk is a product of the probability that a particular chain of events could occur and the consequence of the event to the workers or the public. Risk assessment consists of the calculation of the probabilities and the analysis of the consequences. For each of the major areas of concern (i.e., SNM, waste management, facility decommissioning, environmental restoration, and infrastructure), appropriate risk categories were identified. In the few instances where specific data were developed, these categories were then quantitatively assessed to determine the magnitude of the risk in terms of potential impact upon the health and safety of the subject populations.

When specific data were not available, a qualitative assessment was performed. Although this approach does not allow for a numerical comparison between alternatives, it does support comparison of relative risks among the alternatives. This information provides a foundation for an alternative comparison process involving costs, schedule, and other parameters. In those instances where information was available, the risk was quantified and the numerical results were included. This level of detail was not available in the majority of situations, and therefore the overall assessment is referred to as a qualitative assessment, even if some quantification is present.

By reviewing the proposed series of events for a particular alternative, it was possible to judge the type and magnitude of the risk when qualitative assessments were required. These judgements were used to assess the relative differences among the alternatives. The assessment concentrated on relevant information pertaining to the likelihoods of events (probabilities or frequencies) and the consequences of the events if they were to occur (i.e., the severity of the impact to the workers and the public). No attempt was made to establish an absolute risk value for any alternative. Rather, the focus was upon the differences, in a relative sense. As data becomes available in the future, it will be possible to replace the qualitative assessments with quantitative information. This will be accomplished during Phase III of the ASAP program.

Every alternative, no matter how carefully planned and implemented, will exhibit some degree of risk. Even a no-action alternative has risk that cannot be eliminated or avoided. Risk is accepted in every activity undertaken by people, although there are often steps implemented to minimize or control the risks. Those same concepts are applied to this risk assessment. A no-action alternative at the Site exhibits risks due to the continued presence of radiological and nonradiological material, the ongoing maintenance activities, and the constant movement of traffic with potential for transportation accidents. These risks may be low or high, but they are risks. Therefore, although this assessment does not establish a baseline risk, it does attempt to determine if any of the alternatives increase or decrease the risk potential to the public or the workers.

For the purposes of ASAP Phase II, the risks for the worker and public populations are grouped into three broadly defined categories: (1) OSHA-type risks, (2) radiological risks, and (3) transportation risks. These categories are defined in Subsection 2.0. It is understood that other risk categories may be defined during later phases of ASAP. However, the categories used in Phase II were chosen to provide a broad representation of risk for initial comparisons only. For each of these categories, two major time periods are considered: During and After (implementation of the activities comprising the alternative). The Before time frame is not explicitly addressed because the risks inherent in the Before time period are the same regardless of which alternative is considered (see 2.0, Methodology, which follows).

Within each category and for each population set and time period, major potential risk contributors were identified. (Note that OSHA risk, by definition, applies only to the worker population.) The potential events which could detrimentally or beneficially affect workers or the general public were identified for each alternative, and their frequencies of occurrence and magnitudes of impacts qualitatively defined. These factors were then compared across alternatives to determine if any risk increases or decreases would result from the activities associated with the alternatives.

Although an objective of the risk assessment is to identify the major risk contributors within a given alternative, it is not the intent of this assessment to determine how the risk within one risk category (e.g., transportation) compares to the diverse risks in the other categories. In other words, although it may be possible to estimate for a particular alternative that risks associated with one category (e.g., transportation) may dominate the risks associated with the other categories, it is not possible at this stage of the assessment to draw conclusions regarding the magnitude of the different risk contributors. For example, a particular alternative may exhibit the potential for a relatively higher transportation risk and a relatively higher exposure risk. Both of these risks may be high relative to similarly categorized risks for other alternatives, but they may not be equal to each other - they may not have comparable specific impacts upon the workers, public, or environment. Therefore the reader is cautioned not to draw conclusions about the cumulative risks within an alternative. It is neither possible nor correct to conclude that a relatively high risk in category A, plus a relatively low risk in category B, plus a relatively high risk in category C is the same cumulative risk profile as a relatively high risk in category A, plus a relatively high risk in category B, plus a relatively low risk in category C, even though both profiles have two high and one low risk. Although an alternative may exhibit characteristics which make it prone to a higher potential for risk than the other alternatives, this does not mean that the alternative has a high or unacceptable risk. If risk is subsequently converted from qualitative to quantitative terms, this type of cumulative risk comparison will be more achievable.

Any assessment, whether qualitative or quantitative, relies upon the completeness and accuracy of the data used within the assessment. There is always some uncertainty within any data; the uncertainty range may be broad or narrow, indicating the level of confidence in the data sets. A long range goal of all assessments is to minimize the uncertainties to the degree possible. Thus, as part of the path forward for the alternative assessments, information will be sought that will remove or narrow the uncertainties, and/or validate or modify the assumptions employed within the different categories of risk. Quantification of risks will be done during ASAP Phase III.

The large number of potential interactions, the lack of precision in estimating many events, and the difficulties in accurately assessing the impacts of some events (such as low levels of exposure to humans) combine to make risk assessment potentially controversial and subject to varied conclusions and interpretations. Nevertheless, it is necessary to understand the relative differences in risk to be able to use risk as a tool in engineering designs or decision-making for allocating resources (such as funding or personnel). Despite the lack of absolute precision in risk analysis, the results can be put to considerable practical use, especially by focusing upon the differences in relative risk in order to identify those activities that may benefit from redesign or compensatory measures.

2.0 METHODOLOGY

When focusing upon health and safety issues, it is prudent to look at the risks associated with different types of contributors, in different time periods. The time periods are discussed in the following subsections. General risk considerations are discussed in more detail in Subsections 2.1 through 2.3.

During Completion of the Activities Associated with the Alternative

As an alternative is implemented, actions will be undertaken that may have varying degrees of risk associated with them. This time period is defined as the During period. For example, dismantling of buildings, packaging, and shipping waste may each subject individuals and groups to certain risks (e.g., collapsing structures, leaking canisters). Therefore, for each alternative, it is necessary to understand what specific activities will take place, what form, type, confinement, and amount of material is being handled, and how and where it is to be shipped. This period of time encompasses the time required for final shipment of materials, regardless of when final shipment is scheduled to occur. Thus, assessments associated with this period include the impacts (if any) of dismantling any buildings or facilities that may be constructed for interim storage of SNM and TRU waste, even though that dismantling takes place significantly later than dismantling of other facilities and buildings.

After Completion of the Activities

There may be residual risks associated with the alternatives which must be considered after completion of the During phase. These risks may be determined using the amount, form, and confinement of material (if any) that still remains onsite, the status of the facility structures, the number of support personnel necessary to maintain the Site, and other factors.

Depending upon the extent of activities which take place in the During completion phase, it is theoretically possible that the residual risk may actually be higher than the risks from other phases, although this is unlikely. The time period associated with the residual risks is defined as the After period.

The Before Period

A third time period is defined as the Before period. The risk associated with this period is that associated with the status quo: the situation as it exists without taking any of the additional actions defined in the various alternatives. Any activity incurs some risk (the magnitude of which is a function of the activity, duration, and population potentially affected). However, for this assessment the risk during the Before period is the same regardless of which alternative is pursued, and therefore the risk was not explicitly established; it will be established during the Phase III assessment. Since risk reduction is a major objective of ASAP, the After period risk must always be less than the Before period risk if the alternative is to be viable.

General Considerations

For each of these time periods, two sets of populations were examined: workers (personnel located onsite) and general public (located outside the site boundary). Different alternatives and activities pose different risks to these populations and the risk is not necessarily the same (and in fact rarely is the same) between the two sets. The risk to individual workers is most likely higher than to individual members of the general public during the implementation phase, at least for certain activities such as dismantling buildings. However, the variations in size of the population affect the magnitude of the overall impact.

For each time period and for each population set, three major risk categories were considered:

1. Risk (other than transportation or radiological risk) associated with performance of assigned labor tasks (defined here as OSHA risk). This category of risk focuses solely on the workers, and measures the risks associated with performing the steps required to implement the activities in each alternative. These include activities such as construction and dismantling, operating machinery, and cleanup.

2. Risk associated with exposure to radiological materials. This exposure risk measures the impacts of the form, type, and amount of the material being generated or handled during the alternative implementation. Both the worker and the public population could be impacted by these risk factors, depending upon the mechanism of the exposure (e.g., air dispersal, leakage into groundwater).

3. Transportation risk. This risk is associated with the shipment of the material from its originating location to its interim and/or final storage location. The final location may be onsite or offsite, depending upon the alternative. Considerations here include the amount and type of material being shipped, the shipping canisters used, the number of shipments required, the frequency of those shipments, the mode of shipment (e.g., rail or truck), and the distance of shipment. Both workers and the general public may be impacted by these risks.

For each of these categories, the types of questions that influence the risk assessment include:

- What are the potential event initiators? These are the events which put the population at risk (e.g., a transportation accident, a construction mishap, a natural phenomenon such as an earthquake).

- What is the likelihood (frequency or probability) of the event initiator?
- How many members of the population sets (workers and public for this assessment) are at risk given the event initiator?
- What is the duration for which the population is at risk? For example, how long will workers conduct operations within existing (versus newly constructed) facilities?
- What are the effects of the event initiator? For example, would there be a radiological release? Would there be a direct impact on members of the population (e.g., the impacts of a structural collapse on workers)? Would there be no effect?
- What is the severity of the effect? In other words, the effect may be a release of contaminants, but the severity may be limited to temporary discomfort or watering eyes, for example. The severity level could also be higher.

Several considerations were used to assess the risk for the Site:

- Issues associated with the construction of a new Special Nuclear Material (SNM) vault, or the upgrade of Building 371 for use as an interim storage location:

  Options are currently under assessment for the consolidation of SNM. Among the options being evaluated are the upgrade of Building 371 to enhance its seismic capacity and improve its resistance to other potential hazards (such as fires), and the construction of a new storage vault onsite. Each option has associated risks to the workers and public. Each requires construction activities, with the Building 371 option requiring work in enclosed, potentially contaminated spaces. Use of either option also requires the packaging and shipping of SNM from other locations onsite, which then poses a risk to the workers while handling and transporting the material. The risks to the workers and public after consolidation in one of these options is slightly different as well. Building 371 will be upgraded to increase its seismic resistance; however, this will not be to the same level of seismic capacity as a new storage vault. Resistance to other natural hazards (e.g., high winds, floods) will also be different between the two (although both result in significant risk reductions to the public). These and other similar considerations could impact the relative and absolute risks to the workers and public. Either option is acceptable for consolidation. Considerations such as cost, schedule, and code and standard compliance are being evaluated to determine an optimum path for implementation.

- Issues associated with a new waste storage (TRU) facility:

  Most exposures associated with waste management of Transuranic (TRU) and Transuranic Mixed wastes (TRM) are to workers while handling and transporting drums, performing drum measurements (assay and radiography), and validating RCRA inspections. Poor storage configurations have caused increased exposure durations, inspection times, and in many instances the need to move drums twice to meet stabilization space requirements. Construction and implementation of a new TRU/TRM waste facility would improve storage configurations, and exposure durations to workers could be dramatically reduced.

- Issues associated with cap integrity:

The dominant issue associated with the capped LLW landfill is the prevention of contamination of groundwater because the water table is high. Sudden storms can deposit large quantities of water on the Site. A large diversion system may be needed to control water flow near the cap. This diversion network will have to be maintained indefinitely along with provisions for suitable radiological monitoring.

- Issues associated with residual risk, including that associated with waste remaining in the buildings, and risks related to operable units:

  Analysis of residual risk attributed to waste remaining in or stored within buildings considered quantities and types of waste (both radiological and nonradiological) that remain, as well as the exposure potential to these materials. Also, the risks of maintaining wastes in a secure configuration (i.e., reliability of long-term onsite containment) were considered, as well as the likelihood that wastes could migrate to other media. Similar concerns exist regarding the migration of hazardous and/or radiological materials from OUs/IHSSs.

  An example of the above concern is the potential for leaving under-building contamination in place. In some areas, such contamination could come into contact with groundwater, and therefore could be transported to other areas. There may be increased risk associated with treating LLMW only for storage, compared to treatment of all LLMW to LDR standards.

- Impacts identified in the Site Vulnerability Study:

  The major concerns expressed in the Site Pu Vulnerability Study will be addressed by all of the alternatives as long as the building ductwork and the process lines containing plutonium are removed (as in Alternative 4, Mothball, where the buildings are deactivated but remain standing). By combining the responses to these issues (the likelihoods with the consequences), it is possible to arrive at a measurement of risk.

The general approach taken for alternative assessments was as follows:

1. The task areas were defined as either SNM, waste management, facility decommissioning, environmental restoration, or infrastructure. The alternative activities which are projected to take place were identified. Table H-1 contains these activities.

Table H-1
Activities Associated With Program Areas Considered for All Alternatives

Task Area	Risk Factors - All Alternatives
SNM	HEUN bottled and shipped; SNM stabilization consolidation and repackaging; residue processing to WIPP WAC and storage; and new SNM interim storage vault as opposed to Building 371 upgrade
Waste Management	LLW and LLMW disposal, treat LLMW to LDR, new TRU interim storage facility, new LLW/LLMW interim storage facility, sanitary waste disposal, and construction debris disposal
Facility Decommissioning	Nonradiological buildings, PU and U buildings (above ground level), foundations, entombment, and soil removal
Environmental Restoration	IHSS soil, groundwater management, and RCRA Cap on OU 7
Infrastructure	Roads, utilities, and septic system

2. For completeness, information was sought from Site personnel and other sources about the potential risk contributors associated with the activities or groups of activities. Information sources included the following:

- Site Insurance and Risk Management department
- Site Industrial Hygiene and Safety department
- Site Construction department
- Information generated to support the Site-Wide Environmental Impact Statement (SWEIS)
- Information from the SISMP
- Information generated to support resolution of Defense Nuclear Facilities Safety Board Recommendation 94-3
- Information generated specifically to support this ASAP Phase II study (e.g., waste volumes, waste types, shipments anticipated)
- Information from other sites, facilities, and complexes which may be pertinent (e.g., other facility decommissioning; other DOE sites such as Hanford)
- References on accident statistics, including U.S. Department of Labor, Bureau of Labor Statistics and the National Traffic Safety Board
- Site experience

3. Using the information gathered, a determination was made regarding whether or not a given alternative activity would increase, decrease, or maintain the risk level relative to a reference point. The reference point can roughly be defined as today's situation, although no attempt was made to quantify the risk associated with the current conditions.

   In most cases, a qualitative assessment was completed, but a quantification of the risks was not performed. General levels of risk potential were established for each activity and program area, and the alternatives were then considered within this context. For example, an alternative in which all buildings are demolished and the resulting rubble shipped for disposal has the highest potential risk, relatively speaking, when considering risks associated with demolition activities. Similarly, an alternative in which no buildings are dismantled has the lowest relative risk for this specific activity set. This technique was utilized throughout, using hard data (e.g., data on projected waste volumes) when available. If hard data were not available, information from other sources, including engineering experience, was used to establish the relative risks.

4. These determinations were then grouped for their associated program area to arrive at a conclusion regarding the overall change in relative risk associated with all the activities within that task area. This was completed for the During and After time frames, for both the worker and the public population groups.

5. The relative risk changes among all of the alternatives were then compared as a check to ensure that they were consistent with the proposed activities and the known or postulated activity risks. If necessary, the assessments were reviewed and revised.

2.1 OSHA Risk

For the purpose of this assessment, OSHA risk is the risk due to industrial accidents. Some of the activities that produce OSHA risk may overlap between risk categories (e.g., chemical spills could be considered OSHA risks for the worker or as exposure risks). These types of overlaps have been accounted for within the assessment so that a risk contributor is not double-counted.

General factors considered within this category include:

- What activities are scheduled?
- How many people participate in the activity?
- How long do they take to perform the activity?
- To what risk factors are they exposed (e.g., construction, confined spaces, and poor lighting)?
- What protective measures are in place to minimize the risks?

Many other similar considerations were included in the assessment of OSHA risk.

2.2 Exposure Risk

Factors considered here were similar to most of those mentioned for OSHA risk, but other issues were considered. These included:

- Form, type, and amount of radioactive material
- Potential mechanisms for dispersion of the material
- Potential for a criticality event
- Factors affecting dispersal (e.g., meteorological data, shielding, evacuation)
- Packaging and storage location

Information developed for other studies was considered to estimate the potential for exposure to waste and stored radioactive materials qualitatively.

2.3 Transportation

Any vehicle that travels by rail or highway is subject to some potential for accident. An accident by itself does not necessarily result in injury or exposure risk. For example, canisters are designed to withstand certain impact forces and other threats to their integrity; the occurrence of an accident does not guarantee a failure of the canister.

Not all transportation risk is associated with accidents. Depending upon the form and type of material being shipped, there may be some risk due to the limited radiation coming from the canisters. Although designed to be minimal and within regulated limits, this limited radiation (dose) from the canisters still poses some risk.
Therefore, as part of this assessment, the information gathered included:

- Method of transport
- Route (distance, population) of shipment
- Number of shipments
- Shipping package
- Type and form of radioactive material shipped

Models and data for transportation risk have been developed and used by DOE and the Nuclear Regulatory Commission. Those models and data are applicable and were used here as appropriate.

Transportation risk was considered in the risk assessment in two parts: the risk associated with onsite shipping and the risk associated with offsite shipping. Onsite risks may have different controls available; therefore the risks on a per-mile or per-shipment basis could be different from those for the offsite shipments. For example, the volume and speed of traffic onsite can be monitored and controlled by the security force to a better degree than may be possible on public roadways.

3.0 GENERAL ASSUMPTIONS

To support the risk assessment, several assumptions were established which apply to all alternatives. Some of the major assumptions have been included in the main document; those are repeated here, along with other issues. The general assumptions included the following:

- Time Periods: Risks were evaluated as a function of time period. Here, time period does not mean a specific calendar time, but rather a range of time which can be characterized by the level of activity taking place during that time period. The length of the time periods (in terms of years) may vary between the alternatives.

- Some alternatives indicate that certain activities will take place only if determined to be economically feasible or cost-effective. For this assessment, it was assumed that in fact these activities do take place. Specifically, when such a qualifying statement is associated with an alternative, it is assumed that:

  - Demolition of buildings does occur if it is indicated as a possibility;

  - Offsite shipment of nonradiological debris does occur if it is indicated as a possibility.

- Similar types and forms of SNM will be consolidated in existing and/or new facilities, or in various designs of disposal or storage locations. Consolidation of SNM does not necessarily equate to a concentration of the risks; factors such as likelihood of release, dispersibility, and population potentially at risk must still be considered. Consolidation (and accompanying activities such as stabilization and repackaging) may significantly reduce rather than concentrate or increase the risk.

- Except for Alternative 1, Unrestricted, some level of monitoring will be required in the period defined as After. This will require that some infrastructure remain.

- OSHA risk will increase for all major construction activities, such as a new SNM vault or TRU waste storage facility. It is also proportional to the quantities of SNM and wastes moved and to the number of handling steps. No attempt was made to discount worker risk by assuming the workers would otherwise be employed offsite in equally hazardous activities if they were not at Rocky Flats.

- Radiation exposure to both the worker and the public during LLW activities can result from possible release of dust, or for workers only, from handling.

- The greatest risk to both the worker and the public during IHSS remediation is also due to the possible release of dust. Some of the IHSSs have measurable levels of radiological contamination.

- Capped retrievable storage facilities pose essentially the same risk to the public as onsite LLW/LLMW disposal in RCRA Subtitle C-type landfills.

- With the exception of Alternative 4, Mothball, all new TRU, SNM, and LLW facilities (if constructed) will be demolished following fulfillment of their interim storage missions. The facilities are assumed to be nonradiological when demolished.

- It is understood that some processing of residues and/or solutions may occur prior to implementation of ASAP. However, for the purpose of this assessment it is assumed that no processing and packaging to meet WIPP WAC will occur prior to ASAP implementation.

- For Alternative 4, Mothball, it is assumed that the remaining buildings have been deactivated as much as possible, infrastructure is reduced to a minimum, and no operations other than monitoring and maintenance take place in the buildings. However, the risks from natural hazards (e.g., earthquakes and fires) as well as from building deterioration still exist.

- WIPP will open and TRU waste will be sent there without long-term storage at the Site. Implicit in this statement is the assumption that the final product meets WIPP WAC even if not processed or packaged to those standards initially. All residues will eventually be shipped offsite to WIPP.

- New storage facilities for SNM and TRU waste will reduce the radiation exposure to the worker once all of the SNM and TRU waste has been transferred. The onsite work force will be smaller if new facilities are used, owing to reductions in operating and maintenance requirements for the newer facilities.

- The hazards associated with removing and disposing of the chemicals in the buildings are identical for all alternatives.

- All operations for all of the alternatives have the same level of shielding.

- The risk from onsite travel will be small when compared to offsite transport because of the short distances involved and the additional control afforded by ownership of the Site.

- All Highly Enriched Uranyl Nitrate (HEUN) will be sent to an offsite repository. No HEUN will be returned to Rocky Flats.

- Buildings not containing radiological operations are not radiologically contaminated. Infrastructure is also assumed to be free of radiological contamination. However, buildings may be contaminated by hazardous materials that are not radiological, for example, solvents.

- Buildings which contain radiological operations are contaminated. Radiological exposure will be proportional to the amount of demolition.

- Consolidation of radioactive material in a new or existing building, followed by movement to a disposal or storage location, will require additional handling, and consequently will result in a higher exposure than moving material directly from their existing locations to a disposal or storage location. The first occurrence of radioactive material handling will result when the radioactive material is moved from its existing location into the consolidation area. The additional handling will occur when these materials are eventually moved to the selected storage or disposal area.

- Removing only the above-ground structure will produce less radiological risk than removing both the above- and below-ground structures (foundation and building and soil).

4.0 RISK COMPARISON

Appendix I describes the risk factors for each individual alternative. Section 3, Comparative Analysis, provides a summary level comparison of the risks, allowing the reader to see how the risks in a given risk category (e.g., transportation) for one alternative compare qualitatively to risks in the same category for each of the other alternatives. Provided below and in the graphs which follow are breakdowns of those summary level risks, expanded to show the relative comparisons as a function of task area (e.g., waste, SNM).

The summaries contained in Section 3 of the main document were derived by combining the individual task area risks within a given risk category into a single value. This value very roughly approximates the cumulative risk within a given risk category from each of the individual task areas. However, because the assessment is predominately qualitative in nature, the resulting single value is not a true mathematical summation of the individual contributors. Instead, it is a visual representation of how risks compare, relative to each other, within a given category. Neither the graphs in these appendices nor the summaries in the main document are intended to represent the actual absolute risks, or risk differences, for or between alternatives.

Relative risk information is also presented graphically at the end of the appendix. The charts are provided for the task areas. The relative (qualitative) risks are presented for transportation, OSHA, and radiological exposure. The relative risk plots are presented for the worker and public population during and after the activity.

Each chart in this appendix presents the risks from the three risk categories: transportation, OSHA-type, and exposure. These three risk contributors are shown within single bars (one for each alternative) for the convenience of the reader. As discussed above and in other parts of this appendix, the cumulative representation should be interpreted as only roughly representing the true relative magnitude of risk for any given alternative. In actual fact, if numerical data become available to enable quantification of the risks, it may turn out that the relative differences between alternatives are different (with different distributions of risk among the three categories) from those shown here. For the purposes of this assessment, however, the representations are believed to be adequate for the comparisons of relative risks between the alternatives.

4.1 Comparison of Worker Risk During Alternative Implementation

Figures H-1 through H-5 are charts of the relative risk for workers while the activities are taking place for each of the alternatives. Figure H-1 represents the risk to the worker population attributable to special nuclear material from each of the three risk categories: OSHA, transportation, and radiological exposure. The charts show the risk components stacked on top of each other for each alternative. When reviewing this and other charts, the reader should concentrate upon the comparisons of specific categories (e.g., transportation), taken one at a time.

If each category for a given alternative has a higher relative risk than another alternative, then it is intuitive that the cumulative risk will also be higher. However, when one risk category is higher (e.g., transportation), and another is lower (e.g., radiological), it is not necessarily true that these cancel out and result in equal cumulative risks; a shortcoming of qualitative analysis is that this result may in fact be all that is capable of being represented.

In fact, the relative risk differences between alternatives in transportation risk, for example, may not be equal to the relative risk differences in OSHA risk. Even though the chart may show the cumulative qualitative risk as being roughly equal, the actual numerical risk differences may in fact be farther apart. This can be determined only when sufficient data are available to allow for the quantification of risks.

In Figure H-1, the risks may be from several sources. For example, they may be from such activities as handling the different forms of plutonium, (i.e., metal and oxides, solid residues, and solutions). Risks to workers for OSHA, exposure, and transportation are all estimated to be higher for Alternatives 1, Unrestricted; 3a, Phased Shipment; 3c, Excavation; 3d, Leveled Buildings; 3e, Entombment and Landfill; and 4, Mothball because of the extra SNM handling necessary as the result of interim storage in a new vault. All SNM will first be consolidated in Building 371 and then moved to a new storage vault. This results in double handling, which causes an incremental increase in the worker risk. The Site's radiological control programs will significantly reduce the likelihood of worker exposure.

However, a new vault is estimated to slightly lower the potential for worker exposure once the SNM is stored there because of the nature of the vault's design and the condition of the plutonium. Alternatives 2, BEMR I, and 3b, Priority Shipment, are similar because of a similar potential for radiological risk due to the use of Building 371, and other commonalities between the two alternatives.

Figure H-2 represents the risk to workers as a result of generated or existing waste. Alternative 4 has the lowest relative risk. This is directly attributable to (1) lower transportation risk as result of disposal of LLW and LLMW onsite (with correspondingly shorter and more controlled shipments of material) and (2) the lower potential for exposure anticipated with decreased demolition. Higher risks to workers in Alternatives 1, 2, 3a, 3b, 3d, and 3e are a result of increased OSHA and transportation risk. Those risks are as a result of increased handling of the material caused by moving more generated waste (which comes from removal of most of the buildings from the Site).

Alternative 1 has the highest transportation and OSHA risk because more material is moved offsite. Whether storage is in a capped or a retrievable storage facility has little impact on the exposure risk to the workers during implementation of the activities.

Figure H-3 represents the risk to workers as a result of facility decommissioning. Alternative 4 has the lowest relative risk because facilities (e.g., Pu, uranium, and nonradioactive buildings) remain standing but vacant. The other alternatives have some increased level of OSHA-type risk, along with increased exposure and transportation risk associated with building dismantling.

Alternatives 3d and 3e are also relatively low (but higher than Alternative 4) because the building foundations remain. Reduced demolition activity and less handling of material should reduce both OSHA and transportation risk. Alternatives 3d and 3e have similar risks because of the building foundation entombment activities. Alternatives 1, 2, and 3c are similar to each other (with higher risks than Alternatives 3d and 3e); foundations are dug up and buildings are demolished. Although there are variations in the number of buildings demolished (e.g., there are no new facilities to demolish in Alternative 2), these are minor incremental changes compared to the other decontamination and decommissioning activities which are to take place.

Alternatives 3a and 3b have the highest relative risks because buildings are demolished, foundations dug up, and workers will use existing (older) storage facilities for a longer period of time than for the other alternatives. This produces incrementally more risk as a result of working in potentially contaminated areas for longer periods of time, and in facilities which may have less resistance to natural phenomena hazards when compared to newer (and cleaner) facilities.

Figure H-4 represents the risk to workers as a result of environmental restoration. Alternatives 1, Unrestricted, and 2, BEMR I, exhibit higher relative risks because of increased transportation risk (Alternative 1 has the highest number of shipments) and increased OSHA risk related to additional soil removal as a result of the more stringent IHSS cleanup criteria (resulting in increased volume and therefore more shipments). Alternatives 3a, Phased Shipment; 3b, Priority Shipment; 3c, Excavation; 3d, Leveled Buildings; 3e, Entombment and Landfill; and 4, Mothball are identical in risk since they are all remediated to generally similar levels.

Figure H-5 represents the risk to workers as a result of infrastructure removal. Alternative 1 exhibits a higher relative risk to workers as a result of the additional work necessary to remove all streets and below-ground utilities. These add to a higher OSHA risk contribution. The other alternatives have essentially the same risk profile.

4.2 Comparison of Public Risk

The following sections discuss the comparisons of relative risks to the general public. Subsection 4.2.1 describes the comparison for the time period during implementation, and Subsection 4.2.2 concentrates on the risk remaining to the public as a result of LLW that could remain onsite in some of the alternatives after implementation is complete.

Although the current potential for risk to the public is low, all alternatives are believed to result in an overall reduction in risk once the activities are completed. This reduction is primarily associated with a reduction to the potential for accidental releases of radiological or nonradiological material. All alternatives reduce the amount of material remaining on Site and afford actions to contain and stabilize it, and thus reduce the potential for and magnitude of postulated release.

4.2.1 Comparison of Public Risk During Site Cleanup

The estimated relative risk plots are contained in Figures H-6 through H-10. OSHA risk does not apply to the public because the public is not physically involved in Site activities, and therefore is not included.

Figure H-6 represents a comparison of the alternative risks for the public as a result of SNM activities. The risks from all of the alternatives are estimated to be very similar. The potential for radiation exposure to the public is reduced over the storage life as a result of the construction and use of a new or upgraded facility for storing SNM (e.g., in a new storage vault or an upgraded Building 371). However, the anticipated treatment of waste (to standards that may not necessarily meet WIPP WAC) with disposal onsite is estimated to slightly increase the radiological risk to the public when compared to alternatives with no treatment or onsite disposal. Therefore Alternative 1 and Alternatives 3a, 3c, 3d, 3e, and Alternative 4 have somewhat lower relative risks (than they otherwise would) as a result of the use of a new facility, although this is offset in Alternatives 3a, 3c, 3d, 3e, and 4 by the higher risks attributable to the potential for reprocessing certain materials to WIPP WAC just prior to shipping.

Figure H-7 represents the relative risk to the public during the site cleanup as a result of existing and future waste generation. Alternative 1 has the highest radiation and transportation risk due to greater quantities of material removed. Alternatives 3a, 3c, 3d, 3e, and 4 are expected to have reduced transportation risk to the public during the cleanup. This is a result of decreased risk associated with onsite disposal or storage of LLW. Onsite storage results in fewer shipments offsite, which in turn reduces the risk from transportation-related accidents. This is true for Alternatives 3a, 3c and 4 as well, with the different storage/disposal options causing some minor variations in the risks. Alternative 3b, Priority Shipment, with offsite disposal, has a relatively higher risk than 3a, Phased Shipment. Alternative 4, Mothball with less removal of buildings and foundations, has lower relative risk. In all cases, the initial risk was assumed proportional to the estimated waste volumes. However, different types and forms of material may have different risks when compared to each other.

A new TRU waste storage facility should also reduce the potential risk of exposure for the public in Alternatives 1, Unrestricted; 3a, Phased Shipment; 3c, Excavation; 3d, Leveled Buildings; 3e, Entombment and Landfill; and 4, Mothball. However, leaving the LLW onsite will slightly increase the potential for exposure risk in Alternatives 3a, 3c, 3d, 3e, and 4. This exposure could result from accidents arising from naturally occurring events such as earthquakes, high winds, or floods, as well as hazards such as human related errors or airplane crashes. Although the risk is higher relative to alternatives in which the LLW is removed from the Site (e.g., Alternatives 1, 2, and 3b), the actual likelihood of these types of events is believed to be extremely small.

Figure H-8 represents the relative risk to the public during the Site cleanup as a result of facility decommissioning. Leaving the foundations in place (Alternatives 3d and 3e) is estimated to decrease the risk to the public associated with potential transportation-related exposure accidents. Leaving the foundations in place will result in less construction demolition, less soil removal, and therefore fewer shipments.

Figure H-9 represents the risk to the public during Site cleanup as a result of facility environmental restoration. It is estimated that the relative risks to the public from this particular task area would be similar in Alternatives 3a through 3e and 4 due to exposure and transportation risks. There is also an incremental risk from exposure during waste capping in Alternatives 3a, 3b, 3c, 3d, and 3e. However, this is offset to some degree by relative risk reductions as a result of less movement of IHSS soils. Alternative 1 exhibits the highest radiation and transportation risk because of the larger quantity of material removed. Alternative 2, BEMR I, is slightly lower than Alternative 1, but higher than Alternatives 3a through 3e and 4, because of the proportionally higher volume of material.

Figure H-10 represents the relative risk to the public due to activities associated with infrastructure. The only significant risk difference arises in Alternative 1, where a substantial number of shipments are taking place. For all other alternatives, the risks are essentially equal when compared to each other.

4.2.2 Comparison of Public Risk After Site Cleanup

The relative risk plot for cumulative public risk after Site cleanup is contained in Figure H-11. This figure represents the cumulative risk from all risk categories. The risk is shown as a cumulative risk, rather than separated by task area, because the individual contributions from each task area are relatively minor by themselves. Even when taken cumulatively, the residual risk is still quite low. Therefore, for graphical representation and ease of viewing, only cumulative risk is shown.

Alternatives 1 and 2 have the lowest cumulative risk to the public after implementation is complete. A residual risk is shown for Alternative 1, even though this alternative has the strictest standards, because a finite, but very small, amount of soil contamination may remain, even though the soil will meet all standards associated with Alternate 1, Unrestricted. This amount may be extremely difficult to detect (essentially zero). However, a residual risk is indicated for conservatism.

All other alternatives have incrementally more residual risk than Alternative 1, Unrestricted, with Alternative 4, Mothball having the greatest remaining residual risk. However, the actual risk for Alternative 4 is believed to be very small.

The cumulative risk in Alternative 4 is associated with the facilities and foundations, as well as the LLW and LLMW, which remain onsite. Because these materials will be onsite, there is a possibility, although small, of release due to accidents or natural hazards such as seismic events.

4.3 Comparison of Worker Risk After Implementation

Figure H-12 indicates the relative cumulative risk for the workers after implementation is complete. As for the public, only cumulative risk is shown. The relative risk profile for the workers is similar to that for the public, with two notable exceptions. First, because no workers remain onsite at the completion of Alternatives 1 and 2, there is no worker residual risk for those alternatives (public risk may still exist, even if small). Second, the workers may experience risk related to the OSHA risk category as well as the radiation exposure category (whereas the public is subject only to the radiation exposure category). The reasons for the relative differences in Figure H-12 are similar to those presented for Figure H-11. In addition, the workforce required in Alternative 4 is substantially greater than for the other alternatives, increasing the OSHA and radiological exposure risk potentials accordingly.

4.4 Summary

This appendix describes the approach used to complete a qualitative risk assessment for each of the alternatives. Three major risk categories were evaluated: (1) OSHA-type risk, (2) transportation, and (3) radiological exposure. These categories were investigated for two durations: (1) during implementation of the activities within an alternative and (2) after the activities were complete. The focus of the risk assessment was upon the relative risk differences incurred by the workers and the public.

Subsections 4.1, 4.2, and 4.3 and their associated figures provide discussion on the comparison of the risks between the alternatives. Many alternatives exhibit similar risk profiles, although there are instances in which certain alternatives may have relatively higher risks for specific time periods and/or specific risk categories. The risks presented in this document are relative, not absolute. They provide comparative information only, and are not meant to be used to infer magnitudes of risk for any of the alternatives. The information presented is useful in drawing conclusions about differences in risk between alternatives.

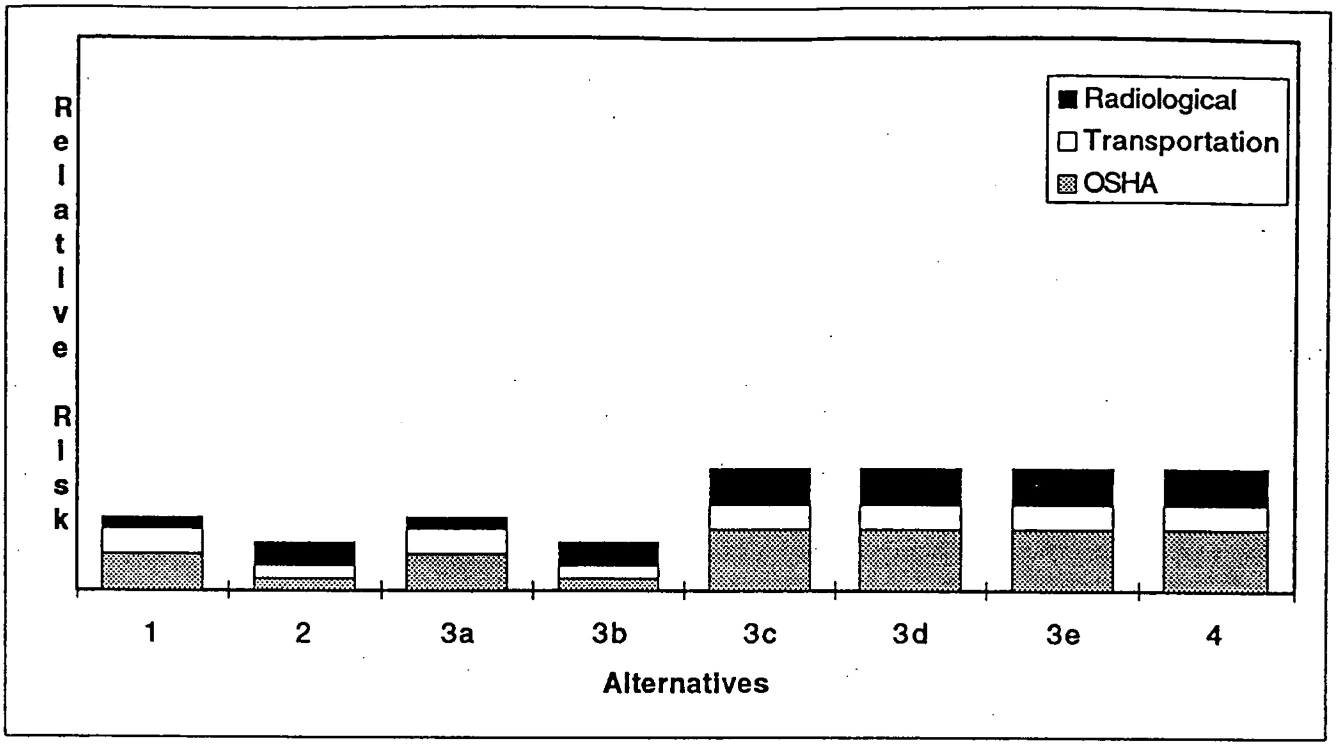


Figure H-1 Worker, Special Nuclear Material, DURING

Risk on this chart is relative

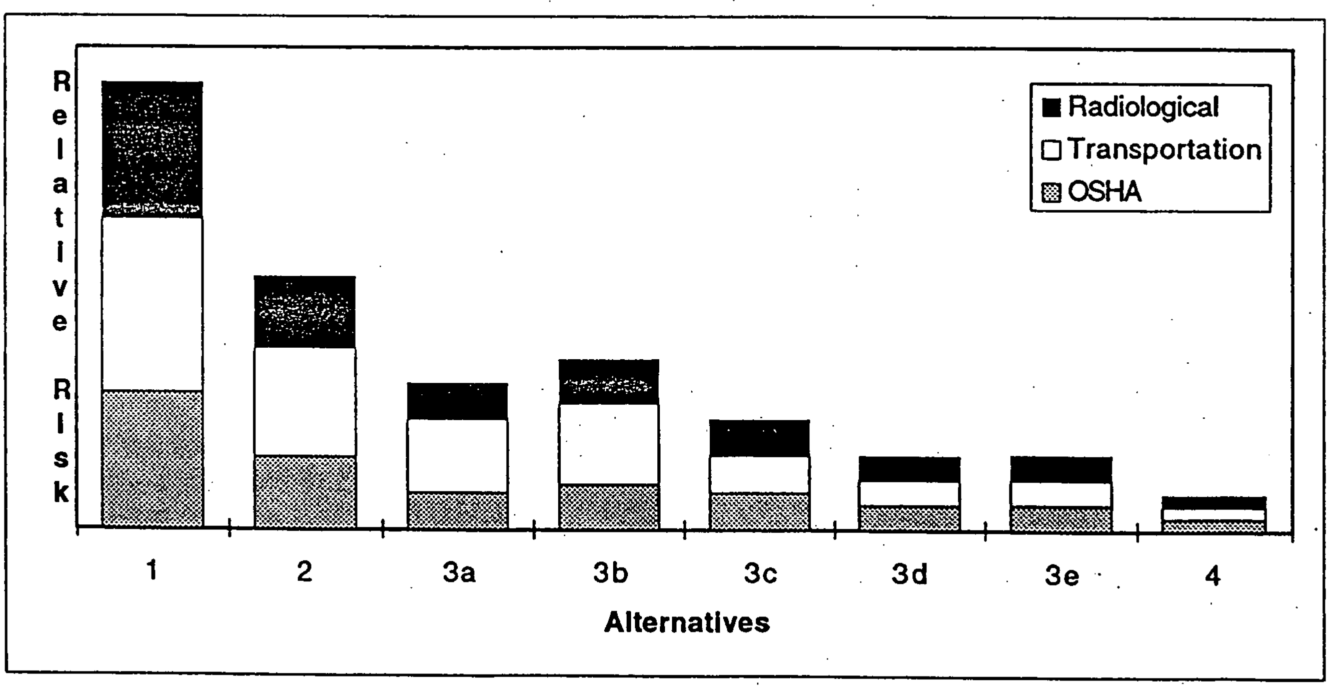


Figure H-2 Worker, Waste, DURING

Risk on this chart is relative

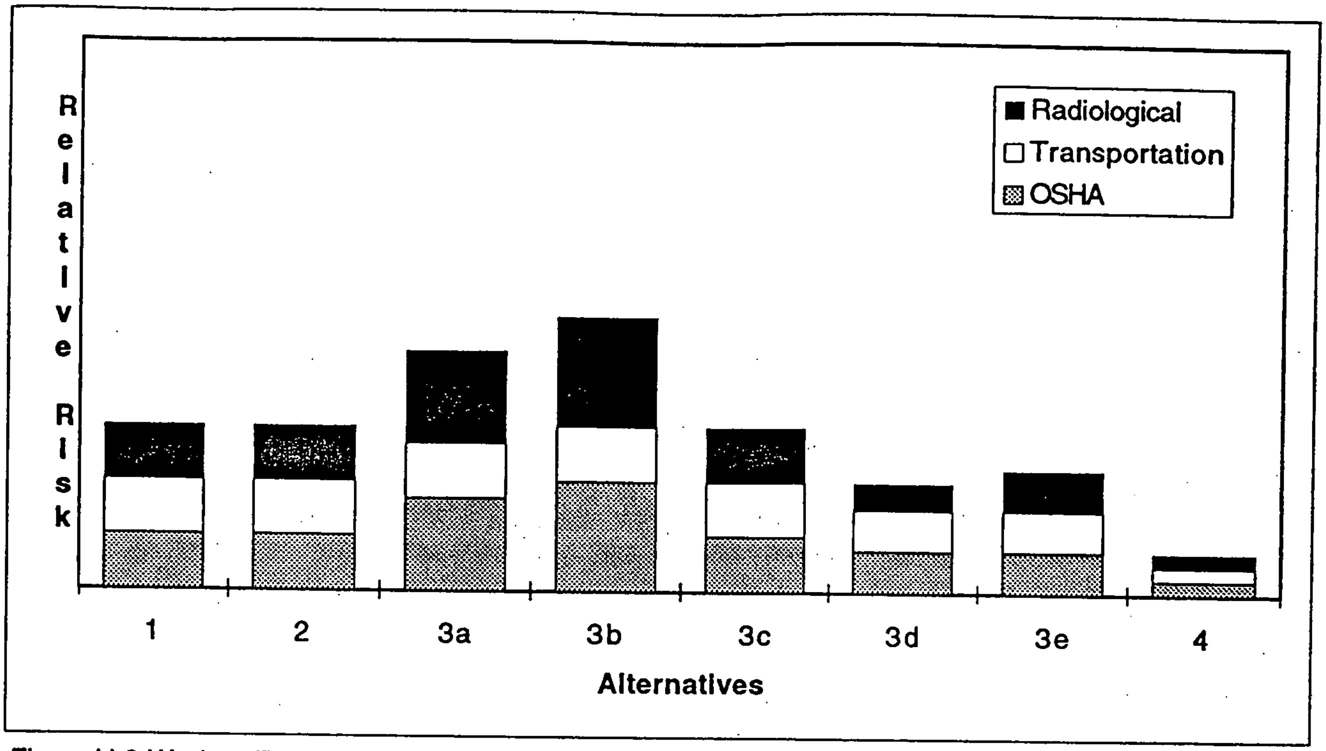


Figure H-3 Worker, Facility Decommissioning, DURING

Risk on this chart is relative.

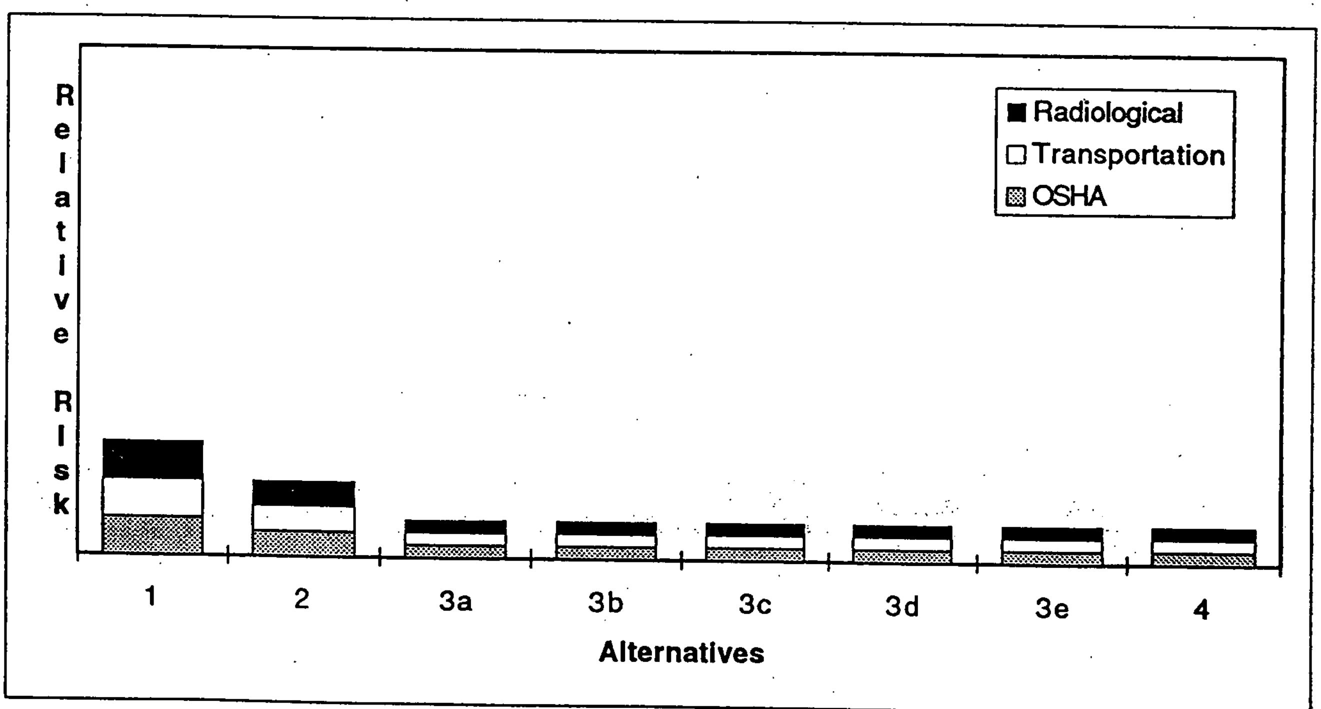


Figure H-4 Worker, Environmental Restoration, DURING

Risk on this chart is relative.

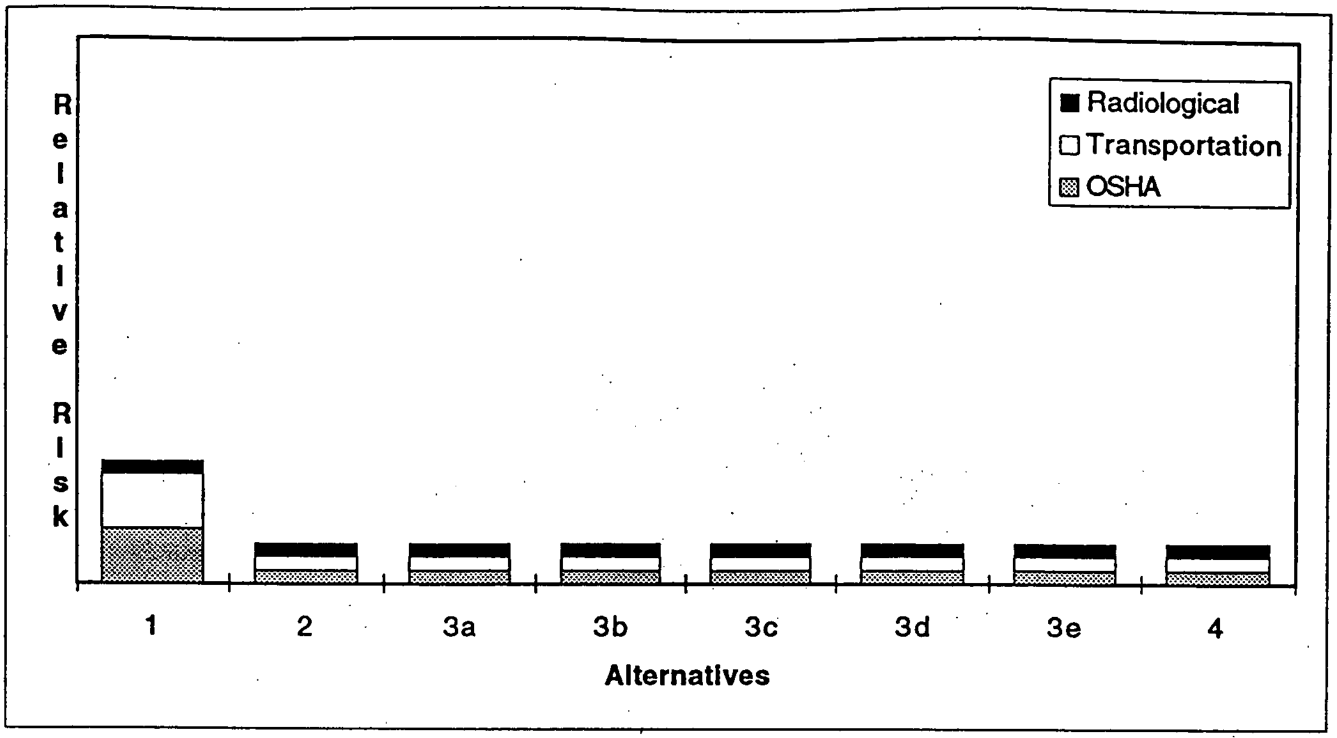


Figure H-5 Worker, Infrastructure, DURING

Risk on this chart is relative.

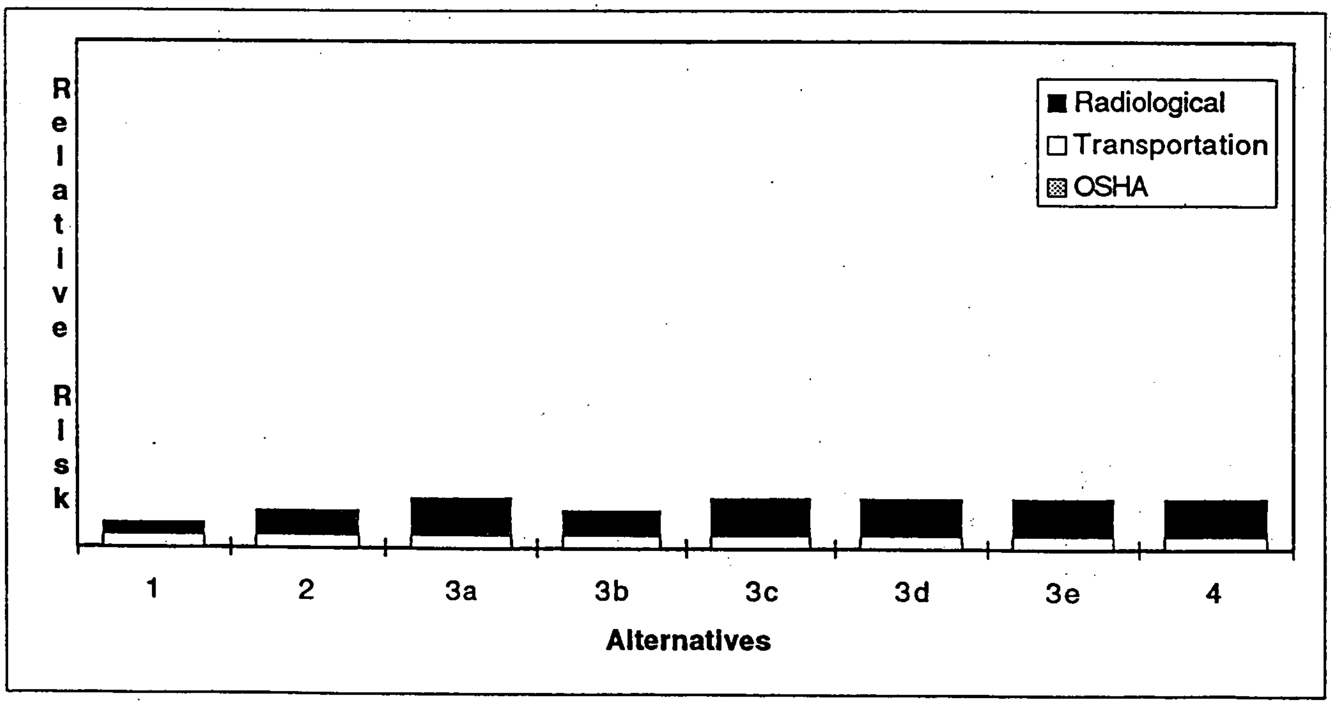


Figure H-6 Public, Special Nuclear Material, DURING

Risk on this chart is relative.

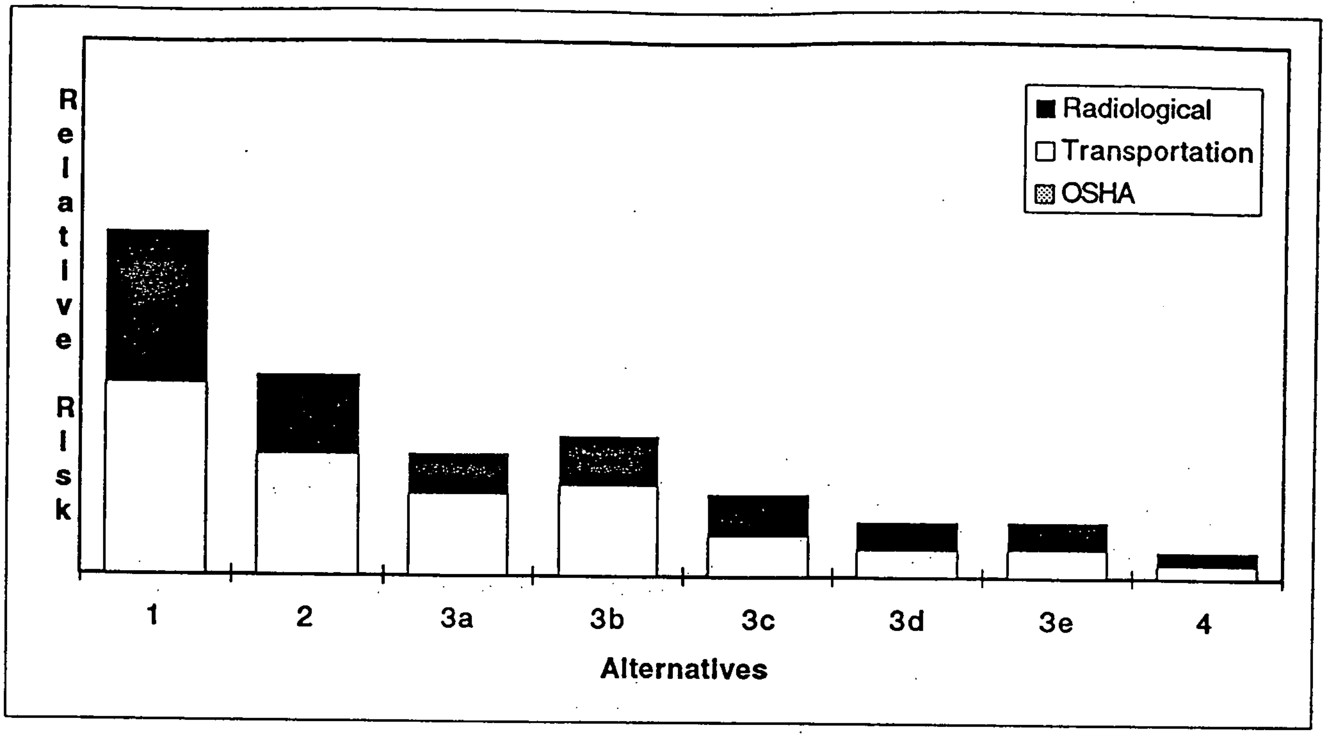


Figure H-7 Public, Waste, DURING

Risk on this chart is relative.

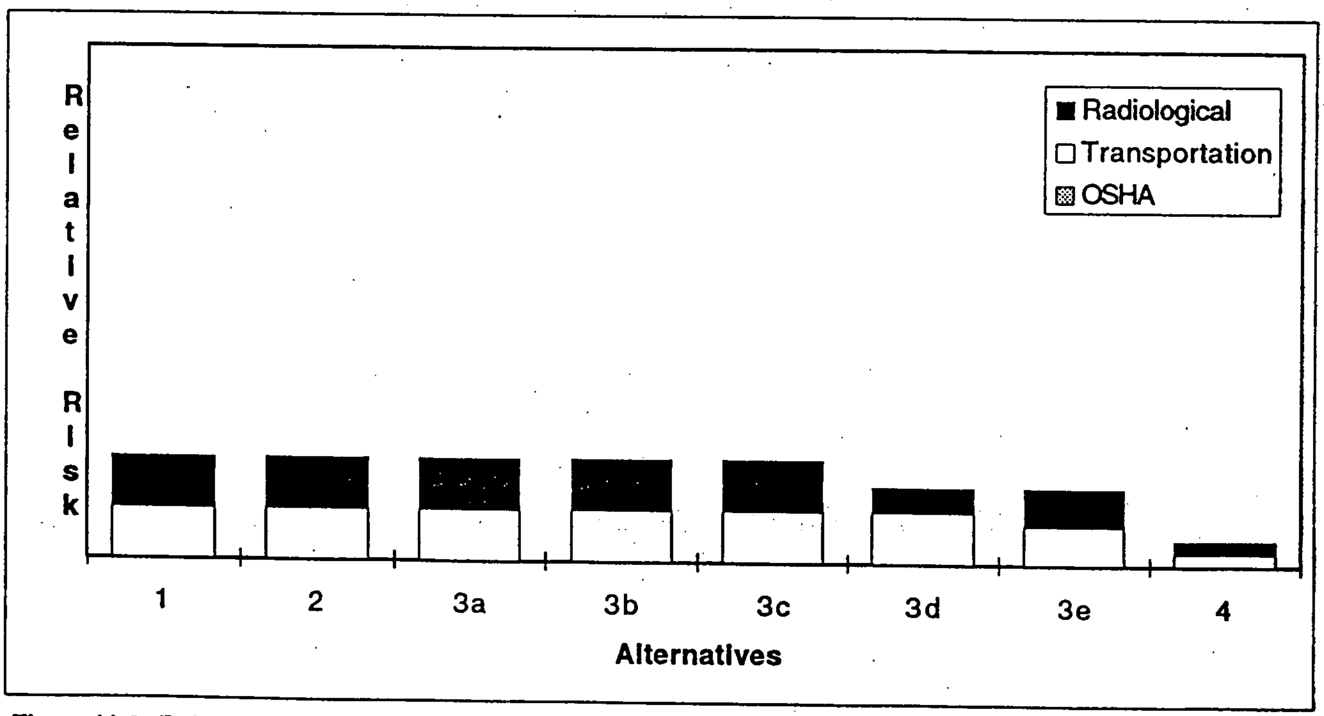


Figure H-8 Public, Facility Decommissioning, DURING

Risk on this chart is relative.

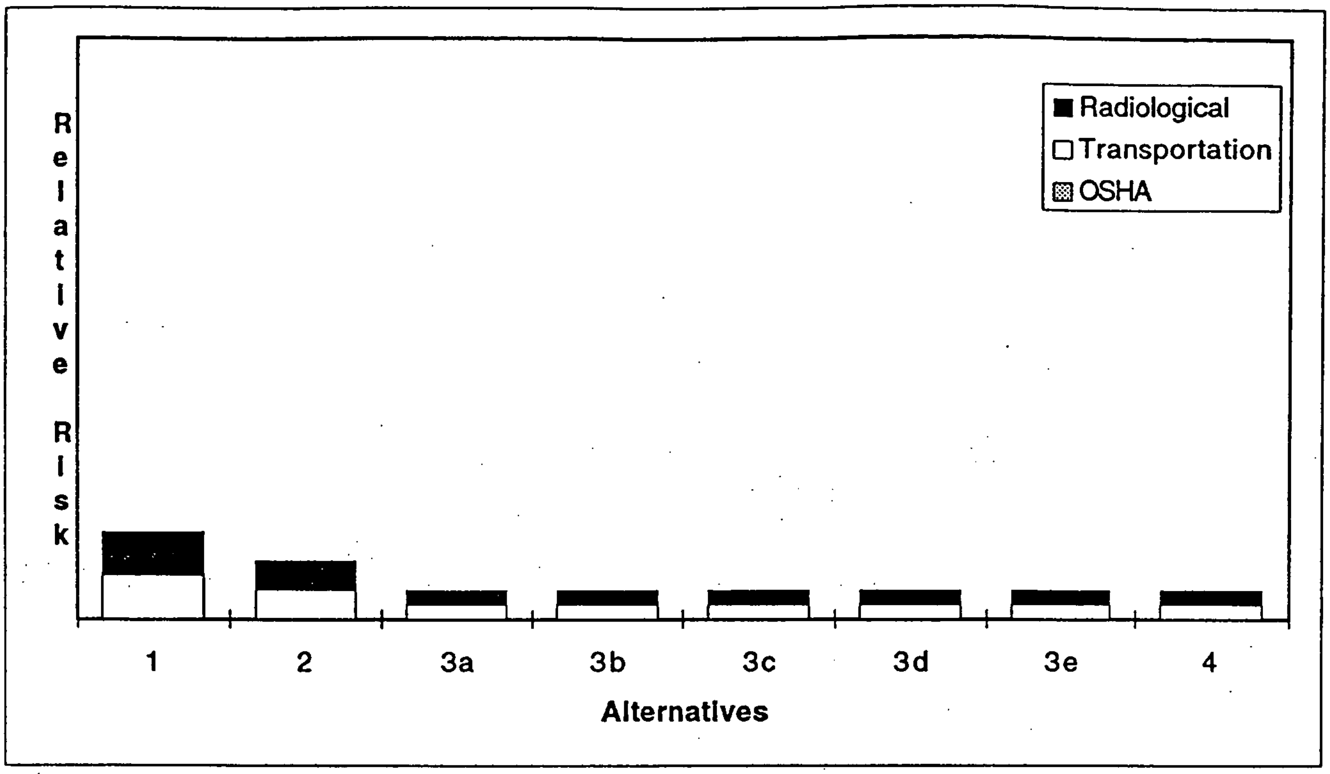


Figure H-9 Public, Environmental Restoration, DURING Risk on this chart is relative.

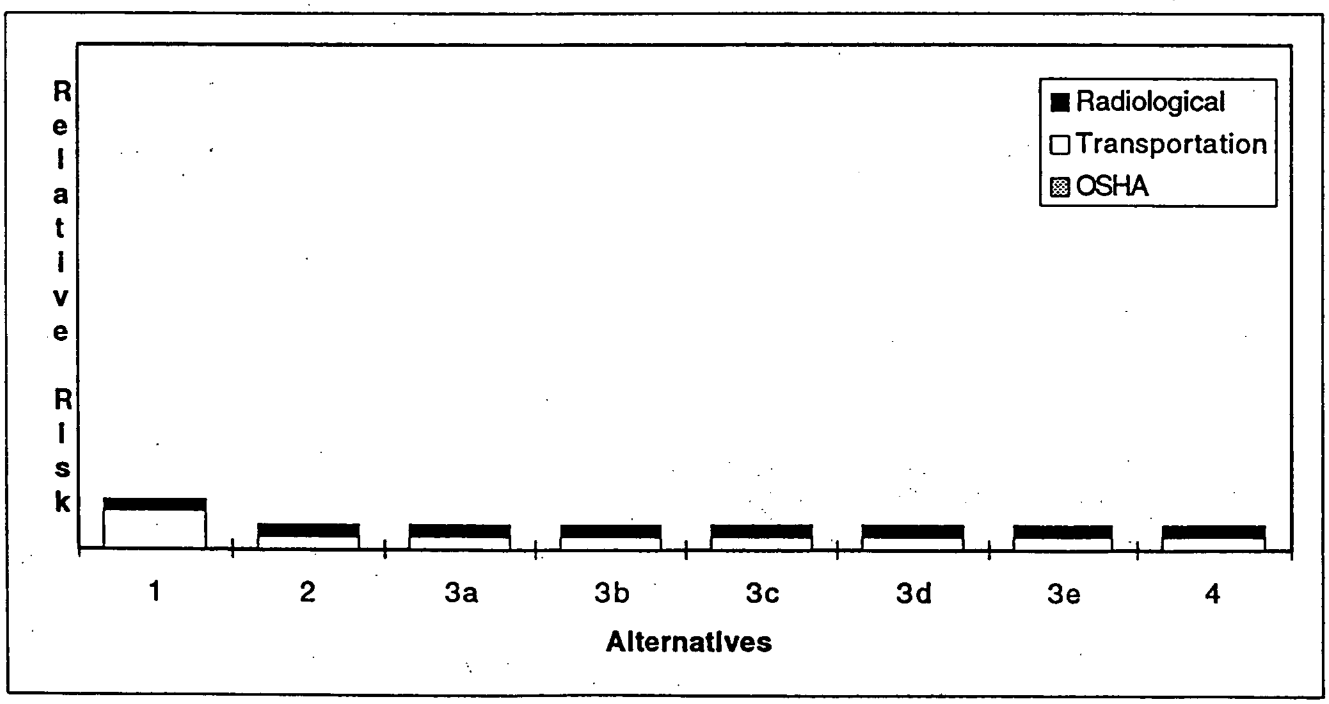


Figure H-10 Public, Infrastructure, DURING Risk on this chart is relative.

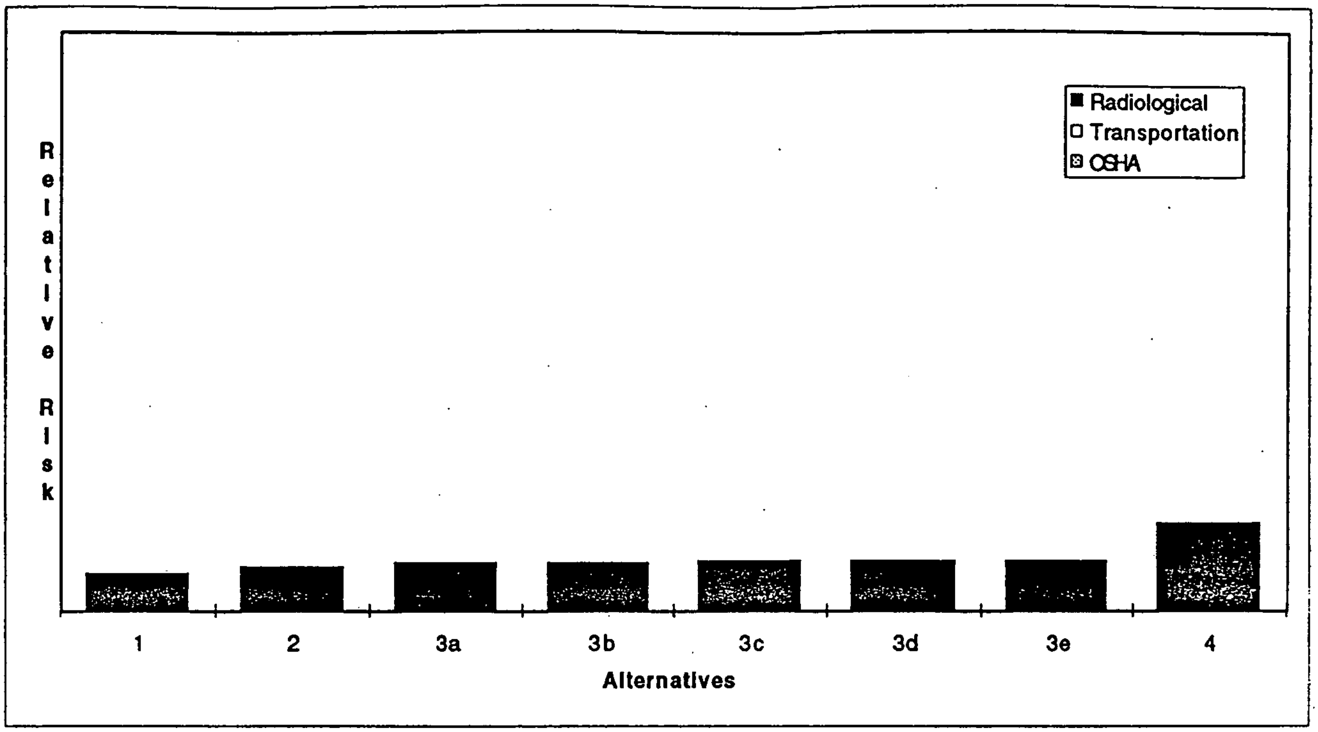


Figure H-11 Public, Cumulative, AFTER Risk on this chart is relative.

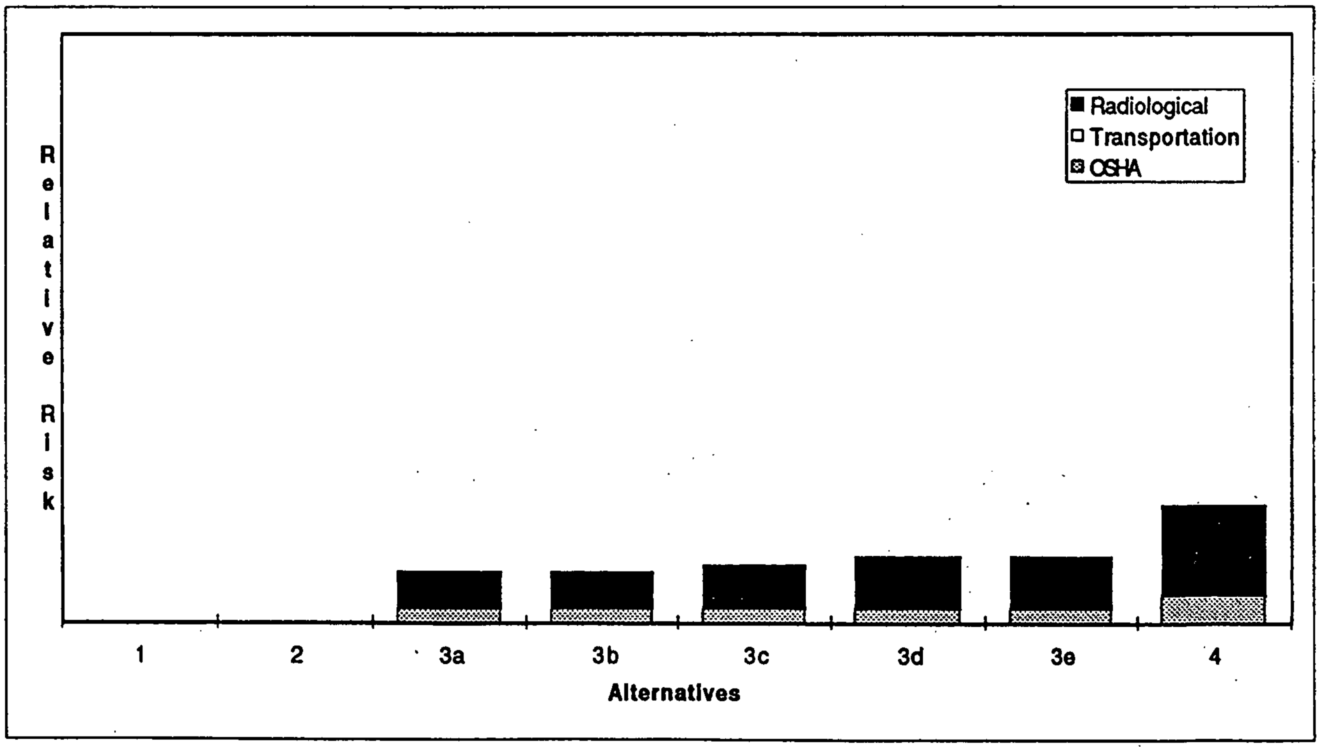


Figure H-12 Worker, Cumulative, AFTER Risk on this chart is relative.

APPENDIX I

DISCUSSION OF ALTERNATIVES

1.0 INTRODUCTION

Appendix I expands upon Section 2, Presentation of Alternatives; forms the basis for the comparisons presented in Section 3, Alternative Comparative Analysis; and provides a supplement to the cost and risk information included in Appendices G and H respectively.

1.1 Assumptions

A number of global assumptions were made during the preparation of this document and are provided here. Assumptions specific to particular alternatives are described in each subsection.

- The Site will be operated in compliance with applicable statutes, regulations, orders, and agreements negotiated with state and federal agencies.
- The Site will comply with all current collective bargaining agreements and the National Defense Authorization Act of Fiscal Year 1993, Section 3161.
- Costs are not escalated with regard to inflation unless specifically noted.
- WIPP will open in FY98 for disposal of TRU and TRM waste with an EPA No-Migration Variance to the LDR standards.
- The Nevada Test Site will be available to accept LDR-compliant LLMW in FY98.

2.0 ALTERNATIVE DETAILS

2.1 Organization of Alternative Descriptions

The focus of this discussion centers on two categories of key attributes and other interrelated factors: cost, schedule, and risk as shown in Figure I-1. The key attributes categories are: (1) Special Nuclear Material (SNM) attributes and (2) environmental attributes, which are presented in the format described in Figure I-2. The other interrelated factors are cost, schedule, and risk.

Cost forecasts are presented for both the interim end state (when the Site reaches a steady state condition) and the final end state. Individual logic diagrams identify the key activities and interdependencies for each alternative. Except for BEMR I, the logic diagrams do not include schedule information. The logic diagrams have been divided by task area: SNM, Waste Management, Facility Decommissioning, Environmental Restoration, and Infrastructure. Schedules also have been provided which contain more detail than the logic diagrams, and have been time-constrained. The schedules are partitioned by building areas to enable the user to follow the sequence of activities more easily. The schedules are derived from databases each containing over 1,000 activities, to function as a senior management tool to permit a high-level overview of the planned activities and their relationships. Finally, the risk discussion focuses on the significant contributors human health and environmental risk for each alternative.

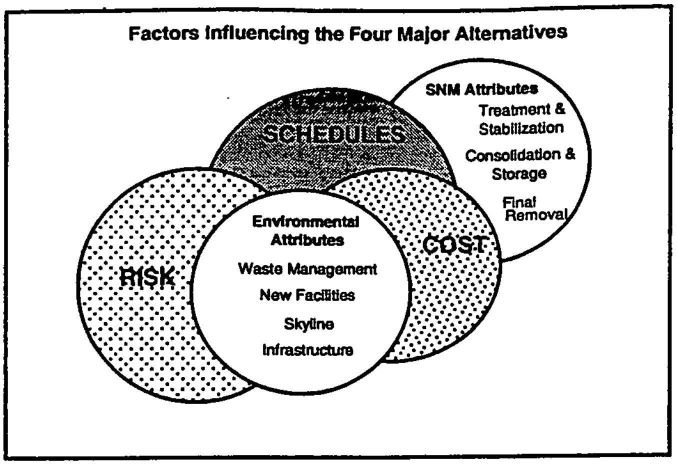


Figure I-1 Evaluation Parameters

2.X Alternative X

2.X.1 End State Description

2.X.2 Key SNM Attributes

- SNM Treatment and Stabilization
- Consolidation/Storage - Each alternative addresses onsite storage of SNM in terms of two possible options: construction of a new dedicated vault or upgrades of Building 371. Each alternative also considers whether solid residues are initially processed and packaged to meet WIPP WAC (and transportation requirements) or later, prior to shipment for disposal as TRU waste.
- Final Removal - Each alternative identifies the date by which the SNM material is assumed to leave the Site and be received by an authorized DOE repository.

2.X.3 Key Environmental Attributes

- *Waste Management*—Each alternative addresses disposition of the Site's inventory of nuclear and nonnuclear waste through disposal and/or retrievable and monitored storage. Disposal options mean that the waste material is placed in certain designated onsite/offsite areas with the understanding that no plans exist to ever move it.
- *New Facilities* — Each alternative describes any new facilities that would be constructed.
- *Skyline* — Skyline projects the view of the Site at the final end state of an alternative. Buildings, including or excluding foundations, would be decontaminated if necessary and either left standing or demolished.
- *Infrastructure* — Each alternative addresses disposition of the Site's connection to public utilities and conveyances during and at completion of the project (end state); and requirements for long-term monitoring and infrastructure upgrades.

2.X.4 Cost and Schedule

- *Cost*
- *Schedule*
- *Cost and schedule risk*

2.X.5 Risk (Human Health and Environment)

Figure I-2 Format for Discussion of Alternative Attributes

2.2 Alternative 1, Unrestricted

2.2.1 End State Description

This alternative would reclaim all of the land comprising the entire Site to a level that would permit residential housing development anywhere on the Site. It would be the most extensive of the land reclamation options and represents the upper boundary of land reclamation alternatives evaluated.

2.2.2 Key SNM Attributes

SNM – SNM would be consolidated and packaged for safe interim storage. All SNM would be removed by the year 2015. Residues would be stabilized and treated to waste acceptance criteria (WAC) for disposal at the Waste Isolation Pilot Plant (WIPP) and ultimately shipped offsite and disposed as TRU waste.

2.2.3 Key Environmental Attributes

Waste Management – All waste would be placed in monitored retrievable storage facilities until shipment to a final receiver. Buildings and their foundations would be excavated and removed. Truck and/or rail shipments would occur throughout the life-cycle and eventually all waste would be shipped offsite.

New Facilities – Three new low maintenance, interim storage and retrieval facilities for SNM, transuranic (TRU) waste, and low-level (LLW) and low-level mixed waste (LLMW) would be constructed.

Skyline – At the end of the alternative timeline, the skyline would be devoid of structures and buildings. All facilities, including the new facilities, would be decontaminated as required and demolished, including underlying structures.

Infrastructure – No infrastructure (roads, streets, above-and below-ground utilities) remain after Site closure.

2.2.4 Cost and Schedule

Cost – The total estimated cost range for Alternative 1, Unrestricted (in escalated 1996 dollars) is shown In Table I-1.

Table I-1
Estimated Total Project Cost - Alternative 1, Unrestricted

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
N/A	N/A	2029	(LOW) $13.50B	$5M
			(Most Probable) $22.50B	
			(HIGH) $47.80B	

1. Not applicable.
2. All work would be complete. Only long-term monitoring would remain.
3. Unescalated annual cost

The cost estimate for Alternative 1 is being presented as a range because of the extremely high uncertainty associated with remediating the Site to meet 10^{-6} residential standards. For example, in estimating the volume of LLMW requiring treatment to LDR standards, the range is from a total of $3 billion to $17 billion, with a total of $5 billion having been selected as the most probable cost. In comparing Alternative 1 to other alternatives, the most probable cost should be used. The reader must be aware, however, that the actual cost range is bounded by the low/high figures. The most probable cost represents a conservative estimate in terms of level of effort, unit pricing, waste volumes, schedule, treatment requirement, and infrastructure needs.

The relative costs in the areas of SNM, Waste Management, Facility Decommissioning, Environmental Restoration, and Infrastructure for Alternative 1 are high compared to the other alternatives. No funding profile was prepared for Alternative 1, since resource-leveling would render the alternative unworkable. At a funding level of $700M/yr, the escalated indirect costs in the year 2074 exceed available funding, making further work impossible. At that point (FY2074), several billion dollars of work would remain that could never be completed. For Alternative 1 only, the annual costs are presented as **unconstrained**.

Schedule – The Level 0 network logic diagram which leads to the complete unrestricted closure of the Site is shown in Figure I-3. All facilities constructed for interim SNM, transuranic mixed waste, and LLW/LLMW storage onsite would be removed at the end.

Figure I-4 shows the Level 1 schedule. For Alternative 1 only, the Level 1 schedule is not funding-constrained. To complete the activities within the period shown, a funding level in excess of $1 billion/year would be required, with a level of up to $1.8 billion/year necessary for the next 8 to 10 years.

Consistent with the Level 0 logic, this schedule shows that building decontamination and decommissioning (D&D) follows removal and processing of SNM metals, solutions, and residues. D&D in turn would be followed by ER. Waste management would continue throughout the schedule as waste is removed from facilities and IHSSs, placed in interim storage, and eventually shipped offsite for disposal.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – SNM consolidation and risk reduction must be evaluated on the basis of SNM safety and risk impact. A comparison of residue plans with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing is achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the new SNM storage facility would be needed, in addition to a failure analysis of protective barriers.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was not assumed for LDR treatment requirements. Treatment of all LLMW to land disposal restrictions (LDR) was assumed because all waste is shipped offsite.

- Other Issues Affecting Cost and Schedule – The issue posing the greatest risk to Alternative 1 is the difficulty in achieving adequate funding levels. Availability of adequate disposal facilities was assumed. Use of rail transport as compared to truck shipments must be evaluated in order to maximize offsite disposal in terms of cost and schedule efficiencies.

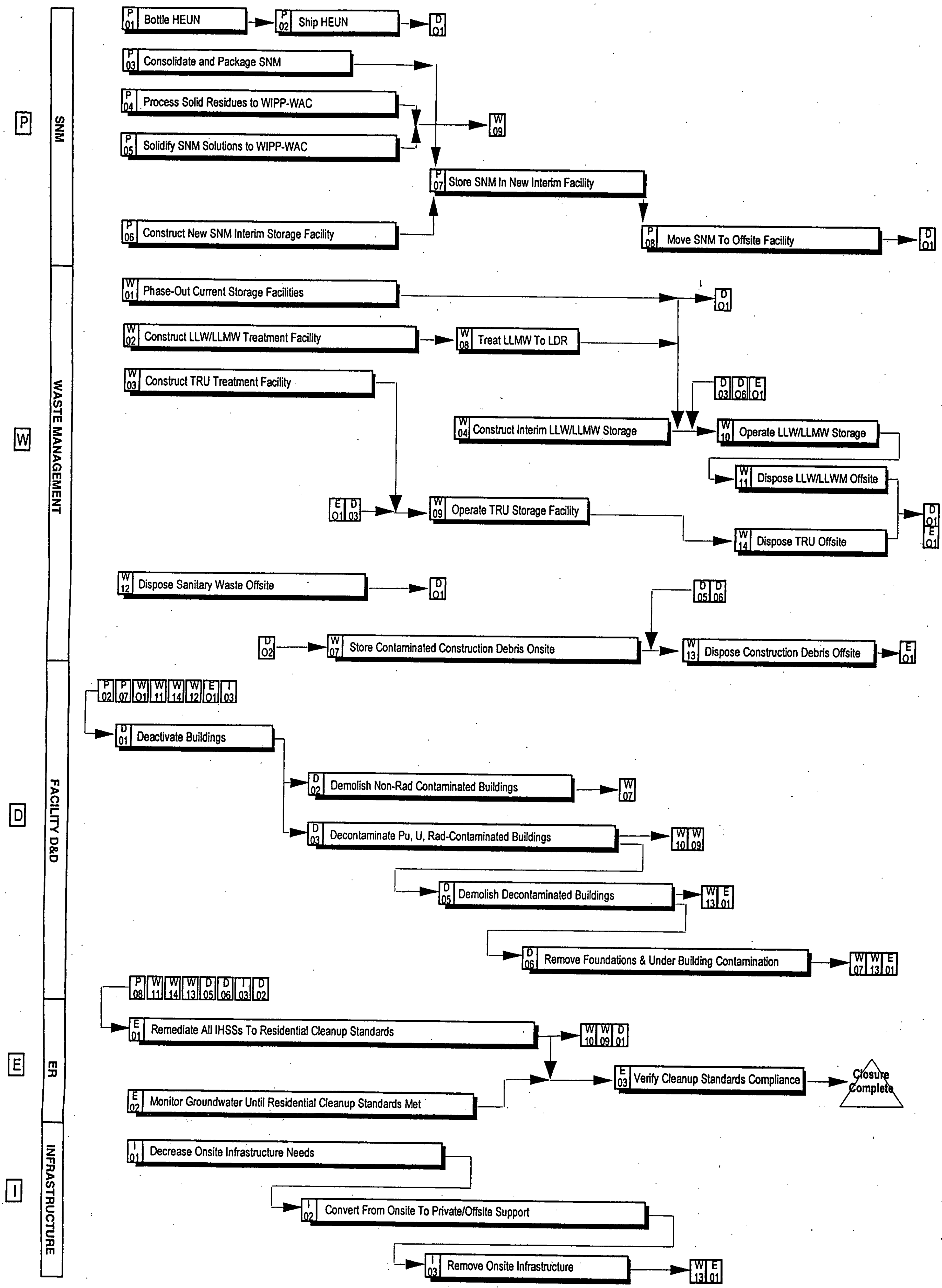


**Figure I-3 - Alternative 1, Unrestricted
Level 0 Logic**

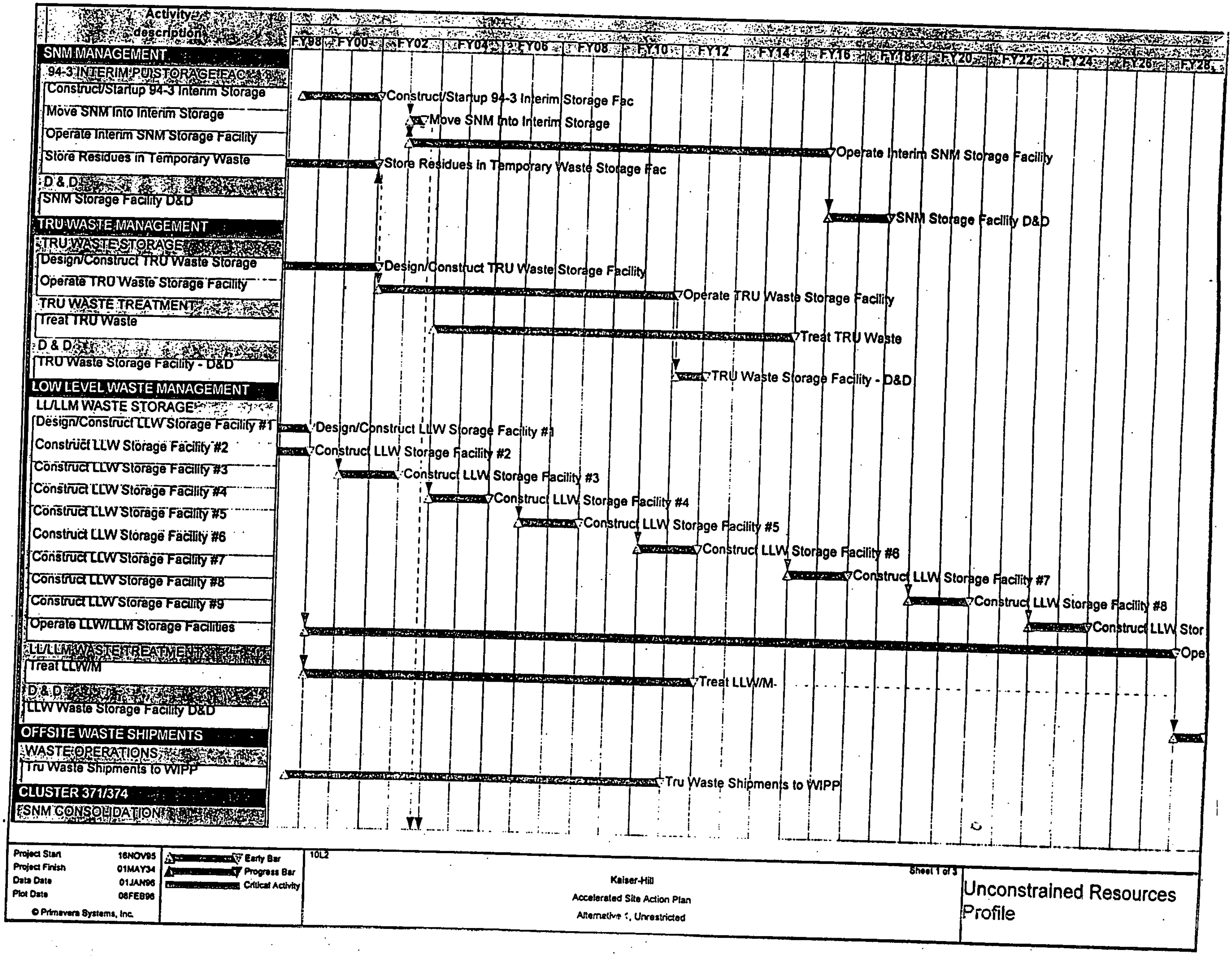


Figure I-4 Unrestricted Alternative - Level 1 Schedule

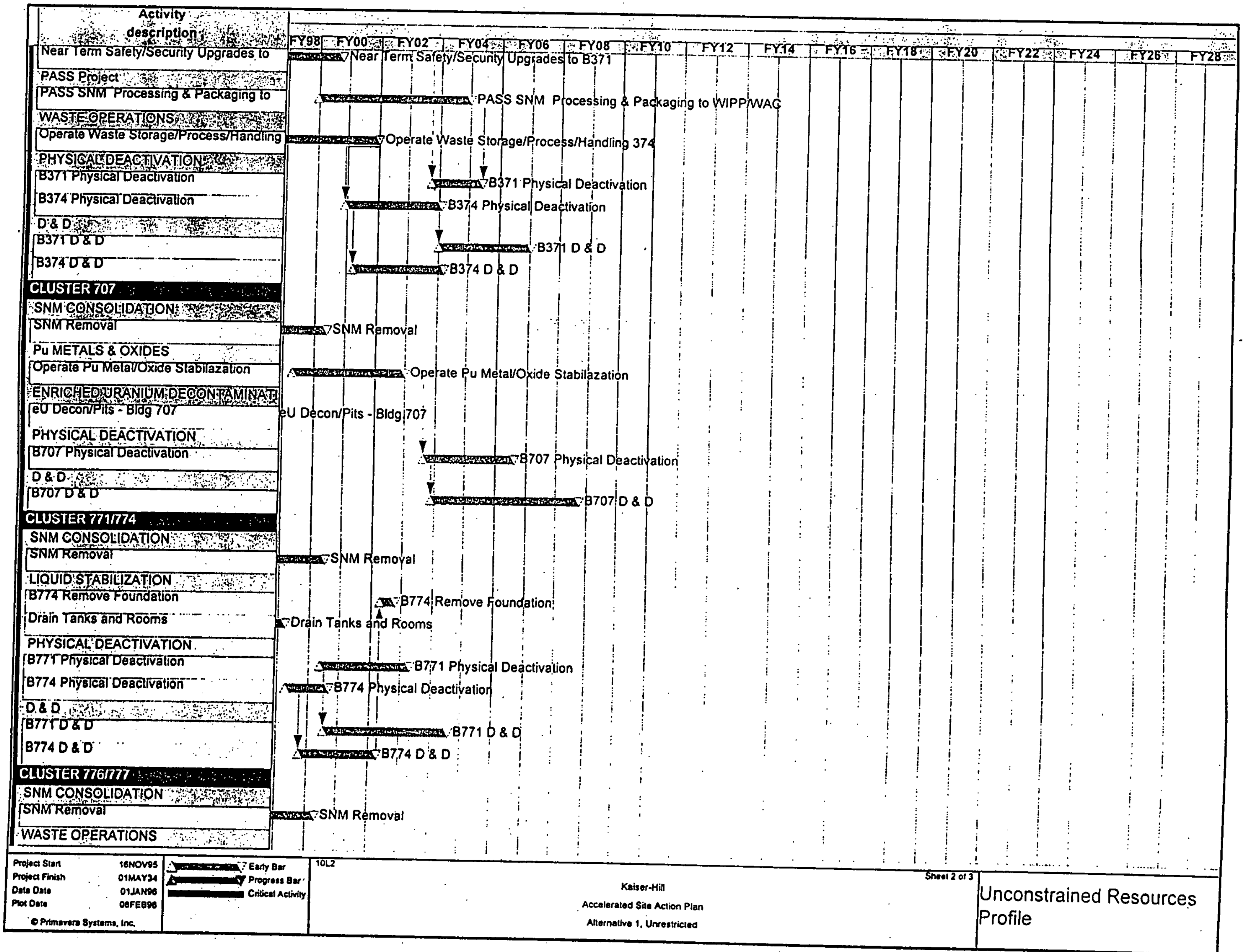


Figure I-4 Unrestricted Alternative - Level 1 Schedule (continued)

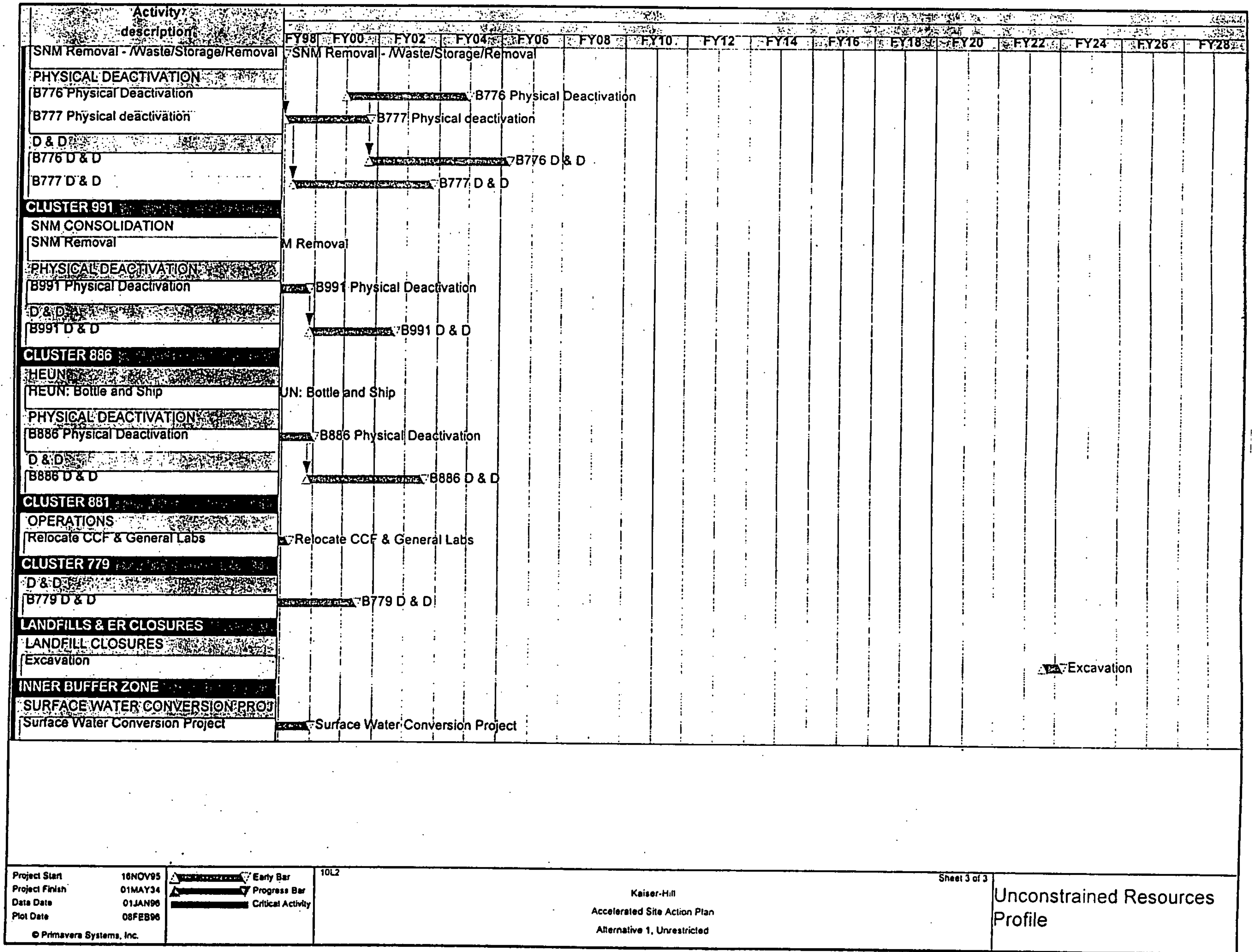


Figure I-4 Unrestricted Alternative - Level 1 Schedule (continued)

2.2.5 Risk

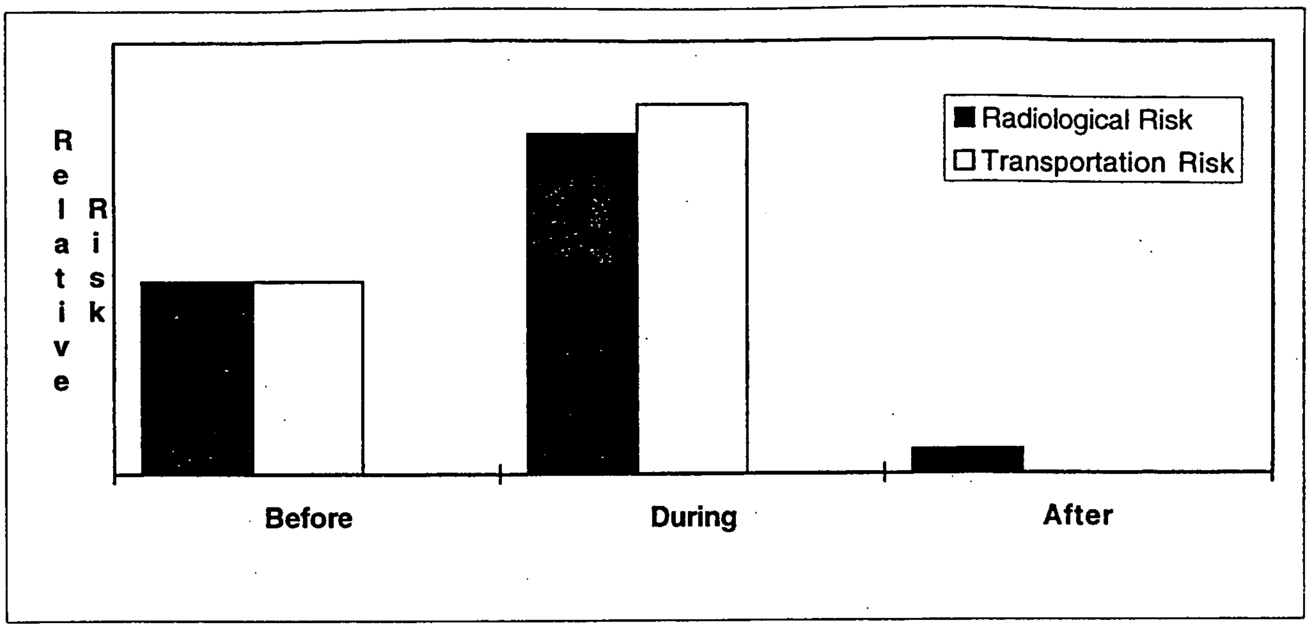
The processing and bottling of highly enriched uranyl nitrate (HEUN); SNM consolidation and repackaging; residue processing and packaging; and solution stabilization and packaging will all produce a radiological risk to the workers. However, these operations exist or are similar to operations that are ongoing or planned for the Site. These operations are included in every alternative, and there should be no significant difference in risk between the alternatives because of these operations.

The construction of new interim storage facilities for SNM, LLW, and TRU waste would contribute to worker exposure because of the additional handling of the radioactive material in the new facilities. This may be partially offset by the advantages of a new facility (e.g., more robust facility, less maintenance). Construction of these facilities also increases OSHA risk to workers because of increased activity levels, but reduces radiological risk to the public because the new facilities would be built according to current standards, reducing the potential for airborne emissions or other release mechanisms.

The removal of radioactively contaminated buildings, foundations, and surrounding soil is a contributor to worker radiological risk. The debris from demolition of these buildings, nonradiological buildings (which may be contaminated with hazardous materials), and the infrastructure may be significant contributors to worker OSHA risk and transportation risk because of the mass of materials involved. The radiological risk to the public is expected to incrementally increase during demolition because of the potential for contaminants to become airborne or enter water sources, but decrease in the long-term because of the elimination of the source material which contributes to the current small exposure risk to the public

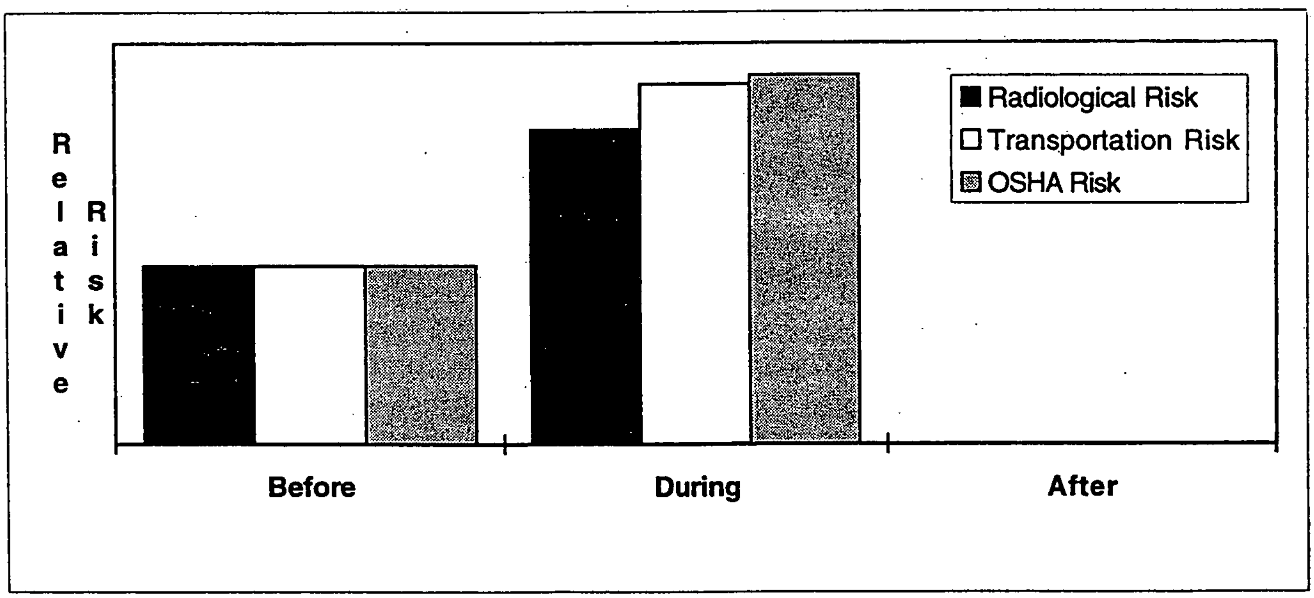
The extensive cleanup of individual hazardous substance sites (IHSSs) would increase the radiological and transportation risk to workers because of the amount of material involved. The transportation risk to the public would also increase because of the significant number of over-the-road (or rail) shipments which could number in the tens of thousands. However, on an individual basis, the risk is expected to be small for each shipment. Eventually, the shipments would stop, and the transportation risk to the public would be eliminated; the overall radiological health risk to the public would decrease to essentially zero.

Figures I-5 and I-6 present qualitative public and worker risk profiles for Alternative 1, Unrestricted.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-5 Public Risk, Alternative 1 - Unrestricted



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-6 Worker Risk, Alternative 1 - Unrestricted

2.3 Alternative 2, Baseline Environmental Management Report (BEMR I)

2.3.1 End State Description

The 1995 Baseline Environmental Management Report (BEMR I), a mandatory annual report from DOE, HQ to Congress, provided 1995 projections of scope, schedule, and life-cycle costs for all DOE Environmental Management (EM) activities at the Site. This alternative represents early Site life-cycle planning with clean up to 10^{-5} (one-in-one-hundred-thousand) open-space and recreational use standards for the Buffer Zone, and 10^{-4} (one-in-ten-thousand) industrial standards for the Industrial Area. Consideration would be given to facilitating economic development onsite. Regulatory flexibility was assumed for the IAG requirements. Using an annual cash flow projection of $750 to $800 million per year, the total life-cycle costs would range between about $22 to $38 billion (unescalated) with cleanup activities being complete by 2060 per DOE, HQ models, and $44 billion (unescalated) per Site models with cleanup activities complete by 2070. The Site modeling projected escalated life-cycle costs at $94 billion.

2.3.2 Key SNM Attributes

SNM – SNM would be consolidated and packaged for safe storage in Building 371 in Alternative 2. All SNM residues would be removed by the year 2020. Residues would be reprocessed, repackaged, shipped offsite, and disposed as TRU waste.

2.3.3 Key Environmental Attributes

Waste Management – All waste would be stored in existing monitored retrievable facilities until disposal offsite. Facilities would be decontaminated and demolished. The first twelve inches of material below the lowest floor level would be removed. Construction debris would be disposed offsite. The only nonretrievable waste that would be disposed onsite would be nonradioactive sanitary waste. Truck and/or rail shipments of wastes would take place throughout the life-cycle of activities.

New Facilities – No new facilities would be constructed.

Skyline – The skyline would be devoid of all structures and buildings.

Infrastructure – The majority of utility infrastructure would be removed except for the road network and water distribution. Onsite infrastructure would be maintained until support functions were completed.

2.3.4 Cost and Schedule

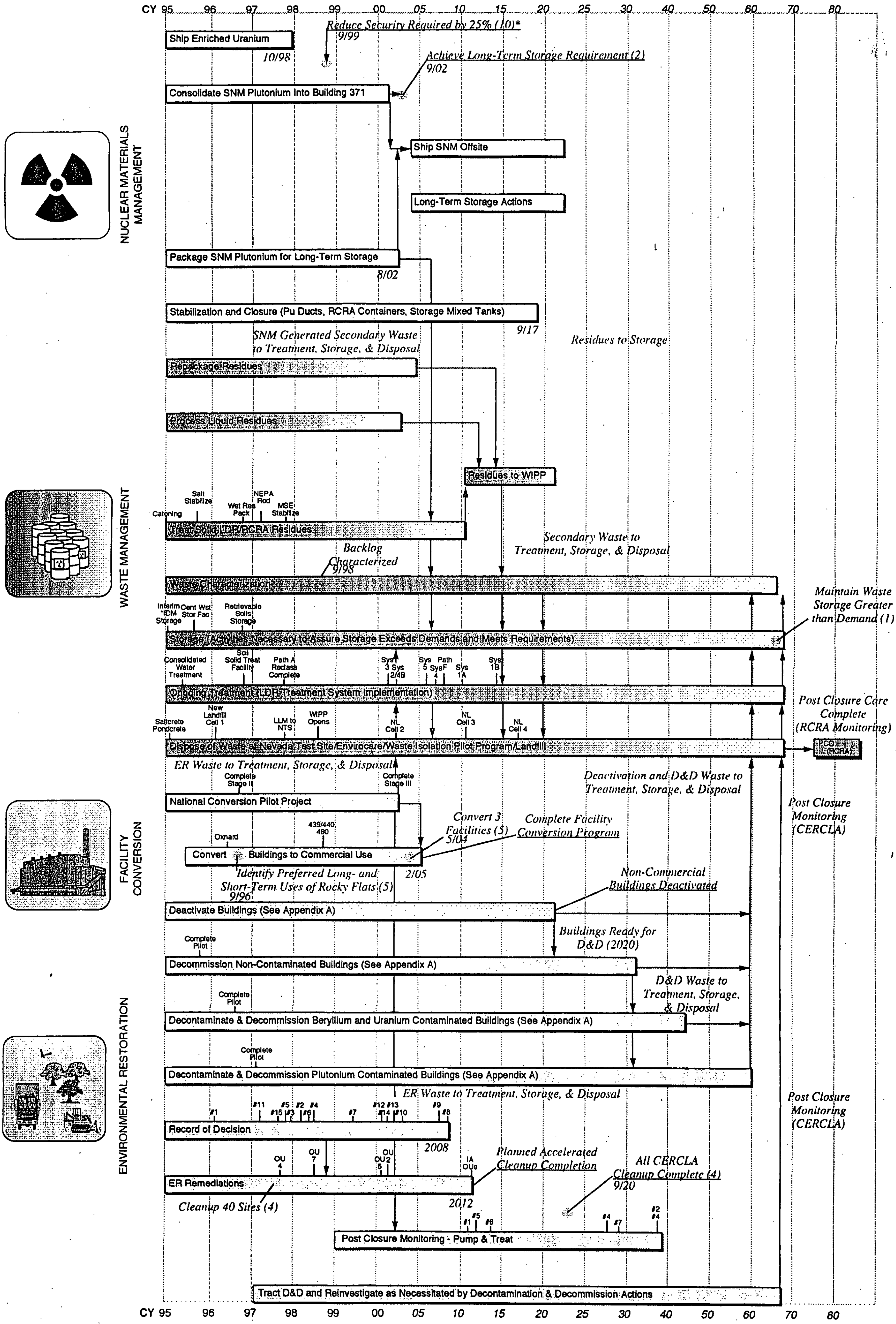
Table I-2 summarizes the BEMR I total life-cycle cost estimate for the Site. These figures were generated by Site modeling efforts and are shown in unescalated FY96 dollars because this estimate was prepared one year earlier than the other alternatives and used different cost methods. The associated schedule and logic information is provided in Figure I-7.

The unescalated costs shown in Table I-2 and the schedule/logic diagram were extracted directly from the BEMR I document and no attempt has been made to reconfigure this information into the format used for the other alternatives. The BEMR forecasts are based upon different assumptions and constraints than the other alternatives, and are provided here only as a point of reference.

Table I-2
Estimated Total Project Cost - Alternative 2, BEMR I

Interim End State[1]		Final End State[2]		Annual O&M Cost[4] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
N/A	N/A	2060	$21.1B[3]	$10M

1. Not applicable.
2. All work would be complete. Only long-term monitoring would remain.
3. Includes productivity improvements
4. Unescalated annual costs



* IDM - Investigatively Derived Materials

Note:
CY = Calendar Year
Parenthetical Numbers Refer to Strategic Objectives
Time Scale is Not Linear

Figure I-7 Alternative 2, BEMR I Logic

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – The BEMR I forecast did not necessarily consider the implications of all current DNFSB recommendations because its preparation preceded those recommendations.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was assumed for IAG milestones and cleanup levels. Treatment of all LLMW to LDR requirements was assumed.

- Other Issues Affecting Cost and Schedule – The resources required to execute the Site's BEMR I plans exceeded the FY95 estimated funding projections because of funding decreases occurring after BEMR I was prepared.

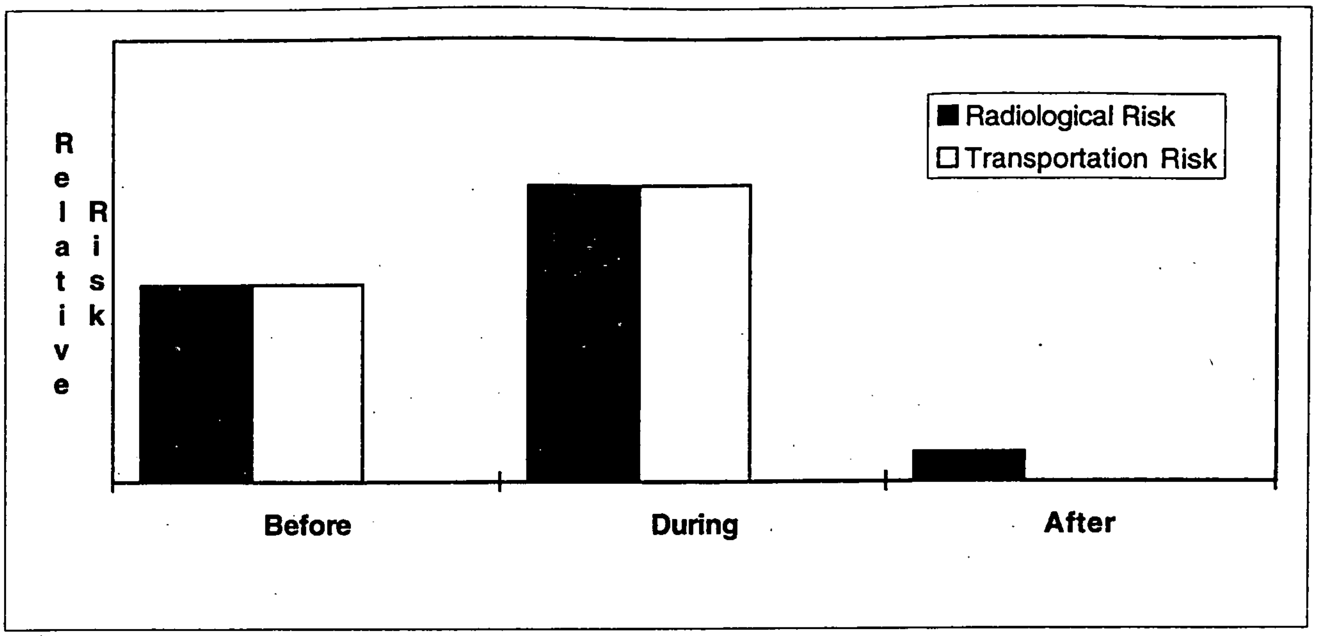
2.3.5 Risk

The contributors to risk for Alternative 2 are the same as those already discussed for Alternative 1, Unrestricted except that there would be no new construction. The standards being used for remediation in Alternative 2 would decrease the amount of material handled and the amount of time needed compared to Alternative 1. Consequently, workers would experience a decrease in the radiological, OSHA, and transportation risk during implementation, compared to Alternative 1.

However, this trend may be offset by increased radiological exposures from maintenance, increased inspections, and other activities that would be needed in older buildings. The public may see a relative rise in risk during implementation because of increased risk from the existing storage buildings which were built to earlier standards and might not meet current standards for criteria such as resistance to seismic events.

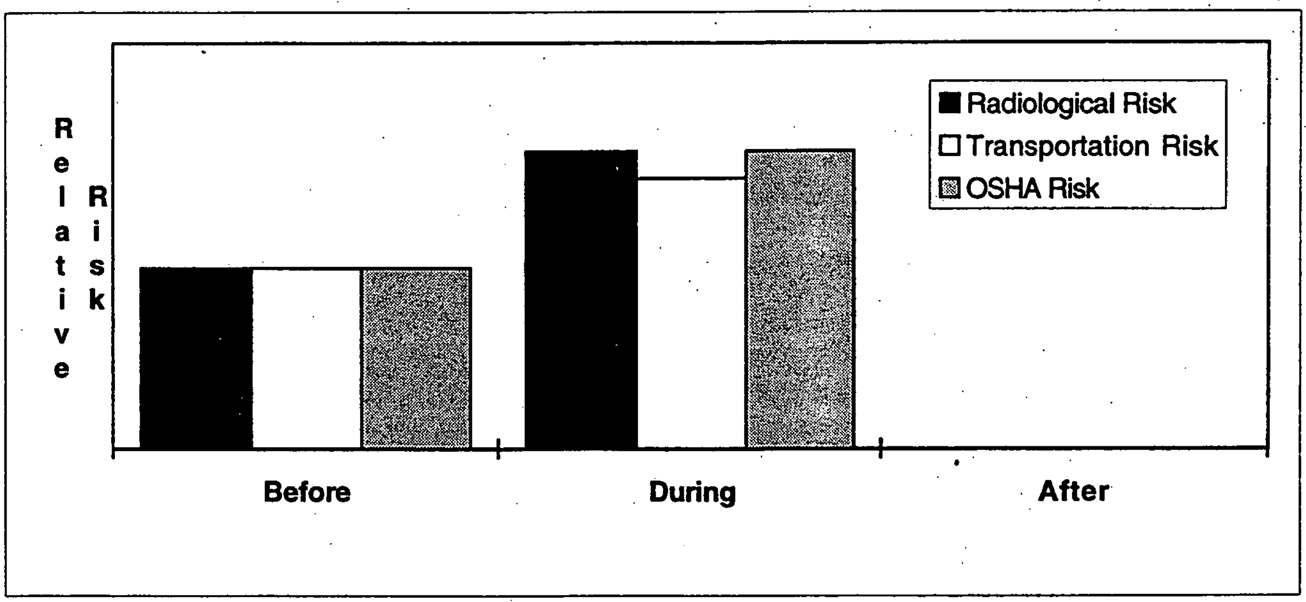
Although the relative transportation risk to the public during implementation would decrease because of reduced offsite disposal, the remaining soil would leave the public with an increased radiological risk, compared to Alternative 1, because less strict remediation standards were used.

Figures I-8 and I-9 present qualitative public and worker risk profiles for the Alternative 2, BEMR I.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-8 Public Risk, Alternative 2 - BEMR I



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-9 Worker Risk, Alternative 2 - BEMR I

2.4 Alternative 3a, Phased Shipment

2.4.1 End State Description

At final closure, the Site would be retained in a state that would control access to the capped areas of the Site and would restrict the use of the inner Buffer Zone and the Industrial Area. The Phased Shipment Alternative allows for some infrastructure to remain. Alternative 3a represents planned retrievability of all onsite waste.

2.4.2 Key SNM attributes

SNM – SNM would be consolidated and packaged for safe interim storage. All SNM would be removed by the year 2015. Residues would be stabilized and treated to meet WIPP WAC just prior to shipment offsite for disposal as TRU waste.

2.4.3 Key Environmental Attributes

Waste Management – LLW/LLMW and TRU/TRM wastes would be stored in monitored and interim facilities until an offsite receiver became available. The foundations would be excavated and stored for eventual disposal. The volume of contaminated waste generated is expected to be minimal. Nonradioactive construction debris would be disposed onsite unless it is more cost-effective to be disposed offsite. TRU/TRM waste, LLW/LLMW, and newly generated Sanitary waste would be disposed offsite. Approximately 50 truck and/or rail shipments of waste per year are assumed once shipping begins. The amount of waste managed under this alternative would be considerably less than Alternatives 1 and 2 because cleanup is limited to only those IHSSs which present significant risk (estimated at 55).

New Facilities – Three new low maintenance storage facilities for SNM, TRU wastes, and LLW/LLMW would be constructed.

Skyline – At the end of the Alternative 3a timeline, the skyline would be devoid of all structures and buildings including the new facilities.

Infrastructure – Minimal onsite infrastructure supporting the new facilities would remain only for as long as needed. This includes roads and a small onsite septic system. Additional site support capabilities and utilities would be provided by public and commercial sector

2.4.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 3a, Phased Shipment (in escalated 1996 dollars) is shown in Table I-3.

Table I-3
Estimated Total Project Cost – Alternative 3a, Phased Shipment

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2009	$8.880B	2023	$14.6B	$14M

1. SNM Consolidation, and most D&D would be complete; only WM treatment/storage/disposal, SNM shipment offsite, and final ER activities would remain.
2. Removal of all waste and D&D of temporary facilities would be complete. Only long-term monitoring remain.
3. Unescalated annual costs.

The uncertainties described for Alternative 1, Unrestricted also impact this alternative but to a much lesser extent. The cost estimate for Alternative 1 was presented in the low/probable/high format due to the extremely high uncertainty associated with remediating the Site to meet 10^{-6} (one-in-one-million) residential standards for public risk and the length of time to complete the activity. For the remaining alternatives, only cost tables and single-case schedules are provided.

The relative costs of waste management, facility decommissioning and infrastructure task for Alternative 3a are lower than for the Unrestricted Alternative but slightly higher than for Alternative 2, BEMR. In comparison to the costs of the remaining alternatives yet to be discussed, Alternative 3a is slightly higher than Alternatives 3c, d, e, and 4.

Schedule – The alternative Level 0 network logic diagram is shown in Figure I-10. This logic identifies the key activities and their interdependencies for this alternative and also is applicable to all of the Retrievable and Monitored Storage/Disposal Alternatives, 3a through 3e, and Alternative 4, Mothball. The variations among the alternatives are listed in the notes to Figure I-10. Figure I-11 shows the Level 1 schedule for Alternative 3a. To apply the $700 million/year funding constraint, activities and selected task area costs were delayed in time until the cost of work, including escalation, would never exceed the $700 million mark in any one year.

In Alternative 3a, offsite waste shipments would begin as soon as practical, (i.e., after critical risk reduction activities were completed) and at an initial rate of approximately 50 shipments per year. As other work would be completed and funding became available, the shipping rate would increase until all waste would eventually be removed from the Site. Durations for D&D activities include time for removal of building foundations. As compared to Alternative 1, this schedule includes an ongoing groundwater monitoring program. All SNM would be removed from the Site by 2015.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – A comparison of residue plans with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing was achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the new SNM storage facility would be needed, in addition to a failure analysis of protective barriers. Temporary storage facilities would be required to facilitate transportation of all waste offsite.

- Regulatory Issues Affecting Cost and Schedule — Regulatory flexibility was assumed for Interagency Agreement (IAG) milestones, but not for LDR treatment requirements. Treatment of all LLMW to LDR requirements was assumed to occur just prior to shipment.

- Other Issues Affecting Cost and Schedule — The cost of aboveground storage facilities as compared to capped, monitored, and retrievable storage facilities would need to be evaluated.

Notes on Figure 1-10, Level 0 Network Logic Diagram
(Shown on fold-out facing this page)

(1) SNM logic is the same for the Retrievable, Monitored and Storage/Disposal Alternatives, 3a through 3e, except residue processing to meet WIPP WAC, which occurs later in 3a, Phased Shipment and 3b, Priority Shipment, than in the other alternatives. In 3b, Priority Shipment, consolidation and risk reduction would be delayed, and funding of residue stabilization and SNM consolidation are based on risk with priority given to shipment.

(2) Alternative 3d, Leveled Buildings would place remediation and D&D waste, which must be moved, into capped, retrievable, and monitored storage facilities. Waste within the cap footprint which does not need to be moved would be capped in place.

(3) Alternative 3d, Leveled Buildings would leave building foundations in place, but no waste would be placed in the foundations prior to capping.

(4) Alternatives 3c, Excavation; 3d, Leveled Buildings; 3e, Entombment and Landfill; and 4, Mothball assume regulatory flexibility for LDR treatment where LLMW is treated to provide safe, long-term protection of the workers, the public, and the environment, but not necessarily to meet prescriptive LDR standards. In Alternative 3a, Phased Shipment, waste would be treated to LDR just prior to shipment; in Alternative 3b, Priority Shipment, waste is treated to LDR before storage.

(5) Alternative 4, Mothball assumes no removal of under-building contamination, indefinite institutional controlled access and long-term physical security for the industrial area, and indefinite maintenance of groundwater management systems.

(6) Alternatives 3c, Excavation; 3d, Leveled Buildings; and 4, Mothball assume onsite disposal of LLW/LLMW in retrievable and monitored storage/disposal facilities instead of the entombed foundations and RCRA landfill assumed in 3e, Entombment and Landfill. In Alternatives 3a, Phased Shipment, and 3b, Priority Shipment, retrievable waste would eventually be disposed offsite.

(7) Alternatives 3a, Phased Shipment, and 3b, Priority Shipment, assume waste would be stored in aboveground storage facilities while awaiting shipment offsite; although the capacity needs for Alternative 3b are less than those for Alternative 3a. Alternative 3b, Priority Shipment assumes limited new storage (aboveground) to facilitate maximum shipment only.

(8) Alternatives 3c, Excavation; 3d, Leveled Buildings; and 4, Mothball, assume construction of onsite capped, retrievable, monitored storage/disposal of some configuration.

(9) Alternative 4, Mothball assumes all facilities would be left standing vacant unless demolition is more cost-effective. Decontamination would be performed to achieve standards necessary to terminate operation of all safety equipment and to shut off utilities.

(10) Alternative 3c, Excavation would include excavation of foundations with debris being placed in capped, retrievable and monitored storage/disposal facilities.

(11) Alternative 4, Mothball may require additional monitoring. Alternative 3b, Priority Shipment, may require road upgrades to handle shipping volumes.

(12) Alternative 4, Mothball, assumes most infrastructure would be located offsite with infrastructure at the minimum level necessary to ensure safety and the structural integrity of facilities (e.g., minimal utilities, passive ventilation, and minimal lighting).

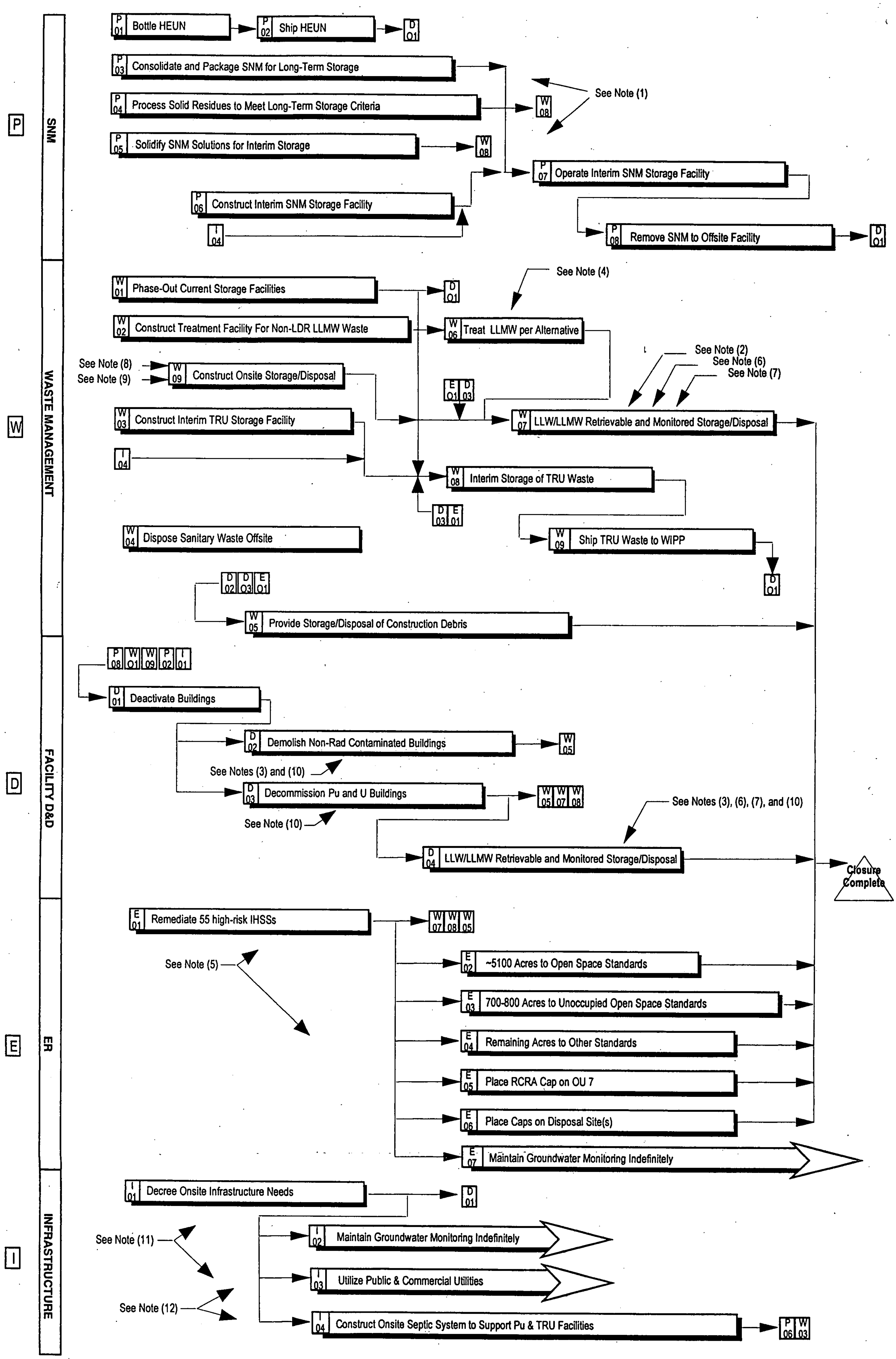


Figure I-10 - Mothball and Retrievable, Monitored Storage and Disposal Alternatives
Level 0 Logic (Baselined to 3a with annotations for 3b - 3e and 4)

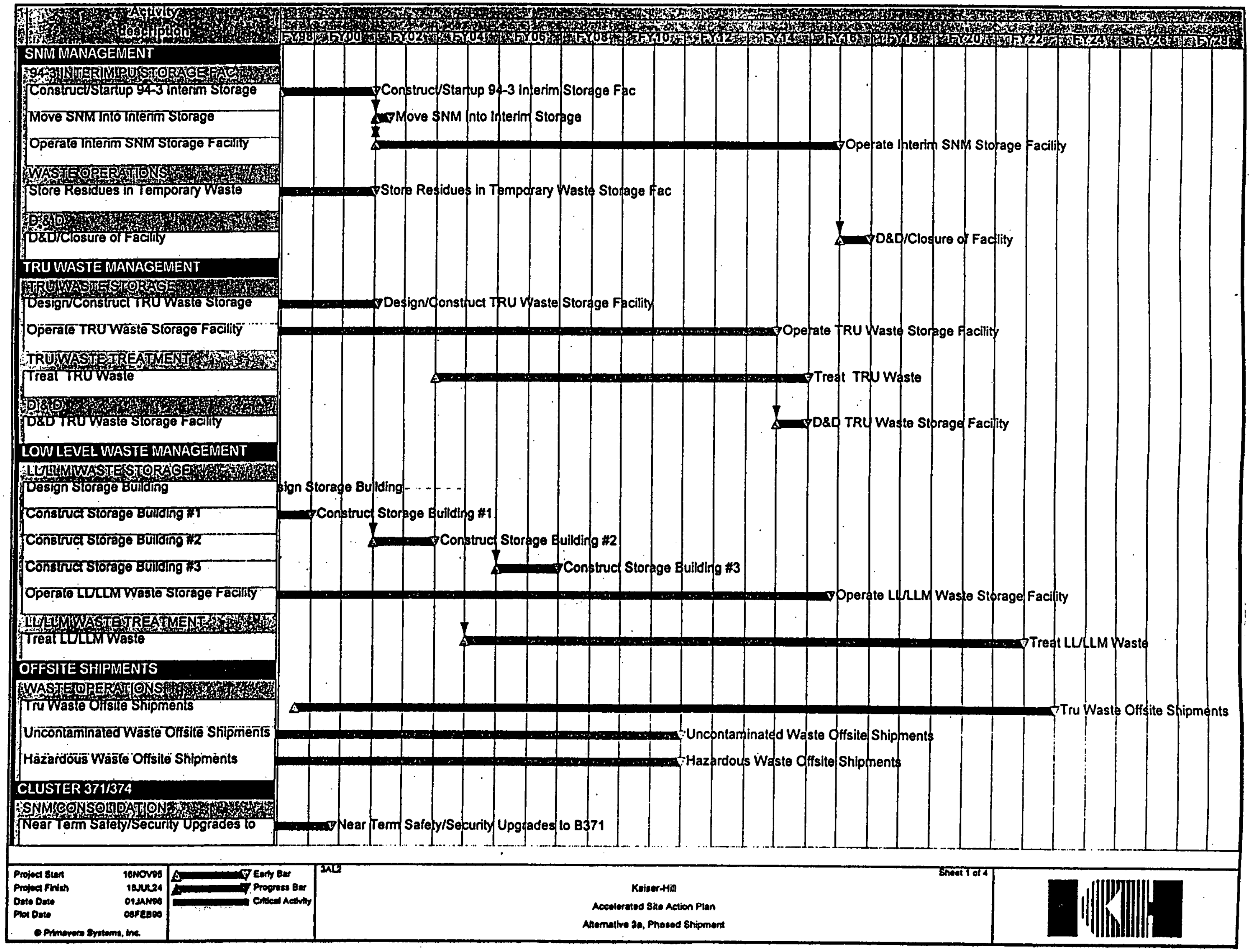


Figure I-11 Alternative 3a, Phased Shipment - Level 1 Schedule

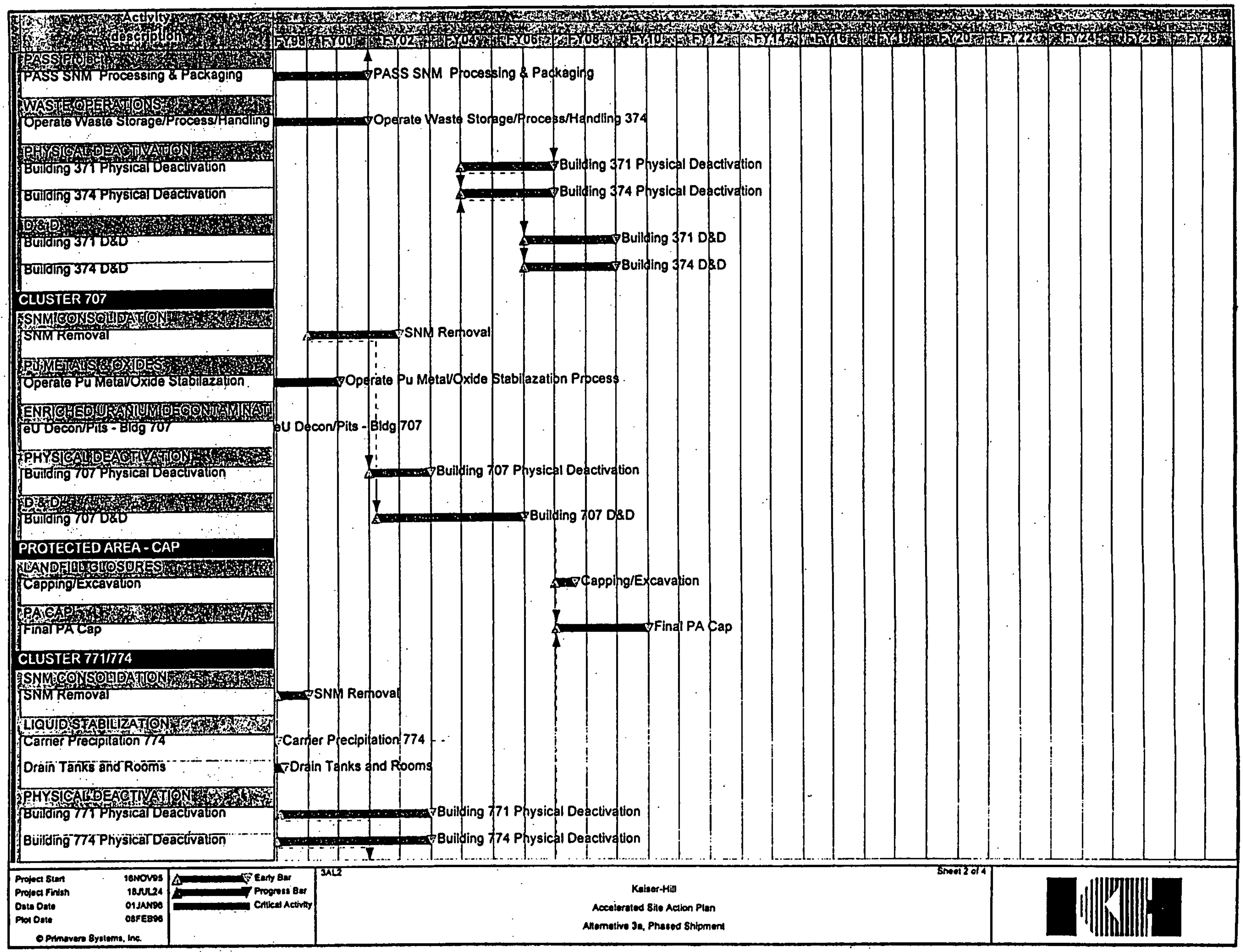


Figure I-11 Alternative 3a, Phased Shipment - Level 1 Schedule (continued)

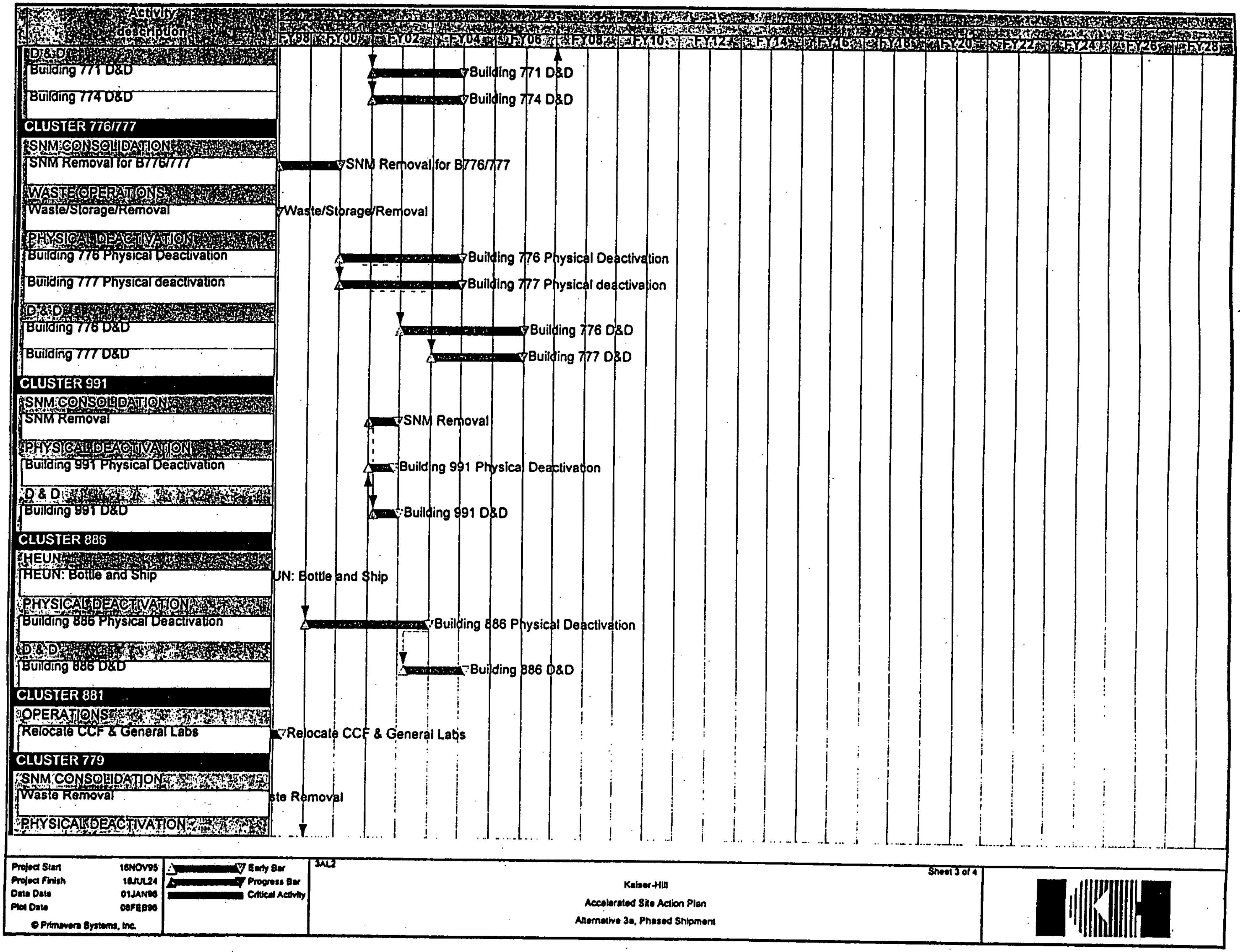


Figure I-11 Alternative 3a, Phased ˈpment - Level 1 Schedule (continued)

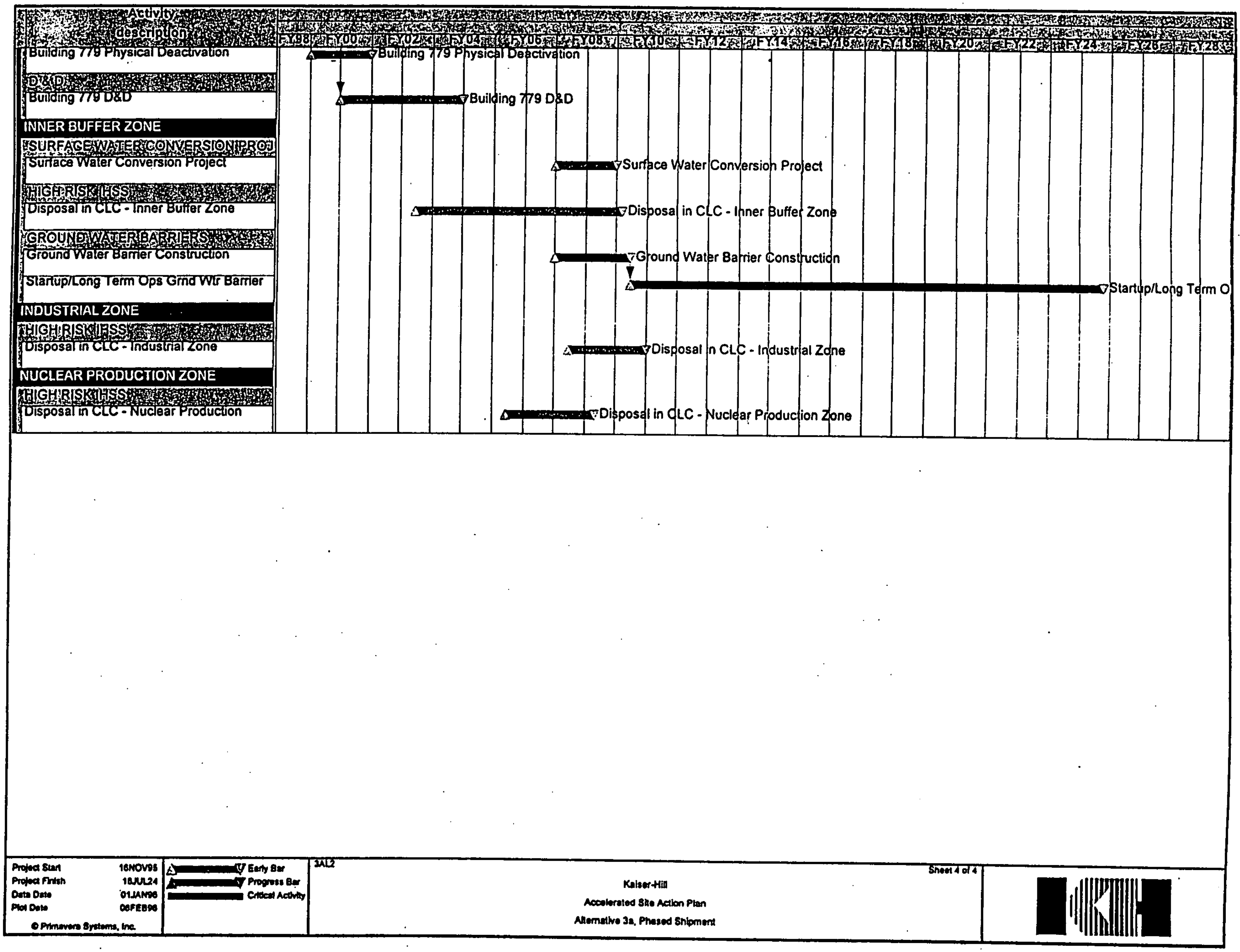


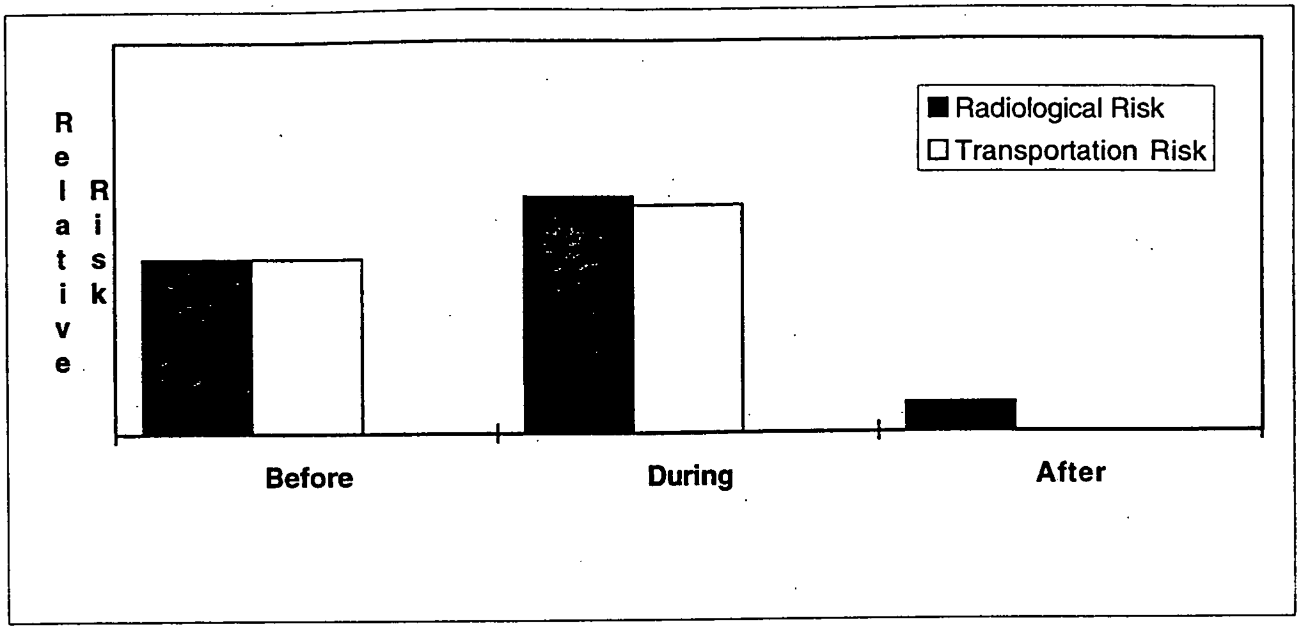
Figure I-11 Alternative 3a, Phased Shipment - Level 1 Schedule (continued)

2.4.5 Risk

The contributors to risk for Alternative 3a, Phased Shipment are similar to those discussed for Alternative 1, Unrestricted, except that: (1) a new capped retrievable or aboveground LLW/LLMW storage facility would be constructed, and; (2) remediation standards would be less restrictive. The radiological, OSHA, and transportation risks to the workers during implementation would be reduced compared to Alternative 1 because less material would be handled and shipped. However, this could be affected by the fact that the workers would be working within existing (older) storage facilities for a longer period of time. This contributes to both worker OSHA and radiological risk during the implementation phase. Transportation risk to the public decreases during implementation however, due to fewer shipments.

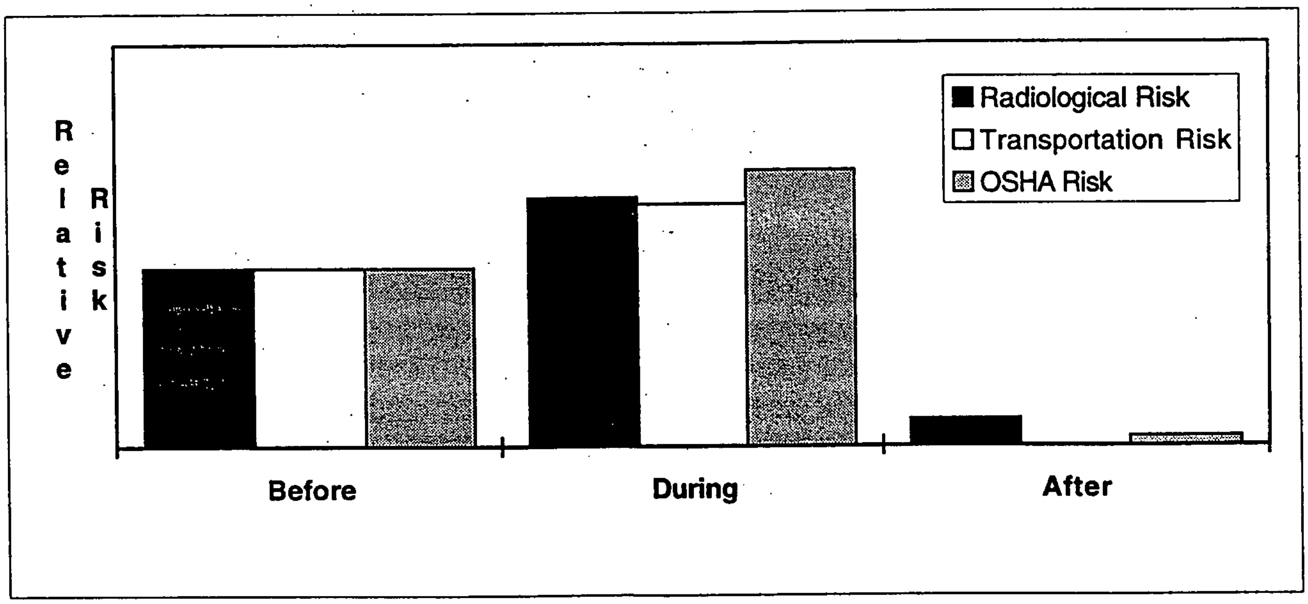
The exceptions noted here between Alternative 3a and Alternative 1 increase the residual radiological risk to the workers and the public, because the soil remaining in Alternative 3a may be more contaminated than in the Alternative 1, Unrestricted case. Workers also may experience an increase in residual OSHA risk when compared to the Unrestricted case. This is because (1) there would still be workers onsite, and (2) those workers will still be involved in monitoring activities which would contribute to OSHA risk.

Figures I-12 and I-13 present the qualitative risk profiles for the public and worker, respectively, for the Alternative 3a, Phased Shipment.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-12 Public Risk, Alternative 3a - Phased Shipment



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-13 Worker Risk, Alternative 3a - Phased Shipment

2.5 Alternative 3b, Priority Shipment

2.5.1 End State Description

At final closure, the Site would be retained in a state that would control access to the capped areas of the Site and restrict the use of the inner Buffer Zone and the Industrial Area to open space and industrial use, respectively. Alternative 3b, Priority Shipment would allow for some infrastructure to remain. This alternative would delay SNM and facility decommissioning activities as a result of the acceleration of waste shipments.

2.5.2 Key SNM attributes

SNM – No new SNM facility would be constructed; instead, Building 371 would be upgraded for safety reasons resulting from delays in consolidation and SNM risk reduction. Residue stabilization and SNM consolidation funding was based on risk with priority given to waste shipment. Residues eventually would be shipped offsite and disposed as TRU waste.

2.5.3 Key Environmental Attributes

Waste Management – LLW/LLMW would be stored in retrievable and monitored, or existing facilities until shipment. TRU/TRM wastes would be stored in existing facilities. TRU/TRM waste, LLW/LLMW, and newly generated Sanitary waste would be disposed offsite. Foundations would be excavated for storage and offsite disposal. The volume of contaminated waste to be generated is expected to be minimal. Nonradioactive construction debris would be disposed onsite unless it is more cost-effective to dispose offsite. Approximately 200 truck and/or rail shipments of waste per year were assumed. When WIPP opens, TRU waste would be shipped as a priority before LLW/LLMW.

New Facilities – New low-maintenance LLW/LLMW interim-storage facilities would be constructed. No new interim SNM or TRU storage facilities would be needed because of accelerated shipping schedules and the use of existing facilities.

Skyline – At the end of the Alternative 3b timeline, the skyline would be devoid of all structures and buildings.

Infrastructure – Most infrastructure would be located offsite with a small interim onsite septic system to support remaining storage facilities. Site capabilities would be replaced by public and commercial utilities. Road upgrades would likely be needed to handle transport of large shipping volumes.

2.5.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 3b, Priority Shipment (in escalated 1996 dollars) is shown in Table I-4.

Table I-4
Estimated Total Project Cost - Alternative 3b, Priority Shipment

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2010	$10B	2018	$12.8B	$14M

1. SNM Consolidation, and most D&D would be complete; only SNM shipping, WM treatment/storage/disposal, removal of new interim facilities, and final ER activities would remain.
2. All removal of SNM/waste from Site would be complete. Only long-term monitoring would remain.
3. Unescalated annual cost.

The uncertainties of Alternative 1, Unrestricted also apply to Alternative 3b. Excluding the relative costs of waste management, facility decommissioning, and infrastructures for Alternative 3b are similar to those for Alternative 3a, lower than those of Alternative 1, but slightly higher than the other alternatives yet to be discussed.

Schedule – The Level 0 network logic diagram shown in Figure I-10 also applies to Alternative 3b. Figure I-14 shows the Level 1 schedule for Alternative 3b. To apply the $700 million/year funding constraint, activities and their respective costs were delayed in time until the cost of work, including escalation, never exceeded the $700 million mark in any one year.

In this alternative, offsite shipment of waste would be accelerated ahead of other work, including all but the most urgent risk reduction activities, and all waste would eventually be removed from the site. As the waste backlog is eliminated, funding would then become available to resume SNM risk reduction, D&D, and ER. The delay in SNM consolidation would require extensive upgrades to Building 371, offsetting the need to construct new interim SNM and TRU storage facilities. In spite of delays due to shipping, all SNM would be removed by 2015. In contrast to Alternative 1, the schedule for Alternative 3b would include an ongoing groundwater monitoring program.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – A comparison of residue plans with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing was achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the upgraded Building 371 storage facility would be needed, in addition to a failure analysis of protective barriers. The cost of upgrading Building 371 has uncertainty because of schedule delays, building conditions, and changes under consideration for defining necessary and sufficient operating standards. The ER and D&D programs would be delayed due to accelerated waste shipping.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was assumed for IAG milestones, but not for LDR treatment requirements. Treatment of all LLMW to LDR requirements was assumed.

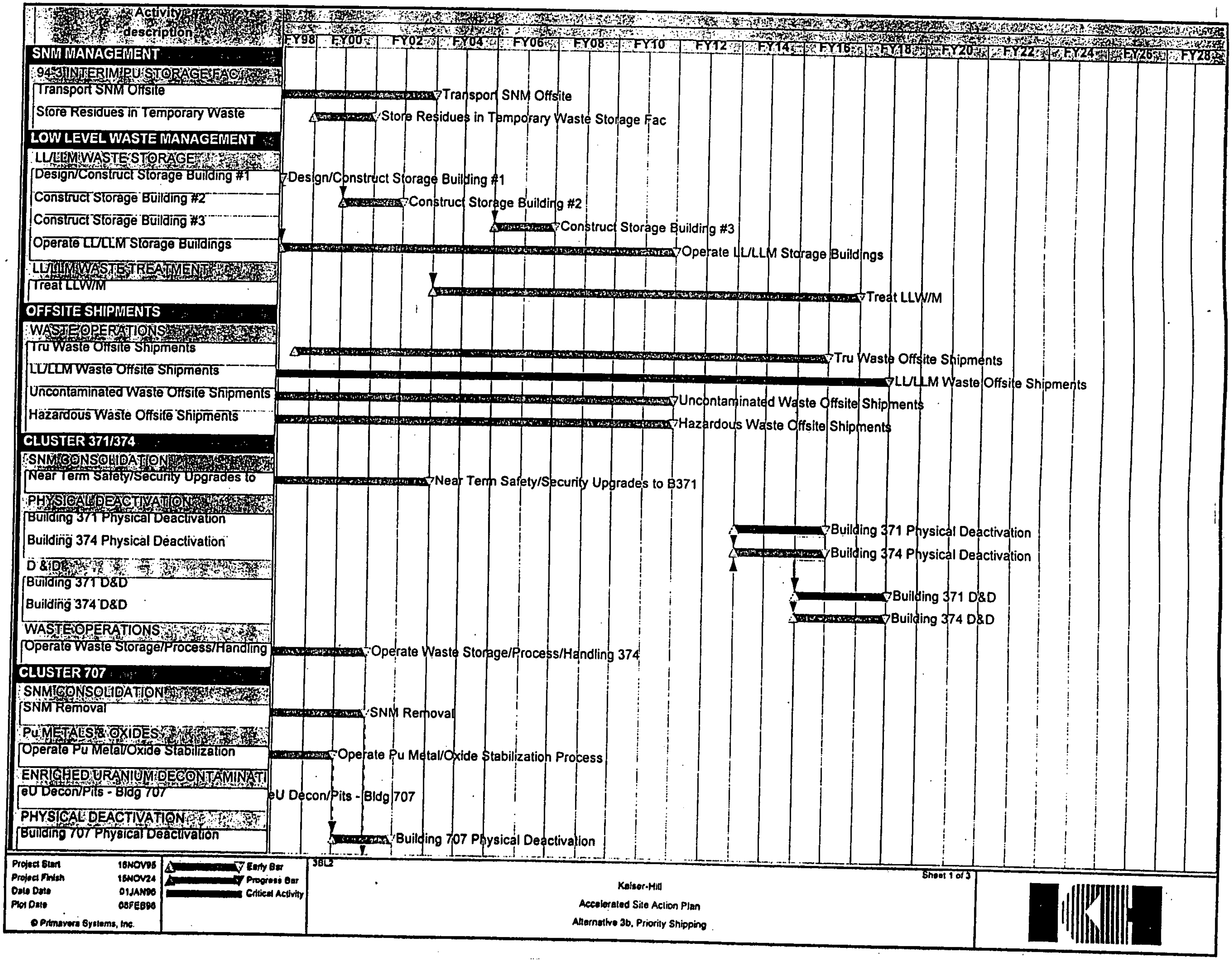


Figure 1-14 Alternative 3b, Priority Shipment- Level 1 Schedule

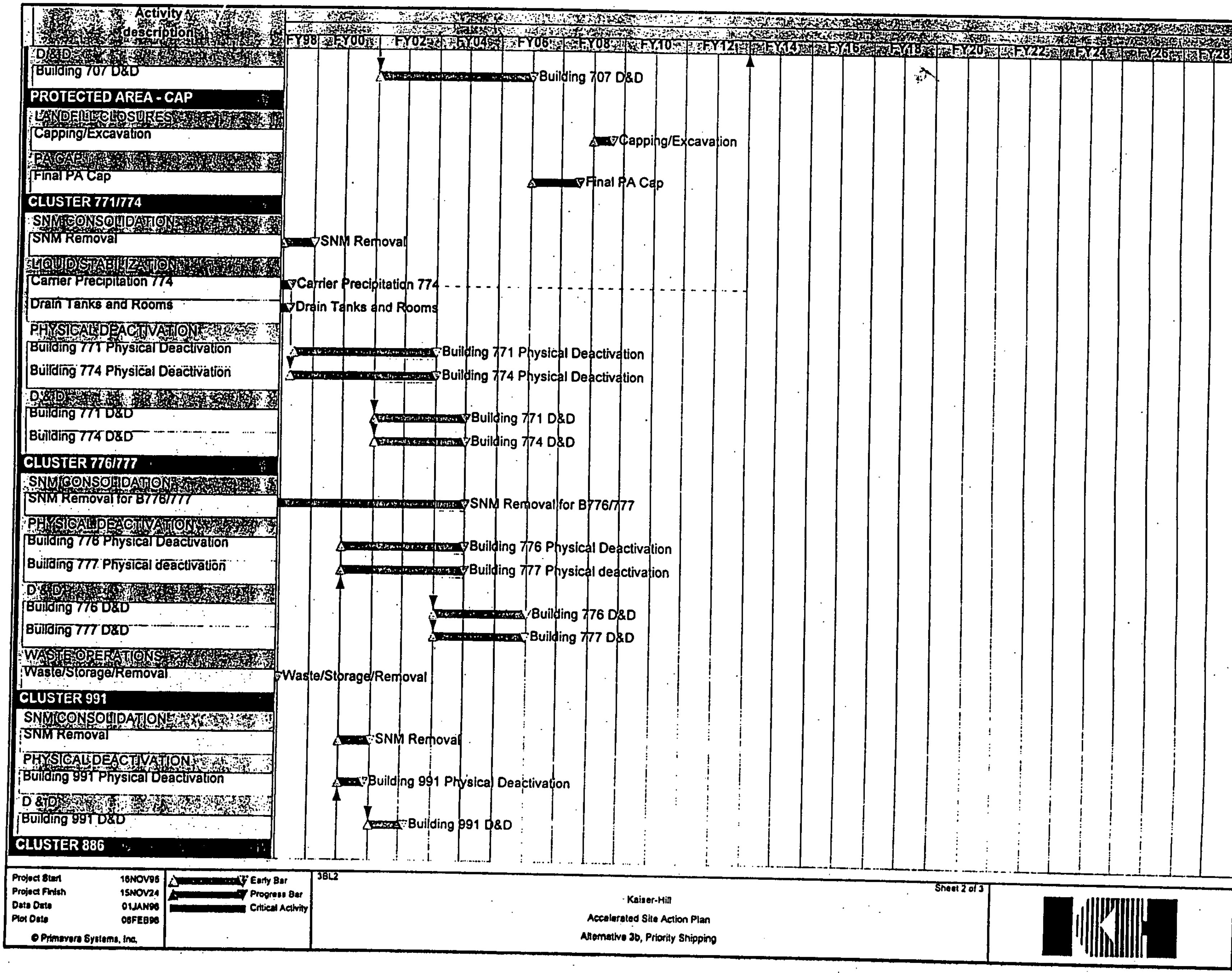
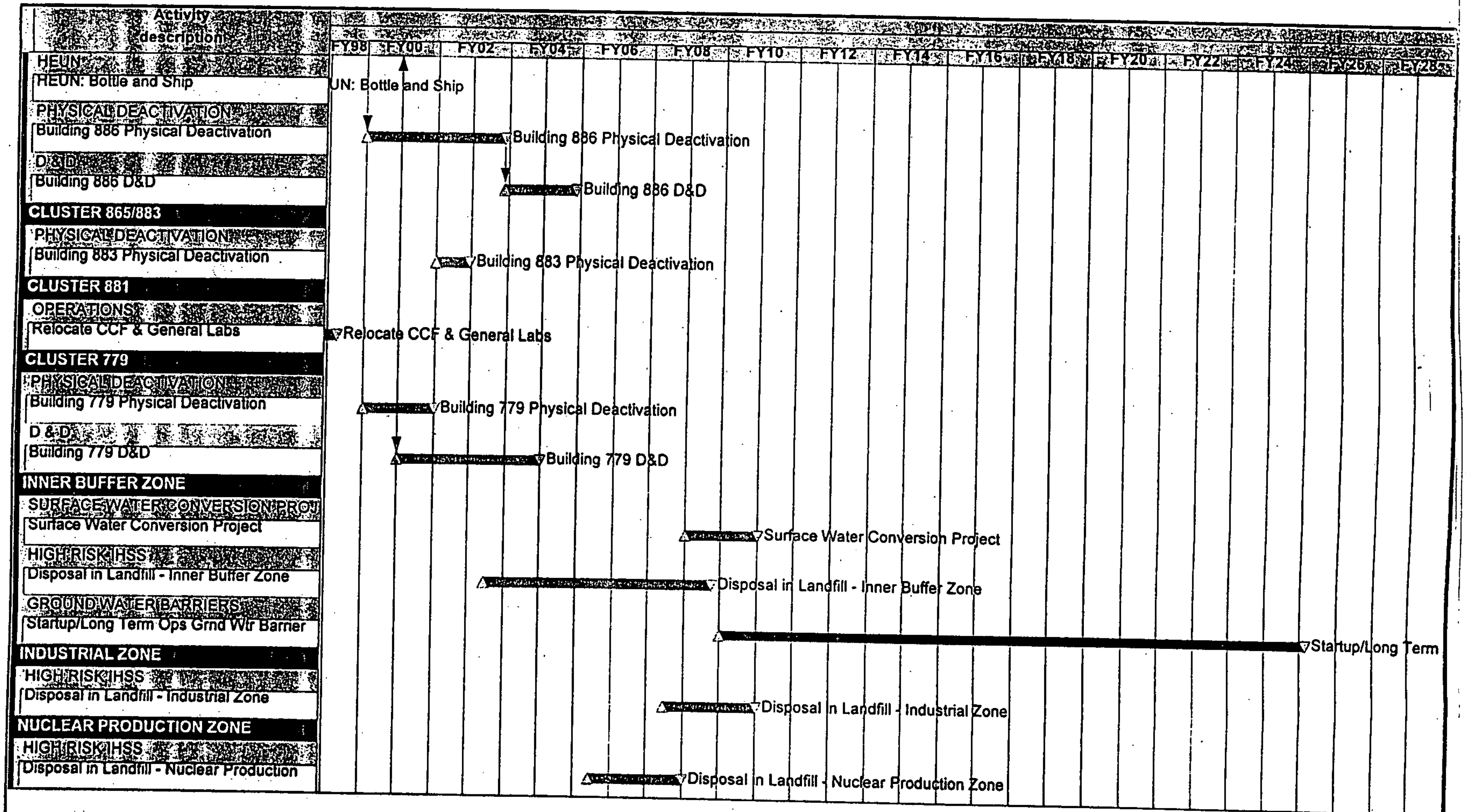


Figure I-14 Alternative 3b, Priority Shipment- Level 1 Schedule (continued)



Project Start	16NOV95
Project Finish	15NOV24
Data Date	01JAN96
Plot Date	08FEB96

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Early Bar
Progress Bar
Critical Activity

3BL2

Sheet 3 of 3

Kaiser-Hill
Accelerated Site Action Plan
Alternative 3b, Priority Shipping

Figure I-14 Alternative 3b, Priority Shipment- Level 1 Schedule (continued)

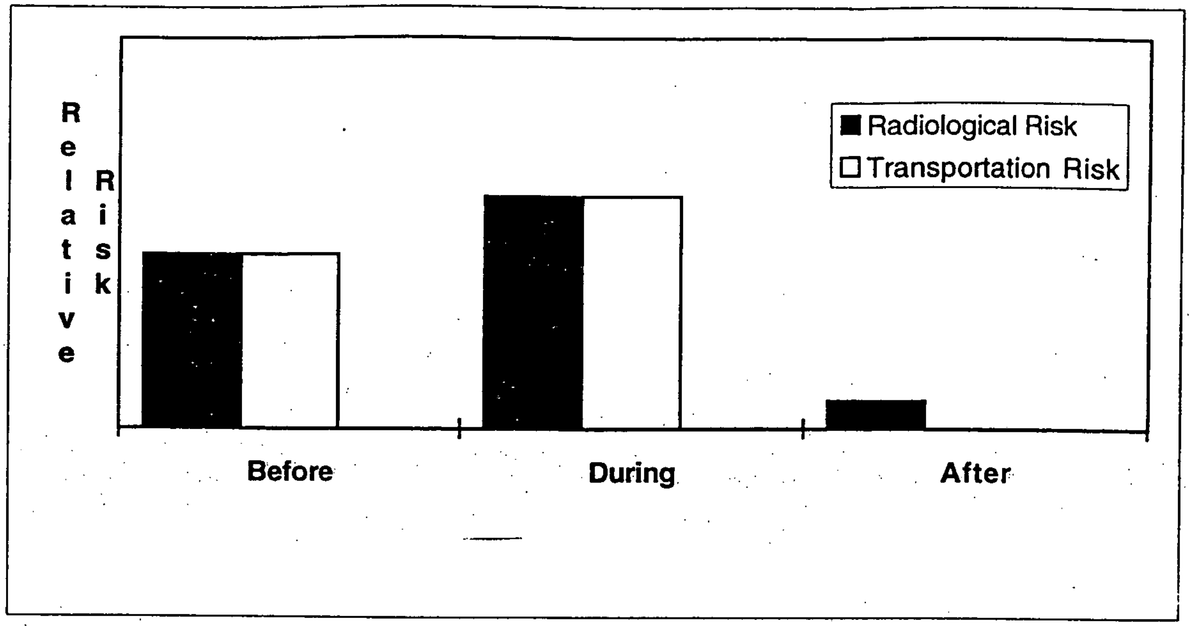
- Other Issues Affecting Cost and Schedule – The cost of aboveground storage facilities as compared to capped retrievable storage facilities would be evaluated. Availability of adequate disposal facilities is assumed. Use of rail-transport as compared to truck shipments and the need for additional new radioactive waste storage facilities must be evaluated. Alternatives for faster shipping schedules (more shipments) would be evaluated. Road improvements might be required.

2.5.5 Risk

The contributors to risk are the same as Alternative 3a, Phased Shipment with the following exception: there would be no construction of new storage facilities other than limited new LLW/LLMW storage, thus reducing the amount of handling and the worker radiological risk. However, this might be offset by the exposures that would be encountered from maintenance, increased inspections, and other activities that are needed in the older storage buildings. The OSHA risk would decrease during implementation because of reduced construction, but increase because of worker presence for a longer time in Building 371. The public may see a relative rise in risk because the existing storage buildings were built to earlier standards and might not meet current standards for criteria such as resistance to seismic events.

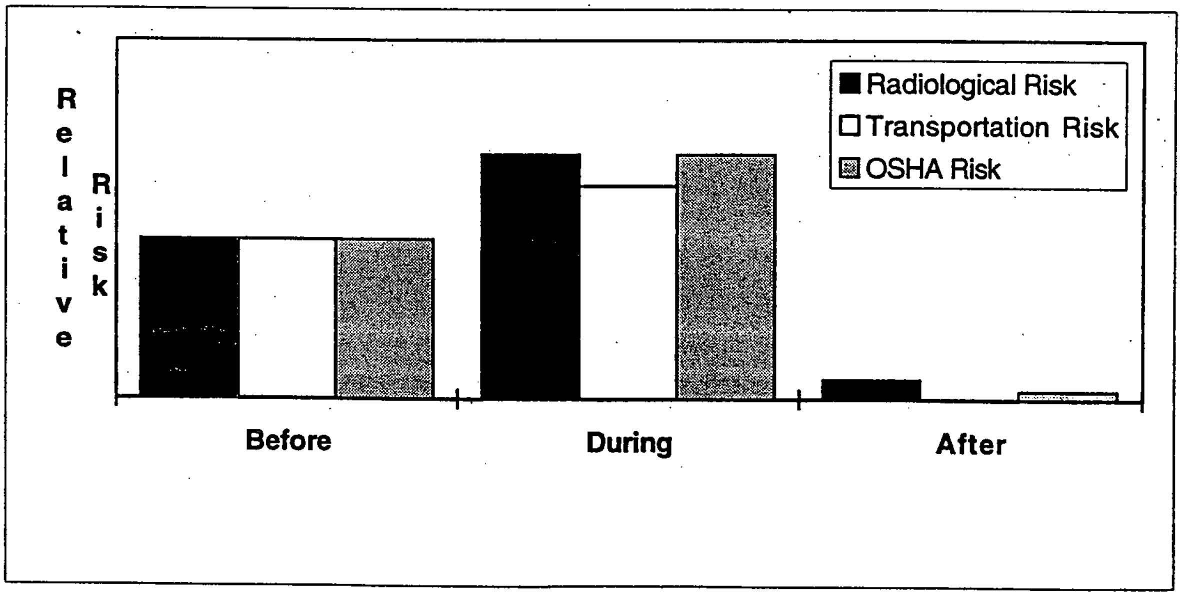
The residual radiological risks to the workers and the public in Alternative 3b, Priority Shipment would be minimal, similar to Alternative 3a, Phased Shipment because in both cases material would be shipped offsite. The residual worker OSHA risk should be lower in Alternative 3a and Alternative 3b because little monitoring would be necessary.

Figures I-15 and I-16 present qualitative public and worker risk profiles for Alternative 3b, Priority Shipment.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-15 Public Risk, Alternative 3b - Priority Shipment



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-16 Worker Risk, Alternative 3b -Priority Shipment

2.6 Alternative 3c, Excavation

2.6.1 End State Description

At final closure, the Site would be retained in a state that would control access to the capped areas of the Site and restrict use of the inner Buffer Zone and the Industrial Area to open space and industrial use, respectively. Alternative 3c, Excavation would allow for foundations to be excavated and the debris stored for eventual shipment after building demolition. The volume of contaminated waste generated is expected to be minimal. Some infrastructure would remain. LLW/LLMW would be placed in retrievable and monitored facilites. No plans exist within this alternative to remove any or all of the retrievable waste; however, the option exists if others decide to do so in the future. Alternative 3c represents greater retrievability of waste than Alternative 3d, Leveled Buildings or 3e, Entombment and Landfill.

2.6.2 Key SNM attributes

SNM – SNM would be consolidated and packaged for safe interim storage. All SNM would be removed by the year 2015. Initial stabilization and treatment of residues would occur to levels meeting interim storage requirements. Eventually residues would be packaged to WIPP WAC, and shipped offsite for disposal as TRU waste.

2.6.3 Key Environmental Attributes

Waste Management – LLW and LLMW would be placed in capped retrievable storage/disposal facilities. LLW/LLMW would be treated to provide safe long-term protection of the workers, the public and the environment. TRU/TRM waste, and newly.generated sanitary waste would be disposed offsite. Foundations would be excavated and the debris stored for eventual shipment after building demolition. The volume of contaminated waste generated is expected to be minimal. Nonradioactive construction debris would be disposed onsite unless it was more cost-effective to dispose offsite. Some waste would be shipped offsite.

New Facilities – Three new low maintenance interim-storage facilities for SNM, TRU waste, and LLW/LLMW would be constructed.

Skyline — The skyline at the end of the Alternative 3c timeline would be devoid of all buildings including the new storage facilities. The capped areas would remain.

Infrastructure — Minimal onsite infrastructure supporting the new facilities would remain as for only as long as the facilities would be required, including roads and a small onsite septic system. Additional site support capabilities and utilities would be provided by public and commercial sector.

2.6.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 3c, Excavation (in escalated 1996 dollars) is shown in Table I-5.

Table I-5
Estimated Total Project Cost - Alternative 3c, Excavation

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2010	$8.8B	2015	$9.7B	$14M

1. SNM Consolidation, and most D&D would be complete; only WM treatment/storage/disposal, SNM shipment offsite, and final ER activities would remain.
2. All work would be complete. Only long-term monitoring would remain.
3. Unescalated annual cost.

The uncertainties described above for Alternative 1, Unrestricted also apply to this alternative. The relative costs of the task areas for Alternatives 3c, Excavation, 3d, Leveled Buildings, and 3e, Entombment and Landfill are similar. The relative costs of waste management, facility decommissioning and infrastructure for Alternative 3c would be lower than Alternatives 3a and 3b, but higher than Alternative 4, Mothball, yet to be discussed.

Schedule – The Level 0 network logic diagram shown in Figure I-10 applies to Alternative 3c also. Figure I-17 shows the Level 1 schedule. To apply the $700 million/year funding constraint, activities and their respective costs were delayed in time until the cost of work, including escalation, never exceeded the $700 million mark in any one year.

In Alternative 3c, all SNM would be removed from the Site by 2015. LLW and LLMW would be stored onsite in capped and retrievable, monitored storage, with only high-risk LLMW being treated for storage. Building foundations would be removed and the debris put in retrievable, monitored storage facilities. The eventual removal of waste from the onsite storage facility was not costed or scheduled as part of this alternative.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – A comparison of residue plans with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing was achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the new SNM storage facility would be needed, in addition to a failure analysis of protective barriers.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was assumed for IAG milestones, and LDR treatment requirements. Treatment of all high-risk LLMW was projected to provide safe long-term protection for workers, the public, and the environment, but all LDR noncompliant waste might not meet prescriptive LDR requirements.

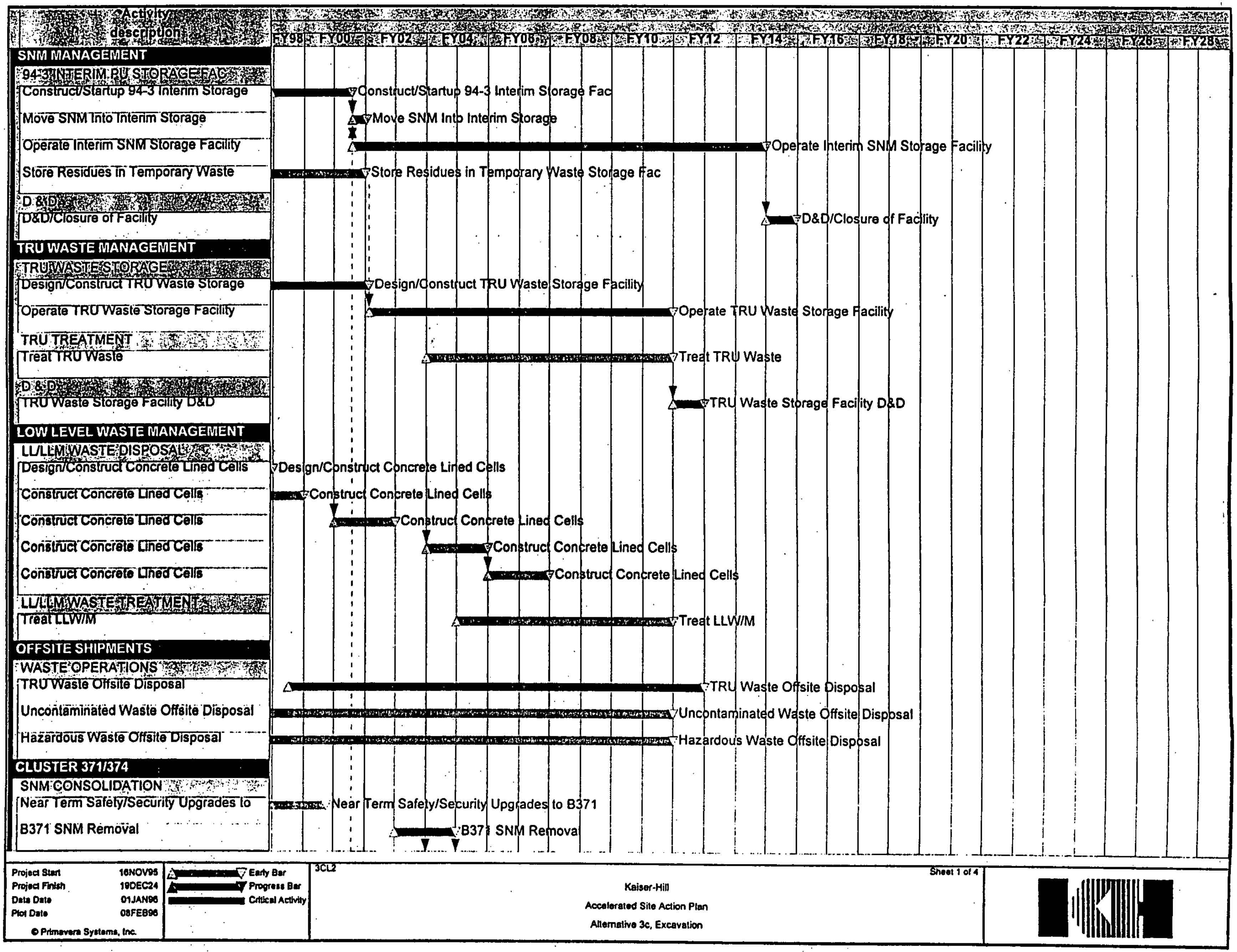


Figure I-17 Alternative 3c, Excavation - Level 1 Schedule

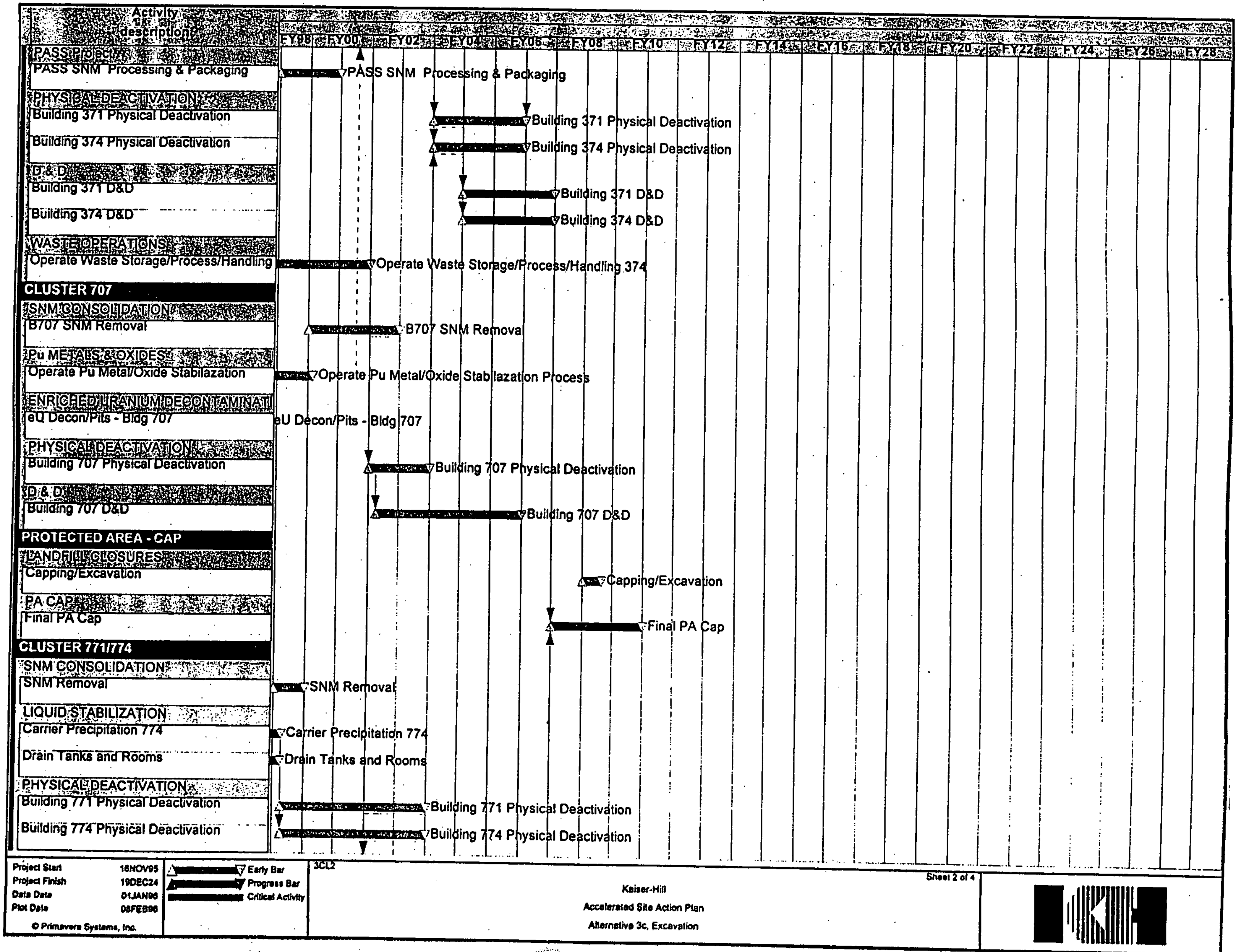


Figure I-17 Alternative 3c, Exc[illegible]tion - Level 1 Schedule (continued)

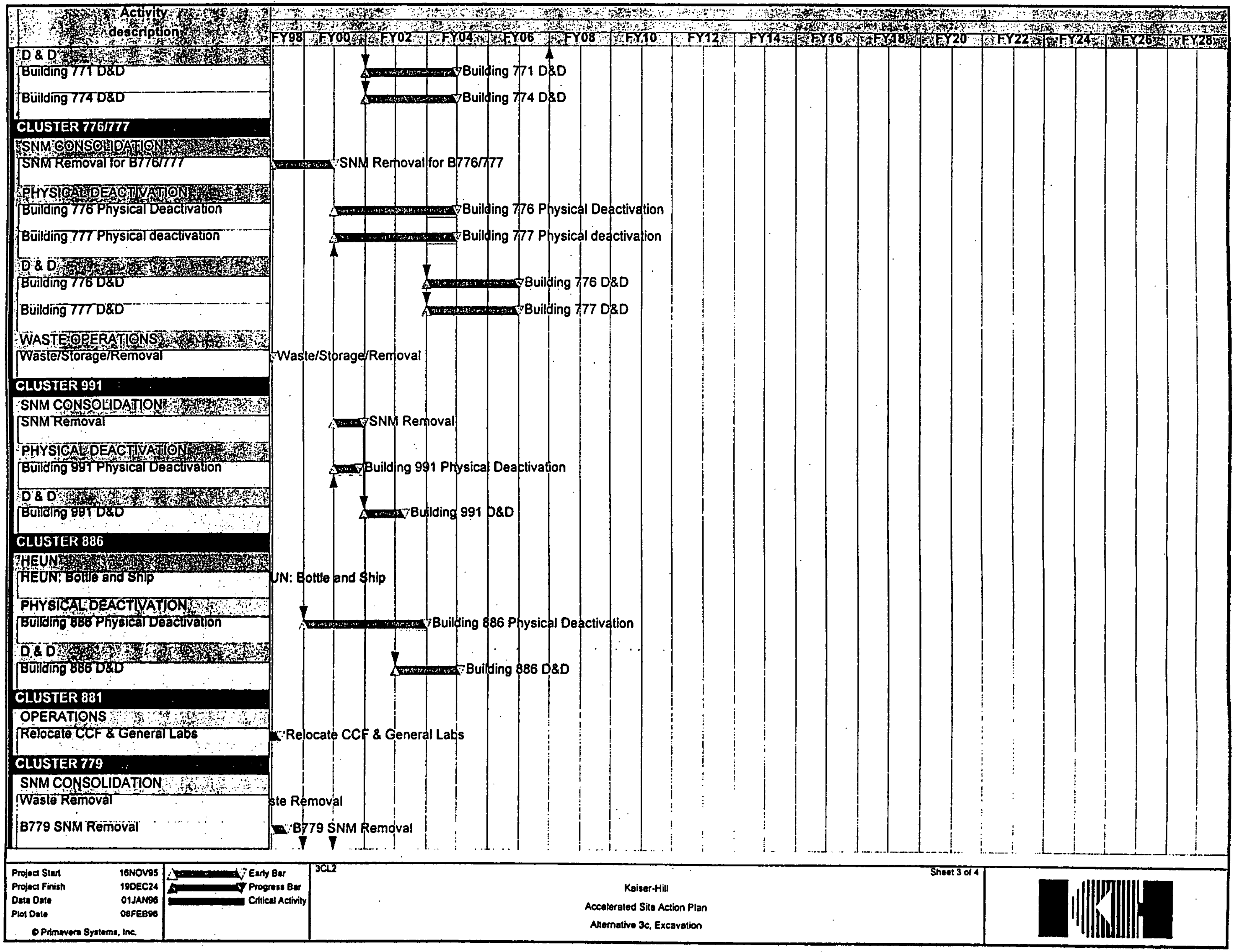


Figure I-17 Alternative 3c, Excavation - Level 1 Schedule (continued)

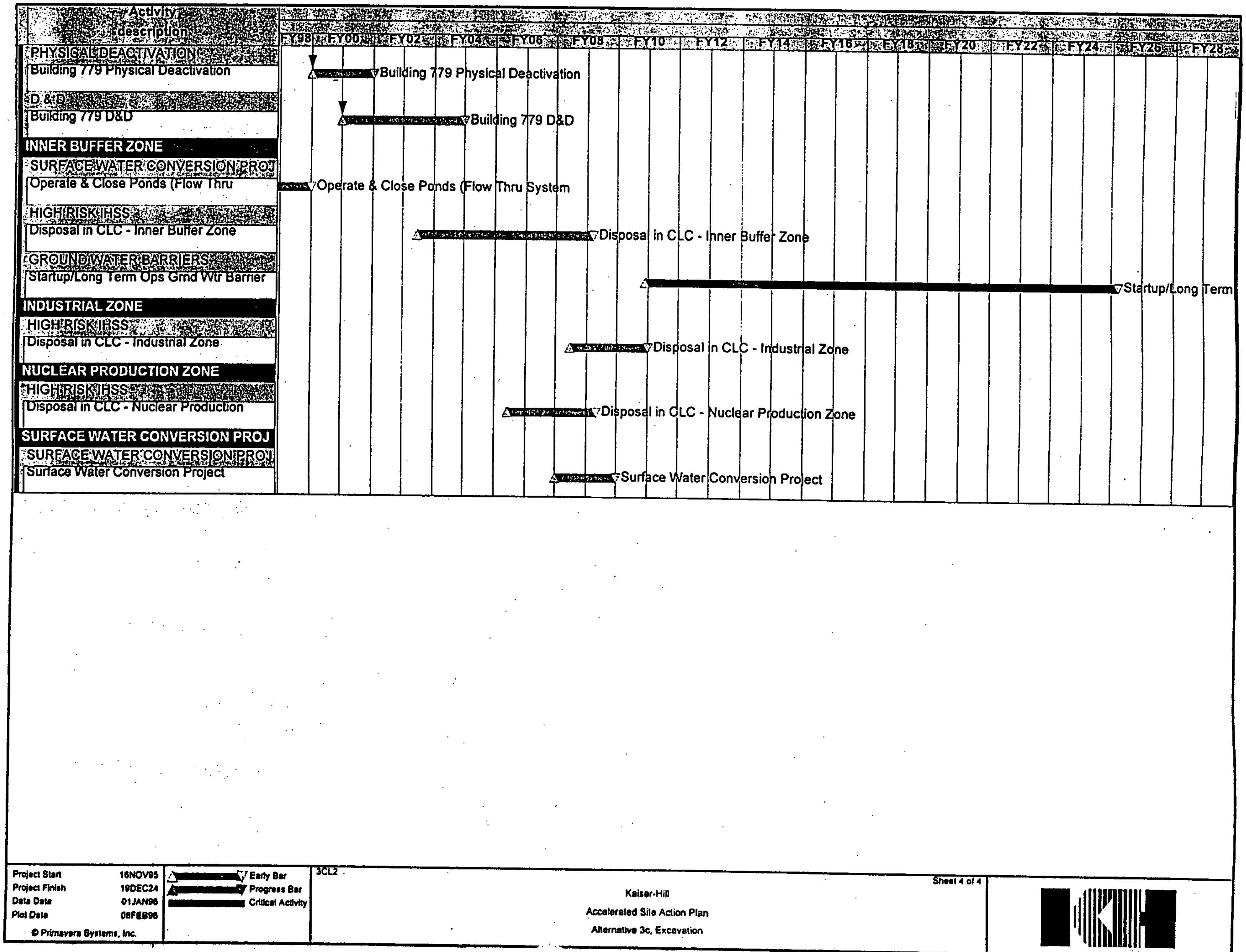
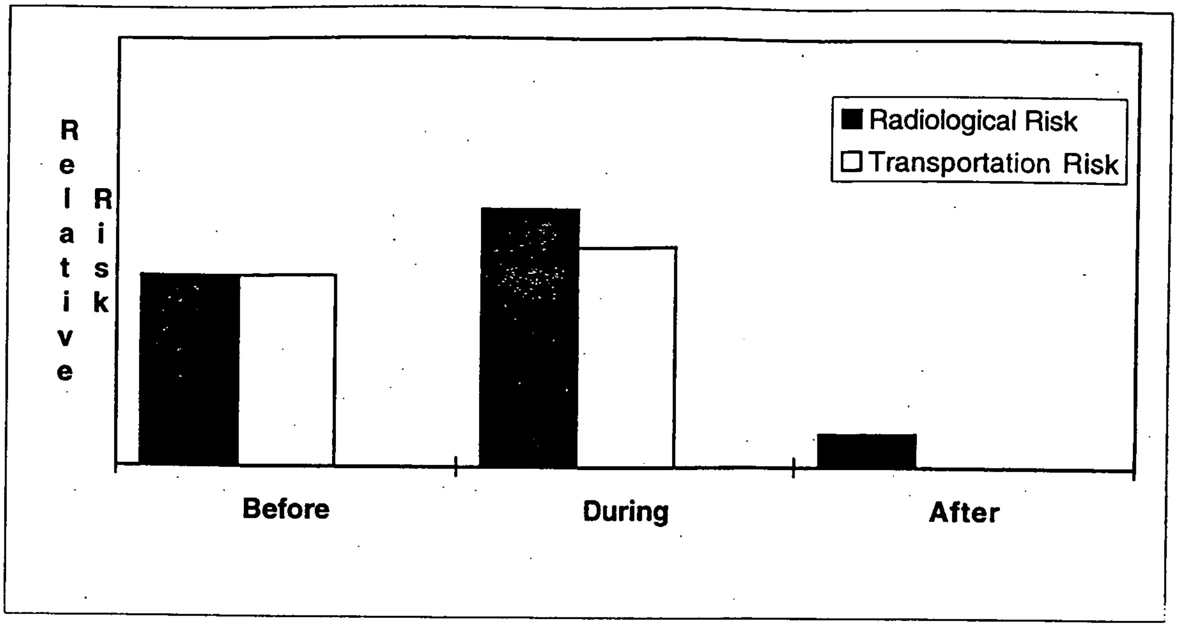


Figure I-17 Alternative 3c, Exc... ion - Level 1 Schedule (continued)

2.6.5 Risk

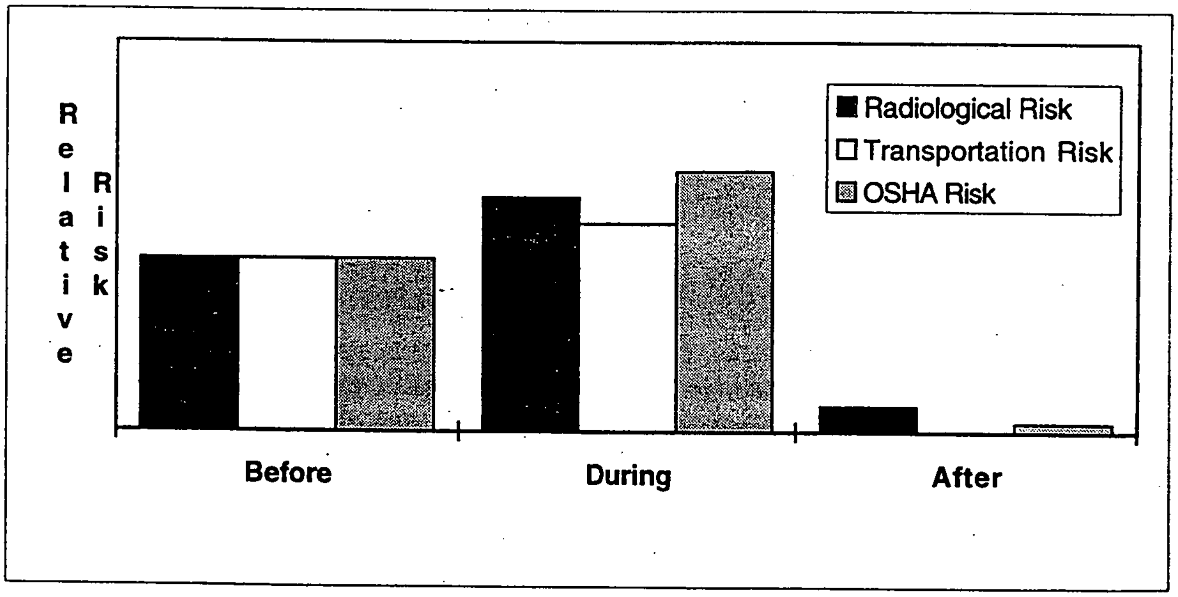
The contributors to risk for Alternative 3c, Excavation, would be essentially the same as for Alternative 3a, Phased Shipment with the following exceptions: (1) LLMW may not be treated to prescriptive LDR treatment standards, (2) solid residues will not necessarily be processed for WIPP WAC initially, (3) LLW/LLMW is not initially shipped offsite, and (4) existing storage facilities remain in place for a shorter period of time. The first two of these exceptions are not expected to have significant impacts upon the cumulative risk profiles. The third exception results in a lower transportation risk to the public during implementation when compared to Alternative 3a and Alternative 3b. Not shipping LLW/LLMW offsite also increases the residual radiological risks to both the workers and the public somewhat, as compared to Alternative 3a and Alternative 3b, since material will remain onsite. The fourth exception noted results in a reduction in worker OSHA and radiological risk during implementation as compared to Alternative 3a and Alternative 3b.

Figures I-18 and I-19 present the qualitative public and worker risk profiles for Alternative 3c, Excavation.



Note: The bars show relative risk within each risk category, not absolute risk. Further, no relative risk is shown between the risk categories.

Figure I-18 Public Risk, Alternative 3c - Excavation



Note: The bars show relative risk within each risk category, not absolute risk. Further, no relative risk is shown between the risk categories.

Figure I-19 Worker Risk, Alternative 3c - Excavation

2.7 Alternative 3d, Leveled Buildings

2.7.1 End State Description

At final closure, the Site would be retained in a state that would control access to the capped areas of the Site and restrict use of the inner Buffer Zone and the Industrial Area to open space and industrial use, respectively. Alternative 3d, Leveled Buildings would allow for buildings to be torn down, but foundations left in place. At the end state, some infrastructure remains. No plans exist within this alternative to remove any or all of the retrievable waste; however, the option exists if plans change in the future.

2.7.2 Key SNM attributes

SNM – SNM would be consolidated and packaged for safe long-term storage. All SNM would be removed by the year 2015. Residues would be stabilized and treated to meet interim-storage requirements. Eventually residues would be packaged to WIPP WAC and would be shipped offsite and disposed as TRU waste.

2.7.3 Key Environmental Attributes

Waste Management – LLW/LLMW would be stored/disposed in retrievable and monitored facilities. TRU/TRM waste would be stored in a new interim facility until shipment to WIPP. Building foundations remain in place. Newly generated sanitary waste would be disposed offsite. Nonradioactive construction debris would be disposed onsite unless it was more cost-effective to dispose offsite. Some truck or rail shipments of waste would occur.

New Facilities – Three new low maintenance interim storage facilities for SNM, TRU waste, and LLW/LLMW would be constructed.

Skyline – At the end of the Alternative 3d timeline, the skyline would be devoid of all structures and buildings including the new storage facilities. Capped areas would remain.

Infrastructure — Only minimal onsite infrastructure supporting the new facilities would remain as long as the facilities are required, including roads and a small onsite septic system. Additional site support capabilities and utilities would be provided by public and commercial sector.

2.7.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 3d, Leveled Buildings (in escalated 1996 dollars) is shown Table I-6.

Table I-6
Estimated Total Project Cost - Alternative 3d, Leveled Buildings

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2010	$8.8B	2015	$9.6B	$14M

1. SNM Consolidation, and most D&D would be complete; only WM treatment/storage/disposal and SNM shipment offsite would remain.
2. All work would be complete. Waste would remain in concrete lined cell. Only long-term monitoring would remain. Building foundations would remain in place.
3. Unescalated annual cost.

The uncertainties described above for Alternative 1, Unrestricted also apply to this alternative. The relative costs of the task areas for Alternatives 3c, Excavation; 3d, Leveled Buildings; and 3e, Entombment and Landfill are similar. The relative costs of waste management, facility decommissioning and infrastructure for Alternative 3d are lower than for Alternatives 3a, Phased Shipment and 3b, Priority Shipment, but are higher than for Alternative 4, Mothball.

Schedule – The Level 0 network logic diagram shown in Figure I-10 also applies to Alternative 3d. Figure I-20 shows the Level 1 schedule. To apply the $700 million/year funding constraint, activities and their respective costs were delayed in time until the cost of work, including escalation, never exceeded the $700 million mark in any one year.

In Alternative 3d, all SNM would be removed from the site by 2015. Capped, retrievable, and monitored storage would be constructed for waste storage, and building foundations would be left in place. No waste would be disposed in the foundations. Durations for D&D are therefore shorter than in those alternatives where foundations would be removed. All waste that must be placed would be moved into retrievable and monitored facilities. Waste within the cap footprint would be left in place under the cap.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – A comparison of residue plans with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing was achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the new SNM storage facility would be needed, in addition to a failure analysis of protective barriers.

- Regulatory Issues Affecting Cost and Schedule - Regulatory flexibility was assumed for IAG milestones and LDR requirements. Treatment of high-risk LLMW was projected to provide safe long-term protection, of workers, the public, and the environment, but all LDR non-compliant waste might not meet prescriptive LDR requirements.

2.7.5 Risk

The contributors to risk in Alternative 3d, Leveled Buildings are the same as for Alternative 3a, Phased Shipment except that: (1) some waste might be capped in place, (2) foundations would be remain in place, (3) existing storage facilities would remain for a shorter period of time, (4) foundations are entombed using noncontaminated fill, and (5) LLW/LLMW would not be shipped offsite. The first three exceptions reduce the relative OSHA risk during implementation because less worker activity would be necessary than in Alternative 3a. Foundations are not removed, and workers do not work as long in the older buildings. The relative radiological risk to the workers during implementation would be reduced since less material would be handled. The worker transportation risk during implementation would be reduced also because fewer shipments would be required. The fourth exception produces an increase in OSHA risk compared to Alternative 3a due to the work activities associated with the building foundations remaining in place. The fifth exception would result in a reduced transportation risk to the public during implementation, but a higher residual radiological risk for both the public and the workers because the material remains onsite.

Figures I-21 and I-22 provide the qualitative risk profiles for the public and workers for Alternative 3d, Leveled Buildings.

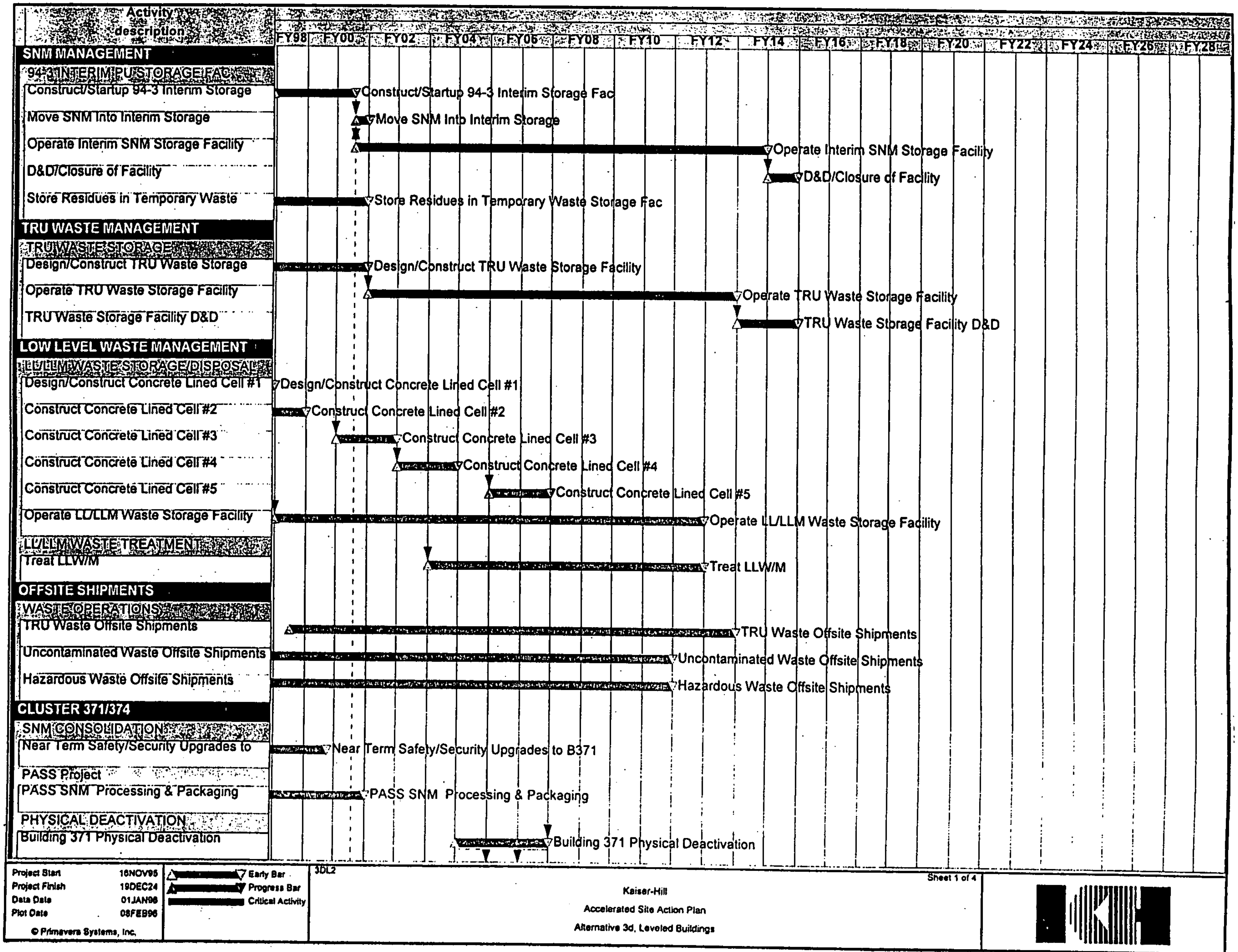


Figure I-20 Alternative 3d, Leveled Buildings - Level 1 Schedule

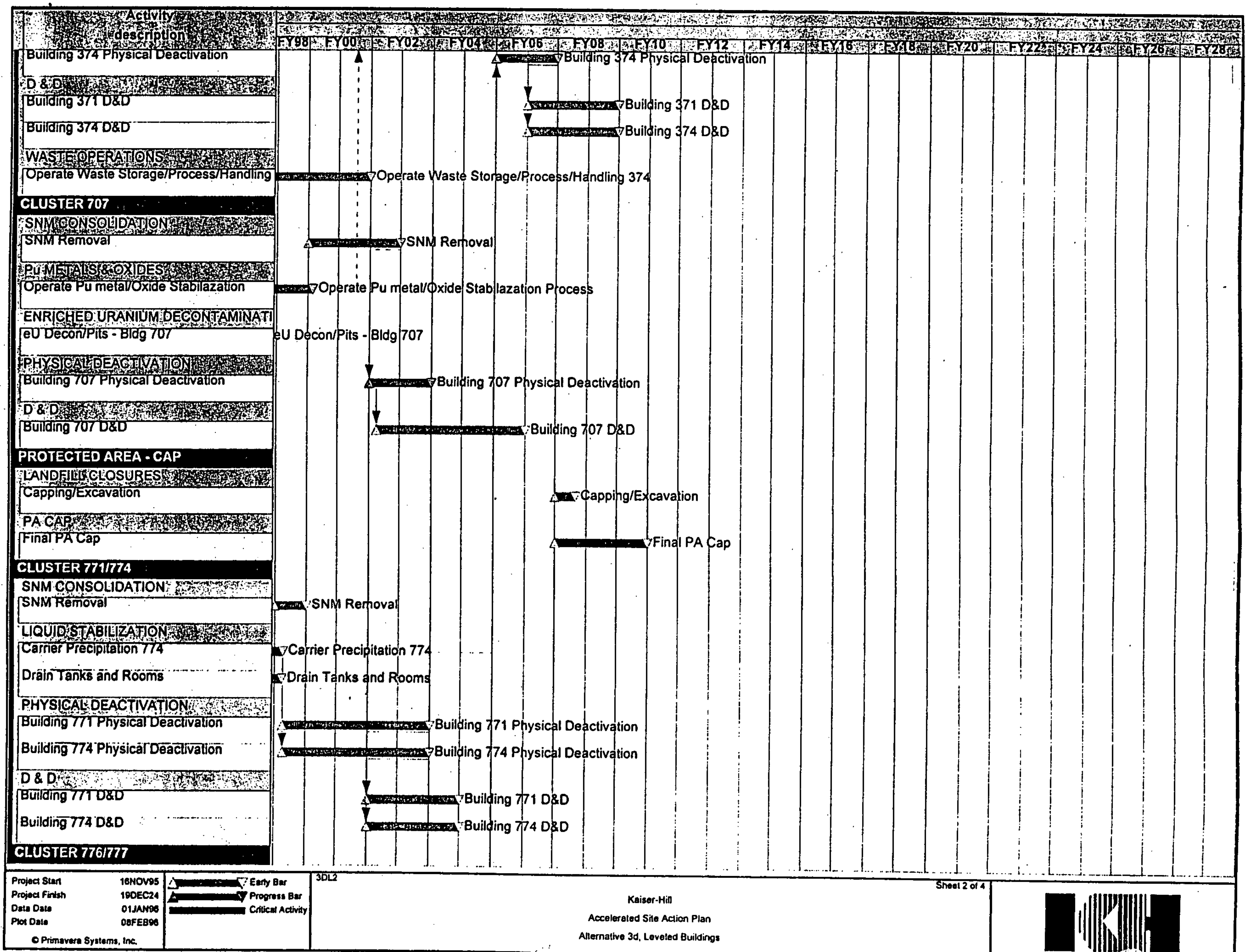


Figure I-20 Alternative 3d, Leveled dings - Level 1 Schedule (continued)

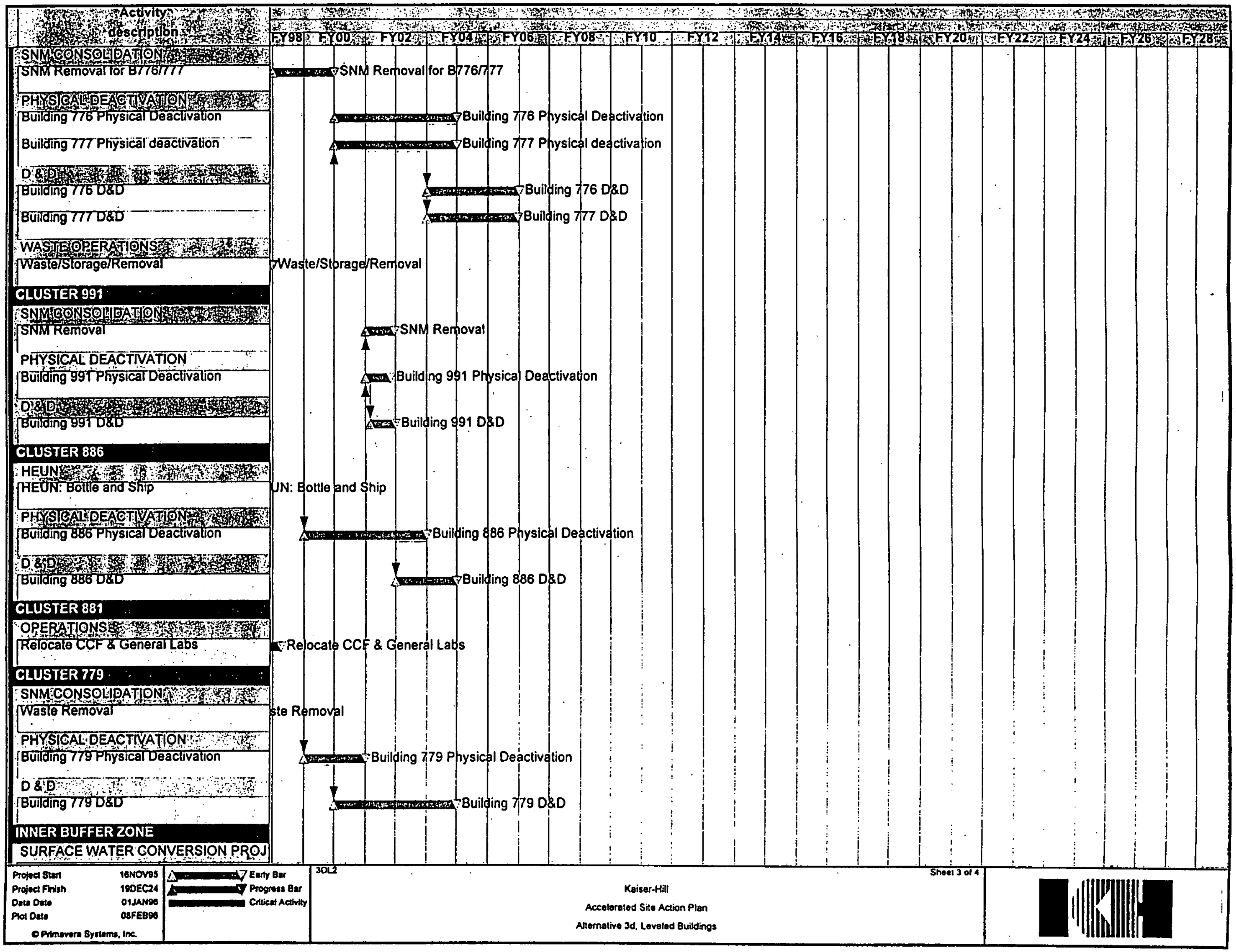


Figure I-20 Alternative 3d, Leveled Buildings - Level 1 Schedule (continued)

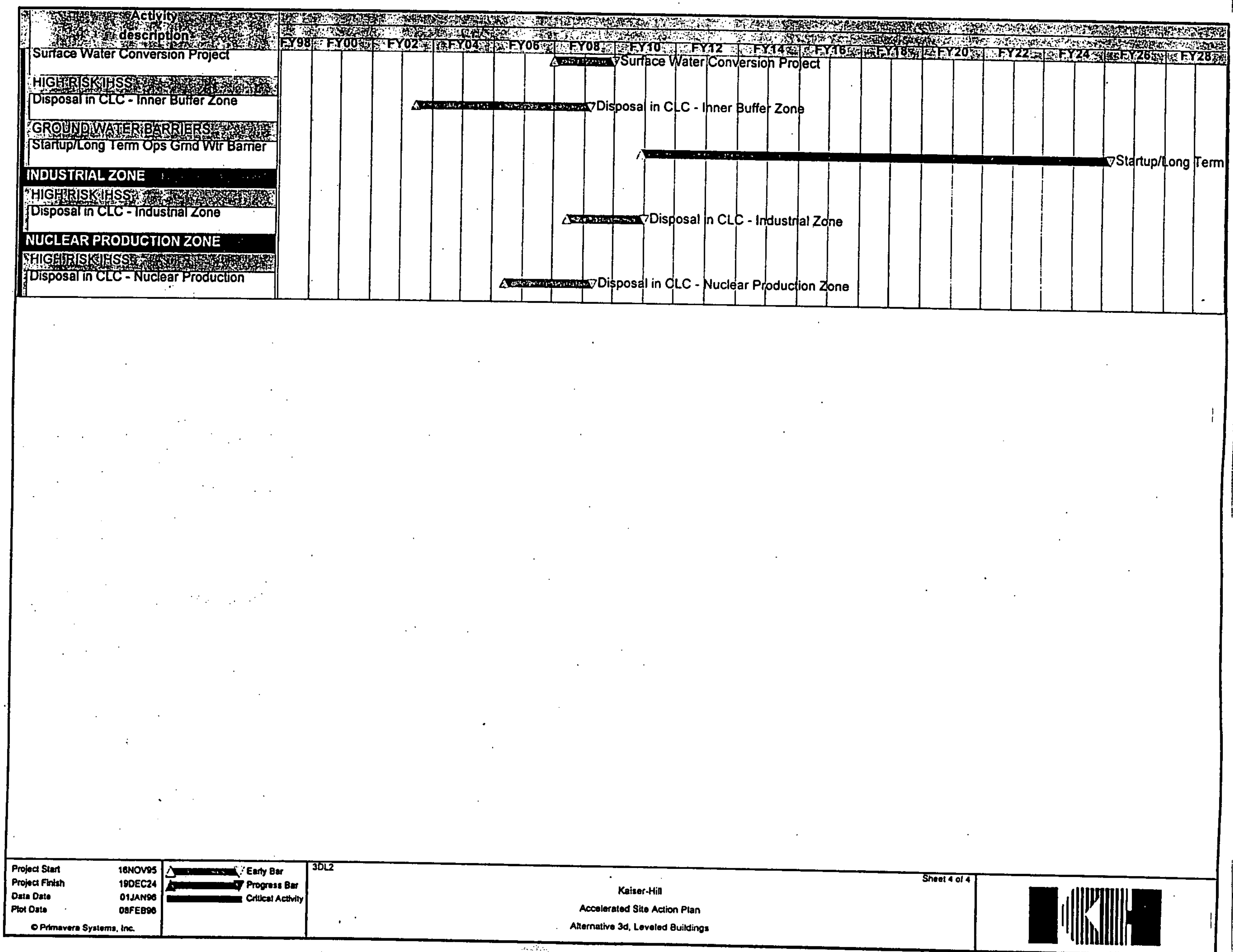
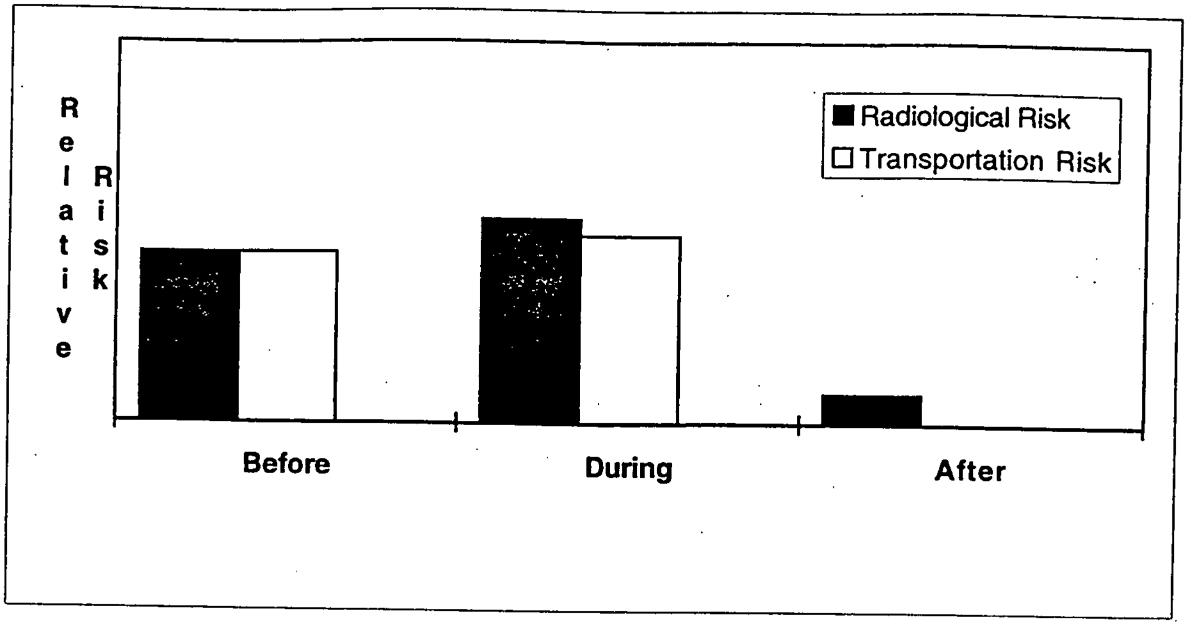
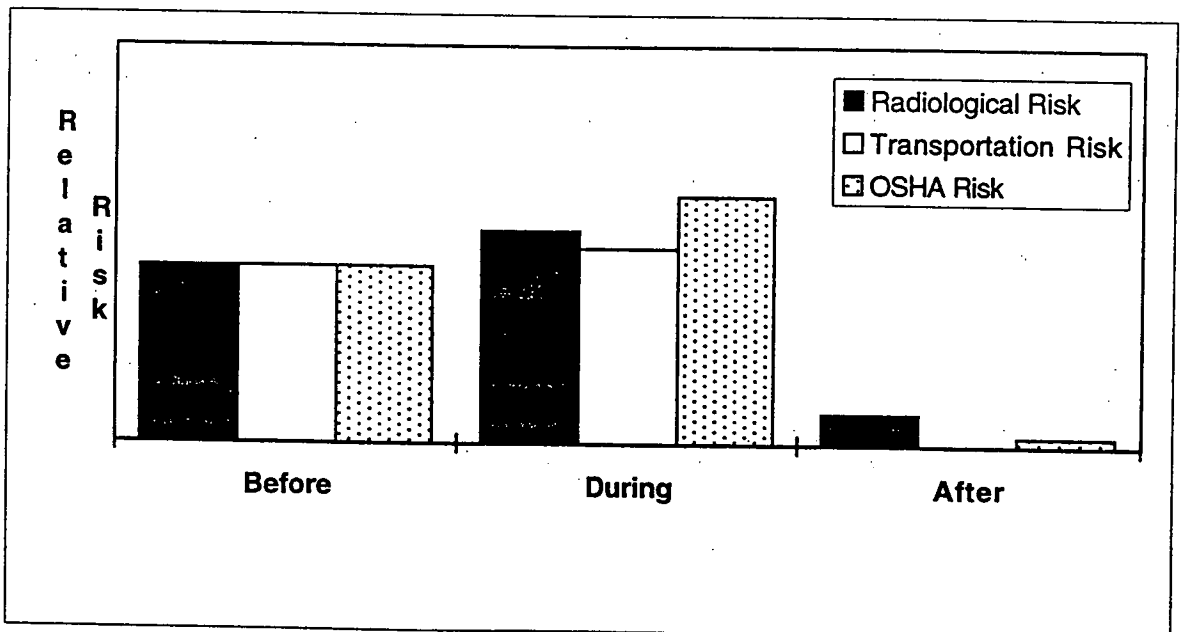


Figure I-20 Alternative 3d, Leveled ildings - Level 1 Schedule (continued)



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-21 Public Risk, Alternative 3d - Leveled Buildings



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-22 Worker Risk, Alternative 3d - Leveled Buildings

2.8 Alternative 3e, Entombment and Landfill

2.8.1 End State Description

The Entombment and Landfill alternative describes the disposition of most LLW/LLMW generated onsite in entombed building foundations and in a RCRA Class C-type landfill. At final closure the Site would be retained in a state that would control access to the capped areas of the Site including the landfill and restrict the use of the inner Buffer Zone and the Industrial Area to open space and industrial use, respectively. No plans exist within this alternative to remove any or all of the LLW/LLMW.

Infrastructure – Minimal onsite infrastructure supporting the new facilities would remain only as long as the facilities were required, including roads and a small onsite septic system. Additional support capabilities and utilities would be provided by public and commercial sector.

2.8.2 Key SNM Attributes

SNM – SNM would be consolidated and packaged for safe interim storage. All SNM would be removed by the year 2015. Stabilization and eventual treatment of residues would meet WIPP WAC. Residues would be shipped offsite and disposed as TRU waste.

2.8.3 Key Environmental Attributes

Waste Management – TRU wastes would be stored in a new interim facility until WIPP became available. Newly generated sanitary waste would be disposed offsite. Nonradioactive construction debris would be disposed onsite unless it was more cost-effective to dispose offsite. LLW containing less than 100 nanocuries/gram would be entombed in the facility foundations onsite. Other LLW/LLMW would be disposed onsite in a RCRA Class C-type landfill. Some offsite disposal would occur using truck or rail shipments.

New Facilities – Two new low maintenance interim storage facilities for SNM and TRU waste would be constructed.

Skyline – At the end of the Alternative 3e timeline, the skyline would only include entombed facility foundations and capped areas.

2.8.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 3e, Entombment and Landfill (in escalated 1996 dollars) is shown in Table I-7.

Table I-7
Estimated Total Project Cost - Alternative 3e, Entombment and Landfill

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2010	$9.0B	2015	$9.9B	$14M

1. SNM Consolidation, and most D&D would be complete; only WM treatment/storage/disposal, SNM shipment offsite, and final ER activities would remain.
2. Removal of all waste and D&D of temporary facilities would be complete. Only long-term monitoring would remain.
3. Unescalated annual cost.

The uncertainties of Alternative 3e are similar to those previously described. The relative costs of the task areas for Alternatives 3c, Excavation; 3d, Leveled Buildings; and 3e, Entombment and Landfill are similar. The relative costs of waste management, facility decommissioning, and infrastructure in Alternative 3e are lower than Alternatives 3a, Phased Shipment and 3b, Priority Shipment.

Schedule – The Level 0 network logic diagram shown in Figure I-10 also applies to Alternative 3e. Figure I-23 shows the Level 1 schedule. To apply the $700 million/year funding constraint, activities and their respective costs were delayed in time until the cost of work, including escalation, never exceeded the $700 million mark in any one year.

In Alternative 3e, Entombment and Landfill, a new RCRA-type landfill would be constructed for the onsite disposal of most LLW and LLMW. The landfill would be constructed incrementally (four cells) to permit receipt of waste in the shortest time. Durations for D&D activities reflect leaving the lower portions (foundations) of the buildings in place. A new interim TRU waste storage facility and SNM vault would be constructed. All SNM would be shipped offsite by 2015.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – An evaluation of residue plans compared with DNFSB 94-1 recommendations would be required to verify that the necessary level of processing was achieved. An evaluation of safety and safeguards considerations that affect the allowable proximity of the public to the new SNM storage facility would also be needed, in addition to a failure analysis of protective barriers.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was assumed for IAG milestones and Site Treatment Plan LDR treatment requirements, unless noted otherwise. Treatment of high-risk LDR waste would be performed to provide safe long-term protection of the workers, the public and the environment, but all LDR noncompliant waste might not meet prescriptive LDR requirements.

2.8.5 Risk

The risk contributors for Alternative 3e, Entombment and Landfill are similar to Alternative 3a, Phased Shipment except that: (1) LLW/LLMW would be treated for safe long-term protection but might not meet prescriptive LDR standards, (2) solid residues would not necessarily be processed for WIPP WAC immediately, (3) existing storage facilities would remain in place for a shorter period of time, (4) LLW/LLMW waste would be disposed onsite in entombed foundations and in RCRA Subtitle C-type landfill(s) respectively, and (5) the Plutonium and Uranium buildings would be partially demolished, with their lower portions entombed.

The first two exceptions are not expected to significantly impact the risk profiles. The third item would result in reduced OSHA and radiological risks to the workers during implementation (compared to Alternative 3a) since workers will not be in the older storage buildings as long. The worker risks associated with landfills during the implementation phase were assumed to be comparable to those associated with capped retrievable facilities. Essentially, therefore, there would be no difference between Alternatives 3e and 3a on the fourth item except that not shipping LLW/LLMW offsite would result in a reduced transportation risk to the public during implementation. This would also result in a higher residual radiological risk relative to Alternative 3a for both the public and the workers because the material remains onsite.

Accelerated Site Action Project Phase II

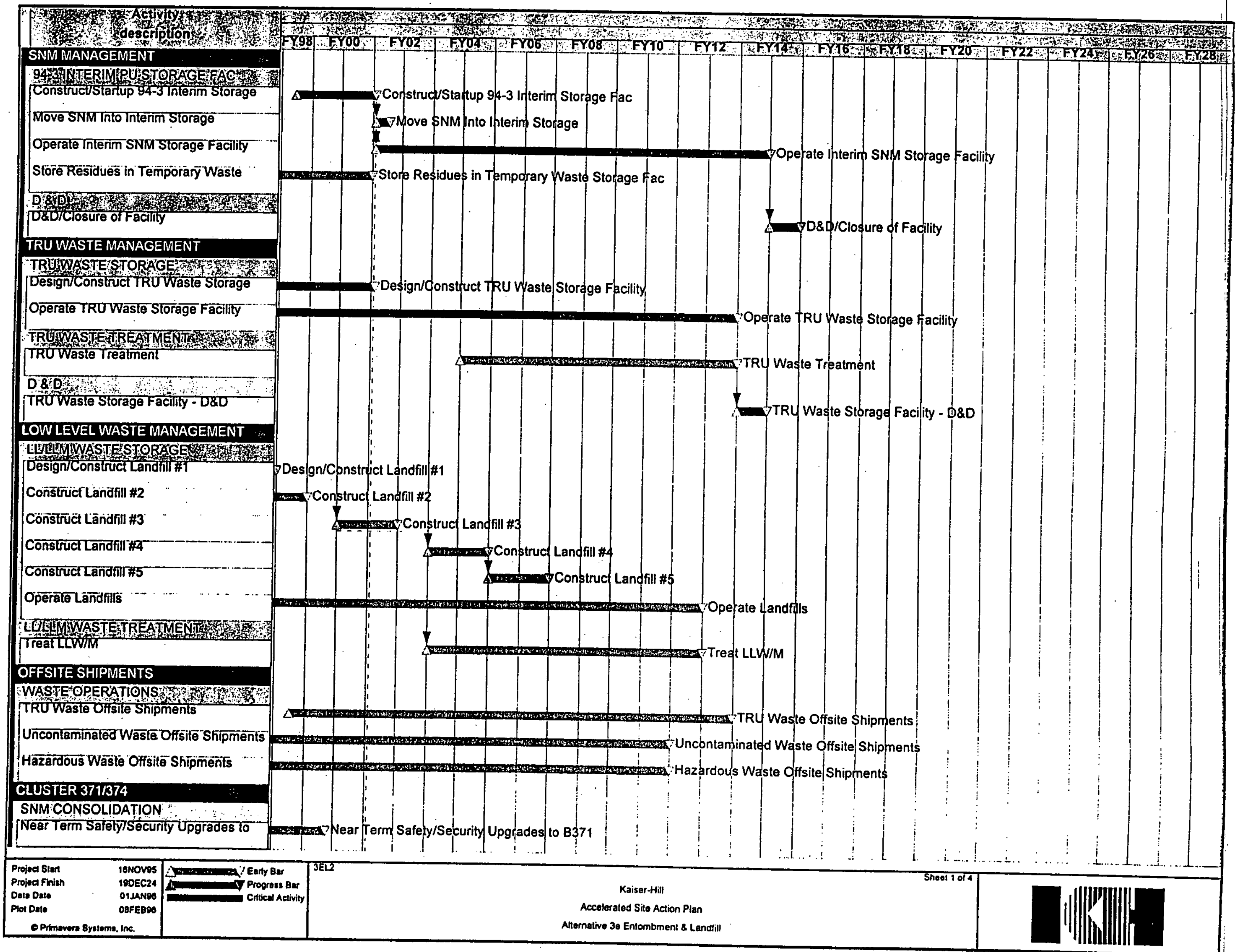


Figure I-23 Alternative 3e, Ento[...]ent and Landfill - Level 1 Schedule

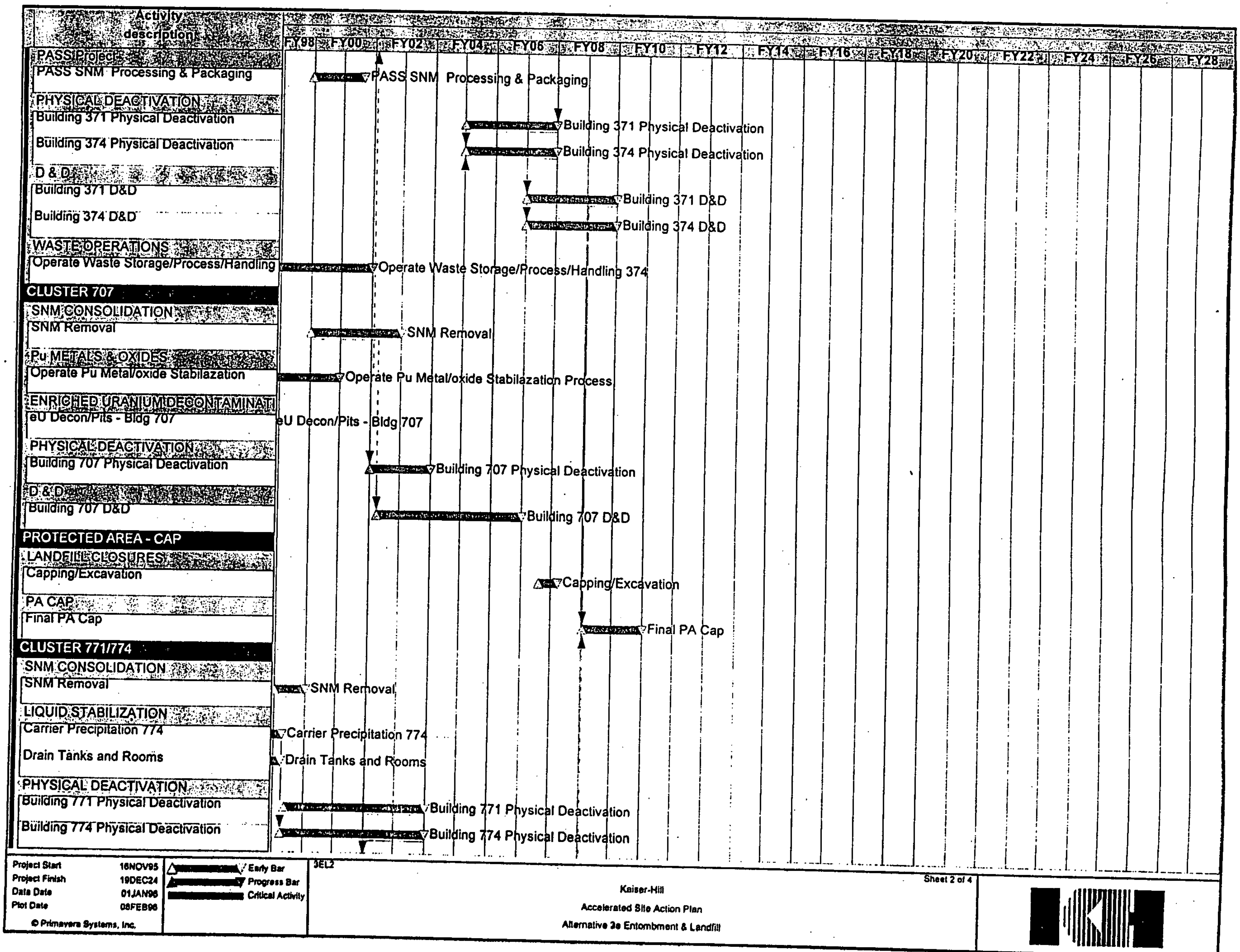


Figure I-23 Alternative 3e, Entombment and Landfill - Level 1 Schedule (continued)

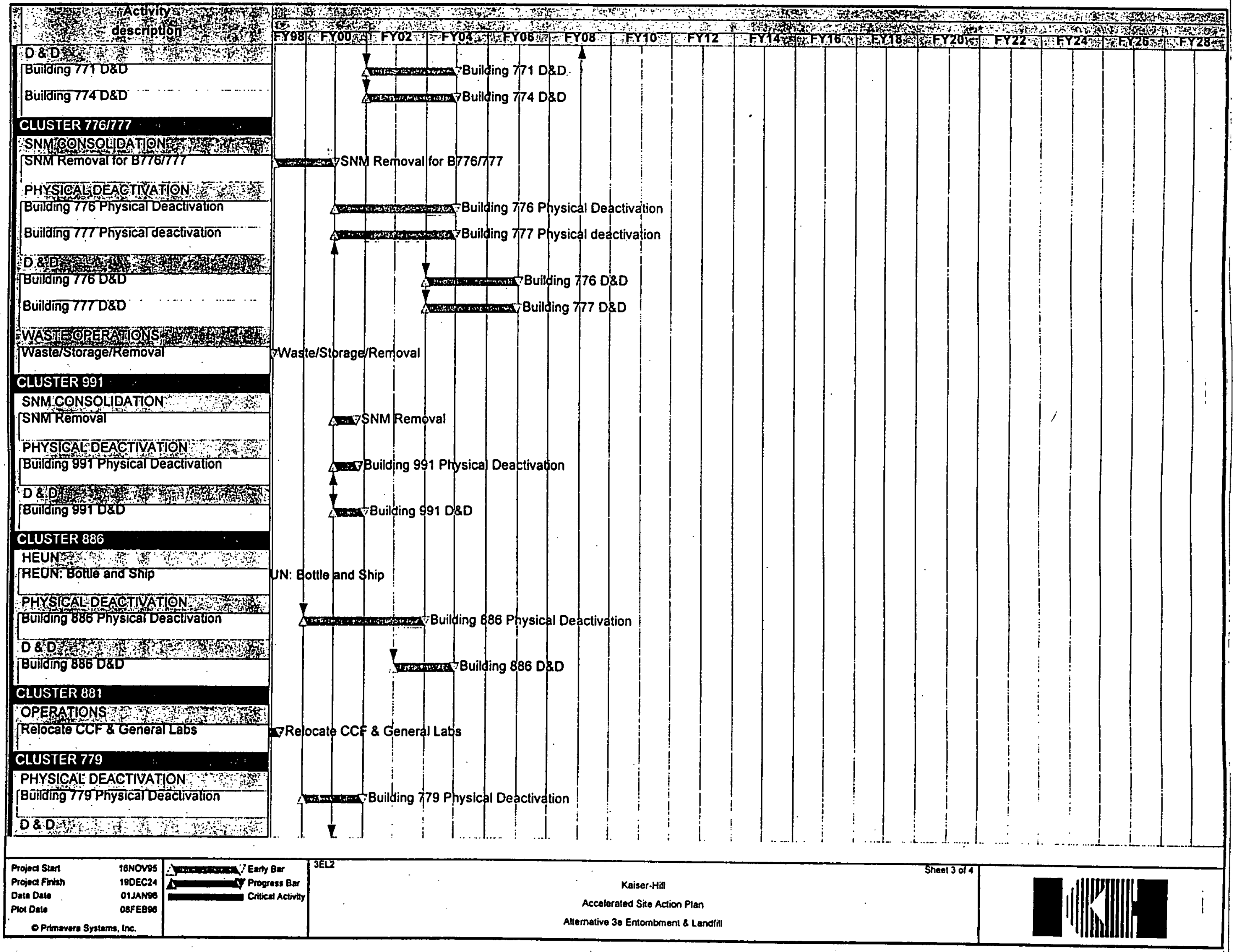


Figure I-23 Alternative 3e, Entombmer... ıd Landfill - Level 1 Schedule (continued)

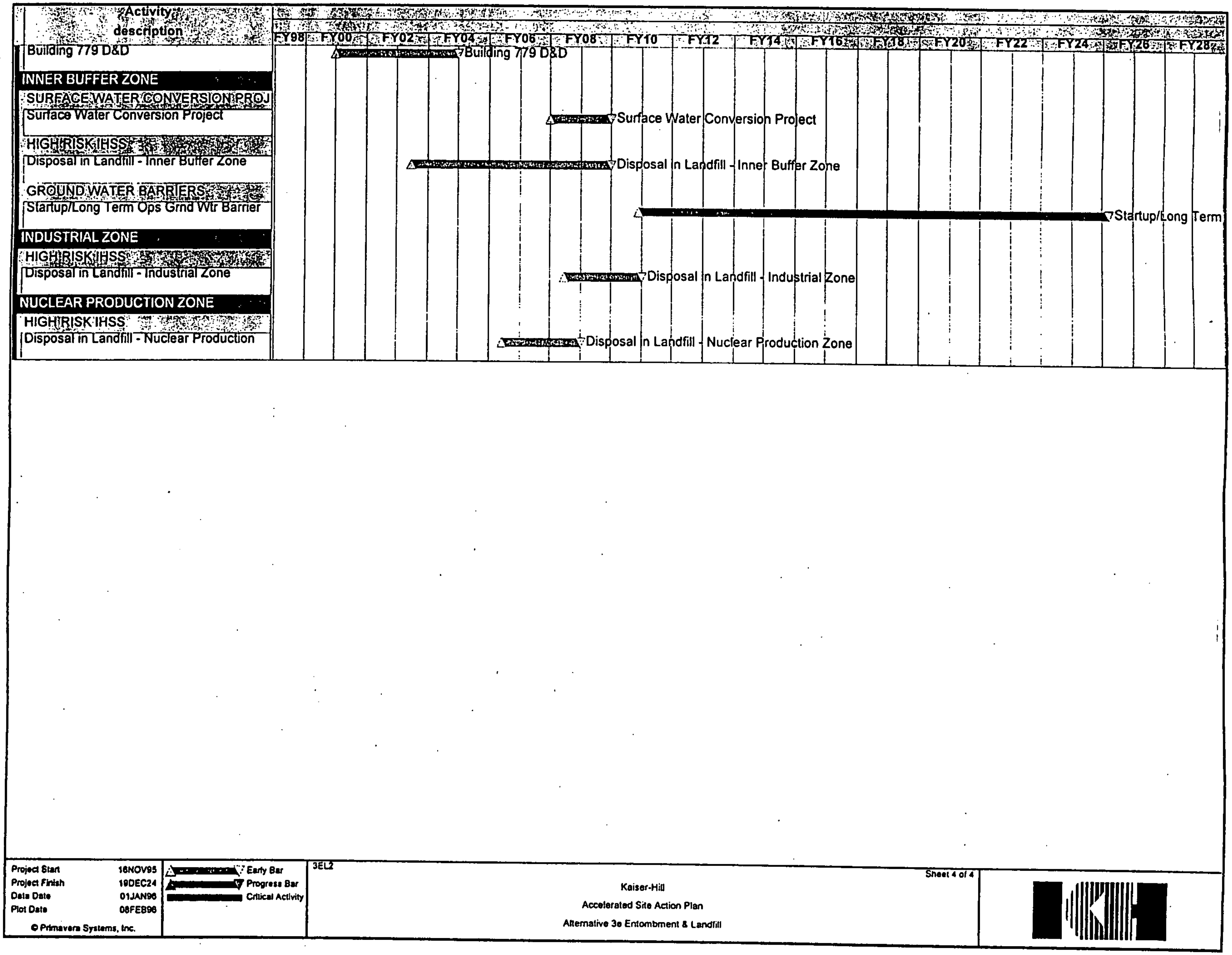
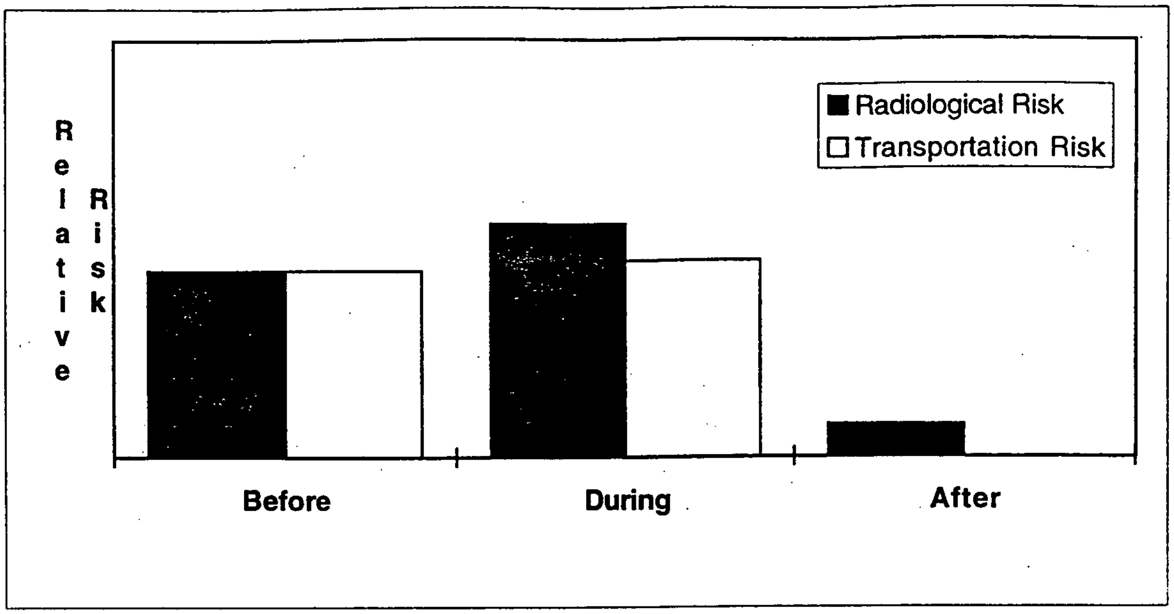


Figure I-23 Alternative 3e, Entombment and Landfill - Level 1 Schedule (continued)

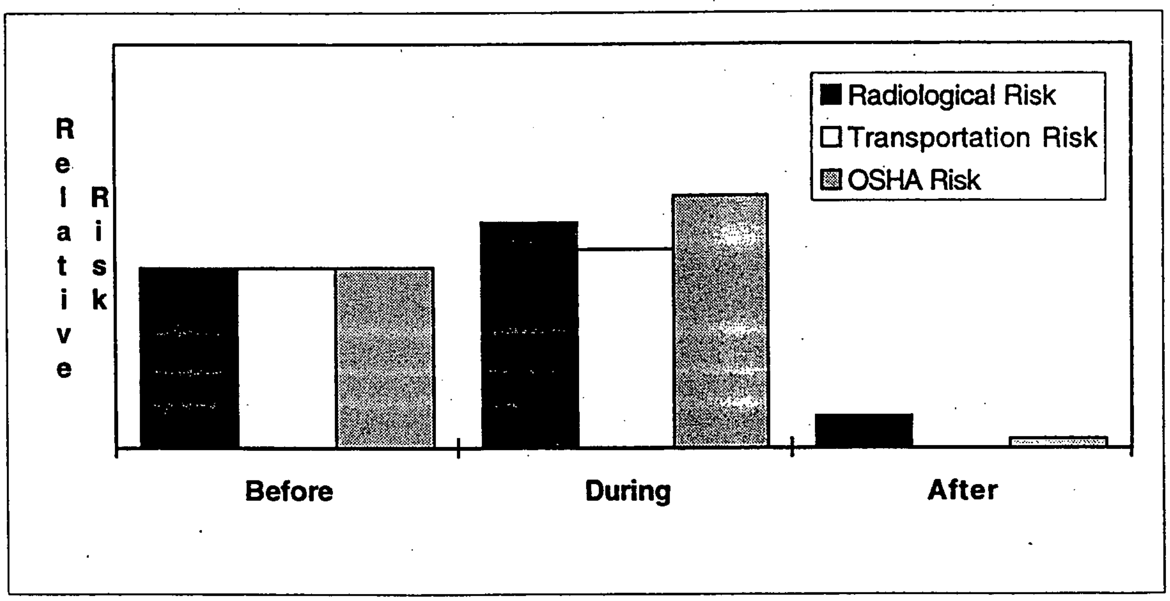
For the fifth exception, the foundations, basements, and soil surrounding radiological buildings would be left in place, reducing the radiological, OSHA, and transportation risk to workers because of less exposure to the potentially contaminated structures and the reduced mass of demolition material. The relative radiological risk to the workers during implementation would also be reduced because less material would be generated and handled, and less exposure would occur within older storage buildings. The worker transportation risk during implementation would also be reduced because of fewer shipments. Public radiological risk would decrease during implementation because less material would be generated and available for potential release. Public transportation risk during implementation would also decrease because of the reduced number of shipments overall.

Figures I-24 and I-25 provide the qualitative risk profiles for the public and workers for Alternative 3e, Entombment and Landfill.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-24 Public Risk, Alternative 3e - Entombment and Landfill



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-25 Worker Risk, Alternative 3e - Entombment and Landfill

2.9 Alternative 4, Mothball

2.9.1 End State Description

At final closure, many structures in Alternative 4, Mothball would remain vacant but standing. The Site would be retained in a state restricting both access to the structures and uses of the inner Buffer Zone and the Industrial Area. No plans exist within this alternative to remove any or all of the retrievable waste. This alternative contains considerable deferred liability because the final disposition of the facilities is delayed.

2.9.2 Key SNM Attributes

SNM – SNM consolidated and packaged for safe long-term storage. All SNM would be removed by 2015. Residues would initially be stabilized and treated to meet long-term storage requirements, but not necessarily to WIPP WAC. Residues may remain for a period of time, but eventually would be packaged to WIPP WAC, shipped offsite and disposed as TRU waste.

2.9.3 Key Environmental Attributes

Waste Management – LLW/LLMW would be disposed in retrievable and monitored facilities. TRU waste would be stored in a new interim facility until WIPP becomes available. Building foundations would remain in place under standing structures. Newly generated sanitary waste would be disposed offsite. Nonradioactive construction debris would be disposed onsite unless it would be more cost-effective to dispose offsite. Some waste would be disposed offsite by truck or rail shipments.

New Facilities – Three new low maintenance interim storage facilities for SNM, TRU waste, and LLW/LLMW would be constructed.

Skyline – At the end of the Alternative 4 timeline, most facilities would be left standing after being placed in a safe configuration unless demolition was cost-effective.

Infrastructure – Increased infrastructure would be necessary to ensure safety and structural integrity of facilities. Minimum utilities, passive ventilation, and lights for inspection purposes would be maintained. Site capabilities would be replaced by public and commercial utilities. Increased level of maintenance, fire protection, security, and radiation protection could be needed.

2.9.4 Cost and Schedule

Cost – The total estimated cost projected for Alternative 4, Mothball (in escalated 1996 dollars) is shown Table I-8.

Table I-8
Estimated Total Project Cost - Alternative 4, Mothball

Interim End State[1]		Final End State[2]		Annual O&M Cost[3] (in Millions)
Year	Cost (in Billions)	Year	Cost (in Billions)	
2007	$6.1B	2015	$7.5B	$35M

1. SNM Consolidation, and D&D would be complete; only SNM shipping and WM treatment/storage/disposal would remain.
2. All work would be complete. Buildings would be left standing and waste stored onsite. Only long-term monitoring would remain.
3. Unescalated annual costs.

The uncertainties described previously are similar to those of Alternative 4.. Excluding consideration of deferred liabilities, the relative costs of waste management, facility decommissioning, environmental restoration, and infrastructure in this alternative are lower than in the other alternatives.

Schedule – The Level 0 network logic diagram shown in Figure I-10 also applies to Alternative 4. Figure I-26 shows the Level 1 schedule. To apply the $700 million/year funding constraint, activities and their respective costs were delayed in time until the cost of work, including escalation, never exceeded the $700 million mark in any one year.

In Alternative 4, LLW and LLMW is disposed onsite in retrievable and monitored storage and disposal facilities. All major facilities are left standing and only minimal decontamination is performed, resulting in significantly reduced durations for D&D activities. All SNM would be removed by 2015. Because buildings would be left intact, expanded infrastructure needs (as compared to the other alternatives) extend into the foreseeable future.

Cost and Schedule Risk

- Technical Issues Affecting Cost and Schedule – The deferred liability costs associated with eventual building D&D and transport of the waste to either an onsite or offsite disposal facility represent a cost risk.

- Regulatory Issues Affecting Cost and Schedule – Regulatory flexibility was assumed for IAG milestones and LDR requirements. Treatment of high-risk LDR waste was projected to provide safe long-term protection of workers, the public, and the environment, but all LDR noncompliant waste might not meet prescriptive LDR requirements.

- Other Issues Affecting Cost and Schedule – An evaluation of infrastructure operating and monitoring life-cycle costs would be needed. The industrial area would remain under indefinite institutional control with long-term controlled access and physical security.

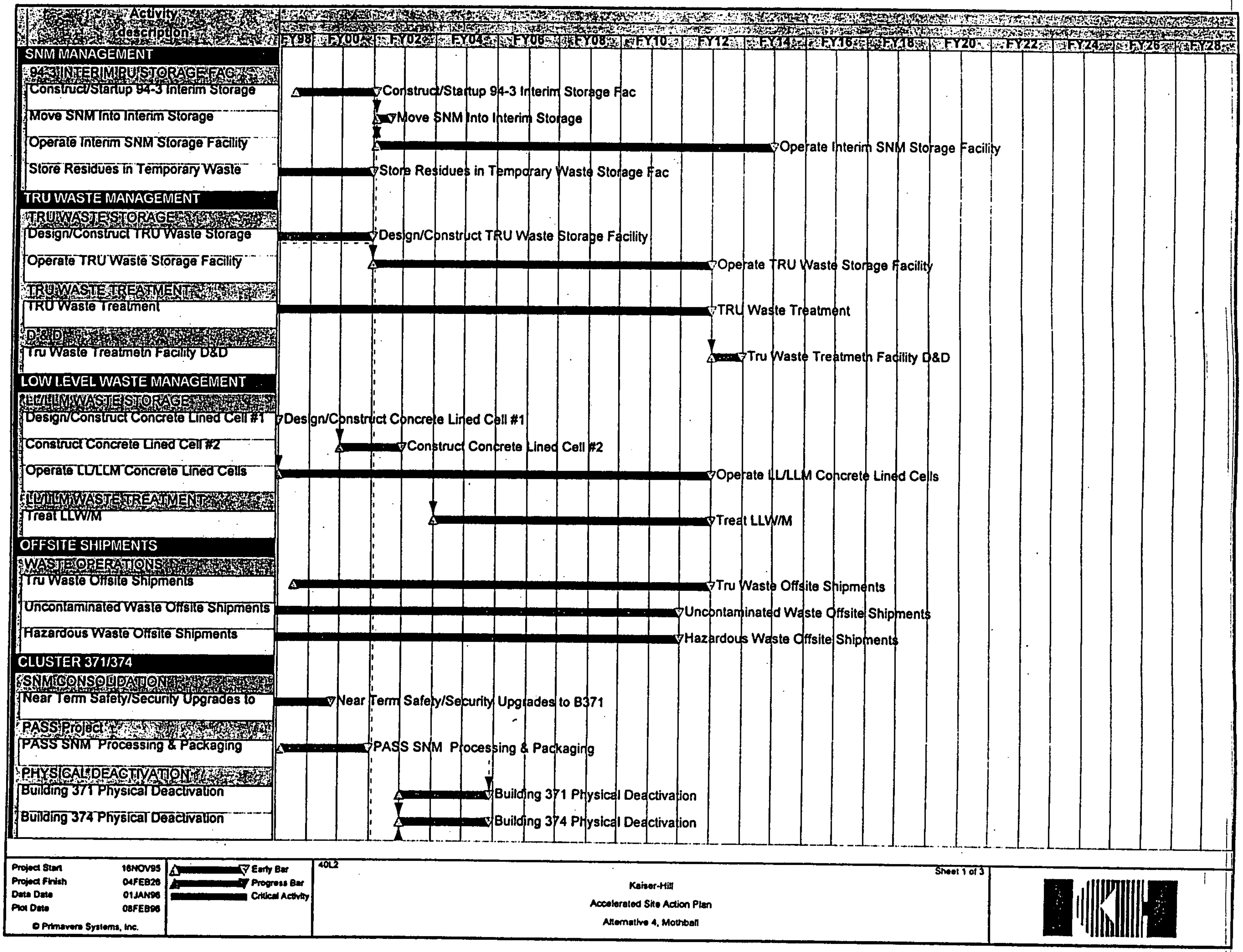


Figure I-26 Alternative Mothball - Level 1 Schedule

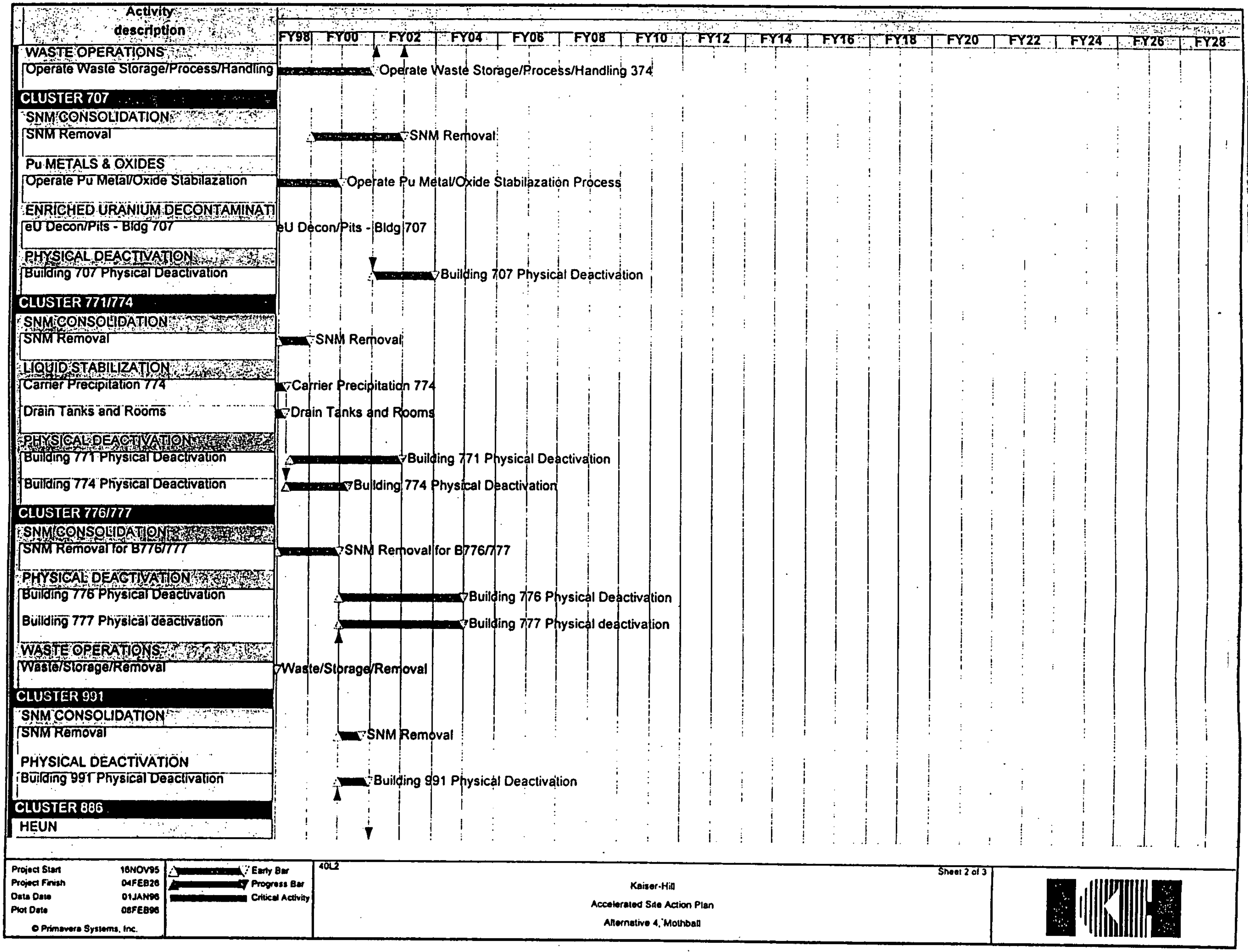


Figure I-26 Alternative 4, Mothball - Level 1 Schedule (continued)

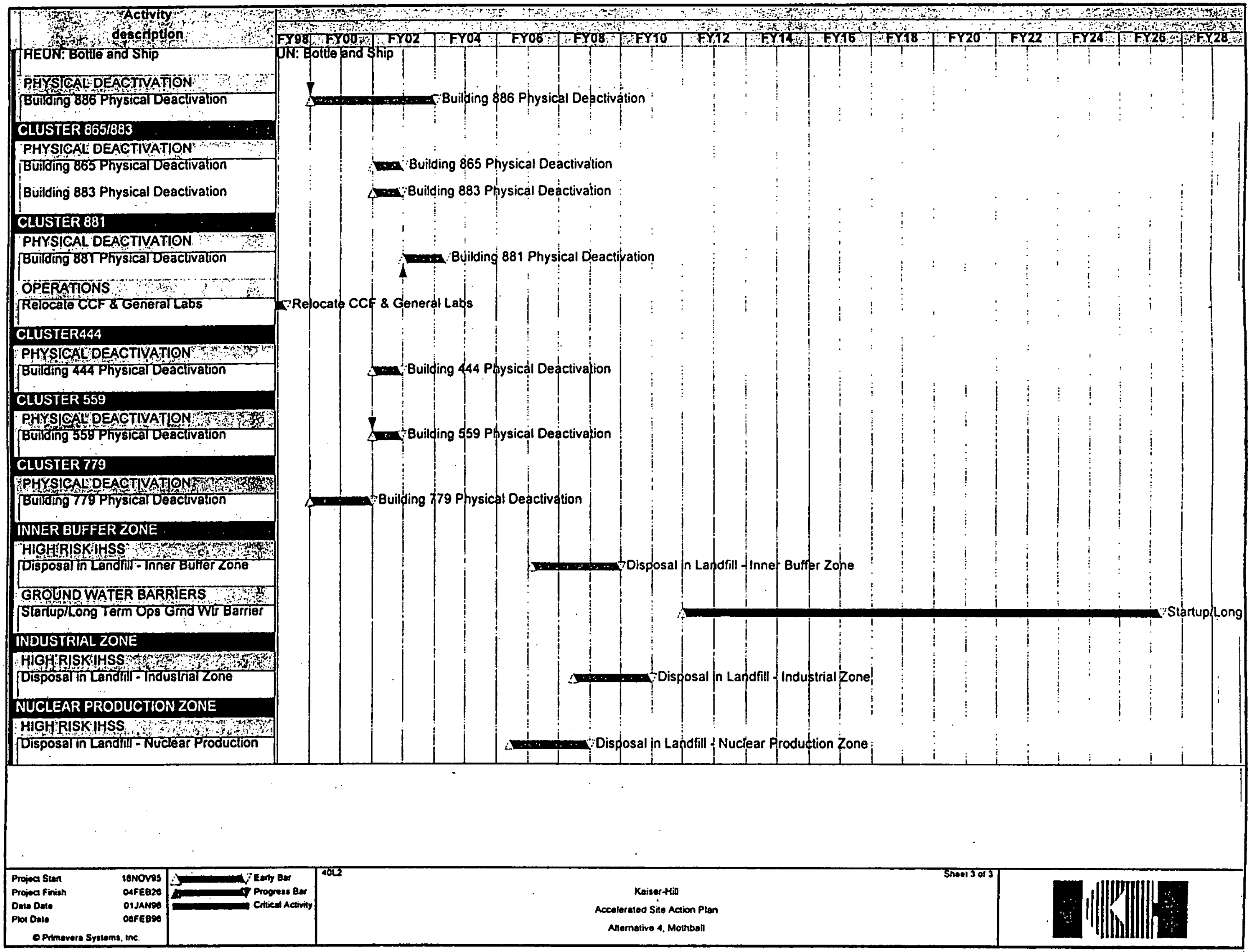


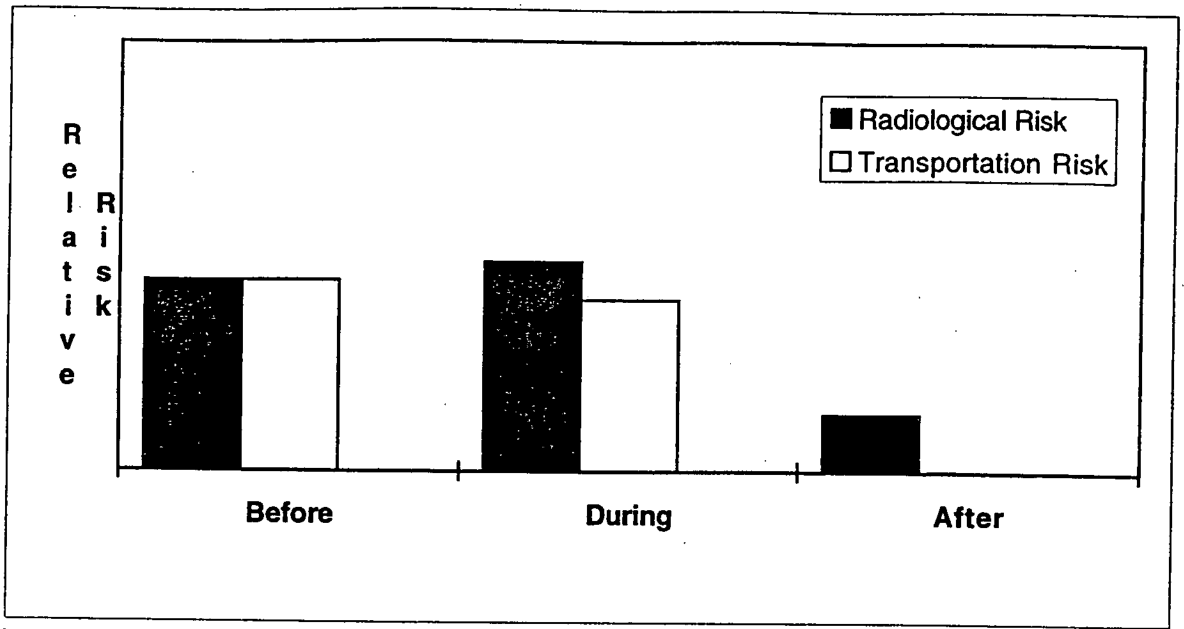
Figure I-26 Alternative 4, Mo[illegible]ll - Level 1 Schedule (continued)

2.9.5 Risk

The contributors to risk in Alternative 4, Mothball are the same as Alternative 3c, Excavation except that: (1) radiological buildings and new facilities would remain intact but vacant, and (2) the work force remaining onsite would be greater.

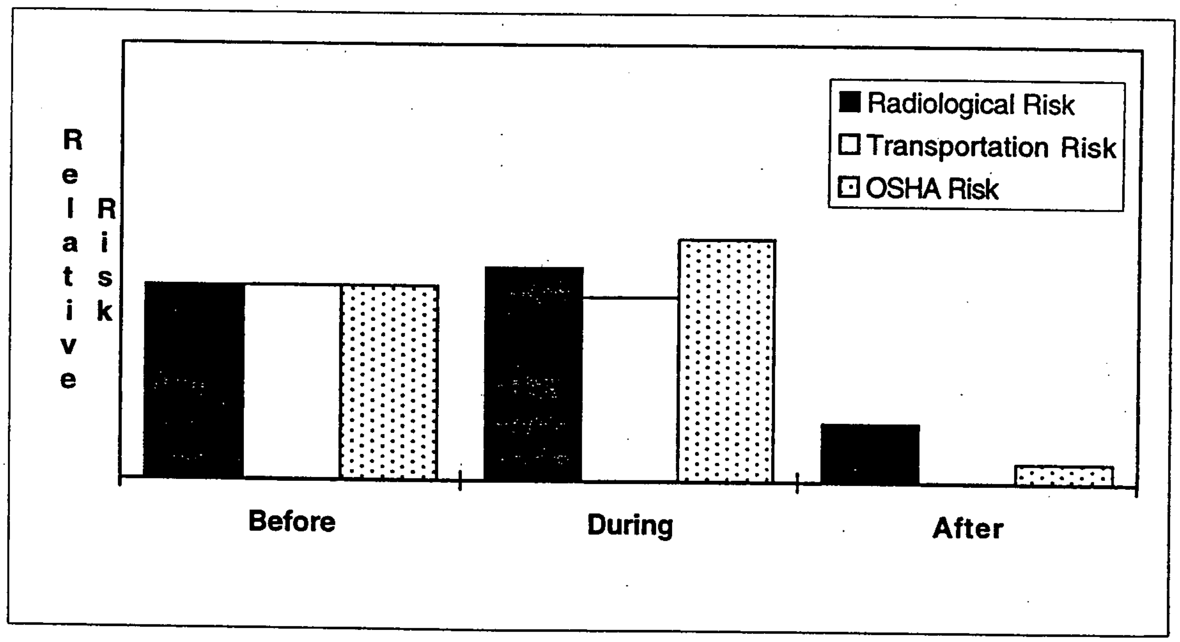
Because the buildings would remain standing, the worker radiological, OSHA, and transportation risks during implementation would decrease compared to Alternative 3c. However, after implementation, the radiological risk to the public and workers would be greater than Alternative 3c since buildings and associated contamination remain onsite. In addition, worker OSHA risk after implementation would also be greater than in Alternative 3c since more workers remain onsite in Alternative 4 and the activities they would conduct would be more extensive than in Alternative 3c.

Figures I-27 and I-28 provide the qualitative public and worker risk profiles for Alternative 4, Mothball.



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-27 Public Risk, Alternative 4 -Mothball



Note: The bars show relative risk within each risk category, not absolute risk.
Further, no relative risk is shown between the risk categories.

Figure I-28 Worker Risk, Alternative 4 - Mothball

APPENDIX J

STAKEHOLDER PROPOSALS

1.0 INTRODUCTION

As a result of the stakeholder involvement activities conducted in ASAP Phase I and on-going in ASAP Phase II, two individual stakeholder proposals already have been prepared and provided to the ASAP team for consideration and review. One proposal is concerned with the interim storage of Rocky Flats plutonium in a rural Colorado infrastructure. The second proposal discusses a proposed near offsite disposal/storage facility for ASAP II Alternative 1 with monitored and retrievable disposal site for all radioactive waste, a safe repository for all Special Nuclear Materials, and a research facility. This appendix includes both of these proposals from stakeholders.

Interim-storage of Rocky Flats Plutonium in a Rural Colorado Infrastructure

by Frank White Smith 10-12-95

This dated version of my proposal for interim-storage in former weapon silos addresses two items in today's news: 1) DoE's decision to produce tritium for future weapons in an accelerator, instead of using a reactor which might also have "burned" mixed plutonium oxides as fuel, making "final disposition," thus making development of borosilicate vitrification as a candidate final disposition process for plutonium metal, oxides and wastes an urgent matter; and 2) House of Representatives action setting DoE's research budget for fiscal 1996 at only 80% of fiscal year 1995 funding, so that all Weapons Complex expenditures must be limited to "Requirements."

Interim-storage of Rocky Flats Plutonium Inventory away from Rocky Flats in Colorado missile silos ... meeting security, engineering and budget requirements ... remains the most desirable means at hand for safely meeting needs of the public and Federal, Colorado and County Governments as well as thousands of institutions and businesses here in the least-possible time and at the least-possible cost.

An elaborate and apparently qualified infrastructure-in-place in rural Colorado for interim-storage of Rocky Flats' plutonium and plutonium oxides inventory is now under formal engineering and security feasibility study by the Department of Energy for interim-storage ... namely in missile Minuteman silos in a sparsely-populated part of rural Colorado, now managed from the Air Force's Warren Air Force Base of Wyoming, mapped by Nukewatch in an attached sheet taken from Nuclear Heartland, showing more than four "Flights" of ten missiles each lying in the State of Colorado and representing a valuable and probably feasible infrastructure-in-place for inerted interim-storage of Rocky Flats' inventory as casked-stabilized-canned plutonium and plutonium oxides or vitrified-casked inventory-and-waste, all being held unstable now on metropolitan Denver's Rocky Flats.

Inasmuch as there will be a recurring need to sample-test stored inventory over interim-storage lifetime, a central well, by which a robotic arm can extract can(s) or log(s) from any cask is contemplated, so that no human radiation exposure is required in the high radiation-levels and/or inert atmosphere inside the silo. Such a robotic device will be external to the silo, used when the silo's concrete header has been rolled-back to position the robotic probe for sampling. A simple analogy for casks in a former weapon silo is the familiar packaging of Lifesavers, each ring representing stacked casks holding their array of cans or logs of stabilized plutonium, oxide or waste, with center-access making possible robot-arm selection of cans for sampling, with spacers for can-geometry against possible criticality accident. Note, for borosilicate logs, criticality is not an issue although there is multiplication of storage-volume required due to the plutonium's dilution-in-glass. I have asked Dr. Forsberg to supply an estimate of the volume-expansion factor for plutonium metal, for plutonium oxide, and for a typical plant scrap mixture.

Each silo site has dual, redundant circuits of R.E.A. power for all air-cooling, security and surveillance, and each also has auxiliary power for pumping possible groundwater; with the surface security monitoring and sensing inside every silo's security-fenced and hardened silo-top closure now kept in military-ready status, armed-and-manned to launch. Road maintenance is kept to a high standard to man, load and service Minuteman silos from Flight barracks and to run missile-installation vehicles from Warren Air Force Base.

If it can be shown that stabilized, canned or borosilicate-vitrified plutonium is safer than Minuteman missiles themselves now in the manned silos, and that canned or vitrified-plutonium will meet all ES&H and Transportation-safety criteria for interim-storage until they can may be fed into a U.S. "final disposition" path forward for surplus plutonium inventory in processes yet-to-be determined, the budgetary savings in silo storage over a new Rocky Flats facility would help finance completion of the Rocky Flats Environmental Technology Site Cleanup, Demolition and Decommissioning, presently at risk of budgetary stretchout in current appropriation-making, allowing Rocky Flats to reach its interim end-state.

Establishing interim-storage outside of metropolitan Denver is of high urgency for some 2.7 milllion citizens here. Its potential in Former Weapon Silos demands engineering, budgetary and security analysis on the highest priority basis.Both development of the "50 year can" and research on "conversion of plutonium, oxides and wastes through borosilicate vitrification" deserve most-urgent feasibility study, so that plans for interim-storage are in hand for cost-effective and lowest-risk RFETS interim end-state planning

An international silo storage issue appears to lie with the Arms Control and Disarmament Agency: it has been practice under the START treaty to implode emptied missile silos, so satellite inspection proves the silo can no longer be used to launch missiles. It is in the mutual interest of both Russia and the U.S. to utilize their hardened silo infrastructure(s) for interim-storage of plutonium, warhead pits and/or high-level nuclear waste to help secure those materials against terrorist, theft, accident or proliferation targeting, the treaty-required proof should be revisited and accomplished saving silos.

See: "Los Alamos heads up tritium option project," Denver Post, Oct 12, 1995 p. B-1' attached;

WHAT IS PLUTONIUM STABILIZATION, AND WHAT IS SAFE STORAGE OF PLUTONIUM?, June 29, 1995, Dr. Chas. W. Forsberg, Oak Ridge National Laboratory paper ORNL/M-4322, Tel. (615) 574-6783;

Management and Disposition of Excess Weapons Plutonium, 1994 and companion study Management and Disposition of Excess Weapons Plutonium, Reactor-related Options, 1995, National Academy Press, Washington, D.C.:

CRITICAL ASSEMBLY; A Technical History of Los Alamos ... the Oppenheimer Years 1943-1945, Lillian Hoddeson, Henriksen, Meade & Westfall, 1993, Press Syndicate of Cambridge University, 499 p;

FINAL ENVIRONMENTAL IMPACT STATEMENT, PEACEKEEPER IN MINUTEMAN SILOS, Jan, 1984 Dept. of the Air Force, 90th Strategic Missile Wing, F.E. Warren Air Force Base, held in Gov. Doc'ts, Denver Public Lib.;

Nuclear Heartland, A Guide to the 1,000 Missile Silos of the United States, Samuel H. Day, Jr. editor, 315 W. Gorham, Madison, WI-53703; and

Dismantling the Bomb and Managing the Nuclear Materials, 1993 U.S. Congress Office of Technology Assessment, Y3.T22/2:2D63/3 SUM for a short Report and Y3.T22/2.2D63/3 for the Full Report.

(f/n Silos FWS 10-12-95)

Each silo is no closer than ten miles to another, and each Flight of ten silos uses a surface barracks-and-laboratory building which, for interim-storage operations would be usable for security and sampling of stored inventory. Each silo is also under a two-ton hardened silo-closure for physical security against theft or terrorist action, analogous to similar concrete doors used to protect Pantex bunkers against intrusion among stored weapon-pits there.

There are both case law and Federal and State Regulations which restrain transfers of any plutonium from Colorado to other States. Yet the U.S. nuclear deterrent is under change: from our present triad of nuclear fleet, strategic bombers and missiles, a future diad of only fleet and bombers will be maintained. Thus, U.S.-Russian treaty-agreed dismantlements among missile-emptied silos in Colorado silos can probably be programmed for resolving the interim-storage site(s) needed for the metropolitan Rocky Flats' Plutonium Inventory.

The land on which each silo stands is owned by the United States Government, rather than being a leasehold. It is contemplated that particular silos used for interim-storage will be closely-held, need-to-know information, to minimize stored inventory targetability.

Stacked cylindrical casks of either stable, canned plutonium and plutonium oxides or casks of borosilicate glass billets might be stored inside silo(s) conformal to missile size, and installed just as segmented Peacekeeper missiles are detailed in the Environmental Impact Statement on the Peacekeeper, using Minuteman silos as proposed by the Air Force during the Reagan Administration. Note that its EIS found No Significant Impact for installing Peacekeeper missiles around Warren Air Force Base, so it is likely that emptied silos using Warren AFB silos for loading of interim-stored casks, using similar practice performed in Colorado by the Air Force, will meet all engineering, seismic, budgetary and security requirements.

A necessary interim-storage condition for holding stabilized plutonium metal or oxides in an inert-gas atmosphere contemplates straightforward silo remodeling that seals the silo atmospherically and allows robotic selection of samples of canned or vitrified inventory during interim-storage in a mobile procedure similar to those used currently in stacker-retriever sampling from inerted-vault storage at Rocky Flats.

In light of the Department's decision to develop an accelerator, rather than any reactor to meet future weapons' tritium requirements, relative merits between borosilicate vitrification and "the 50-year can" must each be examined for engineering, security and cost feasibility.These two options, "50 year cans" and "borosilicate vitrification," having been studied in full, would come to answer whether-or-not there is a Requirement for a new storage facility on Rocky Flats; and only when both have been shown non-feasible should interim-storage facilities be built on Rocky Flats. Indeed, budget for either of the promising offsite processes should be planned, after stabilization of metal and oxides to minimize current risk, so that a feasible offsite interim-storage program can be financed.

Borosilicate vitrification may become the preferred interim-storage mode for plutonium, oxides and high-level wastes from Rocky Flats, if scaleup of Oak Ridge laboratory research proves able to safely produce glass billets from a melter for denaturing them all, allowing the handling and interim-storage of plutonium in former weapon silos until final disposition methods have been developed by the Department of Energy. The C.W. Forsberg et al paper from the Oak Ridge National Laboratories on borosilicate vitrification conversion of plutonium is referenced, and a copy may be obtained from Ken Korkia.

Thursday, October 12, 1995

SECTION B

THE DENVER POST

Los Alamos heads up tritium option project

By The Associated Press

LOS ALAMOS — Los Alamos National Laboratory will lead the nation's development of a proton accelerator to produce a radioactive gas that enhances the explosive power of nuclear warheads.

Jim Danneskiold, a spokesman for Los Alamos, said yesterday the northern New Mexico lab would get about $41 million of a $50 million project budget for fiscal year 1996, which began Oct. 1.

That includes money for continuing experimental work at Los Alamos' Neutron Science Center and equipment to build a Low-Energy Demonstration Accelerator, which would be a prototype for components of the final system.

"One of the technical advantages of the accelerator idea is it uses proven technology that's been worked out over 20, 25 years of research at Los Alamos and other labs," Danneskiold said. "There are some engineering questions. That's the reason for the demonstration program."

Energy Secretary Hazel O'Leary announced Tuesday in Washington that her agency is considering commercial reactors to produce tritium, ruling out the building of an expensive new government reactor.

At the same time, as part of a dual-track strategy, the department said it would continue to test and develop a linear accelerator to produce tritium gas.

The DOE will select one of the technology tracks to follow after three years of engineering and demonstrations of the two alternatives.

The $2 billion accelerator would be developed at the Savannah River weapons complex near Aiken, S.C., if that option is

Please see LOS ALAMOS on 7B

LOS ALAMOS from Page 1B

chosen as the eventual primary source of tritium, O'Leary said.

Scientists at Los Alamos and Sandia national laboratories in New Mexico and Brookhaven National Laboratory in Long Island, N.Y., have been working on technology for accelerator production of tritium for seven years.

Paul Lisowski, project leader of the work at Los Alamos, said the technology has significant safety and environmental advantages over producing tritium by a reactor.

Accelerators, unlike reactors, don't use uranium or plutonium to produce tritium, thus eliminating any chance of a runaway nuclear accident and avoiding the production of high-level nuclear waste, Los Alamos said in a news release.

> 'Accelerator-based systems use well-developed technology, have acceptable costs and produce minimal environmental impact.'
>
> **Paul Lisowski,**
> Los Alamos project leader

"Accelerator-based systems use well-developed technology, have acceptable costs and produce minimal environmental impact," Lisowski said.

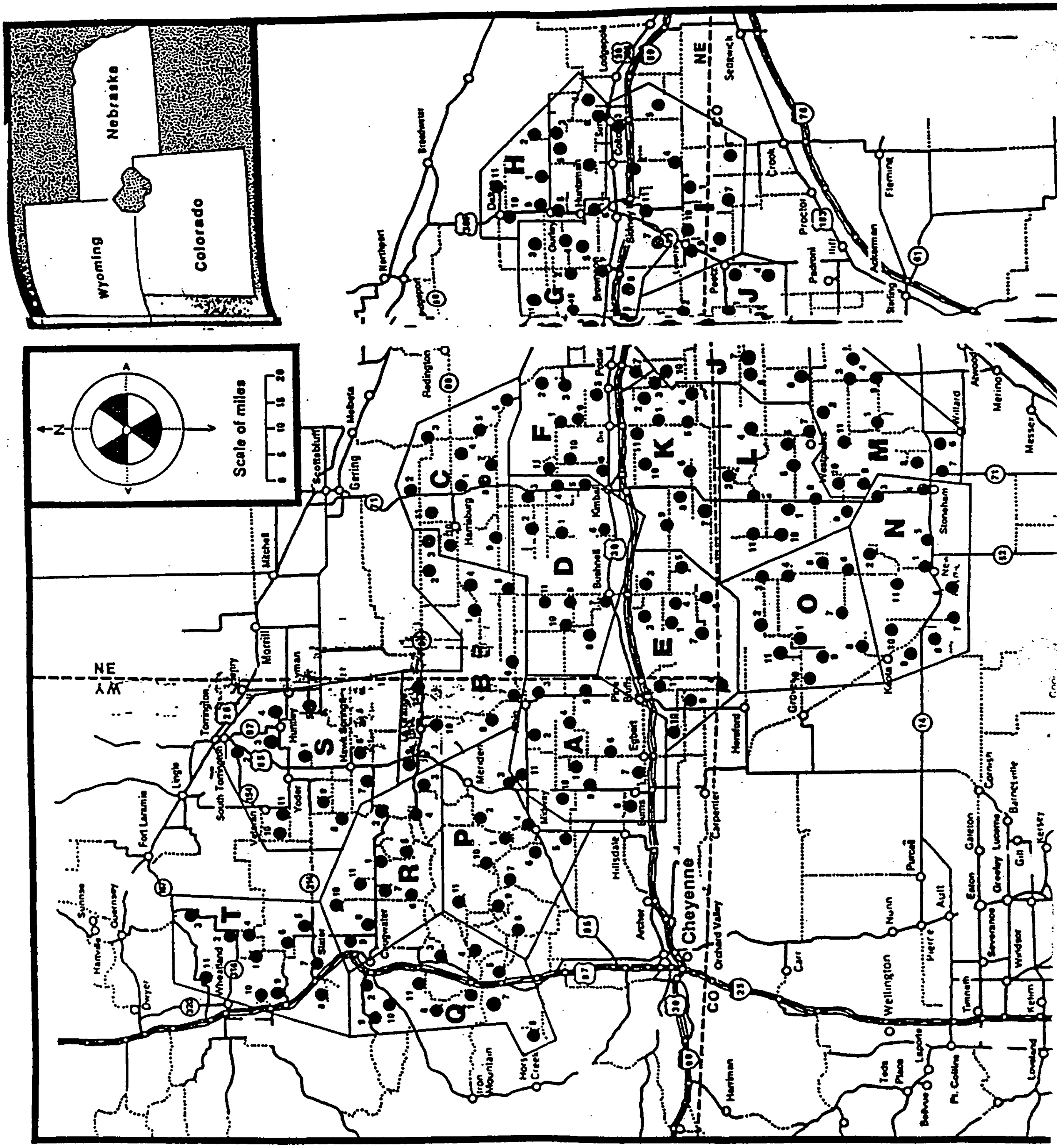
Tritium, a radioactive isotope of hydrogen, decays at the rate of 5.5 percent a year.

Defense officials estimate the government will need new supplies by 2011. The government stopped producing tritium in 1988 after its Savannah River reactors were shut down because of safety problems.

O'Leary said a decision would be made in 1998 whether to pursue the accelerator further or to lease or buy a commercial reactor.

"We're hedging our bets," O'Leary told reporters, adding that the dual strategy would "assure tritium production for our nuclear weapons stockpile" and meet the Defense Department's concerns about meeting the 2011 deadline.

A commercial reactor is the cheapest option. A consultant's report estimated the life cost of using a civilian reactor could reach $4.5 billion compared with about $14.8 billion for a linear accelerator and $10 billion to $16 billion to build a new reactor.


Wyoming
Nebraska
Colorado
Scale of miles
Cheyenne
Scottsbluff
Gering
Torrington
Wheatland
Kimball
Sidney
Sterling
Wellington
Fort Laramie
NE
WY
CO

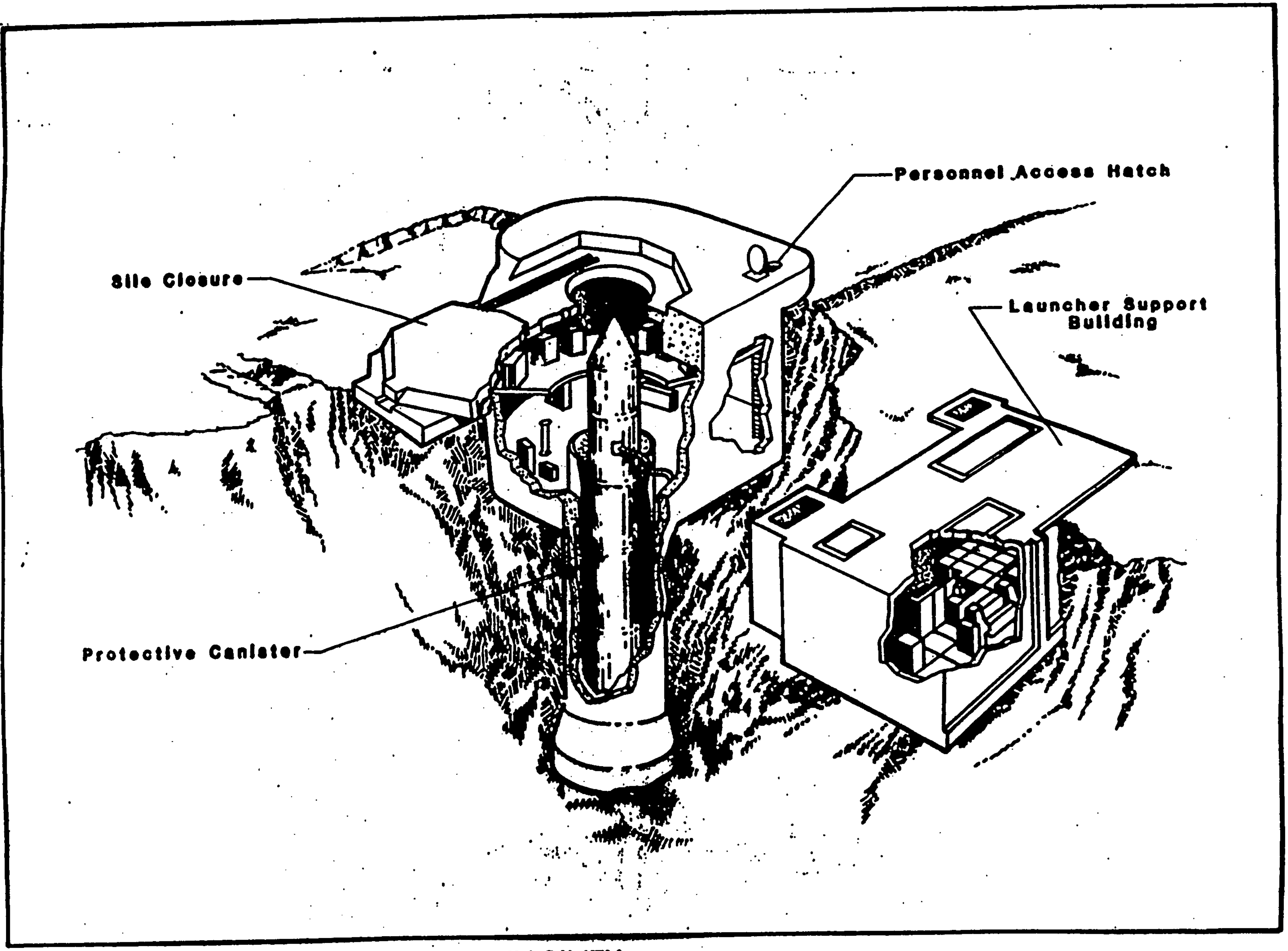


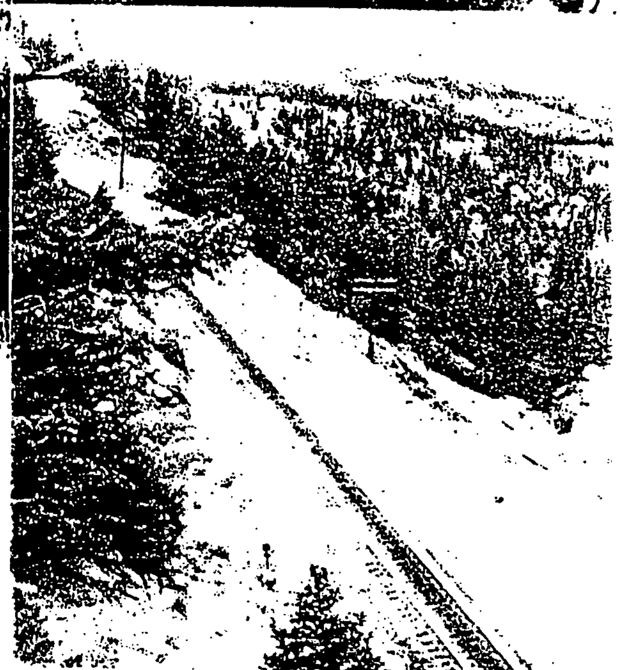
FIGURE S-1 PEACEKEEPER LAUNCH FACILITY

Stone Environmental Engineering Services, Inc.
James S. Stone, P.E., Vice President Engineering
2510 Miller St., Lakewood, Colorado 80215-1323; Ph./Fax 303-2378058; RADWAS06.RFP; 12/4/95

ACCELERATED SITE ACTION PROJECT

Rocky Flats Environmental Technology Site, Denver, Colorado

PROPOSED NEAR OFF-SITE DISPOSAL/STORAGE FACILITY FOR ASAP II SCENARIO 1 WITH MONITORED AND RETRIEVABLE DISPOSAL SITE FOR ALL RADIOACTIVE WASTE, SAFE REPOSITORY FOR ALL SPECIAL NUCLEAR MATERIALS, AND A RESEARCH FACILITY.



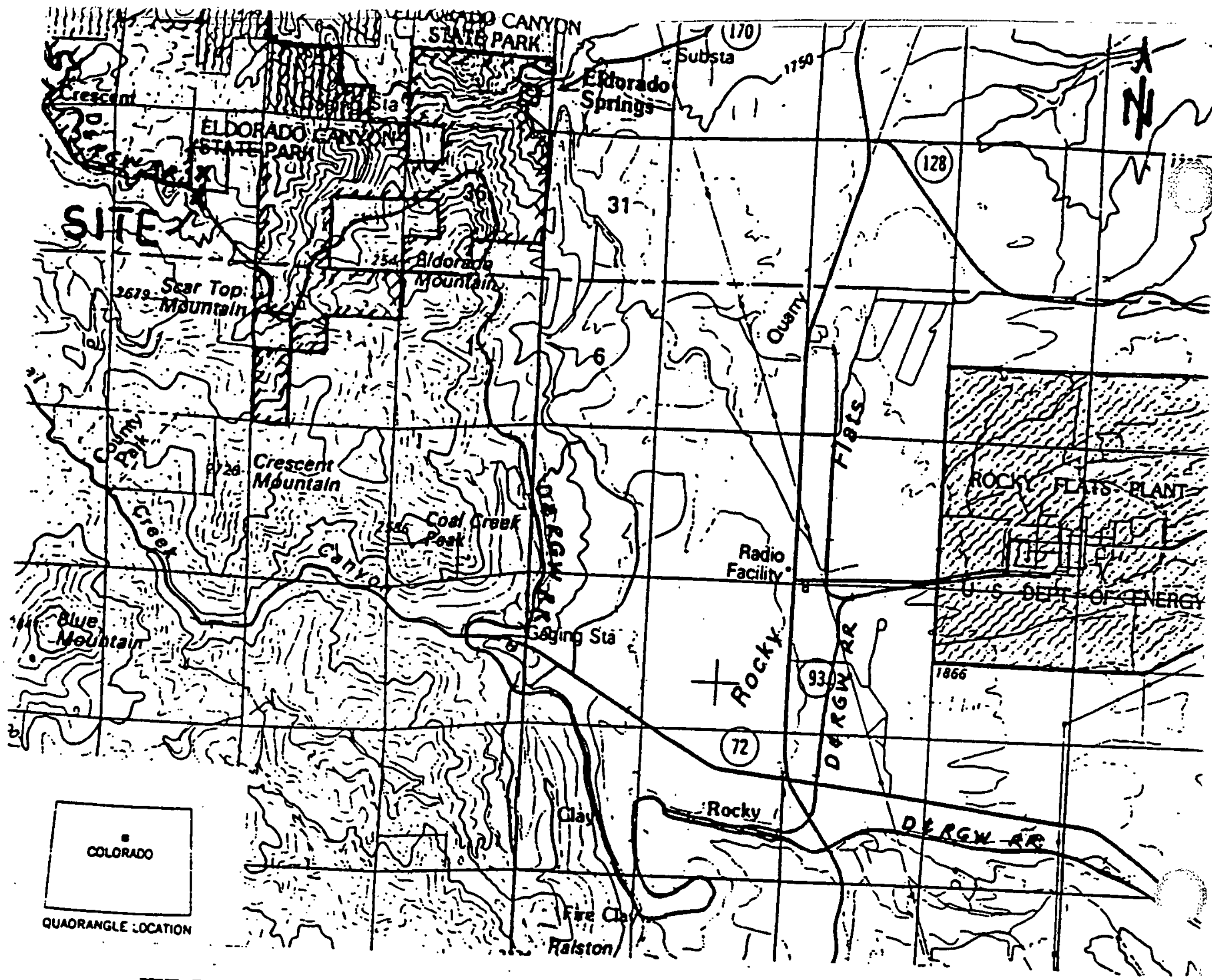


FIG. 1 SURFACE MANAGEMENT STATUS 1986

B.L.M., DENVER WEST, COLORADO QUADRANGLE, 1" = 1 mile

1. SURFACE MANAGEMENT STATUS: Stone Environmental Engineering Services, Inc. owns a 38 acre, remote, dry, stable,, granite ravine located in the foothills ~ 6 miles W-NW in a straight line from the Rocky Flats Environmental Technology Site. SEES offers the site and 3 conceptual designs that complement Kaiser-Hill's Accelerated Site Action Project. Our version of Scenario No. 1 (Greenfield) provides for off-site monitored and retrievable disposal of Low Level & Low Lever Mixed Waste, with the option for different price ranges, and the safe monitored storage of Transuranic Waste and Special Nuclear Material and a Research Facility. The site is ~ 20 miles by railroad from RFETS and ~ 3 miles East from Crescent Village, Boulder County, Colorado. The site is bordered on the West by the Eldorado Canyon State Park; on the South by the Denver & Rio Grande Western Railroad; and on the North and East by private property. In 1963, D&RGW RR designed the railroad spur track and trestle for ash disposal at this site from our proposed municipal waste incinerator in Denver. In 1965, the County of Boulder administration approved the site for ash disposal, but the City Council of Denver opted to develop the Lowry Landfill. In 1986, U.S. Environmental Protection Agency considered the site for disposal of Radium from Denver, but opted to move the Radium into storage sheds in Denver. In 1992, U. S. Department of Energy considered SEES' proposal for Interim Storage of TRUW at the site, but opted for completion of the Waste Isolation Pilot Plant in New Mexico. The site is surrounded by abandoned Uranium mines and is naturally radioactive, which has curtailed local residential development. This design provides adequate protection from all other foreseeable hazards. See the USDOE "TECHNICAL APPROACH DOCUMENT - Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix" shown. Rating = 87%. Residences and the Research Center (Opt. 3.3 only) would be located on the east access road overlooking the planted monofill, Gore Mountain Range, and Gross Reservoir or located in Crescent Village/RR Jnt. Recreation includes hiking, horseback riding, fishing, rock climbing, and serenity. We hope you will approve this plan. We would be pleased to answer questions at your convenience. Please call Jim Stone, P.E. (303) 237 8058). Thanks for your consideration.

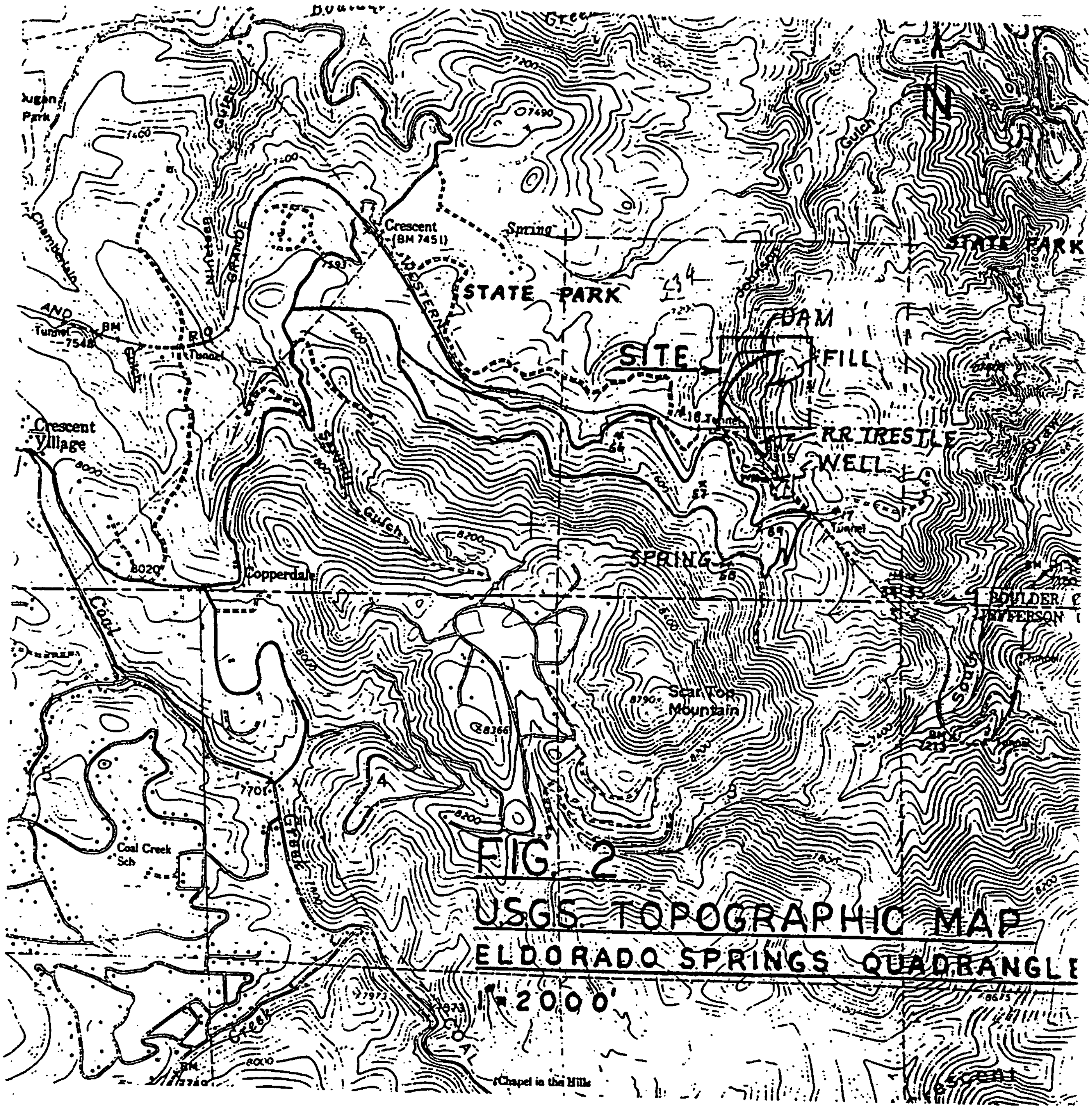


FIG. 2
USGS TOPOGRAPHIC MAP
ELDORADO SPRINGS QUADRANGLE
1"=2000'

2. TOPOGRAPHY: The site was formed by flow foliation of Precambrian granitic bedrock. There is no recorded seismic activity in the last 10,000 years, within 10 miles of the site. The floor of the ravine appears to be dry, unfractured, and drains into Johnson Gulch at the NW property corner. The ravine has a plan area of ~ 15 acres; is ~ 1800 ft. long; ~ 1100 ft. wide; ~ 250 ft. deep at the maximum fill elevation of 7280 ft.; and gross volume of ~ 2.5 million cu. yds. The storm water shed on the north slope of Scar Top Mountain is ~ 124 acres and would produce ~ 61 cu. ft./sec. runoff from a 100 year storm. The railroad track berm has always diverted the runoff into Johnson Gulch. A perennial spring is located ~ 3600 ft. NW from the NW property corner. Well # 10, near the north end of Tunnel # 17, is rated at ~ 10 gals/min. The population density is ~ 4 residences per adjacent square mile and the closest residence is ~ 3/4 mile from the site. The primary route to the site is by D&RGW RR. The secondary roads, built by the defunct developer are obsolete, but are passable with a four-wheel vehicle. It is proposed that the original right-of-way road to the site, just inside the south fence line, would be improved from Crescent RR Junction to extend across the dam and double back on an improved abandoned road. Potentials for transporting LL/LLM waste to the site are to use an aerial cable-bucket line or a buried belt-conveyor corridor. A secured railroad car would be used to transport TRUW/SNM. Additional land (~ 100 acres) will be required for a buffer zone.

OPTIONS FOR A "NEAR OFF-SITE" WASTE FACILITY

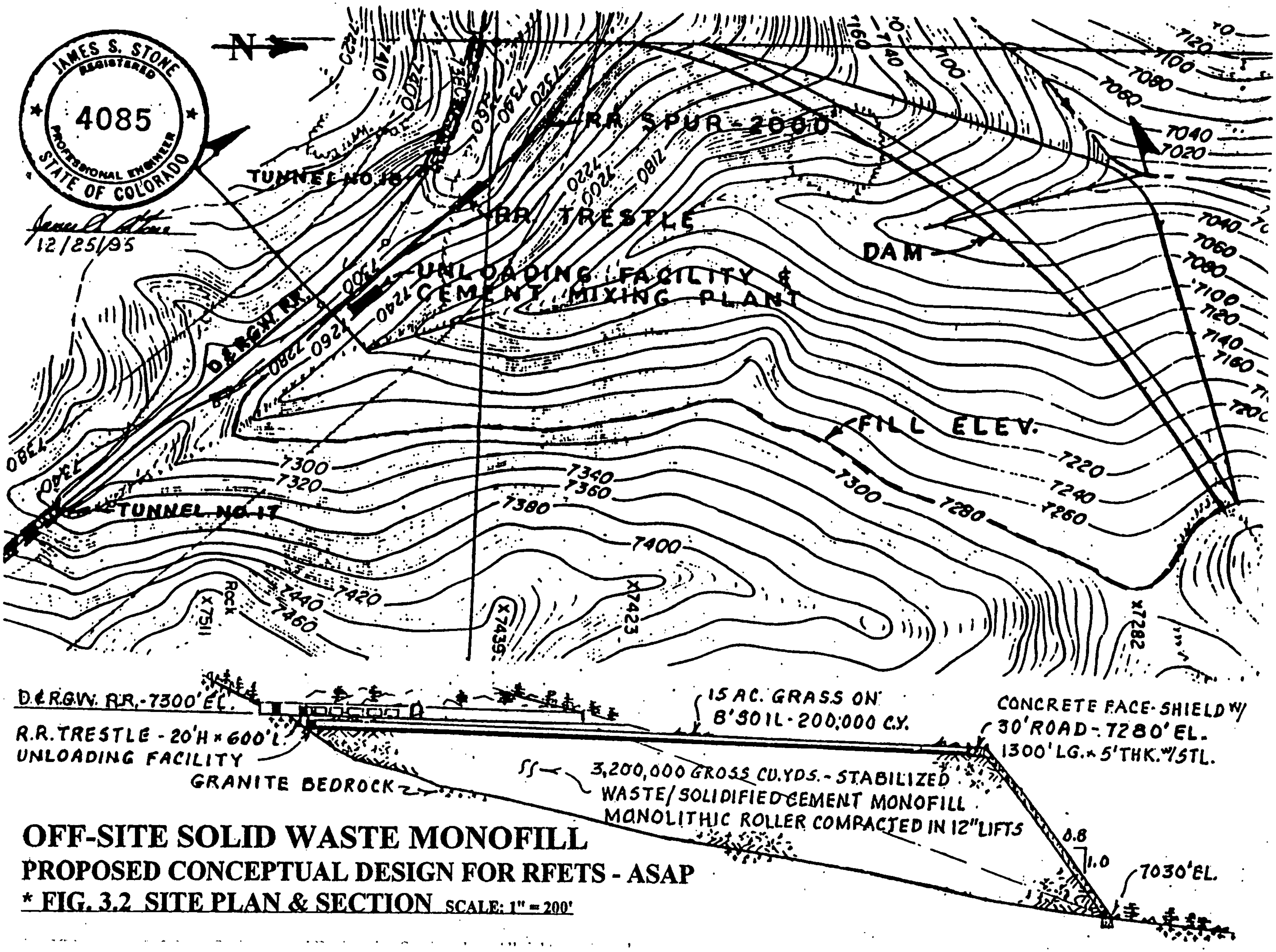
3. **CONSTRUCTION OPTIONS FOR KAISER-HILL's ASAP for RFETS:** The background for the project is described in Fig's 1 & 2. This general preconstruction work applies to all Options and includes; Purchase of ~ 100 acres for a secured buffer zone; Improve ~ 9,000 ft. access road; Clear-cut trees & rock clearance on ~ 25 acres; Use 2 security guards, full time ~ 2 yrs.; Construct ~ 2,000 ft. RR spur, ~ 600 ft. long x 20 ft. high trestle, & RR on-off loading dock; Install ~ 6,000 ft. security fence, with 1 dock gate and 2 road gates; Install site facilities and utilities to suit the respective Option. Comply with all appliable USDOE design and constructions standards for the respective type facility.

Opt. 3.1 This option specifies an open ravine, that is safe, dry, stable, granite, accessable by DRGW RR, to provide for the off-site/safe/retrievable storage of ~ 1,500,000 net cu. yds. of LL/LLMW/DDW, in bulk, 55 gal. drums, & large crates from RFETS.
The work required includes: Seal floor and walls of ravine; Construct a concrete mix plant in the track area; Construct a concrete, roller-compacted, monolithic, gravity dam/shield, with granitic face surfaces, in 12" lifts; Maintain a 4 ft. min. freeboard height above the anticipated waste supply level; Install structural steel racks & aisles (~ 6,850,000 gross sq. ft. floor total area on 24 - 10 ft. levels) for receiving/retrieving waste in concert with the characteristics & volume of the waste supply; Install vent/drain piping for each container; Install an automatic sump/pump/holding tank system (s), to monitor surface runoff and drainage from containers; Install a site security facility including: A 2,000 sq. ft. building for living/office/service with: Faculities & utilities; Service vehicles; Site & building fire protection systems; Remote waste monitoring, communications by phone/radio; Propane tank, 10,000 gal.; Water well, with 10 gpm pump/hydrostatic system/10,000 gal. storage tank.

***Opt. 3.2 This option specifies a ravine per Opt. 3.1, filled with a 3,200.000 gross cu. yds. of stabilized waste/solidified cement monofill, to provide for the off-site/ disposal of ~ 2,500,000 net cu. yds. LL/LLMW/ DDW, from RFETS.**
The required work includes: Construct a concrete mix/cement/waste mix plant in the track area; Construct a concrete, roller-compacted face shield , with a granitic face surface, monolithic with the cement/waste solidified monofill, in 12" lifts. Install all applicable facilities, utilities, similar features and requirements, as described in Opt.3.1. Install road and a planted soil cover on the roof.

Opt. 3.3 This option provides for off-site/monitored/retrievable/storage of ~ 1,200,000 net cu. yds. LL/LLMW/DDW, safe/monitored/retrievable/storage of ~ 10,000 net cu. yds. TRUW/SNM, from RFETS, and a Waste Management Research Facility, together in a secured/modern/subterranean building.
The required work includes: Seal floor and walls of ravine; Construct a fire/earthquake resistant, reinforced concrete, subterranean building in the ravine, with an occupancy partition between the Repository/Office section & the Retrievable Storage section. Backfill the void outside the walls with sand/gravel. The R/O is ~ 30 ft. wide x ~ 1100ft. long x ~ 250 ft. (24 floors) high, with ~ 350,000 sq. ft. gross floor space for Offices, Laboratory, Equipment/Maintenance rooms, and Vaults for TRUW/SNM. The R/O has: the main access road on top; Secured access silos & guard towers; Freight silo with elevator. The RS has 24 matching floors in height and ~ 6,500,000 sq. ft. open floor space for retrievable storage of LL/LLMW. Install a network of access holes in each floor and the roof, connecting to road network on the roof. Install all applicable facilities, utilities, similar features and requirements, as described in Opt.3.1. Install a planted soil cover on rood.

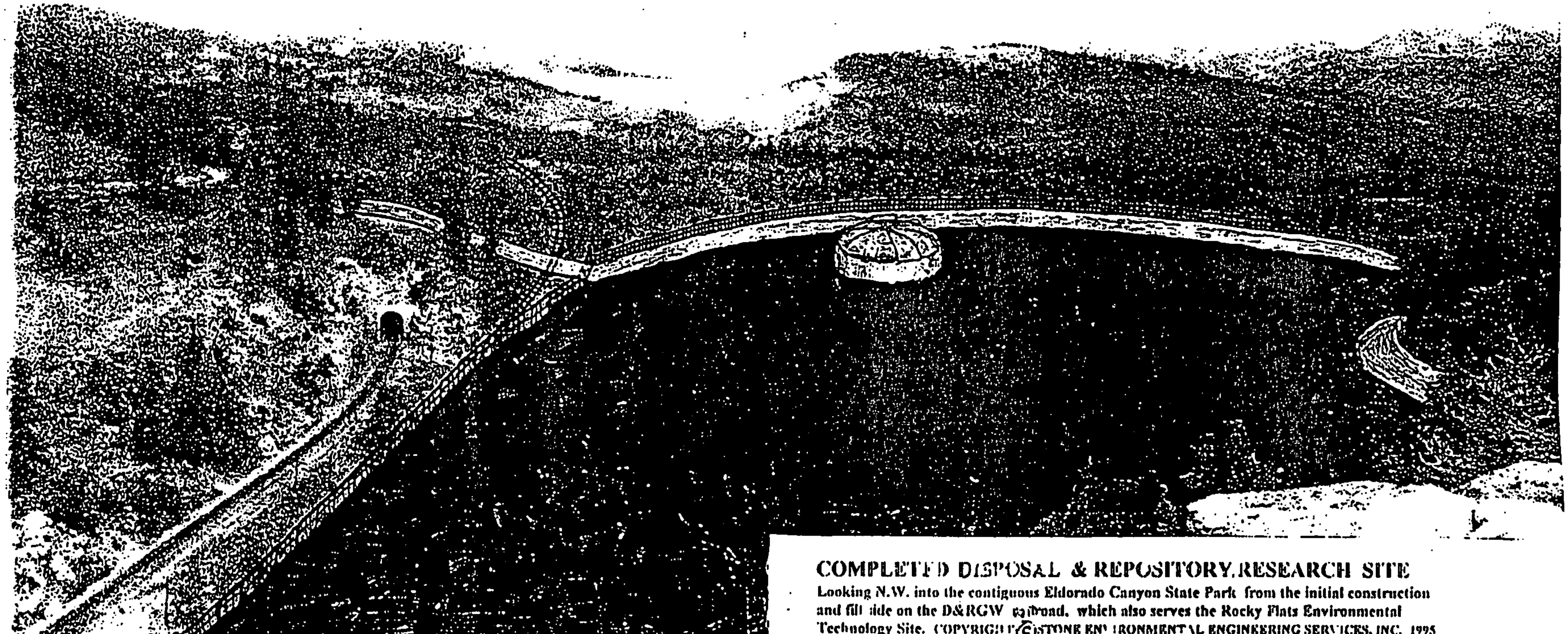
4. **ATTRIBUTES:**
4.1 The concept of an off-site Repository in Colorado to care for our own radioactive waste is unique and laudable.
4.2 This proposal offers an off-site facility with three design options, as follows:
4.2.1 Safe/monitored/retrievable/storage of 1,500,000 net cu. yds.of LL/LLMW/DDW in an open facility
4.2.2 Safe/monitored/disposal of 2,500,000 net cu. yds. of LL/LLMW/DDW in a 3,200,000 gross cu. yds. stabilized waste/solidified cement momofill.
4.2.3 Safe/monitored/retrievable/storage of 1,200,000 net cu. yds. of LL/LLMW/DDW, and safe/monitored/retrievable/storage of 10,000 net cu. yds. of TRUW/SNM, and a secured, modern Waste Management Research Facility.
4.3 The evaluation of this site was 87% in USDOE's "Technical Approach Document on geotechnical, hydrological, environmental and economic rating matrix
4.4 We believe this site is more acceptable to the Stakeholders &
4.4.1 This proposal allows Kaiser-Hill's ASAP *GREENFIELD* scenario to be better evaluated.
4.4.2 This proposal allows a 20 mi. safe railroad haul, eliminates a lot of truck traffic/air pollution, and promotes research the control of radioactivity.



OFF-SITE SOLID WASTE MONOFILL

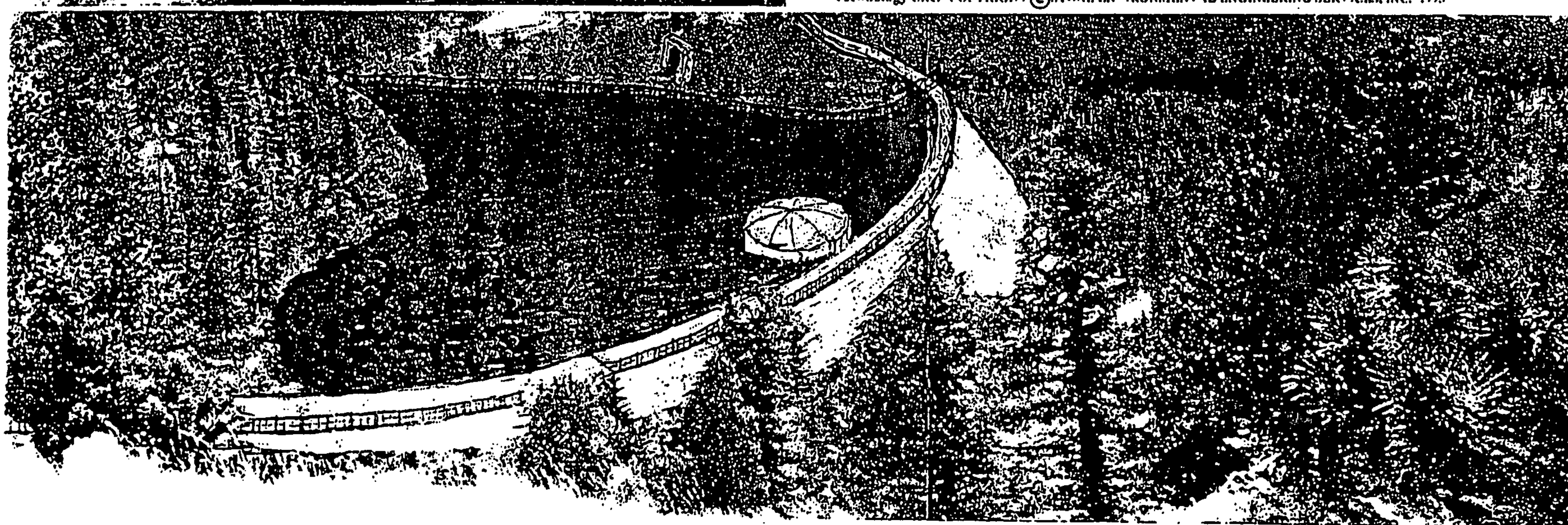
PROPOSED CONCEPTUAL DESIGN FOR RFETS - ASAP

*** FIG. 3.2 SITE PLAN & SECTION** SCALE: 1" = 200'



COMPLETED DISPOSAL & REPOSITORY/RESEARCH SITE

Looking N.W. into the contiguous Eldorado Canyon State Park from the initial construction and fill side on the D&RGW railroad, which also serves the Rocky Flats Environmental Technology Site.



COMPLETED DISPOSAL & REPOSITORY/RESEARCH SITE

Looking S.W. from Research Building at stable/solidified LLW/MLLW monofill with planted soil cover, concrete base shield with access road on top, off/on loading Repository silo for TRUW/SNM monitored/retrievable storage.

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Revision 1

United States Department of Energy

Technical Approach Document

April, 1988

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4085
PROFESSIONAL ENGINEER
STATE OF COLORADO

Uranium Mill Tailings Remedial Action Project UMTRAP

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix

Geotechnical	Rank 0	1	2	3	4	Weight	Factor[a] score
1. Land slope	>10% 19%		< 2% or 5 to 10%		2 to 5%	1	0
2. Surficial materials lithology	Gravel or sand	Very fine sand or sandy silt	Silt	Silty clay	Clay	2	0
3. Surficial materials thickness	0 to 2 ft 0'	2 to 5 ft	5 to 10 ft	10 to 20 ft	>20 ft	1	0
4. Distance to nearest seismic risk capable fault[b]	0.5 to 1.0 mi	1 to 5 mi 4mi.	5 to 10 mi	10 to 20 mi	>20 mi	4	4
5. Susceptibility to slope failures, subsidence, or hydroconsolidation	Moderate to high		Low		Very low	4	16
6. Present erosion	Intense gullying	Moderate gullying	Minpr gullying	Sheet or rill wash	No erosion	4	16
7. Geomorphic stability	Very poor (fluvial environment)	Poor	Moderate	Good	Excellent (non-fluvial environment)	4	16

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	Rank 1	Rank 2	Rank 3	Rank 4	Weight	Factor[a] score
8. Conflict with mineral resources	Serious conflicts		Moderate conflicts		No or minor conflicts	1	4
9. Relative strength and compressibility of foundation soil and rock (if rock - 4 only) Granite	Very soft or very loose	Soft or loose	Medium-stiff to stiff or medium-dense	Very stiff or dense	Hard or very dense	4	16
10. Relative hydraulic conductivity of soil and/or rock formation (including fracture flow)	High $K=1$ to 10^{-1} cm/s	Medium $K=10^{-1}$ to 10^{-3} cm/s	Low $K=10^{-3}$ to 10^{-5} cm/s	Very low $K=10^{-5}$ to 10^{-7} cm/s	Practically impermeable $K=10^{-7}$ to 10^{-10} cm/s	3	12
11. Aquifer characteristics of surficial material	Produces large amounts of good quality water.	Produces moderate to small amounts of good quality water.	Produces large amounts of poor quality water.	Produces moderate to small amounts of poor quality water.	Produces little or no water.	4	16
12. Aquifer characteristics of bedrock	Produces large amounts of good quality water.	Produces moderate to small amounts of good quality water.	Produces large amounts of poor quality water.	Produces moderate to small amounts of poor quality water.	Produces little or no water.	4	16

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	Rank 1	Rank 2	Rank 3	Rank 4	Weight	Factor[a] score
13. Chemical attenuation capacity of soil/rock (clay minerals and metal oxyhydroxides)	Gravel/sand, low clay/metal oxyhydroxide <10% volume content, low buffering capacity, low neutralization capacity.		Silt/clay, moderate clay/metal oxyhydroxide 10 - 50% volume content, moderate buffering capacity, moderate neutralization capacity.		Clay, high clay/metal oxyhydroxide >50% volume content high buffering capacity, high neutralization capacity.	4	0
14. Recharge/discharge areas to usable aquifer	In recharge/discharge area of aquifer that produces large amounts of good quality water.	In recharge/discharge area of aquifer that produces moderate to small amounts of good quality water.	In recharge/discharge area of aquifer that produces large amounts of poor quality water.	In recharge/discharge area of aquifer that produces moderate to small amounts of poor quality water.	Not in recharge/discharge area of aquifer.	4	16
15. Non-domestic use of of surface/groundwater within 5-mile radius	Within 0.5 mile	Within 1.0 mile	Within 3.0 miles	Within 4.0 miles	Within 5.0 miles	1	1
16. Depth to water table in shallowest aquifer below site	<20 ft	20 to 50 ft	50 to 100 ft	100 to 200 ft	>200 ft	5	20

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	1	2	3	4	Weight	Factor[a] score
17. Distance to nearest major spring, perennial stream, perennial lake, or major irrigation ditch	On site	0 to 0.5 mi	0.5 to 1 mi 0.8 mi.	1 to 2 mi	>2 mi	2	4
18. Size of drainage basin above site	>2 sq mi	1.5 to 2 sq mi	1 to 1.5 sq mi	1 to 0.5 sq mi	<0.5 sq mi 0.2 sq.mi.	1	4
19. Annual (class A pan) evaporation to precipitation ratio exceeds	Wet 5		Semiarid moderate 30		Arid dry 60	1	4
20. Relative thickness of low (permeability) hydraulic conductivity of geological formation which isolates migration of contaminants; may have lateral/downward vadose spreading of contaminants	None	0 to 5 feet	5 to 10 feet	10 to 30 feet	>30 feet Granite bedrock	4	16

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	1	2	3	4	Weight	Factor[a] score
21. Population density[d]	Site is within one mile of of any size city or town boundary.	Site is within one mile of of a subdivision.	Site is within one mile of of a proposed subdivision or projected residential growth area.	Site is within one mile of of private residences.	Site is in an uninhabited area; no residences are within two miles.	4	12
22. Transportation network[d]	Traffic congestion very likely, accident potential enhanced.		Traffic congestion likely, accident potential moderate.		Traffic congestion unlikely, accident potential low.	3	12
23. Presence of cultural or historical sites[d]	Nationally significant cultural sites are known to be present within a two-mile radius.	Cultural sites of minor importance have been found within a one-mile radius.	The area was known to be inhabited in prehistoric times.	The area may have the characteristics for finding cultural sites but none are known to exist within a one-mile radius.	There are no known cultural sites within a two-mile radius, nor it is likely that nationally significant sites would be found.	3	12

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	1	2	3	4	Weight	Factor[a] score
24. Threatened, endangered, or economically important species[d]	Threatened, endangered, or economically important species are known to currently inhabit the area during any part of the year.	Prior use of the area by threatened, endangered, or economically important species is established although no recent (within five years) sightings within a two-mile radius have been made.	The area contains suitable habitat for threatened, endangered, or economically important species.	The area contains suitable habitat for threatened, endangered, or economically important species however, similar habitat is abundant throughout the area.	There are no known threatened, endangered, or economically important species within a two-mile radius; nor is the habitat suitable for listed or threatened or endangered species.	4	16
25. Scenic values	Site has high recreational use or is along the travel corridor to areas frequented by tourists.	Site is clearly visible to the majority of town residents or is visible from area scenic viewpoints.	Site is visible to residents existing or planned subdivisions.	Site is not visible from high use areas, viewpoints, or populated areas.	Site is not visible to any residents within the city limits, surrounding unincorporated areas, or planned growth areas.	3	12
26. Land use - current[d]	A change in land use would directly affect the livelihood of the owner or surrounding owners.	A change in land use would impact surrounding landowners.	The site would disrupt existing use; however, suitable adjacent land could be traded satisfactorily so as to not negatively impact the landowner's economic base.	Current use of the site is considered low in productivity/quality relative to other areas.	A change in land use would have an insignificant effect on the existing or adjacent landowner or user.	4	16

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Continued)

Geotechnical	Rank 0	Rank 1	Rank 2	Rank 3	Rank 4	Weight	Factor[a] score
27. Land use - potential[d]	The area has potential for higher uses.	Adjacent land is suitable for development; presence of tailings would preclude desirability of other future adjacent land areas.	Land may have potential for development but similarly suitable land is abundantly available in the area.	The area does not have potential for productive use without stimulation or change by man.	Land has no recognized inherent value or potential.	5	20
28. Land ownership	Surface and subsurface rights are owned by multiple, and different, parties.		Surface rights are owned by multiple parties; subsurface rights are owned by a single party.		Surface and subsurface rights are owned by a single party.	6	24
29. Distance from existing site	Longest		Moderate		Lowest 6 mi.	7	28
30. Distance to borrow sites: fine materials/ coarse materials	Longest		Moderate		Lowest 6 mi.	2.5/2.5	10/10
31. Existing road network	Poor condition; extensive improvements required.		Moderate condition, some improvements required.		Good condition; no or few improvements required.	3	12

Table 5.3 Geotechnical, hydrological, environmental, and economic rating matrix (Concluded)

Geotechnical	Rank 0	Rank 1	Rank 2	Rank 3	Rank 4	Weight	Factor[a] score
32. Road has spots with positive grade from mill site and tailings to disposal site	>10%		8 to 10%		0 to <8%	3	12 $(\frac{377}{432}) = 0.87$

[a]Factor score = rank x weight.
[b]Refers to a capable fault as defined by 10 CFR Part 100, Appendix A.
[c]Determination of susceptibility is based on evidence of recent slope failures, subsurface materials, and subsurface conditions.
[d]If more than one ranking definition applies, site should be ranked for the lowest point value.

REFERENCES FOR SECTION 5.0

CGS (Colorado Geological Survey), 1982. "Preliminary Disposal Site Screening Report for the Grand Junction and Rifle Mill Tailings Piles," Department of Natural Resources, Denver, Colorado.

DOE (U.S. Department of Energy), 1986. Alternate Site Selection Process for UMTRA Project Sites, UMTRA-DOE/AL-200129.0007 R-3, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1982. Criteria for Evaluating Disposal Sites, UMTRA-DOE/ALO-7, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

APPENDIX K

GLOSSARY

This glossary contains a compilation of acronyms and abbreviations used in the ASAP draft. This is by no means a complete listing of all terms and assumes the reader has a basic knowledge of radioactivity, chemical hazards, environmental regulations, and the Rocky Flats mission elements. Terms and definitions used were derived primarily from the source documents listed below and they may be consulted if a more complete glossary is desired.

- Rocky Flats Dictionary (Abbreviations, Acronyms, and Initialisms used at Rocky Flats)
- Rocky Flats Dictionary (EG&G Rocky Flats Definitions)
- Conceptual Project Plan for A Path Forward, Version 5.0, 3/29/95

SELECTED ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
ASAP	Accelerated Site Action Project
AST	Aboveground storage tank
B/A	Budget authority
BEMR	Baseline Environmental Management Report
BOE	Basis of Estimation
CAD	Cost Account Document
CAMU	Corrective Action Management Unit
CAPASU	Criticality Alarm and Plant Annunciation System
CAS	Criticality Alarm System
CCF	Central Computing Facility
CDI	Criticality Detection Instrument
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CTMP	Comprehensive Treatment and Management Plan
D4	Deactivation, decontamination, decommissioning, and dismantlement
D&D	Deactivation and decontamination
DECON	Dismantlement Option
DNFSB	Defense Nuclear Facilities Safety Board
DOE	United States Department of Energy
DOE/EM	Department of Energy, Office of Environmental Restoration and Waste Management
DOE,HQ	Department of Energy Headquarters
DOE,RFFO	Department of Energy, Rocky Flats Field Office
DOT	Department of Transportation
DPP	Decommissioning Program Plan
EDE	Effective dose equivalent
EDL	Economic discard limit
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
EPA	United States Environmental Protection Agency
ER	Environmental Restoration
ES&H	Environment, Safety, and Health
eU	enriched uranium
FDC	Fire Dispatch Center
FSUWG	Future Site Use Working Group
FTE	Full-time equivalents
g/l	grams per liter
GLC	Geosynthetic clay liner

HEPA	High efficiency particulate air
HEU	Highly Enriched Uranium
HEUN	Highly Enriched Uranyl Nitrate
HSWA	Hazardous and Solid Waste Amendments
HVAC	heating, ventilation, and air conditioning
IA	Industrial Area
IAEA	International Atomic Energy Agency
IAG	Interagency Agreement
IDC	Item description code
IHSS	Individual Hazardous Substance Site
ISB	Integrated Sitewide Baseline
Kg	Kilogram
K-H	Kaiser-Hill
LDPE	Low density polyethylene
LDR	Land disposal restrictions
LEU	Low enrichment uranium
LLW	Low-level waste
LLMW	Low-level mixed waste (also LLM)
LLMWDF	Low-level mixed waste disposal facility
LOI	Loss on Ignition
LS/DW	Life Safety Disaster Warning (System)
m^3	Cubic meters
MCL	Maximum contaminant levels
mrem	Millirem
MSE	Molten salt extraction
NA	No action
NCPP	National Conversion Pilot Project
NDA	Non-Destructive Analysis
NEPA	National Environmental Policy Act
NFA	No further action
NFPA	National Fire Protection Act
nCi	Nanocurie (One trillionth of a Curie)
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
O&M	Operations and Maintenance
OU	Operable Unit
OSHA	Occupational Safety and Health Act
PA	Protected Area
PAC	Potential area of concern
PASS	Processing Accountability and Safe Storage
PCB	Polychlorinated Biphenyls
pCi	Picocurie (One billionth of a Curie)
PEIS	Programmatic Environmental Impact Statement
PIC	Potential Incident of Concern
PPRG	Programmatic Preliminary Remediation Goal
PRG	Preliminary Remediation Goals
Pu	Plutonium
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site (also Site)
ROD	Record of Decision
RTR	Real-time radiography
SAAM	Selective Alpha Air Monitoring (System)
SAS	Secondary Alarm Station
SFDC	Secondary Fire Dispatch Center
SISMP	Sitewide Integrated Stabilization Materials Program
S&M	Surveillance and Maintenance
SNM	Special Nuclear Material
SRS	Savannah River Site
SSSP	Site Safeguards and Security Plan

SST	Safe Secure Transport
STP	Site Treatment Plan
SWEIS	Sitewide Environmental Impact Statement
TBD	To be determined
TRU	Transuranic waste
TRM	Transuranic mixed waste
TSCA	Toxic Substances Control Act
TSDF	Treatment, storage, and disposal facilities
UBC	Under-building contamination
UMTRA	Uranium Mine Tailing Remedial Action
UST	Underground storage tank
VOC	Volatile organic compound
VSS	Vital Safety Systems
WAC	Waste Acceptance Criteria
WBS	Work breakdown structure
WIPP	Waste Isolation Pilot Plant

As Low As Reasonably Achievable (ALARA) - An approach to radiation exposure control to maintain exposure, both individual and collective, to the work force and the general public, as far below the limits as the specific technical, economic, and practical considerations permit.

Assessment - Evaluation, often quantitative, of the actual condition of a facility against the requirements established for the facility. Assessments may focus on regulations for protection of the environment, protection of human health (both on-site workers and other potentially exposed populations), and others. Assessments are often associated with characterization efforts, but represent judgments and evaluations applied to facility conditions versus the mere compilation of such data.

Authorization basis - The combination of technical, management, and performance standards, which when applied and implemented in concert with one another for all of the hazardous processes or activities within a facility, allows the hazardous processes or activities to be performed with consequences that are acceptable, for normal and reasonably expected abnormal events.

Base activities (also Baseline or Mortgage) - Those activities essential to maintain the minimal acceptable level of environmental, risk, health, and safety compliance requirements within facilities, Site utilities, and Site areas.

Calcination - A process which uses furnaces to heat residue feed to a high temperature (typically 500-1000º C, but well below the melting point) in the presence of oxygen to stabilize the material by causing oxidation and loss of moisture.

Characterization - (1) As applied to a facility or site: Sampling, survey, monitoring, and sample or data analysis activities to determine the nature, level, and extent of radioactive or other hazardous contamination. Characterization is the collection or compilation of measurable data to provide necessary technical information for the development, screening, analysis, and selection of appropriate cleanup techniques. (2) As applied to individual containers or samples: Analysis (quantitative or qualitative) and description of the essential characteristics or constituents of a material, usually a waste.

Cleanup or Remediation - Any actions (including decontamination and removal - defined separately) taken to reduce health or environmental hazards associated with the presence of hazardous or radioactive wastes at a DOE facility. The closely allied terms, "remedial action" and "remedy," are used in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 101(24), to denote relatively permanent corrective actions taken to mitigate the effects of a release of hazardous materials, and in the context of CERCLA, are distinguished from removal actions, which are more near-term, often temporary measures.

Closure - Completion of removal or remedial actions required under CERCLA, together with testing, sampling, or verification of the cleanup site. Closure may also require establishment of post-closure monitoring of the remediated area. The specific requirements for closure of a site subject to CERCLA will be detailed in a closure plan which is approved by the appropriate regulatory agencies. Also, under the Resource Conservation and Recovery Act (RCRA), the act of securing a hazardous waste management facility pursuant to 40 CFR Part 264 requirements.

Compliance Agreements (also Regulatory Agreements) - Legally binding agreements between regulators and regulated entities that set standards and schedules for compliance with environmental statutes. Includes Consent Order and Compliance Agreements, and Federal Facility Compliance Agreements.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - federal statute (also known as Superfund), enacted in 1980 and reauthorized in 1986, that provides the statutory authority for cleanup of hazardous substances that could endanger public health, welfare, or the environment.

Contamination - Unwanted radioactive or other hazardous material which is dispersed (often in particulate form) on or in equipment, structures, objects, personnel, soil, water, or air. Contamination may be either surface or volumetric (i.e., neutron-induced radioactivity within a solid material); surface contamination may be either removable or fixed.

Contingency - A specific provision for unforeseeable elements of cost within a defined project scope (e.g., incomplete design unforeseen and unpredictable conditions, and uncertainties).

Deactivation - The process and activities associated with placing a facility in a safe shutdown condition. Includes removal of Special Nuclear Material inventories.

Decommissioning - (1) The process of safely removing from operation a DOE facility contaminated or formerly contaminated with radioactive or other hazardous material so as to provide adequate protection from radiation and hazardous material exposure and to reduce the likelihood of contaminant migration into soil, water, or air. (2) Includes any and all actions taken to stabilize, reduce, or remove radioactive and/or hazardous contamination or actions to refurbish or to demolish the facilities (D4 when used in this context).

Decontamination - The process of reducing the level or removing radioactive or hazardous materials contamination from facilities, equipment, or soils by washing, heating, mechanical cleaning, chemical or electrochemical action, or other techniques. Decontamination may be a component of decommissioning used to prepare a facility for refurbishment or demolition, dismantlement, or entombment. Decontamination may be complete or partial based on an evaluation of the relative benefit of the effort to reduce risk and the follow-on decommissions tasks anticipated.

Defense Nuclear Facilities Safety Board (DNFSB) - An independent federal commission tasked with overseeing the safety of operations at all defense-related nuclear facilities, including those involved in weapons production and those undergoing dispositioning. The board reports directly to Congress and the President, and for DOE facilities, submits recommendations for action to the Secretary of Energy.

Demolition - Actions undertaken to tear down or raze an unneeded structure. Demolition efforts (usually involving explosives, wrecking balls, and similar techniques) are not generally conducive to minimizing the spread of contamination and therefore must be used with care for heavily contaminated facilities.

Dismantlement - Actions undertaken to completely or substantially remove a contaminated facility by controlled disassembly. As contrasted with demolition, dismantlement is generally accomplished in a more controlled manner so as to minimize the spread of contamination and to facilitate the removal and disposal of contaminated components.

Disposal - Emplacement of waste in a manner that assures isolation from the biosphere for the foreseeable future with no intent of retrieval and that requires deliberate action to regain access to the waste. This term also has a specific meaning under the Resource Conservation and Recovery Act (RCRA), which defines a "disposal facility" as one where hazardous waste (as defined under RCRA) is intentionally placed on or into land or water, and where such waste will remain after closure.

DOE Orders - Internal requirements that establish DOE policy and procedures for compliance with applicable statutes and regulations.

DOE-STD-3013-94 - Criteria for Safe Storage of Plutonium Metals and Oxides. Criteria for safe storage of plutonium metals and plutonium oxides, greater than 50% plutonium by weight, for at least 50 years at DOE facilities. The criteria include the following: thermal stabilization of oxide to less than 0.5% loss on ignition (LOI); metal or oxide sealed in inert atmosphere in a material container; material container sealed in a boundary container; boundary container sealed in a primary containment vessel; periodic surveillance of the filled containers.

Effluent - A gaseous or liquid waste stream released to the environment from a facility. An outflow or discharge of waste, as from a sewer.

Entombment - Sealing or burying a radioactively contaminated facility or other radioactive material within a strong and structurally long-lived material (e.g., concrete or clay soils) to provide long-term control of the material. Because of land disposal restrictions implemented under the Resource Conservation and Recovery Act, this form of disposal is generally not applicable to nonradioactive hazardous material. Entombment is essentially equivalent to the Nuclear Regulatory Commission term ENTOMB.

Environmental Assessment - A National Environmental Policy Act (NEPA) document prepared to appraise the effect of a proposed project on the aggregate social and physical conditions that influence a community or ecosystem. EA helps determine if an EIS is required.

Environmental Impact Statement - A NEPA document prepared by a federal agency on the environmental impact of its proposals for legislation and other major actions significantly affecting the quality of the human environment.

Environmental Restoration - Cleanup and restoration of sites contaminated with hazardous substances during past production or disposal activities.

Escalation - The correction applied to cost estimates to account for the impact of inflation.

Facility - A building, plant, storage building, laboratory, or other structure that fulfills a specific purpose and is owned by or otherwise under the responsibility of the DOE. Examples include enclosed or covered storage areas, production or processing plants, radioactive waste disposal structures, testing or research laboratories, and accommodations for analytical examinations of irradiated and unirradiated materials or components. This term also has a specific meaning under the Comprehensive Environmental Response, Compensation, and Liability Act that is much broader than the above and can include ponds, ditches, vehicles, and other places where hazardous substances may be located.

Footprint - Contaminated area

Future Site Use - Activities or potential activities taking place on a DOE site at a later time after specified dispositioning efforts have been completed. Unrestricted, restricted, and exclusionary use are all categories of future site uses; these may be further subdivided into more specific types of land or facility usage (e.g., farmland, public recreation, industrial). Future site use will in part govern the cleanup standards and techniques employed at a contaminated site and must be determined with appropriate input from regulatory agencies, the public, and other stakeholders.

Glovebox - (1) An enclosure having openings fitted with gas-tight gloves by means of which certain radioactive or other special materials may be safely handled. (2) Containment structure for handling radioactive materials, which is fitted with gloves and windows and is maintained under negative pressure.

Ground water - Water that fills the spaces between soil, sand, rock, and gravel particles beneath the earth's surface. Rain that does not immediately flow to streams and rivers slowly percolates down through the soil and rock to a point of saturation to form ground water reservoirs. Ground water flows at a very slow rate, compared to surface water, along gradients that often lead to river systems.

Hazardous material - A substance determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported, and which is designated as such in Code of Federal Regulations, Title 49, Section 172.101, or the appendix to 172.101.

Hazardous waste - A substance having one or more of the characteristics of ignitability, corrosivity, reactivity, or toxicity, or listed by the Colorado Department of Health as a hazardous waste in 6 CCR 1007-3, Part 261.

Individual Hazardous Substance Site (IHSS) - A specific location where contaminants, either radioactive or hazardous, have been released or suspected of being released to the environment. All IHSSs require characterization and a Record of Decision for sites such as Rocky Flats which are listed as a Superfund site on the National Priorities List.

Land disposal restrictions (LDR) - Provisions of the Hazardous and Solid Waste Amendments requiring phased-in treatment of hazardous wastes before disposal.

Loss on Ignition (LOI) - A test criteria which determines percentage of mass loss measured when a sample of thermally stabilized plutonium is heated at a specific temperature for a specific time period to remove residual moisture and other volatile species from the sample. This test is used to determine the degree of chemical stability of the sample.

Low-level waste (LLW) - (1) Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or (2) byproduct material as defined by DOE Order 5820.2A (DOE 1988D). Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided that the concentration of transuranics is less than 100 nanocuries per gram. Typically contains small amounts of radioactivity in large volumes, and most can be handled without protective shielding. Solid low-level waste consists of trash such as clothing, tools, and glassware. Liquid waste consists primarily of water circulated as cooling water.

Mixed residue (also Residues) - Plutonium bearing materials which contain recoverable quantities of plutonium in concentrations greater than the economic discard limit, and RCRA-regulated constituents. Residues were historically stored for the speculative recovery of plutonium in preference to the greater cost of new plutonium production in a reactor. By court decision the residues are regulated as hazardous wastes and they have radioactivity levels similar to Transuranic wastes.

Mixed waste - A substance which meets the definition of both radioactive waste, as defined in DOE Order 5820.2A, and hazardous waste as defined in 6 CCR 1007-3, Part 261. Mixed waste contains both radioactive and hazardous components, as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively.

Mortgage - see Base Activities.

Nondestructive Assay (NDA) - Refers to the use of nuclear radiation to measure the quantity of fissionable material present in a container without opening it.

Operable Unit (OU) - A discrete portion of a site consisting of one or more release sites considered together for assessment and cleanup activities. The primary criteria for placement of release sites into an operable unit include geographic proximity, similarity of waste characteristics and site type, and possibilities for economy of scale.

Operations - The set of DOE funded activities at DOE sites encompassing production, research, analysis, and other activities unrelated to the remediation of health or environmental hazards. Operation does not encompass those site support functions (utilities, roads, security, etc.) that would be necessary for the continued functioning of the Site in the absence of an operational mission. DOE-funded manufacturing, assembly, procurement, or other activities whose end result is a definable, physical product.

Order-of-Magnitude - A range of magnitude extending from some value to ten times that value.

Pipe Component - A package designed for plutonium residues which allows increased amounts of plutonium by weight within the TRUPACT II container, immobilizes fine particles, reduces exposures by increased shielding, and limits gas generation dangers. Current designs use 304 Stainless Steel Schedule 40 pipe ranging from 4 to 12 inches in diameter with a vented cap.

Potential Area of Concern (PAC) - A location which may have experienced a release of a contaminant to the environment, requiring further characterization to determine the nature and extent of the release.

Potential Incident of Concern (PIC) - An incident or event which may have caused a release of a contaminant to the environment, requiring further characterization to determine the nature and extent of the release.

Plutonium (Pu) - A heavy, radioactive, metallic element with the atomic number 94; its most important isotope is fissionable Pu-239, produced by neutron irradiation of uranium-238; produced artificially by neutron bombardment of uranium; emits alpha, beta, gamma, and neutron radiation.

Preliminary Remediation Goal (PRG) - Defined concentration levels of specific contaminants which are used to focus characterization efforts and facilitate remedial decisions. PRGs are usually based on conservative risk analysis concentrations, background concentrations, or minimum detectable concentrations.

Processing - A term used to describe any handling step of plutonium- or enriched uranium-bearing materials involving unpackaging, sorting, plutonium assay, stabilization, repack,aging, or inspect and certification.

Protected Area (PA) - An area with physical barriers (e.g., walls or fences), which is subject to access controls and meets the standards of DOE Order 5632.2A. At Rocky Flats, the triple-fenced area north of Central Avenue where most of the major production buildings are located.

Radioactive Waste - Solid, liquid, and gaseous materials from nuclear operations that are radioactive or become radioactive for which there is no further use. Wastes are generally classified as high-level (having radioactivity concentrations of hundreds of thousands or curies per gallon or cubic foot), low-level (in the range or less than 1 microcuries per gallon or cubic foot), or intermediate-level (between these extremes).

Radiological Controlled Area (RCA) - An area to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials.

Real-time radiography (RTR) - A nondestructive examination technique which uses X-Rays to generate a video image of a container's contents. It is used as a screening diagnostic tool to verify the condition of material within waste drums and is particularly useful for identifying the presence of free liquids in solid waste drums.

Record of Decision (ROD) - The CERCLA document used to select the method of remedial action to be implemented at a site after the Feasibility Study/Proposed Plan process has been completed. Also, a NEPA document that lists the decisions and rationale/bases for the decisions.

Regulations or Requirements - federal or state laws and other standards having the force of law, which are legally applicable to the operation or cleanup of a DOE facility. Regulations or requirements are legally enforceable by entities other than DOE.

Release criteria - Requirements, including maximum allowable residual contamination levels, which must be met prior to release of a facility for alternate use, either by DOE or the public, following dispositioning. Release criteria may be further specified as either conditional or restricted release criteria or unrestricted release criteria. Radiological criteria for unrestricted release are found in DOE Order 5400.5.

Remedial Action (RA) - (1) As applied to operations, the mandatory response when a required operational condition cannot be met. Remedial actions include maximum duration for facility operation in an out-of-tolerance condition before it is required to terminate operations. (2) As applied to environmental restoration, the actual construction or implementation phase of a Superfund site cleanup.

Remedial Investigation (RI) - An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site, establish criteria for cleaning up the Site, identify preliminary alternatives for remedial actions, and support the technical and cost analysis of the remedial alternatives. The RI provides the Site-specific information for the feasibility study.

Remediation - A general term encompassing any actions (including decontamination and removal) taken to reduce health or environmental hazards associated with the presence of hazardous or radioactive material at a DOE facility.

Removal - Physical relocation of hazardous materials in order to reduce or eliminate potential adverse health or environmental impacts. This term also has a specific meaning under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 101(23), where it denotes near-term, often temporary corrective actions and monitoring performed in response to a release of hazardous materials. In the context of CERCLA, removal activities are distinguished from remedial activities, which are more permanent, long-term corrective actions.

Residential scenario - A defined set of risk analysis conditions which considers a 70-year resident at a contamination location with 24 hour per day, 365 day per year contact with air, water, soil, and other contaminant pathways. This represents the most conservative use scenario in analyzing the risk to humans from exposure to environmental contamination.

Residues - Radioactive liquids and solids with plutonium concentrations above formerly defined economic discard limits (EDL). For all practical purposes, residues are TRU or TRM waste with special management requirements due to their higher plutonium content.

Resource Conservation & Recovery Act (RCRA) - The Act and subsequent amendments, as codified in Title 40 CFR, Parts 260-270, provide for the protection of human health and the environment through proper management and minimization of hazardous wastes. Residues are also TRU or TRUM waste.

Riprap - A layer of stone or rack placed on an embankment slope to prevent erosion.

Safe Secure Transport (SST) - A tractor and trailer assembly which has been modified to allow safe and protected highway shipment of plutonium and enriched uranium.

Safe storage - Actions required to place and maintain a contaminated deactivated facility in a condition where future risk to workers, the public, and the environment from the facility is maintained within acceptable limits during a desired time period. Safe storage generally involves partial decontamination of the facility, followed by a period of interim care with all active systems (i.e., ventilation, utilities, fire protection) kept in service. The facility is secured by physical barriers and guards against intrusion and a surveillance program is implemented. Structural and contaminant conditions are continually monitored and maintenance work is performed as needed.

Safeguards - An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized possession, use, or sabotage of special nuclear material. Safeguards include the timely indication of possible diversion of special nuclear material and credible assurance that no diversion has occurred.

Safety Analysis Report (SAR) - A formal report describing all aspects of a nuclear facility, including the findings of the safety analysis process for that facility and/or its operations. A SAR delineates the various safety analyses performed including postulated accidents, frequency of occurrence, potential consequences, and associated risks; and provides a summary of the findings of the safety analysis along with an assessment of risk to the public, employees, facility, and environment resulting from normal operations, operational accidents, and natural phenomena events. A Preliminary SAR is prepared during the design phase of a new facility and a Final SAR is prepared and approved prior to starting operations.

Safety envelope - The defined set of operating conditions for Rocky Flats facilities that ensures the safety of workers, the public, and the environment in accomplishing the Rocky Flats mission. It is the basis for the DOE authorization to operate the facility.

Saltcrete - A low-level mixed waste resulting from the cementation of spray evaporated wet salt material. The spray evaporation is the final step for the current Rocky Flats treatment of low-level liquid wastes.

Scrub alloy - A product resulting from the pyrochemical reduction of plutonium salt residues to remove the higher activity americium and place it into a self-shielding button for further processing at the Savannah River Site. The plutonium salts were created as a residue by the pyrochemical purification (Molten Salt Extraction) of plutonium metal.

Shipment - The activity or process of shipping; i.e., preparing and tendering a shipment to a carrier for off the site transport. The term includes packaging, labeling, marking, and preparation of shipping papers necessary for shipment.

Site - A contiguous area of land (which may or may not be divided by a public right-of-way) containing one or more DOE facilities, which is either owned or leased by DOE or the federal Government. The general public may or may not have access to a DOE site.

Special nuclear material (SNM) - Plutonium, U-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, determines to be special nuclear material, but does not include source material.

Stabilization - A process by which a material is converted through chemical or physical steps to a form that is chemically inert, neither reactive nor corrosive, in an ambient environment.

Stakeholder - Any person, agency, corporation, or organization that claims an interest in or will be potentially affected by current and planned activities at a DOE site, regardless of whether they are aware of this potential. Stakeholders may include, but are not limited to, local, state, and federal government agencies, private citizens or citizen groups, American Indian tribes, and corporations. Any DOE organization (e.g., DP, EM-30) which claims an interest in or will be potentially affected by current and planned activities at a DOE site, regardless of whether they are aware of this potential.

Standards or Guidelines - Internal DOE requirements and criteria, usually promulgated in DOE Orders or Notices, which do not have the force of law but which formally define DOE policy and practice in a particular area. Standards or guidelines also include national consensus standards and accepted industry codes and practices that DOE has adopted. Draft or proposed regulations that are expected to become effective in the near future may also (on a case basis) be adopted as standards by the DOE.

Storage - Retention and monitoring of waste in a retrievable manner pending final disposal, although the degree of retrievability may vary considerably. This term also has a specific meaning under RCRA, which defines a "storage facility" as one which engages in the holding of a hazardous waste (as defined under RCRA) for a temporary period, after which the waste is treated, disposed of, or stored elsewhere. Specific storage time limits for hazardous wastes and operating requirements for permitted storage facilities are established under RCRA.

Surveillance (also Surveillance & Maintenance or S&M) - Routine, periodic activities undertaken to monitor the condition of deactivated facilities containing radioactive or hazardous material in order to maintain such facilities in a safe condition and to detect facility conditions that could lead to the release of radioactive or hazardous substances to the environment. Examples of surveillance activities include routine radiological measurements and physical inspections. Maintenance actions may be undertaken to correct problems identified during surveillance activities.

Thermal desorption - A stabilization process that uses an increase in temperature and/or a decrease in pressure to remove volatile constituents from a complex mixture.

Transuranic element - An element above uranium in the periodic table (i.e., with an atomic number greater than 92); all eleven known transuranic elements are radioactive and are produced artificially; e.g., curium, lawrencium, and plutonium.

Transuranic Package Transporter (TRUPACT II) - A special container used to transport drums or boxes of transuranic waste.

Transuranic waste (TRU) - Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with a half-life greater that 20 years and concentrations greater than or equal to 100 nanocuries per gram at the time of assay.

Transuranic-mixed waste (TRUM) - Transuranic waste containing both radioactive and RCRA-regulated hazardous components.

Treatment - Method, technique, or process that alters the chemical or physical nature of a waste material to reduce its toxicity, volume, or mobility or render it more amenable for transport, storage, or disposal. Used in the context of RCRA, it has the same meaning.

Under-building contamination (UBC) -Locations underneath building basements or foundations which may have experienced a release of a contaminant to the environment, requiring further characterization to determine the nature and extent of the release.

Unrestricted reuse - The reuse of a site or facility following dispositioning without institutional controls or restrictions. Unrestricted reuse implies that the facility or land is safe for release from DOE ownership and control; this may or may not actually occur. Unrestricted reuse of a facility also requires that applicable unrestricted release criteria first be met.

Waste acceptance criteria (WAC) - A specific set of conditions and standards which must be satisfied for waste to be accepted by a treatment, storage, or disposal facility.

Waste Isolation Pilot Plant (WIPP) - Research and demonstration facility located at Carlsbad, New Mexico, intended to demonstrate safe disposal of radioactive waste in a deep geologic environment. A decision on whether to convert WIPP to a disposal facility for transuranic waste will be made after successful testing is demonstrated.

Waste loading - A term which refers to the amount of waste incorporated during treatment into a final waste form. Higher waste loadings indicate a greater amount of waste as a component of the final treated volume or weight, and thus are sought to minimize amounts for storage or disposal. Low waste loadings imply treatment which is not very effective or generates large amounts to store or dispose.

Waste minimization - The reduction, to the extent feasible, of waste volume prior at any point in the life cycle. Waste minimization includes any source reduction or recycling activity that results in either: (1) reduction of total volume of hazardous waste; (2) reduction of toxicity of hazardous waste; or (3) both.

Weapons material - Includes DOE weapons, any assemblies, components, or parts thereof, and associated test and handling equipment.