5.2.2 Locking Gate

The current gate at the State Highway 240 access, shown in Photograph 5-8, will be replaced with a more sturdy, double swing, pipe gate providing a 28-foot clear opening. A lock will be installed for operation by the B Reactor Museum staff or by security. Gate posts, with an outer diameter of approximately 6-1/2 inches and a minimum thickness of 0.28 inch, will be used to comply with Hanford Plant Standards (KEH 1991a).

The proposed gate is shown in Figure 5-7.

The current gate at the entrance to the parking lot of the 105-B Reactor Facility, which is shown in Photograph 5-9, is adequate for the site.

5.2.3 Fencing

A 4-foot-high, 3-strand barbed wire fence (Specification Reference HWS-7739) will be installed along the distance of Route 6. This fence will be constructed 50 feet from the proposed road centerline and will parallel the length of Route 6 to the

Photograph 5-8. Alternative B--Gate at Highway 240 Access.

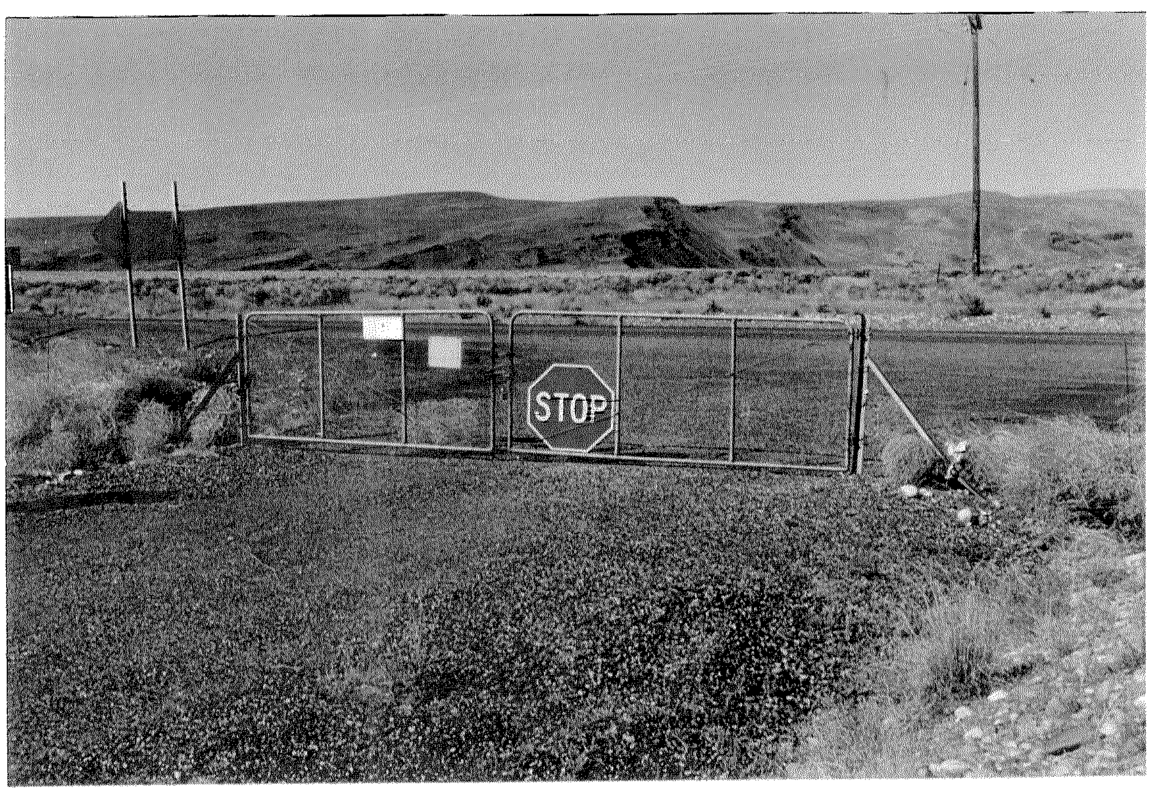
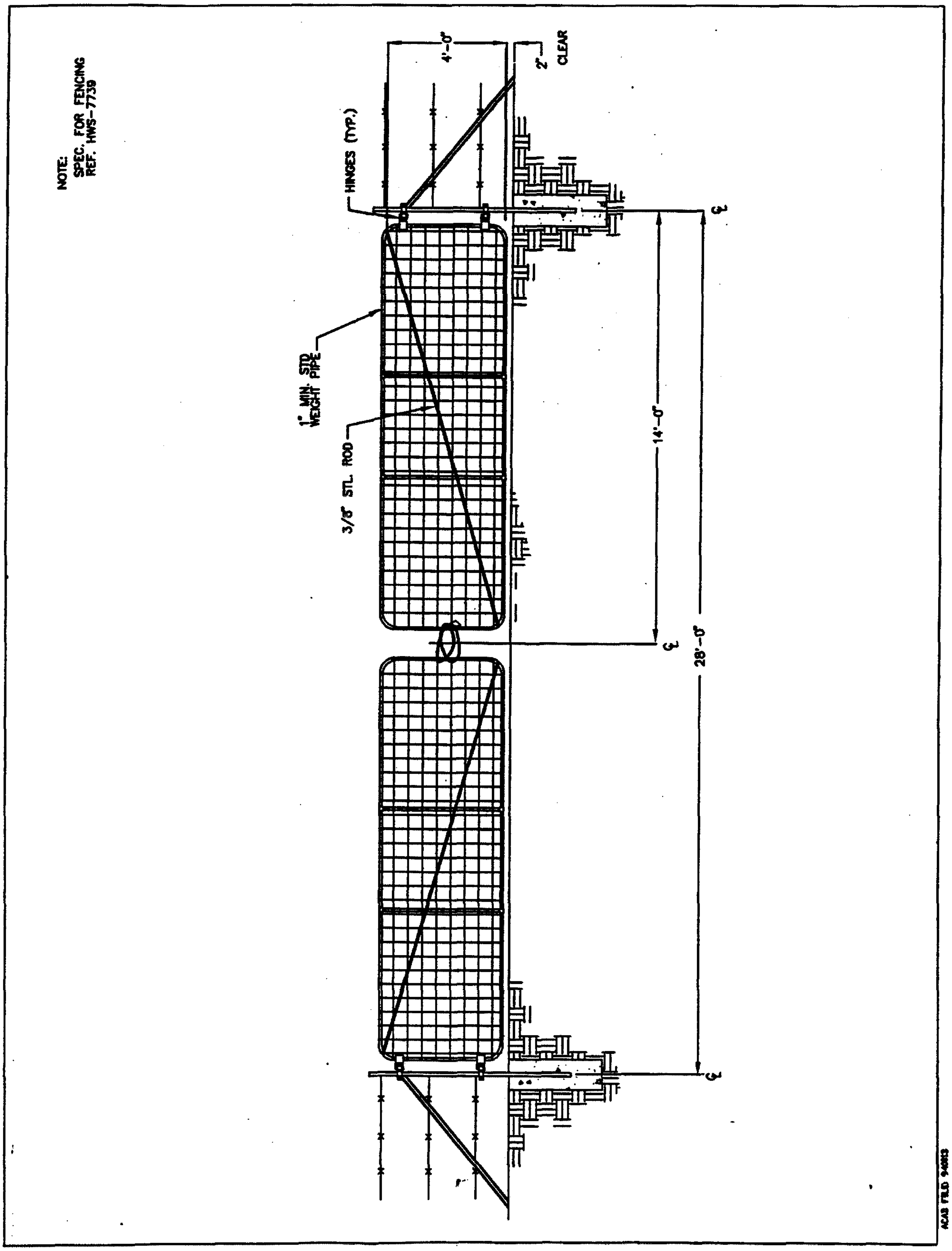
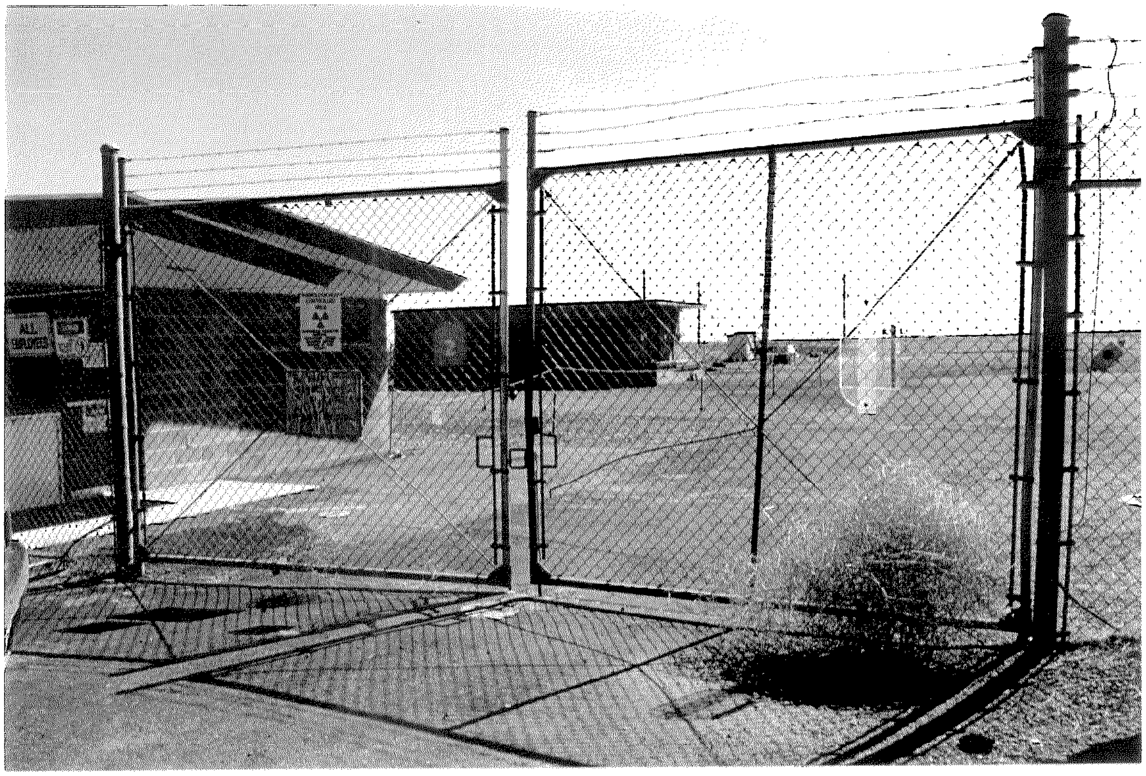


Figure 5-7. Proposed Gate at Highway 240 Access.



Photograph 5-9. Alternative B--Gate at 105-B Reactor Facility.



entrance gate of the 105-B Reactor Facility. Posts will be installed at 15-foot intervals along the length of the fence. The fence would be placed on both sides of the road for Alternative B trough D. Alternative E would not need a fence on riverside of the road.

Consideration could be given in the design of portions of the fence to relate the detailing and materials to reflect the historic character of that used in the original perimeter security fencing.

5.2.4 Parking Lot

Minimal parking lot improvements could be made to the existing parking lot at the 105-B Reactor Facility by using the existing grade which slopes gently north (Photograph 5-10) and covering with a 1-inch light asphaltic treatment. Pavement markings would then be applied for an estimated four buses at 12 feet wide and 15 cars at 10 feet wide.

Additional ADA requirements would require designated parking for the handicapped. The parking should include accessible parking spaces in conformance with ADA Accessibility Guidelines (ATBCB n.d.), which will require a minimum of one space.

Photograph 5-10. Alternative B--Existing Parking Lot.

Lighting of the parking lot would not be necessary depending upon the staffing and operating hours.

5.2.5 Signage

Directing visitors to the 105-B Reactor Facility would require offsite signing, probably at locations along Highway 240 and from several points around Richland, Vantage, and the rest area at Vernita Bridge. It is estimated that eight to ten such directional signs would be required. These directional signs should be designed in a style that is coordinated with signage of the Hanford Museum of Science and History to convey a consistent image.

5.2.6 Staffing

Since this alternative allows the public to access the site, staffing of one FTE employee is proposed. Operating hours of the facility are proposed as seven days a week from 9 a.m. to 4 p.m.

Security for the employee would be necessary. Several levels of systems could be implemented from a high technology video monitoring system to an individual employee "tip over" badge. The "tip over" badge is used at the INEL Reactor Museum. This system monitors the vertical position of the person. If the person has fallen, an alarm is set off at a predesignated area.

5.3 ALTERNATIVE C - PUBLIC ACCESS WITH ENHANCED DISPLAYS

While this alternative includes the improvements identified within Alternatives A and B, the primary emphasis includes improvements to provide better interpretation of the historic facility and upgrades to the displays. The general goal of this alternative is to provide better interpretation through improving not only the displays, but also the presentation of the 105-B Reactor Facility.

Improvements identified in this alternative do not require implementation on a specific schedule. Most are independent and could be accomplished over an extended period of time to improve the interpretation of this significant structure.

5.3.1 Display Upgrades

While the current displays (Photograph 5-11) are excellent and more than equivalent to those in the Oak Ridge or INEL Museums, additional improvements could provide more text to describe the photographs, artifacts, and memorabilia.

The success of hands-on displays in museums has increased their popularity and strengthened this trend in interpretive programming. The B Reactor Museum has many exciting opportunities to provide such hands-on experiences.

Decorating with authentic 1940's era furnishings the highly visible rooms along the tour route would provide a more realistic image of the facility during early production. This would include the removal of some existing displays from significant B Reactor rooms, such as the work area. Recreating the image could include hands-on displays, with less formal displays and more adaptive settings. Lighting at levels similar to those originally used could be incorporated and supplemented with accent spot lighting. There are also opportunities to stimulate other senses, such as through audio effects recreating the tremendous sound of the 70,000 gallons per minute volume of water rushing through the reactor cooling channels.

5.3.2 Presentation/Demonstration Room

A room that could seat 40 to 50 was identified by other similar facilities as one of the best opportunities to successfully work with community groups, particularly school age children. This room could easily be built within the old tool/storage

Photograph 5-11. Alternative C--Existing Displays.

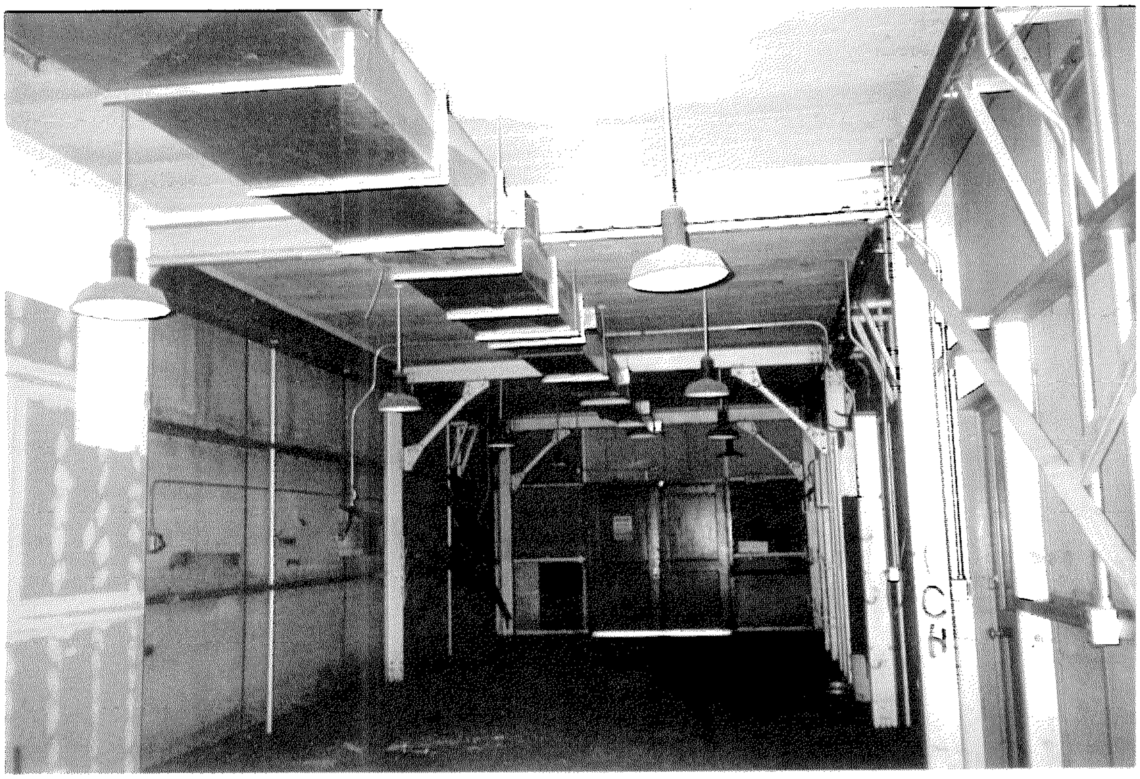
north wing of the B Reactor which is vacant (Photograph 5-12). Because it is somewhat separated from the main reactor structure and also close to the proposed entrance/exit, it provides an excellent location for such a use. This room could be easily air conditioned with a portable unit.

Section 106 of the NHPA requires that modifications to this National Register Site be completed in concert with the Washington SHPO and the Section 106/110 compliance process.

5.3.3 Exhibit/Entry Lobby

Utilizing the existing access door into the tool/storage north wing, provides an entry area and congregating area outside the primary reactor area and an excellent area to utilize the excellent displays that have been prepared. A small control counter/office area could be included here, providing an area where employees could be productive and still monitor access to the facility. Another critical need noted by other similar facilities was for a workroom for staff and volunteers to maintain, repair, and develop new displays.

Photograph 5-12. Alternative C--Tool/Storage Area--
Potential Space for Presentation Room.



The 105-B Reactor Building does not presently maintain additional electrical distribution in support of the added loads that have been identified in these alternatives. An upgrading of the electrical distribution system will be made to meet National Electrical Code regulations and safety for maintenance personnel and tour participants.

5.3.4 Side Exhibits

The "theme development" of the facility could start along the access road from Highway 240, where a security gate and even guard house could be constructed illustrating the tight security of the project during World War II, as well as during the cold war. Other elements that could be utilized to develop this preferred impression include original concrete post fencing with barbed wire, power pole replacement, securing old vehicles and equipment from this era, and other similar effects.

5.4 ALTERNATIVE D - PUBLIC ACCESS WITH ENHANCED DISPLAYS AND ADDITIONAL TOURS

The addition of several areas in the facility would enhance the current museum tour with minor upgrades for safety and disability access. These additions would add significantly to the technical and aesthetic value of the museum. The proposed additional tour route areas are the valve pit area, the fan house, the lunch room, and the fuel storage basin viewing area as shown in Figure 5-8. Alternatives A, B, and C would also be implemented under this option.

Each of these areas was an integral part of the entire plutonium production process. The valve pit area was the entry point of the cooling water supply into the facility from the 190 Building. Water was channeled through the valve pit and supplied the hollow aluminum process tube channels surrounding each rod for cooling the fuel.

The fan room houses the main blowers, heaters, air filters, and exhaust fans for the facilities heating, ventilation, and air conditioning system during reactor operations. The exhaust fans were attached to a concrete enclosed exhaust duct which exhausted the building air into the 200-ft high concrete stack, attached to the building. These massive units are located in individual fan cell rooms, accessed from the main fan room.

The fuel storage basin was a water shielded collection, storage, and transfer facility for the fuel elements discharged from the reactor. Typically, the fuel elements were sorted in the pickup chute area, hand-tonged into storage buckets, and transferred by the overhead monorail system to the storage area for decay of short-lived radionuclides. Then the buckets were moved by monorail to the transfer area and placed in railroad cask cars for transport to chemical reprocessing facilities in the 200 Area.

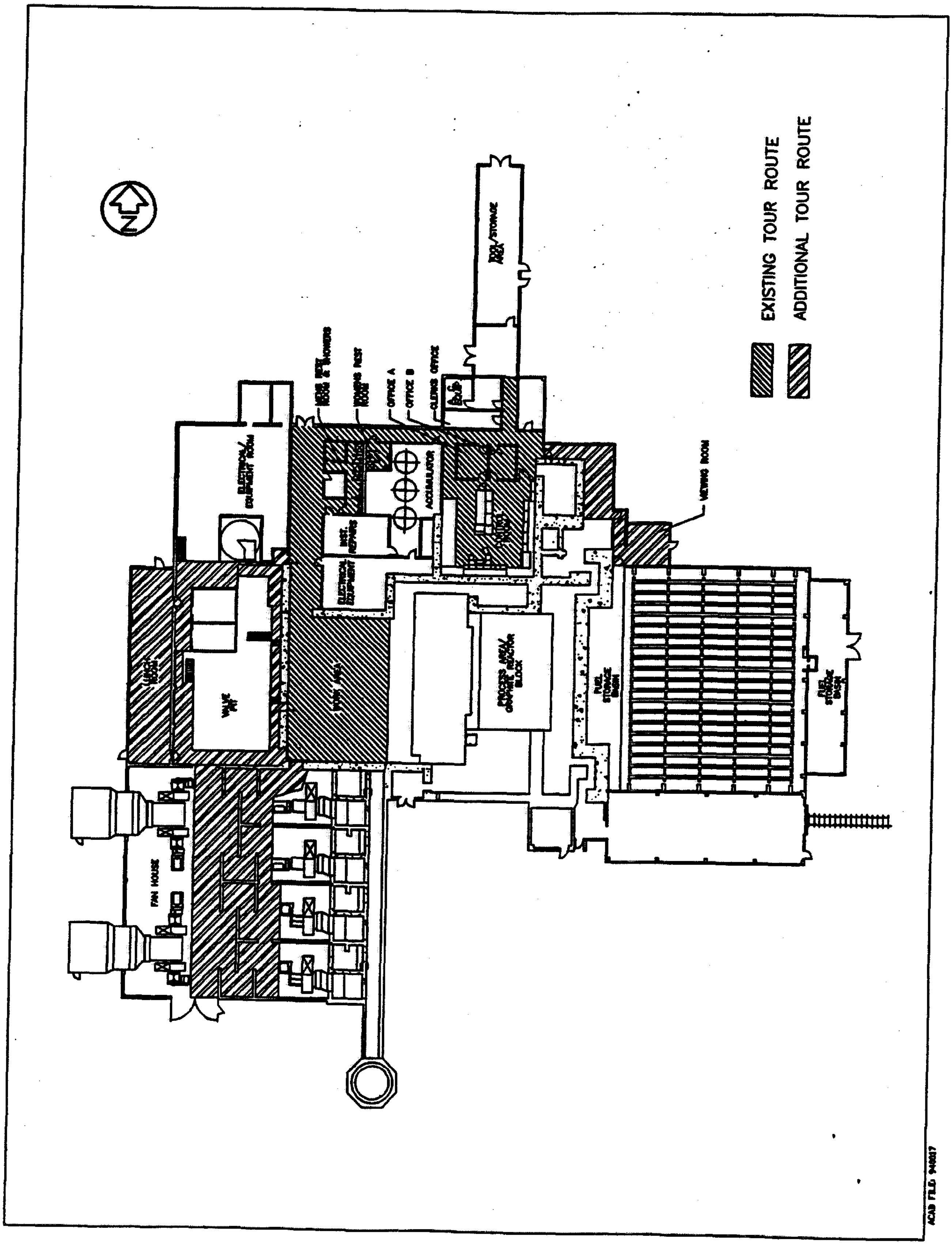
The ventilation upgrades addressed in Alternative A would be sufficient for venting the natural radon contamination throughout the additional tour route areas.

5.4.1 Valve Pit Room

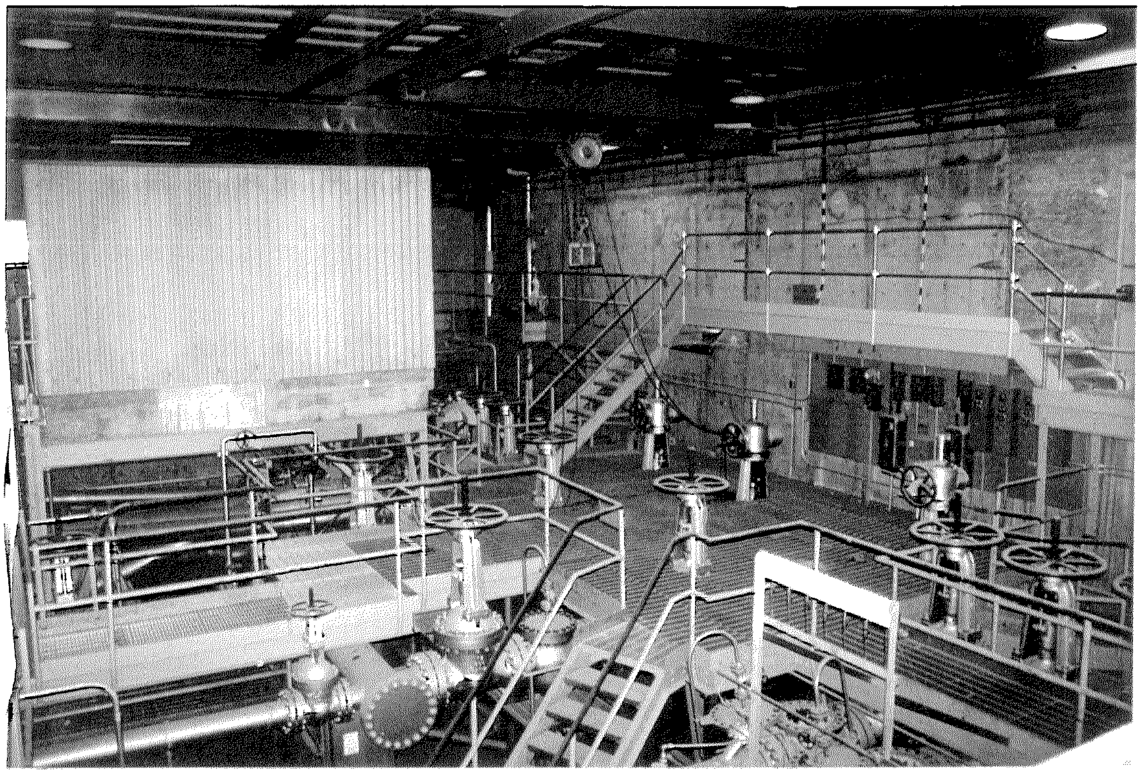
The valve pit area is accessible from the corridor leading to the work area, from the fan room, and from the exterior of the facility.

A grated walkway on the ground level overlooks the perimeter of the valve pit (Photographs 5-13 and 5-14). The recommended access route through the valve pit area is from the corridor entrance to the lunch room, through the lunch room area from north to south, and into the fan room, as shown in Figure 5-8.

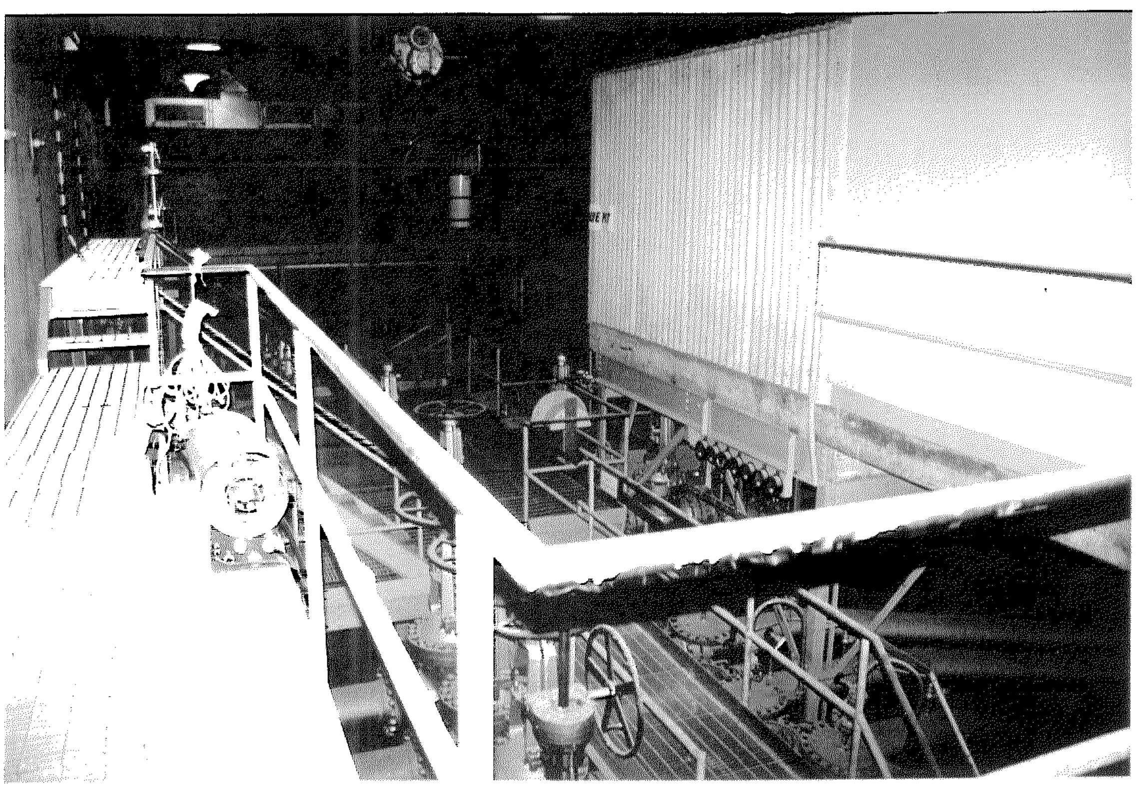
Figure 5-8. Tour Route Additions.



Photograph 5-13. Alternative D--Valve Pit Room.



Photograph 5-14. Alternative D--Valve Pit Room.



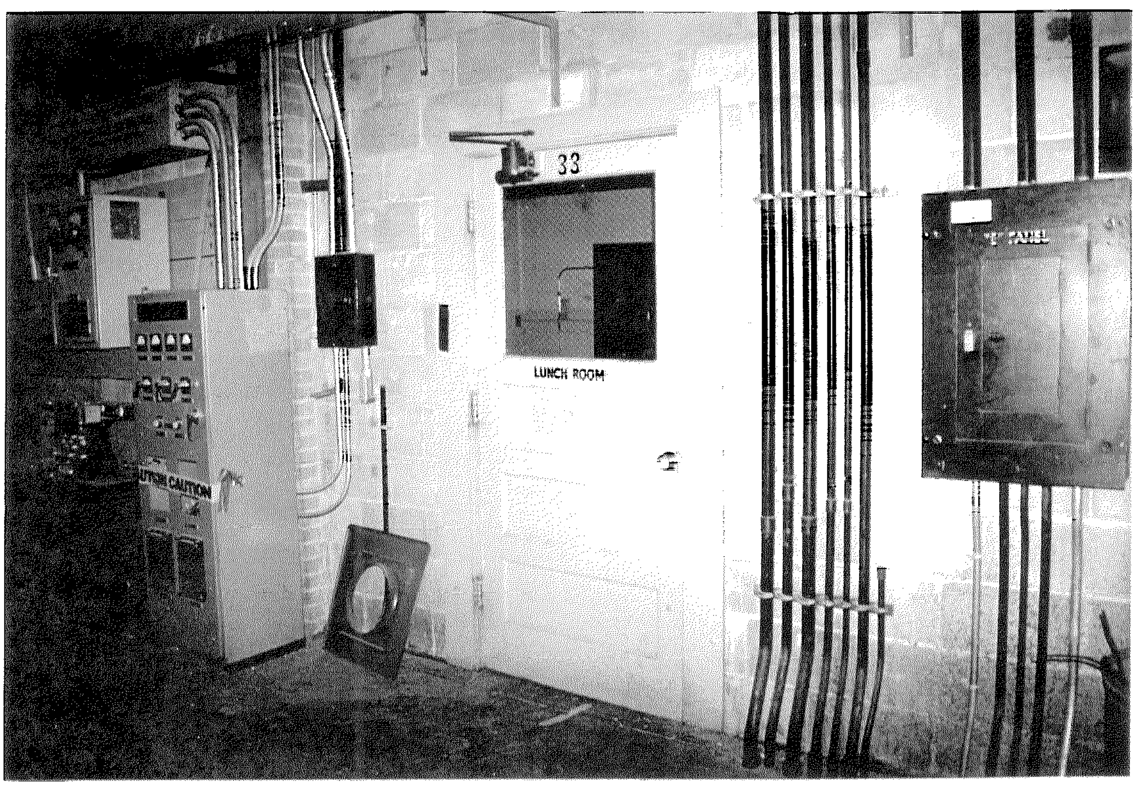
Two options are available for access compliance, the current grating has a 1-inch opening between grates, this grating could be replaced with 1/2-inch opening in the access path between the corridor entrance door and the north lunch room entrance and between the south lunch room entrance and the fan room. Another option is to lay and secure 1/4-inch wooden plywood planks in the same path identified. Using the similar grating would retain the historic aesthetic value.

Barriers and signs would be necessary to restrict access along the total perimeter of the valve pit. These signs should be posted at the locations of stairs leading to the lower level valve pit.

Lighting in this area was recently modified. Two-thirds of the existing ceiling lights in the room are currently on line. Modification of the remaining light fixtures should be evaluated in Phase II.

The lunch room area (Photograph 5-15) could serve as an additional display and video presentation area. Upgrades in this area include general housecleaning and removal or replacement of existing appliances (i.e., sink, stove, etc.), possible addition of a portable air conditioning unit, and access restriction to a lower level stairway. An exterior door is located in this area.

Photograph 5-15. Alternative D--Valve Pit Room/Lunch Room.



5.4.2 Fan Room

The fan room, located on the ground level, south of the valve pit is another potential area which could enhance the existing museum tour (Photograph 5-16). Access to this area includes the entrance from the valve pit area, access from the work area, and an exterior wall door.

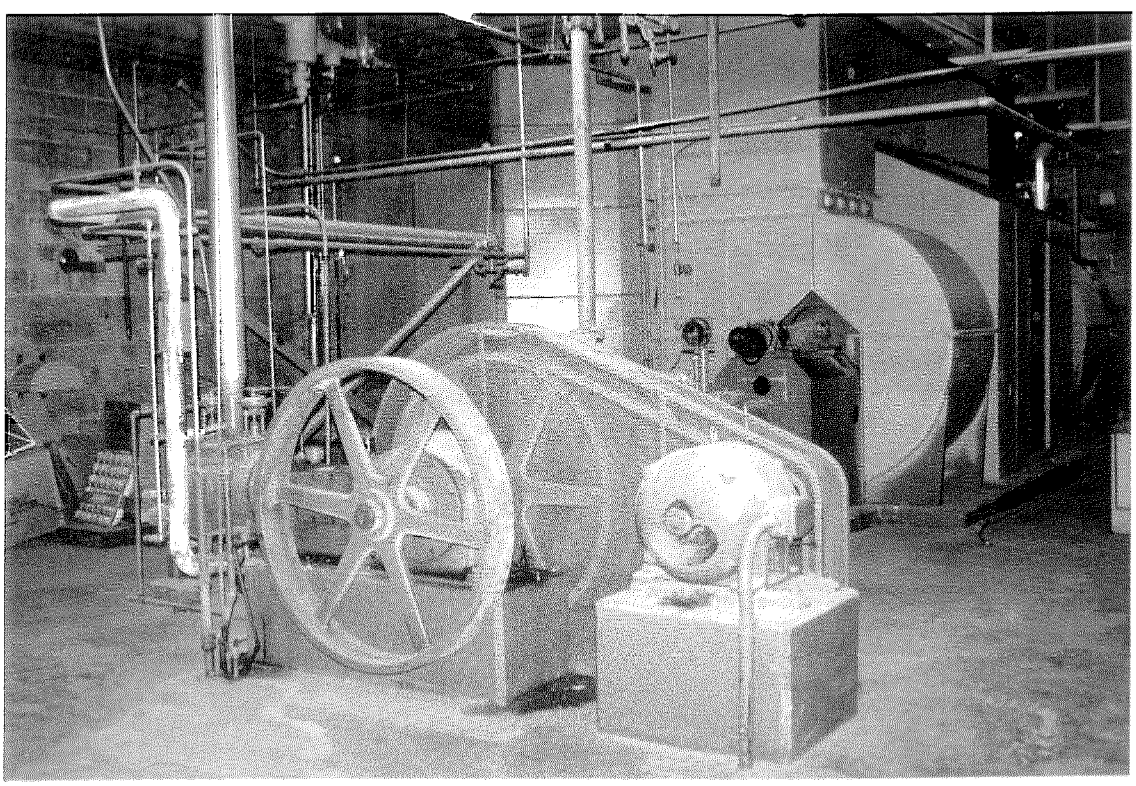
This area contains some tools and equipment which should be removed from the area and stored elsewhere. Those items or tools that were of the reactor operations heritage could be kept as part of the display. General housekeeping in this area would be necessary.

Barriers and controls would have to be erected for limiting access to areas and demonstrating the flow of foot traffic in that portion of the route. Barriers would also be necessary for restricting access in contaminated portions of the fan cell rooms.

Lighting in these areas is sufficient.

Disability access is not limited throughout the fan room.

Photograph 5-16. Alternative D--Fan Room.



5.4.3 Fuel Storage Basin

The fuel storage basin can be viewed from an adjacent room north of the basin (Photograph 5-17). This room can be accessed from the interior and the exterior of the facility. Access from the interior corridors of the facility meets the requirements for disability access, including the door and a ramp approaching the room. One wood wall partition (west wall) of the viewing room is not an original wall of the facility and could be removed to provide easier access to this room.

There are three sliding pane windows on the south wall of the room which can be opened to the fuel storage basin. These windows must be secured from allowing access.

Lighting in the viewing room is sufficient. The lighting above the basin can be improved simply by replacing the bulbs in the fixtures.

The electrical control panel for the lights is located in the viewing room and must be covered with a 1/4-inch plastic sheet screen to isolate the electrical equipment from the public. Photograph 5-18 shows the location of this panel on the north wall. The survey sign on the door is posted due to the current natural radon contamination which will be upgraded in Alternative A.

Photograph 5-17. Alternative D--Fuel Storage Basin Viewing Room.

Photograph 5-18. Alternative D--Viewing Room Electrical Panel.

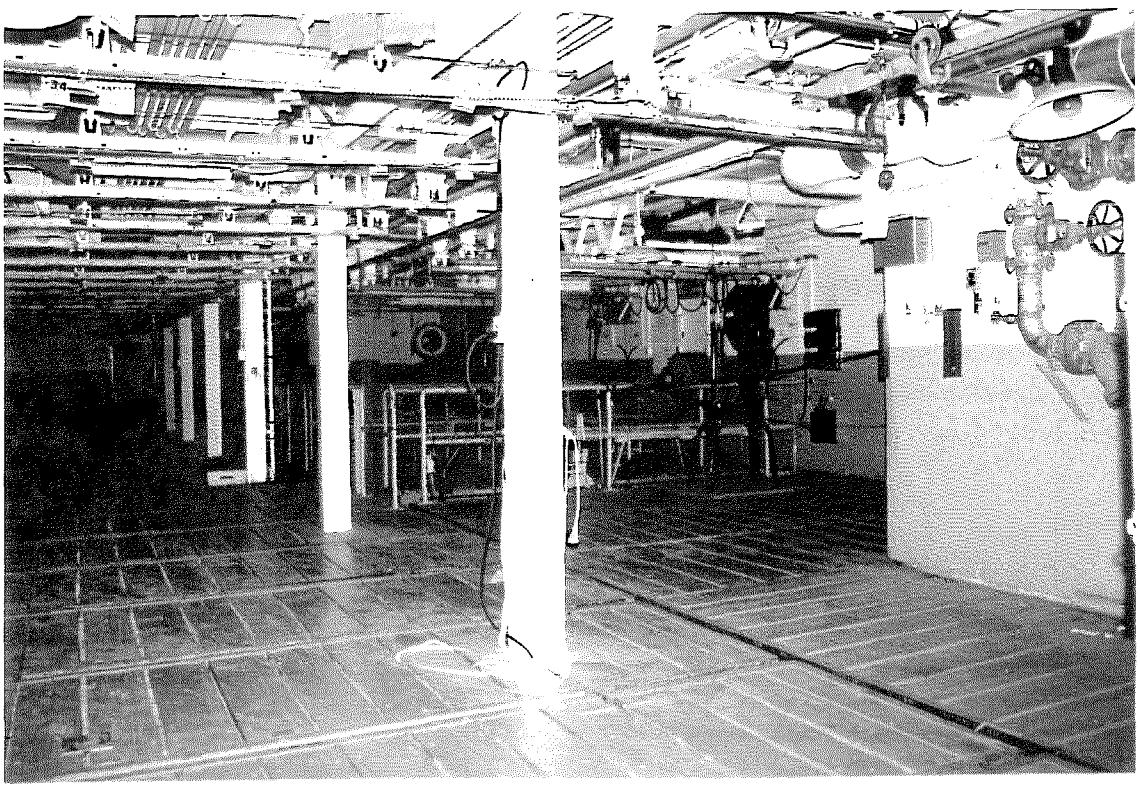
The fuel storage basin is currently covered with wooden planks (Photographs 5-19 and 5-20) which were used as a floor for the workers above. To improve the display, portions of the planks could be removed to show the basin. The overhead monorail system could be placed at this location with a bucket mounted to demonstrate the handling of the fuel, as described in Appendix B.

5.5 ALTERNATIVE E - PUBLIC ACCESS WITH ENHANCED DISPLAYS, ADDITIONAL TOURS, AND RIVER ACCESS/CULTURAL CENTER

The emphasis of this alternative focuses on providing interpretation of resources that were not part of the Hanford or B Reactor project. However, these resources are indirectly related in that each interpret impacts of sensitive issues related to the environmental and pre-Hanford conditions of the area. The improvements identified in this alternative also provide community service benefits through increased recreation opportunity and interpretation of important natural and cultural resources. This alternative is cumulative in that it includes the improvements identified in Alternatives A through D.

Photograph 5-19. Alternative D--Fuel Storage Basin.

Photograph 5-20. Alternative D--Fuel Storage Basin.



Improvements identified in this alternative do not require implementation on a specific schedule. Most are independent and could be accomplished over an extended period of time to improve the interpretation of this significant structure.

The improvements discussed in this alternative are located along the new access Route 6 (from Highway 240) and the Columbia River. The potential improvements listed below are independent, in that one or several could be pursued and may be implemented in a time-phased manner.

Initially (and as a minimum) the land along the new access road from Highway 240 could be designated as some type of open space providing recreation opportunities or interpretive enrichment programs (Photograph 5-21). Zoning this land early on as addressed in Alternative B, Section 5.2, could prove to be beneficial for future land use activities at the site. One or several of the following options could then be located on these lands.

Any actions described in this alternative would only be undertaken in concert with the Washington SHPO, and in accordance with the NHPA Section 106/110 compliance process.

Photograph 5-21. Alternative E--River Access.

5.5.1 Day Use Park

Under this option facilities would be provided to accommodate picnicking, playground, nature/interpretive trails, river access boat ramp, fishing, and related day use type facilities. Facilities could be provided to interpret the geologic, natural or cultural resources of the site.

5.5.2 Park/Camping Facilities

Overnight camping accommodations could be provided on the river side of the access road. These accommodations could include prepared tent-only camping sites, group camping sites, and recreational vehicle camp sites. Support facilities, such as restrooms with showers would be typical for whichever type camping was developed. Recreation available for campers would include river access/boating, fishing, canoeing, picnicking, playground, nature, interpretive trails, archery, and similar activities.

5.5.3 Resource Interpretive Facility

If public access to the 105-B Reactor Facility is provided along Route 6 from Highway 240, interpretive facilities could be developed between the road and the Columbia River that would be convenient and accessible to the many visitors to the museum. Possible interpretive themes could include geologic resources, the river (free flowing section), Native American Indian culture, pre-Hanford cultural characteristics, or environmental/ecological oriented displays.

The U.S. Fish and Wildlife Service (USFWS) manages the area across the river to the north. With the visitors passing this area on their way to the B Reactor, the USFWS might consider developing a visitors center to interpret the natural resources of the site and the purpose of their refuge along the Columbia River.

The old Bruggeman fruit warehouse, part of the Bruggeman farmstead and shown in Photograph 5-22, is located north of Route 6 and could be an additional historical access area. The historical significance of the pre-Hanford existence of this facility would provide a fascinating attraction. Renovation of this facility or providing limited access should be developed further in Phase II.

5.6 ALTERNATIVE F - DISMANTLING

Alternative F consists of decontamination and decommissioning (D&D) and dismantling of the 105-B Reactor Facility and compliance with the NHPA requirements.

Photograph 5-22. Alternative E--River Access/Old Homestead.

An EIS was performed in accordance with the National Environmental Policy Act (NEPA) on the potential impacts of decommissioning the surplus reactors at the Hanford Site. This study included the B, C, D, DR, F, H, KE, and KW Reactors. The results of this study were documented in the *Final Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1992) which was the basis for a ROD (DOE 1993) published in the Federal Register on September 16, 1993.

The preferred alternative was based on total costs and principal environmental impacts, including short-term occupational radiation doses and long-term public radiation doses. The results of the study recognized the B Reactor as an historic site and states "Actions to preserve this historic resource may include extensive recordation by photographs, drawings, models, exhibits, and written histories, and may also include preservation of some portions of the B Reactor for display on or near its present location or at some other selected location."

5.6.1 Decontamination, Decommissioning, and Dismantling

The preferred decommissioning alternative was safe storage followed by deferred one-piece removal. With this option, each of the reactors would be placed in safe storage and routine maintenance, surveillance, and radiological monitoring activities would continue. A safe storage duration of 75 years is identified in the ROD. This

schedule was not identified in the recent *Hanford Federal Facility Agreement and Consent Order* (Ecology, et al. 1989) modifications, as this D&D milestone will be addressed at a later time. After this period, the reactor block would be transported intact to the 200 West Area for disposal.

During preparation for safe storage, building structural repairs would be performed as necessary to ensure containment of radioactive materials. Building security, radiation monitoring, and fire-detection systems would be upgraded to provide safety and security controls and regulated surveillance during safe storage. These upgrades are paralleled to those upgrades necessary for Alternative A under this section.

During safe storage, surveillance, site and facility inspections, radiological and environmental surveys, and site and facility maintenance would be carried out. Major building maintenance would be performed at estimated 5-year and 20-year intervals.

At the end of the safe storage period, the reactor block would be removed and transported as a single piece by tractor-transporter to the 200 West Area. This process is estimated to take approximately 2.5 years for each reactor.

Contaminated materials and equipment would be removed and disposed in the 200 West Area. Uncontaminated portions would be removed (for access for the tractor-transporter) and placed in a landfill.

The Final EIS addresses the estimated dose rates which would result from this option. The dose rates were reported for the option of decommissioning all of the eight reactors in this fashion. The occupational radiation doses were estimated to be about 51 person-rem. Short-term public radiation doses were estimated to be near zero.

5.6.2 National Historic Preservation Act

Section 4.3 of this report identifies the requirements of the Section 106 and 110 processes of the NHPA.

Under this process, the DOE would be required to notify the SHPO of any proposed action on the site. The SHPO will judge whether this action has adverse effect and whether mitigation measures are required. During prior discussions with the SHPO, it was assumed that the option of decommissioning the 105-B Reactor Facility would be considered an adverse effect.

The DOE would be required to submit a MOA identifying the mitigation measures to be taken to the SHPO and the Federal Advisory Council on Historic Preservation for approval. After which time, it is submitted along with supporting information and photographs to the NPS to determine the level of documentation necessary for the action under the HABS/HAER portion of the Section 110 process.

The amount of required documentation will be determined during the HABS/HAER process by the NPS. Generally this includes the following documentation:

<u>Photographs</u>

- Interior and exterior architectural photographs
- Historical photographs
- Close-up photographs of significant equipment/structures

<u>Drawings</u>

- Photograph reproductions of all drawings associated with the building
- Model of the building

<u>Documentation</u>

- Detailed description of the building
- Detailed description of controls and instrumentation
- Detailed description of significant equipment/structures
- Documentation of history of the building

Also as a requirement under the NHPA, portions of the B Reactor may be removed and relocated in order to preserve a part of this historic site.

6.0 COMPARATIVE ANALYSIS

6.1 CRITERIA FOR EVALUATING ALTERNATIVES

The six alternatives discussed in Section 5.0 were evaluated based on two overall criteria, cost and benefit. These criteria were developed during Phase I technical working sessions (PNL and Parsons 1994a). The process used during the brainstorming technical working sessions was similar to the Delphi Process for analyzing alternatives. This process was used as a prototype for the proposed facilitated feasibility study workshop for stakeholders discussed in Section 2.0.

6.1.1 Cost

One of the criteria for evaluating alternatives in Phase I of this feasibility study is the relative cost of each alternative. This cost is based on preliminary information and is used as a level of magnitude estimate for comparison. The alternatives are ranked using a relative range of low to high.

6.1.2 Benefit

Twelve potential benefits of reutilizing or dismantling the 105-B Reactor Facility were developed, evaluated, and ranked during the Phase I technical working sessions. These benefits were ranked in order of importance using two systems, a forced ranking system and a direct comparison ranking system.

During the working sessions, the benefits were defined and ranked in the following order of importance as recommended by the initial Delphi analysis. Individual ranking scores from the direct comparison ranking system are shown in parentheses (the higher the number, the higher the rank). During the Phase II facilitated workshop with stakeholders, a system of weighing the benefits based on ranking could be implemented to provide a more refined approach.

1. Historical (40)

   - Preserve past technological achievement and provide a basis for future technological growth
   - Irreplaceable historical landmark, preserves nation's history
   - Provide long-term site history, including the standing old homestead, towns of Hanford and White Bluffs, cultural resources
   - Part of the history and development of Tri-Cities
   - History of DOE, Hanford Site, and B Reactor
   - History of site security and secretiveness

2. Education (35)

    - Education of past, present, and future nuclear technology
    - Provide history of first production reactor
    - Educate on Hanford Site role (from past to present - World War II to Cold War)
    - Show the entire process from nuclear weapons production to environmental remediation (full circle process)
    - Observe ongoing D&D

3. Engineering (34)

    - Historical engineering significance
    - Streamlined construction engineering schedule
    - Success and durability logistics
    - Recognition of and by Engineering Societies
    - Material innovation

4. DOE/Hanford Image (31)

    - Explain DOE history/role
    - Beneficial to DOE image
    - End secretiveness
    - Show completed projects at Hanford, demonstrates a successful long term, quality, nuclear project

5. Nuclear Support (25)

    - Increase public confidence in nuclear safety
    - Explain and encourage nuclear technology
    - Show advancement of nuclear technology in 50 years
    - Demonstrate control panel, containment story
    - Benefits nuclear industry
    - Show high quality of work

6. Tourism/Economic (25)

    - Promote different aspects of tourism in area
    - Tourism provides general economic growth
    - Enhance public awareness through tourism
    - Promote positive nuclear industry image
    - Support region economy diversification
    - Show self-supporting site

7. Public Relations (23)

- Allow controlled access to the public to Hanford Site
- Explain past and present DOE role
- End secretiveness
- Enhance stakeholder cooperation
- International significance

8. Site Budget (19)

- Build public support of DOE expanded mission
- Provide understanding of site budget
- Show DOE investment in education

9. Environmental (14)

- Shows cleanup and reutilization is feasible
- Showcase for environmental technology
- Indian Cultural Resource Center
- Promote public awareness of area environment
  - highlight groundwater and ecological monitoring
  - Arid Lands Ecology (ALE)
- Demonstrate D&D

10. Scientific (11)

- History of science
- Stimulate public interest in science
- Educate public in decontamination capabilities

11. Aesthetics (6)

- ALE
- Majestic size of reactor block
- Promote positive emotional impact
- Possible Wild and Scenic River designation
- Show high quality craftsmanship for time period

12. Recreational (1)

- Public access to free-flowing stretch of Columbia River
- Old homestead
- Picnics, boating, nature walks, bike path to Vernita Bridge
- Native American Cultural Center

6.2 COMPARATIVE ANALYSIS MATRIX

Each of the six alternatives described in Section 5.0 was ranked against the cost/benefit criteria defined above. A comparative analysis matrix was developed during the technical working sessions, to provide a means of comparing the six alternatives (Table 6-1).

6.2.1 Criteria Ranking

The relative cost was initially assigned to each alternative as an incremental cost of 1 to 5, with a low cost of 1 and a high cost of 5. The benefits were assigned using an opposite range with 5 as a low benefit and 1 as a high benefit and were ranked in order of importance. A low total of cost plus benefit (minimum possible of 24, maximum of 120) is designed to identify the optimum situation; relatively low costs and high benefits.

The alternative comparison matrix was developed initially during the technical working sessions, as the alternatives were defined. The cost in this matrix was based on a relative cost between alternatives. Since that time, site visits and interaction with the facility personnel have aided in further defining and refining the alternatives and their associated costs. The cost estimates in Appendix E were developed based on the additional information. The initial cost ranking system was then reevaluated and was reassigned a range of 1 to 4, with 4 providing an undefined, relatively large cost.

6.2.2 Results

The results of the activity, Table 6-1, proved to be a useful tool for evaluation of alternatives by cost and benefit. Figures 6-1 and 6-2 provide a visual representation of this data.

Alternative C, Public Access With Enhanced Displays, had the lowest total value of 48.5. This alternative included upgrades of the existing displays and the addition of a presentation room. Under this alternative, the public can access the museum using an upgraded Route 6. This proved to have the highest benefit with a relatively low cost.

Alternatives A, B, and D provided results that were very close to each other. The incremental costs associated with implementing Alternative D, Public Access With Enhanced Displays and Additional Tours, are judged to be small comparatively. The addition of the fuel storage basin, valve pit and lunch room, and fan room would provide an increased educational and scientific benefit.

Table 6-1. 105-B Reactor Facility Alternatives Comparative Cost/Benefit Analysis Matrix.

COST/BENEFIT	ALTERNATIVES												
	RANK[b]	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
		Cost[a]	Ben.[a]	Cost[a]	Ben.[a]	Cost[a]	Ben.[a]	Cost[a]	Ben.[a]	Cost[a]	Ben.[a]	Cost[a]	Ben.[a]
Education	2	1	3	1.5	2.5	2	1.5	3	1.5	4	1	4	5
Scientific	10	1	4	1.5	4	2	2	3	2	4	2	4	5
Tourism/Economic	6	1	3	1.5	2	2	1.5	3	1.5	4	1	4	5
Public Relations	7	1	4	1.5	2.5	2	1.5	3	1.5	4	1	4	5
DOE/Hanford Image	4	1	4	1.5	3	2	2	3	2	4	1	4	5
Nuclear Support	5	1	4	1.5	3	2	2	3	2	4	2	4	5
Site Budget	8	1	5	1.5	4	2	2	3	2	4	2	4	5
Historical	1	1	3	1.5	3	2	1.5	3	1.5	4	1	4	5
Environmental	9	1	4	1.5	3.5	2	2	3	2	4	1	4	5
Aesthetics	11	1	3.5	1.5	3	2	3	3	2.5	4	2	4	5
Engineering	3	1	4	1.5	4	2	2	3	1.5	4	1.5	4	5
Recreational	12	1	5	1.5	4.5	2	3.5	3	3.5	4	1	4	5
Individual Totals		12	46.5	18	39	24	24.5	36	23.5	48	16.5	48	60
TOTALS		58.5		57.0		48.5		59.5		64.5		108.0	

[a]Increment Cost - LO (12345) HI
Benefits - HI (12345) LO
[b]Rank extracted from Section 6.1.2

Figure 6-1. B Reactor Museum Feasible Alternatives: Cost and Benefits.

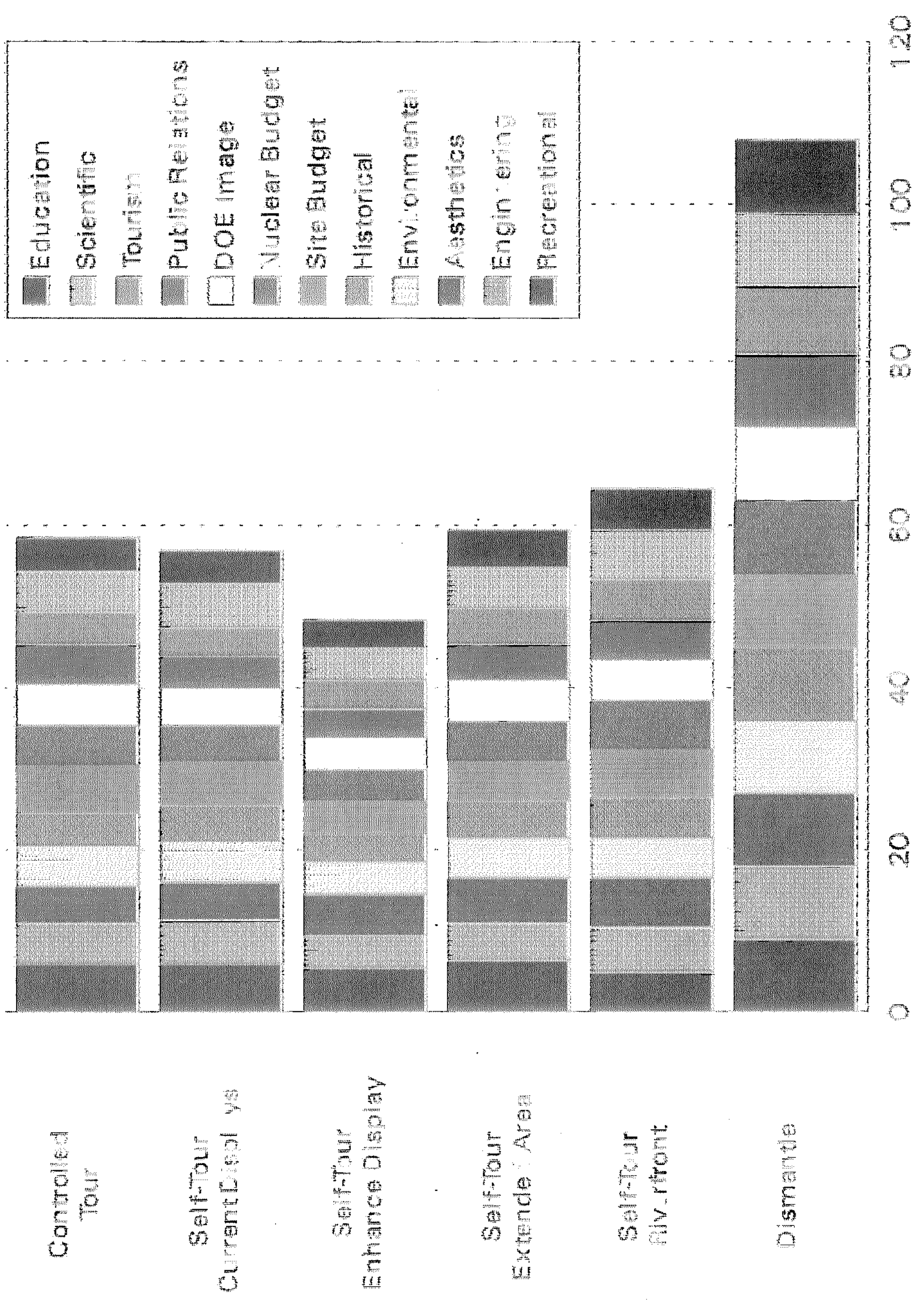
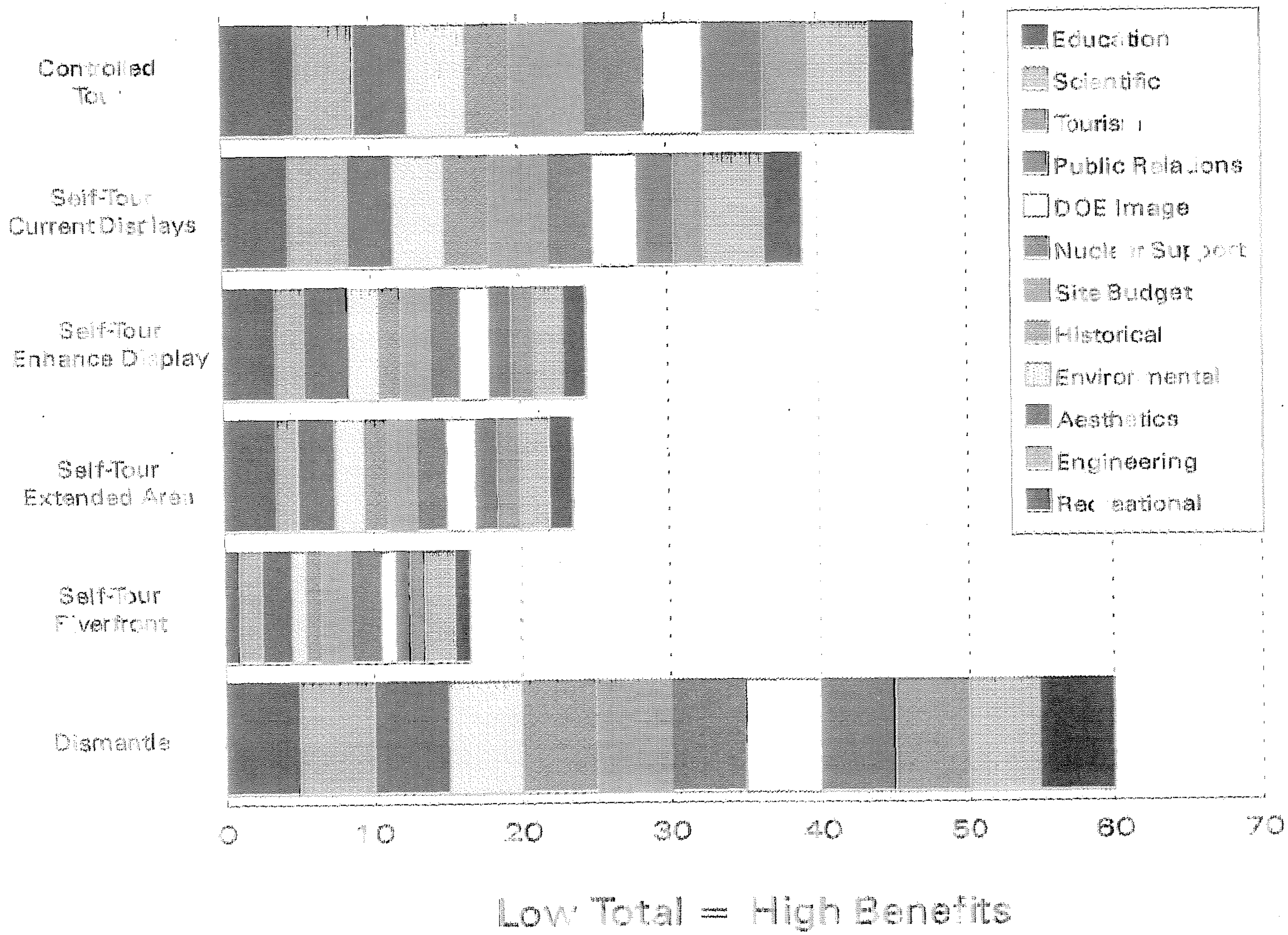


Figure 6-2. B Reactor Museum Feasible Alternatives: Benefits.



The high cost and low benefit associated with Alternative F are immediately evident from the high total score of 108. This option would entail tearing down the existing facility and necessary documentation for compliance with the NHPA. Refined cost data are expected to lend further weight to this argument.

7.0 REFERENCES

16 USC 470, "National Historic Preservation Act," *United States Code*, U.S. Department of the Interior, Washington, D.C.

29 CFR 1900, "Occupational Safety and Health Act," *Code of Federal Regulations*, as amended.

36 CFR 800, "Protection of Historic an Cultural Properties," *Code of Federal Regulations*, as amended.

AASHTO, 1990, *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, Washington, D.C.

ACHP, 1986, "A Five-Minute Look at Section 106 Process," Fact Sheet, Advisory Council on Historic Preservation, Washington, D.C.

ACSE, 1993, *Hanford B Reactor Nomination for Designation as National Historic Civil Engineering Landmark*, Columbia Section, American Society of Civil Engineers, Washington, D.C.

ATBCB, n.d., *American with Disabilities Act Accessibility Guidelines*, Architectural and Transportation Barriers Compliance Board, Washington, D.C.

BHI, 1995, "Emergency Lights Inspection for 100 Areas Inactive Facilities and Maintenance Facilities," D-03-001, BHI-FS-02, *Field Support Work Procedures*, Bechtel Hanford, Inc., Richland, Washington.

Briggs, W., 1994a, "A Landmark in History," *Tri-City Herald*, September 11, 1994, page C1, column 1, Tri-Cities, Washington.

Briggs, W., 1994b, "B Reactor Key to Helping U.S. Beat Nazis in Race to Make Nuclear Bomb," *Tri-City Herald*, September 11, 1994, pg C1, column 2-5, pg C4, column 1-4, Tri-Cities, Washington.

Brown, R. L., 1992, *Cost Benefit Analysis--ALARA*, WHC-SD-SQA-CSD-20003, Westinghouse Hanford Company, Richland, Washington.

Carpenter, R. W., 1994, *100-B Area Technical Baseline Report*, WHC-SD-EN-TI-220, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Coles, G. A., Shultz, M. V., and Taylor, W. E., 1993, *Risk Management Study for the Retired Hanford Site Facilities, Qualitative Risk Evaluation for the Retired Hanford Site Facilities*, WHC-EP-0619, Volumes 1 - 4, Westinghouse Hanford Company, Richland, Washington.

Cushing, C. E., 1992, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev. 5, Pacific Northwest Laboratory, Richland, Washington.

DOE, 1985, "Contractor Industrial Hygiene Program," DOE Order 5480.10, U.S. Department of Energy, Washington, D.C.

DOE, 1987, "Project Management System," DOE Order 4700.1, U.S. Department of Energy, Washington, D.C.

DOE, 1988, "Radiation Protection for Occupational Workers," DOE Order 5480.11, U.S. Department of Energy, Washington, D.C.

DOE, 1989a, "General Design Criteria," DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

DOE, 1989b, *Draft Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119-D, U.S. Department of Energy, Washington, D.C.

DOE, 1992, *Final Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119-F, U.S. Department of Energy, Washington, D.C.

DOE, 1993a, *Record of Decision; Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, Federal Register, Volume 58, Number 178, U.S. Department of Energy, Washington, D.C.

DOE, 1993b, "Fire Protection," DOE Order 5480.7A, U.S. Department of Energy, Washington, D.C.

DOE, 1994, "Environmental Protection, Safety and Health Information Reporting Requirements," DOE Order 5484.1, U.S. Department of Energy, Washington, D.C.

Duckett, A. J., 1989, *History of 100-B Area*, WHC-EP-0273, Westinghouse Hanford Company, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Evans, C. B., 1994, *Integration of Fire Hazards Analysis and Safety Analysis Report Requirements*, WHC-SD-GN-FHA-30001, Westinghouse Hanford Company, Richland, Washington.

Evans, R. A., 1994, *Radiological Design Guide*, WHC-SD-GN-DGS-30011, Westinghouse Hanford Company, Richland, Washington.

HSRCM, 1994, *Hanford Site Radiological Control Manual*, HSRCM-1, Rev. 2, prepared for the U.S. Department of Energy by the Hanford Site Contractors, Richland, Washington.

ICBO, 1994a, "Minimum Basic Wind Speeds and Seismic Zone Map," Figures 16.1 and 16.2, Uniform Building Code, International Conference of Building Officials, Whittier, California.

ICBO, 1994b, "Historic Buildings," Section 3403.5, Uniform Building Code, International Conference of Building Officials, Whittier, California.

ITE, 1992, *Traffic Engineering Handbook*, Institute of Transportation Engineers, Washington, D.C.

KEH, 1991a, Hanford Plant Standards, HPSACM, U.S. Department of Energy, Kaiser Engineers Hanford, Richland, Washington.

KEH, 1991b, *Structural Inspection of Hanford's 100 Area Facilities, Rev. 0*, ER1738-INSPECTION, Kaiser Engineers Hanford Company, Richland, Washington.

Mihalic, M. A., 1994, WHC, Letter to J. L. Bryant, PNL, 9453445, May 13, 1994, Richland, Washington.

Miller, R. L. and Steffes, J. M., 1987, *Radionuclide Inventory and Source Terms for the Surplus Production Reactors at Hanford*, UNI-3714, Rev. 1, UNC Nuclear Industries, Richland, Washington.

OAHP, 1991, National Register of Historic Places Registration Form, Hanford B Reactor, Office of Archaeology and Historic Preservation, Washington, D.C.

PNL and Parsons, 1994a, Alternative Brainstorming Session Meeting Minutes, August 9, 1994, between Pacific Northwest Laboratory and Parsons Environmental Services, Richland, Washington.

PNL and Parsons, 1994b, *Draft Project Definition Report*, Rev. 1, Pacific Northwest Laboratory and Parsons Environmental Services, Inc., Richland, Washington.

TCH, 1994, "Contractors Consider Columbia Point for Cultural Center Site," *Tri-City Herald*, August 19, 1994, page A3, column 1-2, Tri-Cities, Washington.

USDI, 1992, *The Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings*, Preservation Assistance Division of the National Park Service, U.S. Department of the Interior, Washington, D.C.

Wahlen, R. K., 1991, *History of 100-B Area, 105 Building Construction Details*, WHC-EP-0273, Addendum 1, Westinghouse Hanford Company, Richland, Washington.

West, D., 1994, WHC, cc:Mail message to P. W. Griffin, WHC, June 1, 1994, Richland, Washington.

WHC, 1988a, *ALARA Program Manual*, WHC-CM-4-11, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988b, *Industrial Safety Manual*, WHC-CM-4-3, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988c, *Management Requirements and Procedures*, WHC-CM-1-3, Westinghouse Hanford Company, Richland, Washington
MRP 5.7, "Industrial Safety and Fire Protection"
MRP 5.37, "ALARA Program"
MRP 5.38, "Radiation Protection."

WHC, 1994a, "105-B Damaged Roof Panel Repair," Engineering Change Notice 600275, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994b, "105-DR Damaged Roof Replacement," Engineering Change Notice 600276, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

Risk Assessment Results

APPENDIX A

RISK ASSESSMENT RESULTS

Building, Reactor Block, Fuel Storage Basin

- Walls above the top of the core may be unreinforced concrete blocks.
- Many confined spaces exist in the building, both above and belowgrade.
- Evidence of oxidation and water accumulation throughout building.
- Large crack in southeast corner of storage basin.
- Load bearing wall severely cracked in basin, storage area.
- Slant cracks in south and west transfer area walls.
- Loose handrail in stairway above accumulator room.
- Broken concrete steps in charge prep area (Maintenance did not confirm).
- Workshop roof handrail degraded in workshop near control room (Maintenance stated this is probably handrail on second floor above control room).
- Projections into ladder space and lack of caging at access ladder off reactor.
- Slant crack over east door and slant, vertical, and horizontal cracks on south wall in fuel transfer area.
- Large vertical crack in southwest corner of south masonry wall of process area and control rod room.
- Fixture mounted at head height on rear stairwell, just out of zone.
- Mortar deterioration in radiation zones.
- Deteriorated doors in lab area on south side of reactor.

Roof

- Adequate to carry projected load, except beams in two areas require additional bracing.
- Panels must be anchored to metal support structure (unknown).
- Supporting steel joists must be anchored to walls (unknown).
- Some badly damaged precast concrete slab panels require modification or replacement.
- Three panels with large holes, two of which are dangerous in corridor to storage basin.
- One broken panel in fan room, leak from panel.
- One roof panel with 2-inch deflection and two cracked panels in process area, rod room (above control room).

Heating, Ventilation, and Air Conditioning

- Radon gas control.
- Inadequate guards in room 8 on heater fans.
- Building lacks ventilation.
- No active heating system in much of building.

Electrical

- Missing insulation, bare energized 480-volt wires.
- Hot circuits with missing bulbs.
- Improper labeling and tagging.
- Lack of preventative maintenance.
- Access problems.
- Temporary cords used for permanent power supply at general front face.
- Unknown condition of cables in front face curtain, could be corroded.
- Enclosure, main switch gear not grounded in main switch gear room, fault to cabinet occurs.
- Breaker not properly tested and maintained in main switch gear room.
- Enclosure not grounded in remote lighting panels, panel D, and south wall of vent room.
- Fault to cabinet occurs above panel E in valve pit room, electrical hookup is using groundpath for neutral return, raceway sections not firmly connected, results in energized condition.
- Switch using groundpath must be on, heat trace not protected in accumulator room mezzanine.
- Receptacles hanging loose, causing insulation abrasion in third fan room, circuits energized.
- Inconsistencies in tagging/labeling at fan room switch gear (480 volt)
- No panel directory in charging room, south side, panel C.
- Light fixtures with missing globes are mounted at same height as hand rails in walkway above ball hoppers.
- Nesting material present in energized electrical hardware at ball hopper mezzanine.
- Inconsistencies in tagging/labeling in balance of plant.
- Temporary cord is routed through walls and doorways subjecting it to abrasion in balance of plant.
- Temporary cord load capacity is not compatible with panel in balance of plant.

Lighting

- Poor illumination in far side stairway.
- Poor illumination in access ladders off reactor.
- Lamp has come loose from fixture at top of reactor in ceiling near stairwell.

Fire Protection

Fire hazard analysis should be performed in accordance with DOE 5480.7A (DOE 1993) (depending upon remodeling, carpeting, electrical, combustibles).

- Eight emergency lights.
- Five fire extinguishers (inspected on a monthly basis).

Industrial Hygiene

- Overall building contains approx 13,500 Ci radionuclides (primarily activation products contained within graphite core), 98.5 tons of lead, and unknown quantity of asbestos.
- Energetic gamma emitters possible in immediate vicinity of basin walls and activated structures (e.g., graphite blocks, thermal shield).
- Radiation areas and items are mislabeled or misposted, some postings are misleading or out of date.
- Asbestos throughout facility, a majority of which is identified and encapsulated.
- Lead in solid form with oxidized surfaces, primarily in radiation zone and transfer area.
- Observed lead oxidation rates in general greater than expected.
- Very small quantities of mercury contained in glass containers in switch on wall of northwest corner of fuel basin.
- Approximately 1,500 counts per minute highest level of smearable contamination in transfer area. Open pipes in lab area on south side of reactor
- Drains are labeled "uncontaminated", but not sealed in sink near accumulator room, unknown discharge point for drain.
- Unknown quantities of oil in vertical safety rod (VSR) drive motors.
- Oil-containing equipment, majority not leaking.
- Seals and gaskets may be deteriorating and may cause leaking.
- Oil in line oiler, industrial chemical in storage basin adjacent to door 37 at storage basin.
- Oil in rod drive system in outer rod and accumulative room.
- Oil in line oiler and steel tank at north end of 50-foot level.
- Oil on floor and drip pans in ball hopper area.
- Oil from fan bearings and regulators in cabinet in fan room.
- In line oiler and manifold in fan cell 8 at fan house.
- Biological hazards including spiders, wasps, bats, rodents, snakes, etc.
- A 5-gallon can of heptane in fan room at south end.
- Unknown aerosol can in fan room at southwest corner.
- Two 5-gallon containers of decontaminator label indicates harmful if inhaled in fan room at southeast corner.
- Two partially full 5-gallon containers of concentrating chlorinating solution at north end of mezzanine outside outer control rod room.

- A 55-gallon container of unknown material hand-labeled as vermiculite (unable to verify) in valve pit.
- Unknown chemical residues (suspected to be decontamination agent) on floor on north end.
- Most areas have small quantities of oil present
- Unknown solid material in two glass containers on X-2 level, could be cobalt chloride.
- Storage basin wash pad bucket elevator contains spray paint and container of bowl cleaner.
- Unknown mixture of blue crystalline material with liquid in waste basket in fan room at north end.

APPENDIX B

Background Information

APPENDIX B

BACKGROUND INFORMATION

B.1 SITE LOCATION

The Hanford Site is a 560 square mile area of land located in Benton, Franklin, and Grant counties in the south-central portion of the state of Washington. The 100-B/C Area is situated in the north-central portion of the Hanford Site along the southern shoreline of the Columbia River, approximately 28 mile northwest of the city of Richland, Washington (Figure 1-2).

The B Reactor is housed in the 105-B Reactor Facility in the 100-B/C Area of the Hanford Site. It is located approximately 0.5 miles south of the Columbia River and 3.5 miles east of State Highway 240 at the Vernita Bridge crossing.

The Hanford Site Plant coordinates for the B Reactor Location are N69050 and W80680.

The 105-B Reactor Facility is surrounded by most of the original plant facilities constructed to support the B Reactor operation as well as the cooling water retention basin systems for the B and C Reactors.

B.2 SITE HISTORY

The world's first controlled, self-sustaining chain reaction was produced in a simple pile of graphite blocks and natural uranium metal assembled by physicists at the University of Chicago in late 1942. It reached a power level of 200 watts.

A prototype graphite reactor plant was later constructed at the Clinton Engineer Works (later referred to as Oak Ridge) in Tennessee. This larger pile first operated on November 4, 1943, and within a few days reached a power level of 500 kilowatts. Improved cooling fans were installed later and it exceeded 1800 kilowatts in June 1944.

The 105-B Reactor, designed by the E. I. du Pont de Nemours Co. under direction of the Manhattan Project, was the first full-scale production reactor ever constructed. The reactor was one of the three original reactors built at the Hanford Site, formerly the Hanford Engineering Works.

Construction of the 105-B Reactor began June 7, 1943, and fifteen months later, on September 26, 1944, the reactor became operational.

The reactor construction included 2004 pressure tube channels, which was considered to be too conservative since the design originally included 1500 tubes. Additional amounts of uranium fuel were used in the extra pressure tubes which permitted the design to overcome xenon poisoning and move quickly to plutonium production.

The first production batch of irradiated fuel was discharged from the reactor on December 25, 1944, and was sent to a separation plant in the 200 Area and processed into plutonium nitrate.

The B Reactor operated from September 26, 1944, to February 12, 1968.

Operating initially at 250 megawatts (thermal) of power, power levels gradually increased over the years until 2,090 megawatts (thermal) was authorized in 1961. Operations continued at approximately that level until deactivation in 1968 (Carpenter 1994).

A more detailed account of the history of the B Reactor and the prototype leading to the design of this reactor can be found in the *History of the 100-B Area* (Duckett 1989) and the National Register of Historic Places Registration Form for the Hanford B Reactor. The *History of 100-B Area, 105 Building Construction Details*, WHC-EP-0273, Addendum 1 (Wahlen 1991) provides a specific description of the materials and quantities used in constructing the 105-B Reactor Facility.

B.3 FACILITY DESCRIPTION

Appendix C provides a catalog of reference drawings for the 105-B Reactor Facility, graphite reactor block, and the fuel storage basin. The B Reactor is housed inside the 105-B Building and is built of reinforced and unreinforced concrete, masonry block, and steel frame. The B Reactor is similar in size and construction materials to the C, D, DR, F, and H Reactors.

The existing tour areas include the work area and the control room. Candidate tour areas identified in this report include the valve pit, fan house, and fuel storage basin.

B.3.1 Existing Tour Route Areas

B.3.1.1 Work Area. The work area is a concrete enclosed area where the reactor was fueled. This area is opposite the front face of the reactor and is where the aluminum clad fuel slugs were loaded into the reactor and from which maintenance operations were performed.

B.3.1.2 Control Room. The main control room is separated from the left face of the reactor block by a 3-ft thick concrete wall. The control room is comprised of instrument panels (mostly hydraulically operated), electrical control systems, and a control panel.

The control room offices are adjacent to the control room separated by glass partitions. West of the control room is the accumulator room which contains an emergency hydraulic power source for shutting down the reactor.

B.3.2 Additional Tour Route Areas

B.3.2.1 Valve Pit. The valve pit area houses the main control valves for the process water used to cool the reactor. It is located adjacent to the work area. The valve pit room consists of a grated main floor level overlooking the underground process water intake lines and control valves. During operation, the water entered these lines at 70,000 gallons per minute.

B.3.2.2 Fan House. The main blowers, heaters, air filters, and exhaust fans used during reactor operations for the entire building heating and ventilation systems are located in the fan house room. Attached to the fan room is a concrete enclosed exhaust duct which exhausted the building air into the 200-ft high reinforced concrete exhaust stack. The building pressure during reactor operations was maintained at approximately 1 inch of water.

B.3.2.3 Fuel Storage Basin. The fuel storage basin was a water shielded collection, storage, and transfer facility for the fuel elements discharged from the reactor. It is separated from the rear face of the reactor by a concrete shield wall approximately 5 feet thick.

Typically, the fuel elements were sorted in the pickup chute area, hand-tonged into storage buckets, and transferred by the overhead monorail system to the storage area for decay of short-lived radionuclides. Then the buckets were moved by monorail to the transfer area and placed in railroad cask cars for transport to chemical reprocessing facilities in 200 Area.

The radionuclides from process tube scale and failed fuel elements were discharged into the basins and sludge accumulated on the floors of the basins. At the B Reactor, after reactor shutdown, the water was removed, the sludge was pumped into transfer area pits, and the walls were washed with high pressure water and coated with an asphalt emulsion.

The fuel storage basin viewing room is adjacent to the basin and overlooks slotted wood flooring panels which are covering the underground basin.

B.3.3 Graphite Reactor Block

The graphite reactor block, identified as the process area, is located near the center of the building and consists of a graphite moderator stack, biological and thermal shields, process tubes, and control and safety system. The physical characteristics of the graphite stack are shown in Table B-1.

The graphite moderator stack consists of 4-in long by 4 3/16 in^2 graphite blocks stacked to provide a central region for fuel loading and an outer region for a neutron reflector. The stack is cored to provide channels for the 2004 process tube openings and openings for the 9 control rods, 29 safety rods, 3 test facilities, and instrumentation equipment.

The radiation shielding was made up of thermal and biological shields. Materials with high hydrogen content were used for neutron absorption and materials with high density for gamma shielding. The thermal shield, which surrounded the graphite moderator stack, was constructed of cast iron with a nominal thickness of 10 inches. The biological shield surrounds the thermal shield and consists of alternating layers of masonite and steel. A steel outer shell with gas-tight seals for the reactor block penetrations surrounds the graphite stack.

The aluminum process tubes contained the uranium fuel elements and provided channels for cooling water flows.

B.3.4 Reactor Safety Systems

Nine water cooled horizontal control rods moved into and out of passages in the graphite core. These rods controlled the startup transients and power level during equilibrium operation. As the graphite stacks became distorted by growth and shrinkage, the control rod channels became distorted.

Twenty-nine vertical safety rods were designed to backup the control rods. Electromagnets held the rods with just the rod tips in the top thermal shield. Only on shutdown, automatic or intentional, were the safety rods dropped into the reactor. The safety rods became activated due to neutron streaming through the safety rod channels into the stack.

The Ball 3X System was an emergency shutdown system to back up the safety rods if they did not terminate the chain reaction. It consists of nickel-plated boron-steel balls that could be released into the vertical safety rod channels from hoppers above the reactor. The system was originally designed to use a liquid boron solution, but was later modified to use the neutron-absorbing balls.

Table B-1. Reactor Stack Physical Characteristics[a]

Parameter	Old Reactors
Dimensions of Stack:	
Side to Side	36 ft (11 m)
Top to Bottom	36 ft (11 m)
Front to Rear	28 ft (8.5 m)
Fuel Charge Length	23.8 ft (7.2 m)
Number of Process Tubes (Fuel Charges)	2004
Lattice Spacing for Process Tubes (Fuel Charges)	8-3/8 x 8-3/8 In.
Volumes:	
Entire Stack	1028 m^3
Active Zone	658 m^3
Reflector	370 m^3
Process Tubes	(24 m^3)[b]
Control and Safety Rods	(4.1 m^3)[b]
Test Facilities	(0.3 m^3)[b]
Density of Graphite	1.7 g/cm^3
Mass of Graphite:	
Active Zone	1.07×10^9 g
Reflector	6.3×10^8 g
Flux Levels (Neutrons/cm^2-s)	
Active Zone	$5 \times 10^{13}/cm^2$-s
Reflector (Center)	$5 \times 10^{12}/cm^2$-s
Reflector (Outer Edge)	$1 \times 10^{12}/cm^2$-s

[a]Extracted from UNI-3714 (Miller and Steffes 1987)
[b]Volume of openings not included in entire stack volume calculation.

This system was routinely tested to assure that all the balls in the hoppers would drain down into the channels in the stack. During later years of operation, due to cracks and general shifting of the stack, balls became trapped in the stack and caused loss of reactivity. This was overcome by adding more highly enriched fuel.

B.3.5 Support Systems/Facilities

B.3.5.1 Primary Cooling Water System. Pumping stations at the river pump house building (181 Building) on the Columbia River pumped water to an open concrete reservoir at the 182 Building. The water was then pumped to the 183 Filter Plant Building in which flocculents were added in a mixing chamber and sent to the settling basins (chlorine added for algae control) to remove the solids. Water entered gravity flow filters made of sand, gravel, and coal and flowed to underground concrete chambers, called clearwells and then into a pump room. The water was pumped to above ground steel storage tanks in the 190 Building. Sodium dichromate was added to inhibit corrosion of aluminum tubes and fuel jackets in the reactor. Turbine process pumps pumped water from the storage tanks to risers on the front face of the reactor. The cooling water flowed through the hollow aluminum tube channels surrounding each fuel rod.

B.3.5.2 Secondary Cooling Water System. In the event of total failure of electric power to the Hanford Site, a secondary coolant system was established. The 184-B Power House steam plant would supply power to steam turbines for driving a secondary cooling system. Boilers supplied steam to a distribution system in the 100 B/C Area in overhead lines. Steam-turbine vertical pumps were located at the 181 River Pump House, the 183 Filter Plant Pump House, and the 190 Building Storage Tanks.

B.3.5.3 Effluent System. The discharge outlet cooling-water piping system is located on the rear face of the reactor. Water from the process tubes flowed from the rear connector to the crossheaders, down baffles in the downcomer pipe into a concrete chamber, then the effluent flowed by gravity through a underground pipeline to the 107 Retention Basin.

B.3.5.4 Last Ditch System. The last ditch system was designed to provide adequate cooling water to meet the shutdown requirements indefinitely, using the reactor high tanks and export water system. The tanks had check valves which automatically supplied water whenever the static head pressure in the lines fell below those in the tanks.

B.3.5.5 Electrical Plant. Two separate power supplies were used throughout the building, as a protective system for equipment operation. Protective relaying was coordinated so that a minimum of equipment was affected by fault conditions. Emergency electric power was supplied by steam turbine generators, located in the

184 Building Power House. The emergency electrical power source for the instruments was from a gas powered emergency alternator located outside the 105-B Building.

B.3.5.6 Gas System. A mixture of helium and carbon dioxide was circulated through the reactor (1) to remove moisture and foreign gases; (2) to serve as a heat transfer media between the graphite and process tubes for removal of heat from the graphite; and (3) to detect water leaks within the reactor.

The apparatus for circulating, drying, and filtering the gas was located in the 115 Building. Piping in tunnels connected the 115 Building to the 105 Building. The 110 Building was the gas storage and unloading station.

Water leak detection systems consisted of gas sampling tubes spaced evenly on the discharge face of the reactor.

APPENDIX C

Reference Drawing Catalog

APPENDIX C

REFERENCE DRAWING CATALOG

SHEET NO.	DRAWING NO.	DESCRIPTION	REV	PROJECT
1	H-1-10973	105B Normal Lighting Panel Schedule	1	105B
2	H-1-10973	105B Normal Lighting Panel Schedule	1	105B
1	H-1-10974	105B Emergency Lighting Panel Schedule	1	105B
1	H-1-10975	105B Miscellaneous Lighting Panel Schedule	1	105B
1	H-1-10992	105B Normal Lighting One Line Diagram	1	105B
1	H-1-10993	105B Emergency Lighting One Line Diagram	1	105B
1	H-1-11261	Main Cont'l Cabinet Arr'g & Connection 105B	0	105B
1	H-1-11303	Power Supply Panel Connection Dia. 105B	0	105B
1	H-1-11304	Power Supply Panel Connection Dia. 105B	0	105B
1	H-1-11675	Block Dia. 105B	0	105B
1	H-1-13019	Instr. Electrical Control Desk, 105B	0	105B
1	H-1-13099	Inlet Water Panel Connection Dia. 105B	0	105B
1	H-1-13164	Main Annunciator Control Room 105B	0	105B
2	H-1-13164	Main Annunciator Control Room 105B	0	105B
3	H-1-13164	Main Annunciator Control Room 105B	0	105B
1	H-1-14007	Control Room Panel Arrangement 105B	0	105B
1	H-1-14008	Control Room Panel Arrangements 105B	0	105B
2	H-1-14008	Control Room Panel Arrangements 105B	0	105B
3	H-1-14008	Control Room Panel Arrangements 105B	0	105B
4	H-1-14008	Control Room Panel Arrangements 105B	0	105B
1	H-1-14009	Control Room Panel Arrangements 105B	0	105B
2	H-1-14009	Control Room Panel Arrangements 105B	0	105B
3	H-1-14009	Control Room Panel Arrangements 105B	0	105B
1	H-1-19184	Portable Control Console 105B	0	105B

SHEET NO.	DRAWING NO.	DESCRIPTION	REV	PROJECT
2	H-1-19184	Portable Control Console 105B	0	105B
1	H-1-19877	105B Ventilation Ductwork Mode.	1	105B
1	H-1-1997	IBM Machine Location in Control Room 105B	0	105B
1	H-1-26191	Instr'm Inlet Water Panel Arr'g. 105B	0	105B
1	H-1-26289	Electr. Inlet Water Wiring Diag. 105B	0	105B
1	H-1-33610	Elec. Press Mon. -Panel Conn. Diag. 105B	0	105B
1	H-1-80212	100-B/C Area Pre-Design Ext. Rds, Fens., RR	0	105B
2	H-1-80212	100-B/C Area Pre-Design Ext. Rds, Fens., RR	0	105B
3	H-1-80212	100-B/C Area Pre-Design Ext. Rds, Fens., RR	0	105B
4	H-1-80212	100-B/C Area Pre-Design Ext. Rds, Fens., RR	0	105B
5	H-1-80212	100-B/C Area Pre-Design Ext. Rds, Fens., RR	0	105B
4	H-1-80216	100-B/C Area Pre-Design Topo S.W. Plot Plan	0	105B
5	H-1-80216	100-B/C Area Pre-Design Topt N.W. Plot Plan	0	105B
1	H-1-80217	100-B/C Area Pre-Design Waste Site Plot Plan	0	105B
2	H-1-80217	100-B/C Area Pre-Design Waste Site Plot Plan	0	105B
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1	H-2-41643	Arch-Drawing Key Plan	0	105B
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1	H-2-73340	Piping Waste Tank Isolation 241-C-101	0	105B
1	H-2-73342	Piping Waste Tank Isolation Tk 241-C-102	0	105B

SHEET NO.	DRAWING NO.	DESCRIPTION	REV	PROJECT
1	H-6-220	Site Plan Fences, Gates, Roads 105B	0	105B
1	H-6-384	West Boundary Fence-Hanford Res	0	105B
1	W-70481	105B Concrete Storage & Transfer Basin Plan	0	105B
1	W-70482	105B Concrete Storage & Trans Basin Details	0	105B
2	W-70483	105B Concrete Storage & Trans Basin Details	0	105B
1	W-70836	105B Storage Area Floor Plan	0	105B
1	W-70836	105B Storage Area Floor Plans	1	105B
1	W-70837	105B Storage Area Elev-Sect-Detail-Arch.	0	105B
1	W-70838	105B Transfer Area Section thru Line Pits	0	105B
1	W-70842	105B Concrete Section of Downcomer Stacks	0	105B
1	W-71630	Building 105-B Plot Plan	?	105B
1	W-71645	105B Electrical Ground Locations Dwg. Index	29	105B
1	W-71646	105B Motor List	1	105B
2	W-71646	105B Motor List	1	105B
1	W-71648	105B Basement Lighting Plan, Electrical	4	105B
1	W-71650	105B Ground Floor Lighting Electrical	1	105B
1	W-71651	105B Apparatus Floor Lighting Electrical	1	105B
1	W-71652	105B Apparatus Floor Lighting Electrical	1	105B
1	W-71653	105B Lighting @ 56' -4" Floor Plan	1	105B
1	W-71654	105B Lighting @ 80' -5 1/4" Floor Plan	1	105B
1	W-71655	105B Stack & Fan Lighting	1	105B
1	W-71656	105B Storage & Transfer Lighting Power	1	105B
2	W-71656	105B Storage & Transfer Lighting Power	1	105B
1	W-71657	105B Valve Pit Lighting & Power	1	105B
1	W-71658	105B Section A&B Lighting & Power	1	105B
1	W-71659	105B Section C Lighting & Power	1	105B
1	W-71667	105B Miscellaneous Details-Lighting	1	105B

SHEET NO.	DRAWING NO.	DESCRIPTION	REV	PROJECT
1	W-71689	105B- Concrete Details Sheet 8	0	105B
1	W-71833	Bldgs 105B Vent. Fan House Arrg't Plan	0	105B
1	W-71834	Building 105-B & 115-B Plot Plan	?	105B
3	W-71835	Building 105-B Plot Plan	?	105B
1	W-72091	B 105 Pipe Tunnels Lighting & Sect. Electrical	1	105B
1	W-72482	Bldg 105B Vent Air Supply System, Arrg't.	0	105B
1	W-72730	B Cover Struct Framing Layer Packing Device	0	105B
1	W-72748	105B B Cover Struct. Framing Left Side Plates	0	105B
1	W-72749	105B B Cover Struct. Framing Left Side Plates	0	105B
1	W-72758	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72759	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72760	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72761	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72762	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72763	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72764	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72765	105B B Cover Struct. Framing Top Plates	0	105B
1	W-72766	B Cover Framing Left Side 105B	0	105B
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1	W-72769	B Cover Framing Top Side Plated	0	105B
1	W-72769	B Layer Struct Layer Erection Dia. Typ. Det.	0	105B
1	W-72875	Bldg 105B Vent Supply & Exhaust Arrg't	0	105B
1	W-72876	Bldg 105B Vent Supply & Exhaust Arrg't	0	105B
1	W-72877	Bldg 105B Vent Supply System Arrg't	0	105B
1	W-72878	Bldg 105B Vent Supply & Exhaust Arrg't	0	105B
1	W-73570	Bldg 105 Vent Exhaust System Arrg't	0	105B
1	W-74177	Bldg 105B Screen Over Supply Duct Outlet Arr	0	105B

SHEET NO.	DRAWING NO.	DESCRIPTION	REV	PROJECT
1	W-74569	B 105 Key Plan Index & Single Line Diagram	1	105B
1	W-74637	B 105 Valve Pit Lighting & Power Electrical	1	105B
1	W-75243	105B Observation Room Arch. & Steel	0	105B
1	W-76160	B 105 Valve Pit Flow Lab Lighting & Power	1	105B
1	W-76170	B 105 Discharge Area Special Light & Power	1	105B
1	W-79481	B 105 Concrete Storage & Transfer Plan	0	105B
1	W-79837	B 105 Storage Area Elev. Section Details	3	105B
1	W-80482	B 105 Concrete Storage & Transfer-Section	6	105B

APPENDIX D

Other Museum Conversions

APPENDIX D

OTHER MUSEUM CONVERSIONS

A team consisting of Ms. Janet Bryant of Pacific Northwest Laboratory and Mr. Neil Norman of Parsons Environmental Services visited the following two reactor museums. The summary of the INEL EBR-1 Reactor tour was written by Mr. Norman.

OAK RIDGE GRAPHITE REACTOR VISIT - AUGUST 2, 1994

1. The hospitality provided for this tour was excellent. Tour coordinator Ms. Marilyn MacDonald arranged for a skilled guide to meet us at the reactor and he spent all morning with us. In addition, she invited Mr. Jim Cox to come in off retirement to talk about specific problems encountered during the conversion in the early 1960's. Mr. Cox was the Director of Reactor Operations for the ORNL during that period and he located a number of valuable documents from the period which we have now copied. These papers had not previously been available to the museum staff and they were also very pleased to receive the references. They also brought together Mr. Peter Souza, Mr. Nick Weist, and Mr. Glen Dewall from the site to give us their cultural resources aspect of the Museum. They operate within NEPA and the National Historic Preservation Act (Mr. Souza, [615] 576-4231).

2. The handicapped access ramp cost $175,000 when first constructed, but errors in slope necessitated a $200,000 retrofit.

3. There are probably still several thousand curies in the reactor system mostly from failed fuel. The visitor setback from the face is about 6 feet. (Cox) There is no radon problem in the building.

4. Asbestos was encapsulated but not removed.

5. Fire sprinklers were in the original construction. An advanced smoke detection linear beam detection system is going to be added soon.

6. No seismic upgrades have been required.

7. A program using fiber optic cables would be used to visually examine the conditions of the graphite if needed.

8. The museum is open from 9 a.m. to 4 p.m. seven days a week with no staff on hand except for specially arranged tours.

9. The Graphite Museum staff arranged for Marion Marsee, Director of the American Museum of Science and Energy in Oak Ridge to also give us an excellent guided tour there. There is a strong symbiotic relationship between the two museums. The staffs of both museums believe that the total attendance at each is enhanced by the support relationship.

10. Reserved parking for eight cars is available.

11. Signing in the entrance walk gives history of the museum and other site details. A project is underway to convert the signs to metal, and they recommend that we start in metal for best appearance at about the same cost.

12. There are sampling wells visible near the entry walk which have not been signed. All agreed that they should be identified for their safety and environmental purpose.

SUMMARY OF INEL EBR-1 REACTOR TOUR - August 4, 1994

Mr. Harlan Summers of the EG&G Public Relations Department was our guide and spent most of the day with Mr. Noel Fehr and I. The following observations were collected during our tour of the EBR-1 reactor and in related meetings.

1. The museum conversion was done in 1966 by a local contractor, Mr. Harry Pearson.

2. A recent 14-month shutdown of the museum was caused by changes and/or reinterpretations of the DOE Rad Con and Safety Manuals. Changes made included accommodations for Americans with disabilities, asbestos encapsulation in place, and placing safety barriers in front of electrical panels and equipment.

   They need guidance now on DOE order interpretation. The INEL Advisory Committee entered into the dialogue with DOE and was credited by Mr. Summers with being the critical influence for being able to reopen the museum. Mr. Chuck Rice has been the Advisor Committee Chair. He is an old boss of mine from the Nuclear Engine for Rocket Vehicle Application (NERVA) Program and I talked with him for some time by telephone. He recommends that we recruit our Hanford Advisory Committee as a protagonist for the B Reactor Museum.

3. Museum hours are from 8 a.m. to 4 p.m., seven days a week from Memorial Day through Labor Day. Attendance was approximately 10,000 last summer. In addition, guided tours by bus or van are arranged throughout the year with 4,000 more visitors using that means.

   Museum visitation is enhanced because the reactor is on route between Sun Valley or Twin Falls and Idaho Falls or Yellowstone Park. Approximately one FTE person is involved in the tour operations. In addition, one/half of a FTE is devoted to maintenance, but the need is more like one FTE.

4. The Idaho Falls Chamber of Commerce Museum had 25,000 visitors in 1992 and 32,800 in 1993. The EG&G Public Relations staff coordinates tours of the EBR-1 Reactor Museum with the Chamber of Commerce Museum. Both museum staffs believe the cooperation between them leads to a greater total number of community museum visitors rather that providing a competition. The Department of Commerce at (208) 334-2270 has other statistics including the total number of visitors to the community.

5. College engineering students are used as staff, and are paid between $8 and $10 per hour. Guided tours are handled by the EG&G Public Relations Department. Student staff wears safety devices which alarm to the site security forces if the students are not vertical. Students interviewed were very positive about the museum and their summer jobs.

6. Bus tours can carry up to 60 persons. The EBR-1 Building limit is held to 150 persons because of fire safety rules.

7. There are no sprinklers in the building, but a state of the art "Cerberus" fire alarm system was added during the recent down time.

8. A maximum radiation level anywhere in the facility is about 4 mR/hr.

APPENDIX E

Alternative Cost Estimates

APPENDIX E

ALTERNATIVE COST ESTIMATES

SUMMARY TABLE

	ESTIMATED COST	RATIO
Alternative A - Controlled Tour Access	$145,000	1.00
Alternative B - Public Access with Current Displays	$605,000	4.17
Alternative C - Public Access with Enhanced Displays	$730,000	5.03
Alternative D - Public Access with Enhanced Displays and Additional Tours	$820,000	5.66
Alternative E - Public Access with Enhanced Displays, Additional Tours, and River Access/Cultural Center	$1,670,000	11.52
Alternative F - Dismantling	$21,228,163	146.40

PHASE I COST ESTIMATE

ALTERNATIVE A - CONTROLLED TOUR ACCESS

WORK ITEM	COST	TOTAL
Ongoing Repairs (Cost Already Incurred)	$0	$0
Option 1, New Materials in 10 years	$185,000	
Option 2, Original Materials in 10 years	$350,000	
Ventilation	$20,000	$20,000
Fire Protection	$30,000	$30,000
Accessibility	$10,000	$10,000
Water Quality	$5,000	$5,000
Barriers and Signs	$5,000	$5,000
Asbestos Encapsulation	50,000	$50,000
Structural Repairs	$25,000	$25,000
TOTAL ESTIMATED COST		**$145,000**

PHASE I COST ESTIMATE

ALTERNATIVE B - PUBLIC ACCESS WITH CURRENT DISPLAYS

WORK ITEM	COST	TOTAL
Alternative A	$145,000	$145,000
Route 6		
Option 1	$170,000	$170,000
Disk Existing Asphalt		
1-inch Asphalt Treatment		
Option 2	$340,000	
4-inch Leveling Course		
1-inch Asphalt Treatment		
Locking Gate	$10,000	$10,000
Fencing, 3 stranded barbed	$250,000	$250,000
Parking Lot Improvements	$15,000	$15,000
1-inch Asphalt Treatment		
Repaint and Stripe		
ADA Marking Requirements		
Signage (8 - 10)	$15,000	$15,000
TOTAL ESTIMATED COST		**$605,000**

PHASE I COST ESTIMATE

ALTERNATIVE C - PUBLIC ACCESS WITH ENHANCED DISPLAYS

WORK ITEM	COST	TOTAL
Alternatives A & B	$605,000	$605,000
Upgrade Displays	$30,000	$30,000
Presentation/Demonstration Room	$30,000	$30,000
Exhibit/Entry Lobby	$15,000	$15,000
Site Exhibits	$50,000	$50,000
TOTAL ESTIMATED COST		**$730,000**

PHASE I COST ESTIMATE

ALTERNATIVE D - PUBLIC ACCESS WITH ENHANCED DISPLAYS AND ADDITIONAL TOURS

WORK ITEM	COST	TOTAL
Alternatives A, B & C	$730,000	$730,000
Valve Pit Room	$40,00	$40,000
Grated Walkway		
Barriers and Signs		
Ventilation Upgrades		
Lighting		
Fan Room	$20,000	$20,000
Remove Tools/Equipment		
Barriers and Controls		
Ventilation Upgrades		
Fuel Storage Basin	$30,000	$30,000
Isolate Electrical Control Panel		
Upgrade Ventilation		
Remove Walkway Planks		
Overhead Monorail Static Display		
TOTAL ESTIMATED COST		**$820,000**

PHASE I COST ESTIMATES

ALTERNATIVE E - PUBLIC ACCESS WITH ENHANCED DISPLAYS, ADDITIONAL TOURS, AND RIVER ACCESS/CULTURAL CENTER

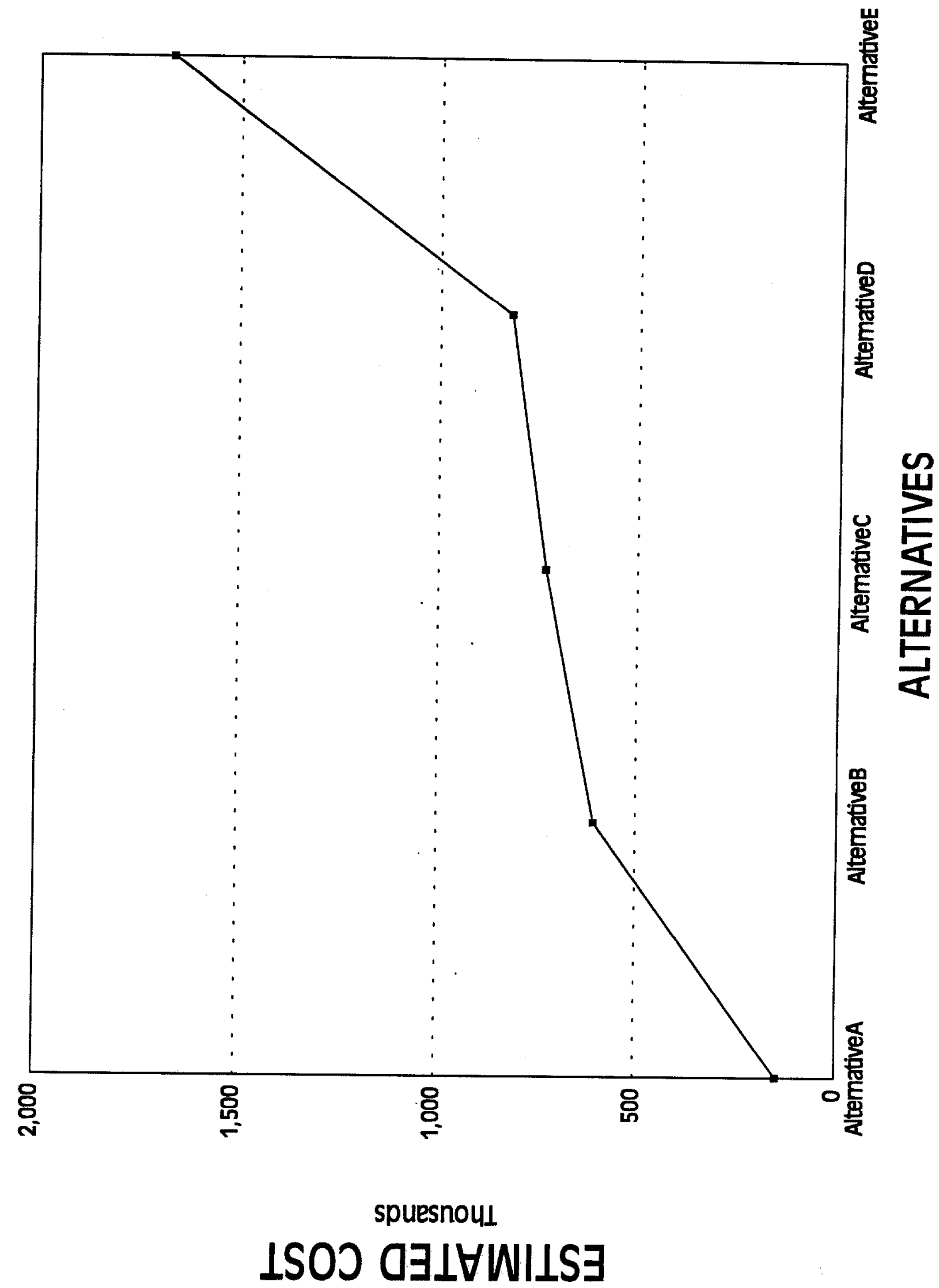
WORK ITEM	COST	TOTAL
Alternatives A, B, C & D	$820,000	$820,000
Day Use Park	$200,000	$200,000
Picnic Sites		
Playground		
Trails		
Boat Ramp		
Park/Camping Facilities	$300,000	$300,000
Camp Sites		
RV Hookups		
Restrooms & Showers		
Playground		
Trails		
Resource Interpretive Center	$350,000	$350,000
Geologic Resource Display		
Columbia River Display		
Indian Culture Display		
Pre-Hanford Cultural Display		
TOTAL ESTIMATED COST		**$1,670,000**

PHASE I COST ESTIMATE

ALTERNATIVE F - DISMANTLING

WORK ITEM	COST	TOTAL
Decontaminate and Decommission		
Safe Storage (75 years)*	$4,046,400	
Alt A Safety & Access Upgrades	$145,000	$145,000
Deferred Removal*	$20,583,163	$20,583,163
Comply with NHPA	$500,000	$500,000
*Extract from ROD		
TOTAL ESTIMATED COST		**$21,228,163**

Figure E-1. Phase I Estimated Cost for Alternatives.



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