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Defense Decontamination and Decommissioning Program

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Defense Decontamination and Decommissioning (D&D) Program

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1.0 ABSTRACT

In 1978, under the authority of the Atomic Energy Act, the United States Department of Energy (DOE) established the Surplus Facilities Management Program (SFMP) to ensure the safe caretaking and decommissioning of both Civilian and Defense "orphan" (no longer part of any currently funded operating program) surplus facilities. The inventory of the SFMP includes approximately 300 facilities requiring remedial action. The facilities include production and test reactors, chemical processing plants, waste treatment disposal systems, laboratories, and various support facilities. The remedial actions planned for these facilities range from the decontamination of facilities with the potential for reuse, to the complete dismantlement of structures and site restoration to allow unrestricted use.

This overview presentation is on the SFMP Defense Decontamination and Decommissioning (D&D) Program, which includes only shutdown DOE-owned facilities used in national defense programs. Included in this presentation are descriptions of the seven Defense D&D program sites, and descriptions of some of their activities.

2.0 SPEAKERS NOTES FOR SLIDES

1. Representing Clarence E. Miller, Jr., Director of the DOE Defense D&D Program, William F. Heine, Manager of Westinghouse Hanford Company Decontamination and Decommissioning, presents this overview of the DOE Defense D&D Program.

2. The DOE is responsible for approximately 300 surplus facilities located around the United States that are no longer part of any currently funded operating program.

   - Of these orphan facilities, 218 were used in U.S. defense research and production activities and have been assigned to the Defense D&D Program for surveillance, maintenance, and disposition.

   - Included in the Defense D&D Program inventory, are test and production reactors, chemical processing plants, waste treatment and disposal systems, laboratories, and various support facilities.

- Remedial actions planned for these facilities range from the decontamination of facilities with the potential for reuse, to the complete dismantlement of structures and site restoration to allow unrestricted use.

- The present long-range plan forecasts completion of program activities in 2006.

3. Defense D&D Program facilities are located at seven sites across the U.S. More than half of the 218 facilities are at the Hanford Site in Washington State. This is the site I am most familiar with and I will talk about Hanford Site activities in greater detail, after a brief discussion of the more interesting projects at the other sites.

4. Mound Site, Ohio

   The Mound Site is located in Miamisburg, Ohio, near Dayton. Activities have included classified operations related to weapons production, and several civilian nuclear research and development projects.

   Facilities at Mound that are part of the Defense D&D Program include the Special Metallurgical (SM) Building, the R-149 Laboratory (located in the Research (R) Building), and the Sanitary Disposal (SD) Plant. These facilities are contaminated with ^{238}Pu and are in various stages of deterioration.

   The SM Building was built in 1960 and used for the processing, recovery, and encapsulation of ^{238}Pu. It was shutdown in 1968.

   Decommissioning activities began in 1984 and have included removal and disposal of auxiliary structures; removal of the filter bank on the SM Building Annex; excavation and disposal of two radioactive waste tanks adjacent to the SM Building; and removal of concrete flooring, floor drains, and contaminated soil.

   The SM Building decommissioning project is scheduled for completion in fiscal year 1996.

5. A remotely operated air chisel has been used for removal of concrete flooring and external foundations from the SM Building.

6. Two liquid waste tanks (3,000 and 5,000 gal) were excavated from their location next to the SM Building. The tanks (5,000 gal shown) were then moved into the building for cleaning and size reduction prior to disposal.

7. New Brunswick, New Jersey

Located on a 5.6 acre site approximately two miles from the center of New Brunswick, New Jersey, New Brunswick Laboratory (NBL) was used from 1949 until 1977 as a general nuclear chemistry laboratory. It included a plutonium laboratory and a hot-cell facility. In 1977, operations at NBL were moved to Argonne National Laboratory in Chicago, Illinois.

Following deactivation, preliminary decontamination was performed and the site was abandoned. The location and ease of public access resulted in several incidents of vandalism. In 1980, it was decided to decommission the site to allow unrestricted use. Demolition of all aboveground structures was completed in 1981, and in 1984, all remaining laboratory structures, foundations, and underground sewer systems were excavated and removed.

The site is presently enclosed by an 8-ft chain-link security fence to restrict access to the area until decommissioning is completed. The remaining work (Phase III) will involve excavation and removal of approximately 120,000 ft^3 of contaminated ash and pitchblende contaminated soil, stored onsite after previous decommissioning operations. Phase III decommissioning is scheduled to begin in fiscal year 1990 and be complete in fiscal year 1991.

8. Grand Junction, Colorado

The Grand Junction Projects Office Site is located in Grand Junction, Colorado, along the Gunnison River. A pilot uranium-ore processing mill was formerly operated on the site, beginning in 1942, by the U.S. Vanadium Corporation. From 1947 until 1974, the Atomic Energy Commission (AEC) operated a uranium concentrate sampling plant and assay laboratory onsite. The AEC also operated a pilot-plant mill onsite, from 1954 until 1958.

Environmental monitoring has demonstrated that toxic materials that remain from ore processing are not isolated from the biosphere. Radon gas is emitted from the tailings piles, and contamination is present in water samples taken from monitoring wells near the Gunnison River. The areas that require remedial action include four buildings, various ponds, and open lands where the tailings piles are located. The total volume of mill tailings and contaminated soils at the site is estimated to be 100,000 yd^3. Also, approximately 300 yd^3 of contaminated process equipment, pipe fittings, and other wastes are buried at the site.

The Draft Environmental Assessment was completed in November 1987 and remedial action work at the site is to be finished in fiscal year 1991.

9. Idaho National Engineering Laboratory

Established in 1949 as the National Reactor Testing Station, Idaho National Engineering Laboratory (INEL) has been the site of numerous research and development programs, including fast breeder reactor development, aircraft and naval propulsion, light-water reactor safety, organic moderator and coolant development, portable military power, space power development, materials testing, and others. There have been 53 nuclear reactors and associated various critical facilities built at INEL, 15 of which are still operable.

The 39 current Defense D&D Program facilities at INEL are grouped into eight decommissioning projects:

- Idaho Chemical Processing Plant (ICPP) Surplus Facilities
- Materials Testing Reactor (MTR) Facilities
- Test Area North - Technical Support Facilities (TAN-TSF)
- Heat Transfer Reactor Experiment (HTRE) Facilities
- Army Reentry Vehicle Facility Site (ARVFS)
- Initial Engine Test (IET) Facility
- Auxiliary Reactor Areas (ARA) II and III
- Auxiliary Reactor Area (ARA) IV.

10. Army Reentry Vehicle Facility Site (ARVFS)

Located near the center of the INEL reservation, ARVFS consists of an earth-covered, metal Quonset hut; a sunken, metal-lined test pit; and an instrumentation trench. It has been used since 1974 for the interim storage of approximately 180 gal of NaK (a sodium-potassium alloy) recovered after the Experimental Breeder Reactor I (EBR-I) core meltdown in 1955. The NaK is contaminated with a variety of transuranic isotopes, including an estimated 10.5 g of plutonium. This waste is contained in four metal drums, two are 55-gal, stainless-steel Mine Safety Appliance (MSA) drums and two were fabricated from sections of carbon steel pipe. These drums are stored in a metal dumpster inside the bunker. A steel plate has been welded to the bunker entrance to prevent unauthorized access.

11. After years of storage, the NaK may have formed volatile superoxides, increasing the potential for explosion of the material. A major concern has been the possibility of water intrusion into the bunker; NaK reacts violently with water.

12. Disposal of the NaK will first require construction of a processing facility scheduled to be completed in fiscal year 1988. Disposal of the NaK and decommissioning of the facility is scheduled to be completed in fiscal year 1989.

13. Heat Transfer Reactor Experiment (HTRE) -2 and -3

The HTRE-2 and HTRE-3 are nuclear propulsion engines mounted on double-wide flatcars. Developed and tested in the late 1950s as part of the Aircraft Nuclear Propulsion Program, they were designed to test advanced fuel elements under conditions of irradiation, temperature, and airflow, approximating conditions that would be encountered in flight. The HTRE-2 contains a water-moderated reactor; and in HTRE-3, there is a hydrided zirconium-moderated reactor.

The operational components of these units are contaminated with numerous fission products, mercury, and materials containing asbestos. Decommissioning activities (to include decontamination and dismantlement) began in fiscal year 1987 and are scheduled for completion in fiscal year 1991.

14. Oak Ridge National Laboratory, Tennessee

The Oak Ridge National Laboratory (ORNL) was established in 1943 for demonstrating the production and the separation of plutonium as part of the World War II Manhattan Project. The ORNL mission has since been reoriented toward developing nuclear power as an energy source. Activities at ORNL now include major efforts in other areas of energy research, such as conservation and fossil energy, and the production of radioactive and stable isotopes not available commercially for use by medical, industrial, and other research organizations.

The surplus Defense D&D Program facilities at ORNL are grouped into seven decommissioning projects:

Fission Products Development Laboratory (FPDL)
Metal Recovery Facility (MRF)
Waste Holding Basin
Old Hydrofracture Facility
Gunite Waste Storage Tanks
The ORNL Graphite Reactor (OGR)
Waste Storage Tanks

15. Metal Recovery Facility

Working within a plastic sheet containment tent, workers have been removing tanks and piping from MRF process cells, using such equipment as this hydraulic pipe-pincher. Development of remotely operated water-jet scarification equipment for decontamination of the cell interior surfaces is underway.

The MRF was constructed in the early 1950s as a small-scale production, reprocessing plant for the recovery of various radioactive materials from reactor fuels, waste sludge, and other process wastes. The building was constructed around seven abovegrade process cells and a dissolver tank pit, with an adjacent belowgrade canal and two nearby buried waste tanks.

Decommissioning of the MRF Facility began in 1983 and involves decontamination of the main structure and process cells to allow reuse, entombment of the canal and dissolver pit, and removal of the waste tanks. The project is scheduled to be completed in fiscal year 1989.

16. Fission Products Development Laboratory

A large, temporary containment structure was erected over Tank Farm Cells 21 and 22 at the Fission Products Development Laboratory (FPDL). It was designed to provide the working space necessary for removal of storage tanks from both cells without relocating the structure.

17. The FPDL began operation in 1958 and was used for the separation of megacurie quantities of ^{90}Sr, ^{137}Cs, and ^{144}Ce for a variety of source applications; it operated until 1975.

Decommissioning activities at FPDL began in 1983. When completed in fiscal year 1989, eight process cells, four manipulator cells, one tank farm cell, and a service tunnel will be available for reuse.

18. Hanford Site, Washington

Operations at the Hanford Site, in the southeast corner of Washington State near the town of Richland, began as part of the World War II Manhattan Project. Nuclear facilities constructed at the Hanford Site include plutonium production reactors, research reactors, chemical separation and processing plants, laboratories, and support facilities.

There were eight graphite-core production reactors and support facilities, located along the Columbia River, shutdown in the late 1960s and early 1970s. Each reactor area contains the reactor buildings and all required effluent water systems, ground disposal structures, and ancillary facilities necessary to support the reactor operation.

The Hanford Site 200 Area facilities in the Defense D&D Program include major chemical processing plants, waste settling tanks, retention basins, support buildings, stacks, and underground storage vaults.

19. This view of the B and C reactors area shows the many different types of facilities associated with the eight surplus reactors at the Hanford Site. These facilities, which were constructed in the 1940s and early 1950s, are deteriorating steadily, and require continuous surveillance and costly maintenance.

In addition to the main reactor buildings, each reactor area contains four to eight support buildings, and the pumps, pipes, exhaust stacks, tanks, settling ponds, and storage basins necessary for reactor operations.

The development and review of an Environmental Impact Statement and planning for actual reactor decommissioning is still ongoing, but work has begun on the effluent and ancillary facilities in the 100-D, -F, and -H areas.

20. The 100-F Area before the start of decontamination and dismantlement activities is shown.

21. In 1983, decommissioning of the 100-F Area support buildings began with decontamination of the 108-F Biological Laboratory, which was then used as the base of operations during decontamination and demolition of the other support structures and aboveground piping. Work is continuing at the 100-D and -H Areas.

22. Typical work in the reactor areas has included felling and burying several tall exhaust stacks.

23. It included demolition of ancillary structures such as this gas recirculation building.

24. And finally, it included removal of contaminated sludge from fuel storage and effluent settling basins.

25. Following the discovery of fuel elements during cleanup of sludge from the bottom of a reactor fuel storage basin, there was concern that there may also be fuel in the bottom of two other storage basins that were backfilled with earth during the 1970s, without first having the sludge removed.

26. This shows a closeup of a fuel storage basin.

27. Fuel storage basin is shown during and after removal of contaminated water and sludge.

28. As an alternative to complete excavation of both basins, which would involve great expense and possible high radiation exposure to workers, plans are underway to test a technique for detecting and locating any buried fuel elements by neutron interrogation. This will entail lowering a neutron generator into pre-drilled holes in the basin fill, and measuring the secondary neutrons resulting from the interaction of primary neutrons from the generator with the ^{235}U in a fuel element. Fuel located by this method would then be extracted from the basin, using concrete or steel caissons.

29. Surplus Reactors Environmental Impact Statement (EIS)

Because of the broad scope of reactor decommissioning alternatives in the 100 Areas, the DOE is preparing an Environmental Impact Statement containing evaluations of the short- and long-term impacts of each alternative. It is expected that the EIS process will be completed in fiscal year 1988.

Several decommissioning alternatives for the retired reactors have been considered during preparation of the EIS.

These include, but are not limited to:

Immediate one piece block removal/disposal
In situ disposal
Safe storage, followed by dismantlement
Safe storage, followed by one piece block removal/disposal
No action.

30. In situ, or inplace decommissioning involves first demolishing the perimeter portions of the reactor building. The reactor graphite block, indicated by the red outline, is left inplace, with its associated 3- to 5-ft-thick heavy shielding walls and 20-ft-thick concrete foundation.

31. Major voids in and around the reactor block are filled and any openings sealed, creating a burial vault for the block.

32. Then, using building rubble and natural materials, the block is covered by a protective mound more than 15 ft thick.

33. In either the immediate or deferred one-piece block removal decommissioning alternative, first the structures surrounding the reactor block would be dismantled and an excavation made under the reactor.

34. A giant crawler would then be moved into position, and the reactor block placed on it.

35. The crawler would transport the 9,000-ton block to the Hanford Site low-level waste disposal vault.

36. Safe storage, followed by decommissioning, would require a significant upgrade of the reactor buildings, and continued surveillance and maintenance for up to 75 yr. Such a deferral of decommissioning activities would allow the decay of radioactive materials still present in the reactor buildings, resulting in reduced radiation exposure to workers during either one-piece block removal or complete dismantlement.

37. The no action alternative involves simply continuing the current surveillance and maintenance activities for an indefinite period, with no plan for permanently eliminating the hazard. The no action alternative must be evaluated, for comparison purposes, in all Environmental Impact Statements; however, the DOE does not consider this alternative to be feasible.

38. Redox Reprocessing Plant

The Redox Plant, operated from 1952 to 1967 as a plutonium separations facility, contains equipment for the dissolution and separation of uranium and plutonium; and for waste concentration, waste neutralization, and solvent recovery.

The principal structure of the Redox Plant is the 202-S canyon building, which is 468 ft long and 161 ft wide. Within the canyon are nine process cells of various dimensions. Support, operating, and sampling galleries are located adjacent to the cells. At one end of the canyon building, is an eight-story silo containing vertical processing columns, a crane operating area, and various operating and sampling galleries.

The Redox Reprocessing Plant Decommissioning Project will involve the disposition of the 202-S canyon building, five exhaust stacks, and several ventilation/filtration support structures. Project planning and engineering work are scheduled to begin in fiscal year 1989. Actual decommissioning operations are expected to take eight yr with completion currently scheduled in fiscal year 2000.

39. Strontium Semiworks

The Strontium Semiworks, located at the Hanford Site 200 East Area, was built in 1949 as a hot pilot plant for demonstration of the Redox process. In 1954, it was converted into a hot pilot plant for the PUREX process. Both processes are techniques for chemically separating plutonium from the uranium and other fission products in irradiated reactor fuel. In 1961, the facility was again modified and resumed operation for the recovery and purification of megacurie quantities of strontium. Operation of the facility was terminated in 1967.

Residual contamination in the Semiworks complex includes approximately 10 C of Pu and 9,000 C of ^{90}Sr.

40. This shows a section view of the Strontium Semiworks Process Building (201-C).

41. This shows a section view of 201-C after barrier placement.

42. Decommissioning activities began in 1983, are scheduled for completion in fiscal year 1988, and have included the disposition, by various means, of process cells, an exhaust stack, underground piping, waste tanks, a hot shop and service galleries, a filter system, and several support buildings.

43. This is a close-up of 201-C during dismantling activities, following decontamination.

44. The final step in decommissioning of the Strontium Semiworks will be the construction of an earthen barrier over the site.

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U.S. DEPARTMENT OF ENERGY

Defense Decontamination and Decommissioning (D&D) Program

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* APPROXIMATELY 300 SURPLUS FACILITIES IN DOE DECOMMISSIONING PROGRAMS

* 217 FACILITIES IN THE DEFENSE D&D PROGRAM

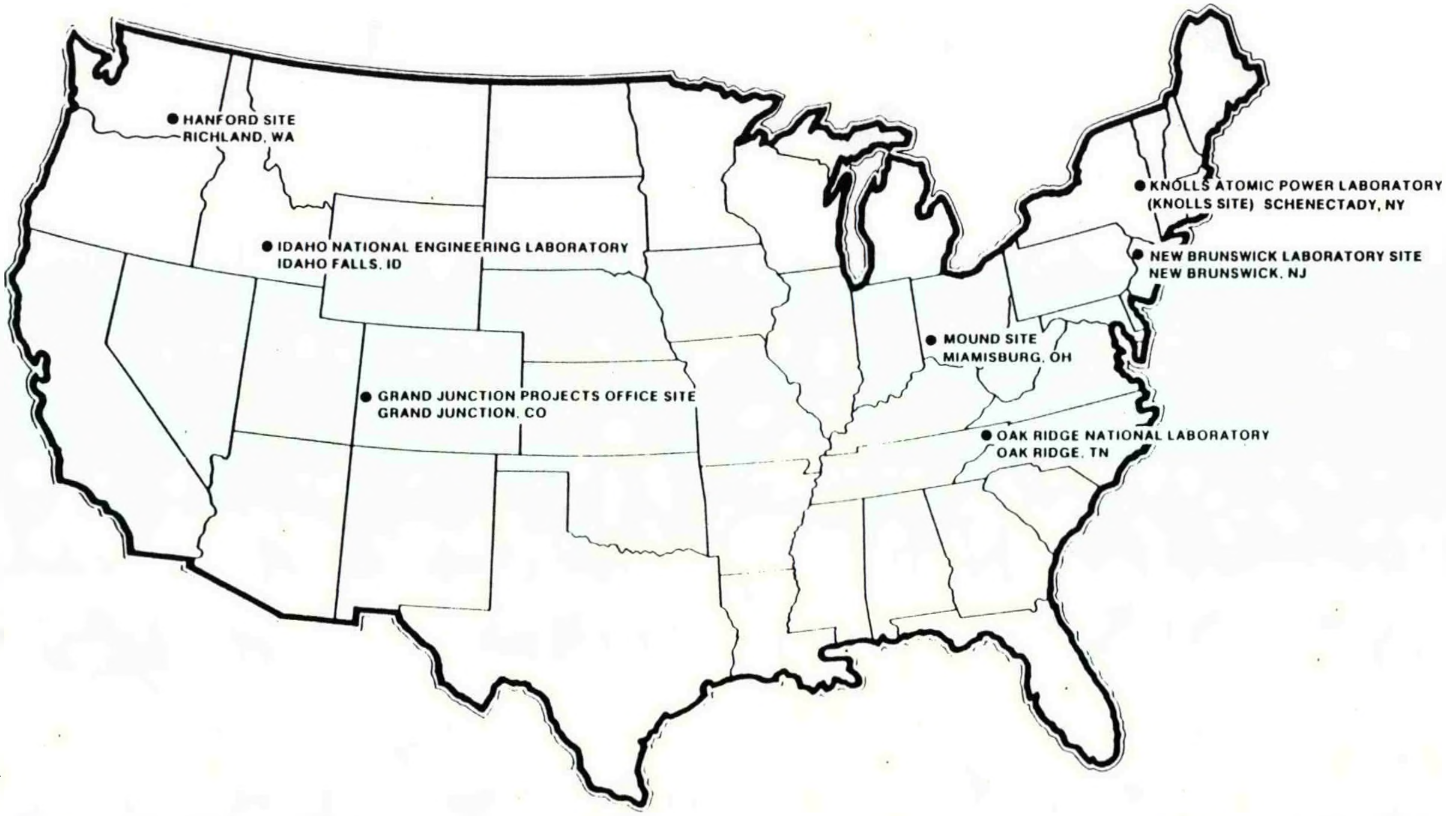
    - INVENTORY INCLUDES: TEST AND PRODUCTION REACTORS, CHEMICAL PROCESSING PLANTS, WASTE TREATMENT SYSTEMS, LABORATORIES, AND SUPPORT FACILITIES

* REMEDIAL ACTIONS RANGE FROM DECONTAMINATION TO ALLOW REUSE, TO COMPLETE DISMANTLEMENT AND SITE RESTORATION

* PROGRAM COMPLETION PLANNED IN 2006

Slide 3

LOCATIONS OF DOE RADIOACTIVELY CONTAMINATED DEFENSE SURPLUS FACILITIES



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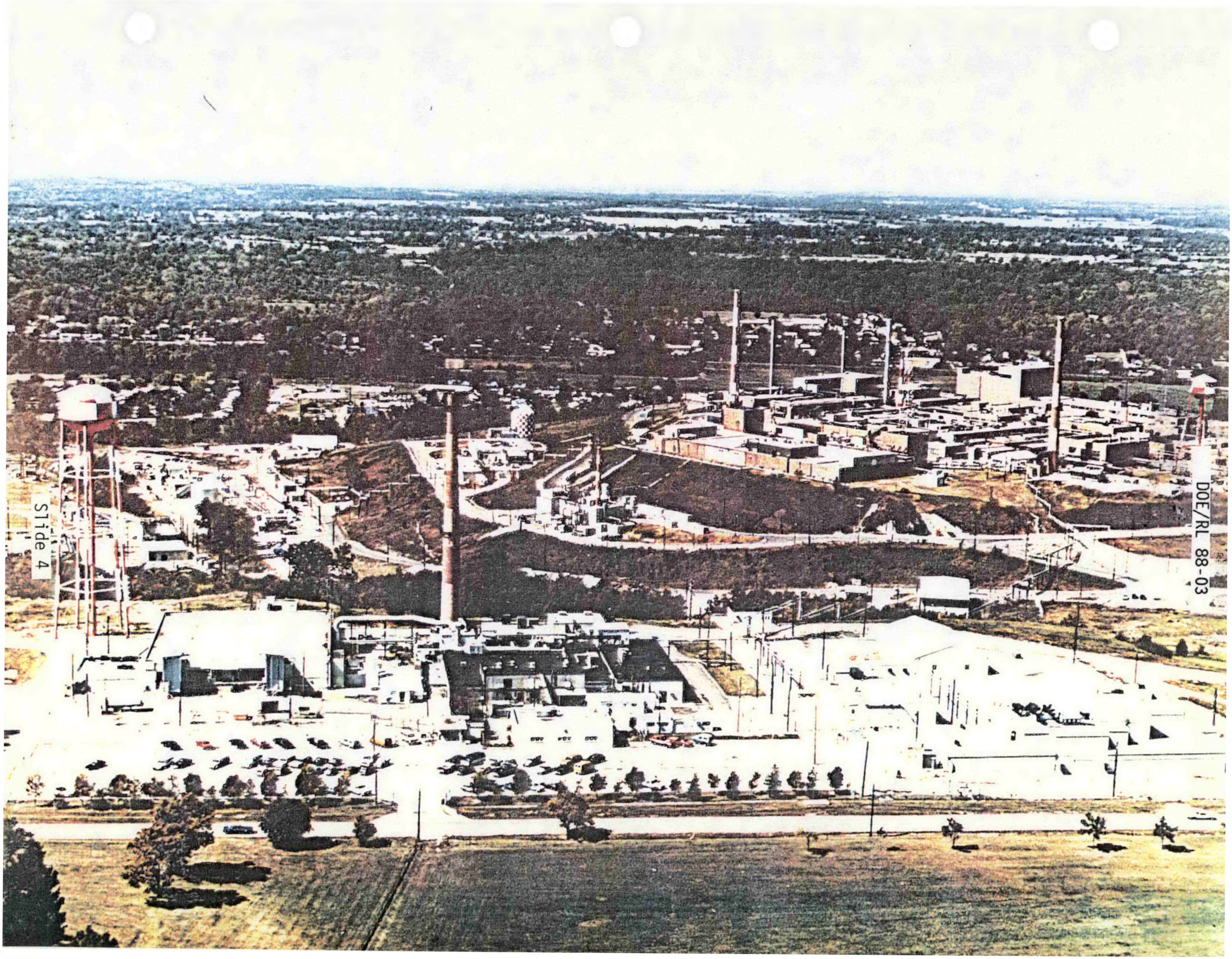

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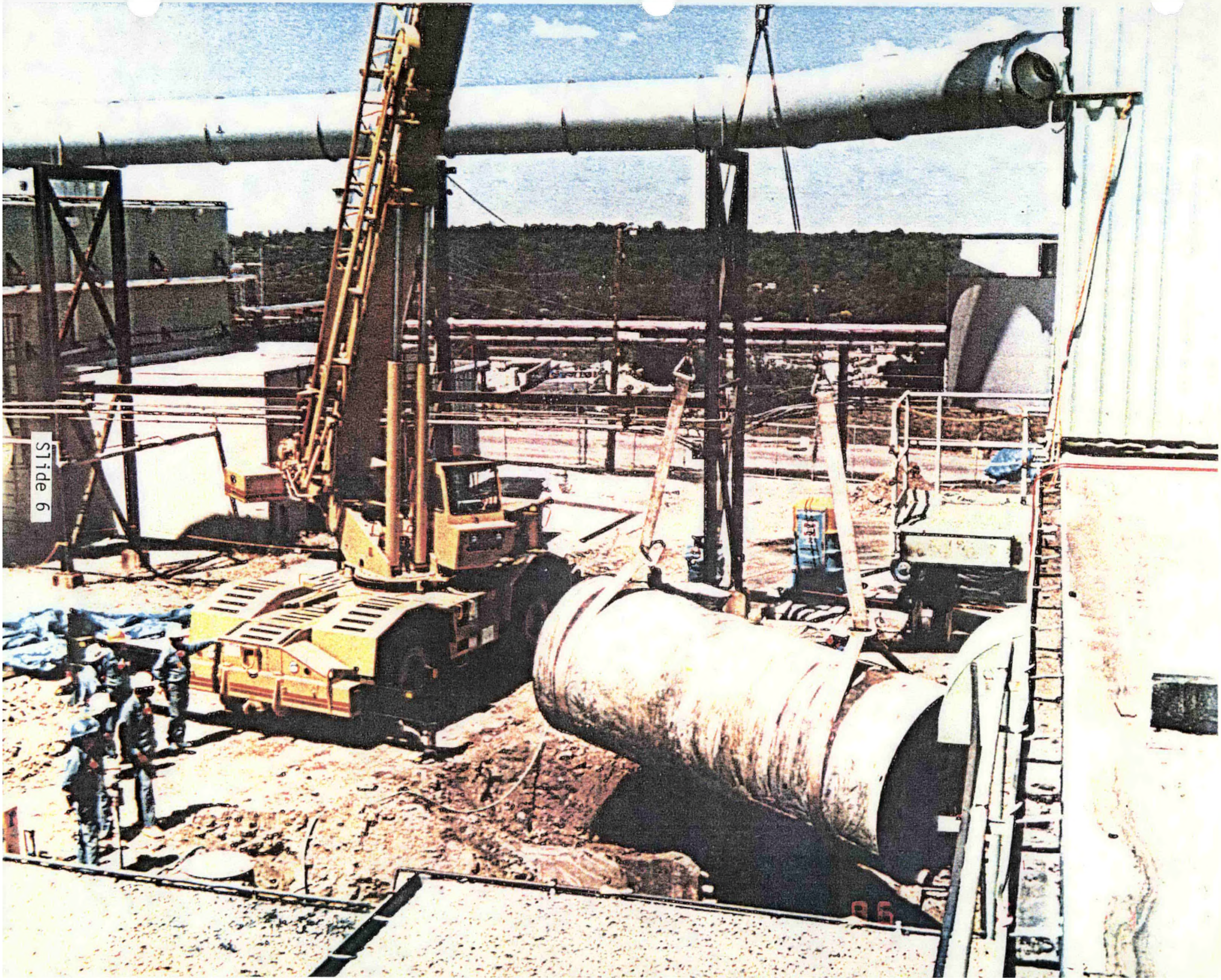

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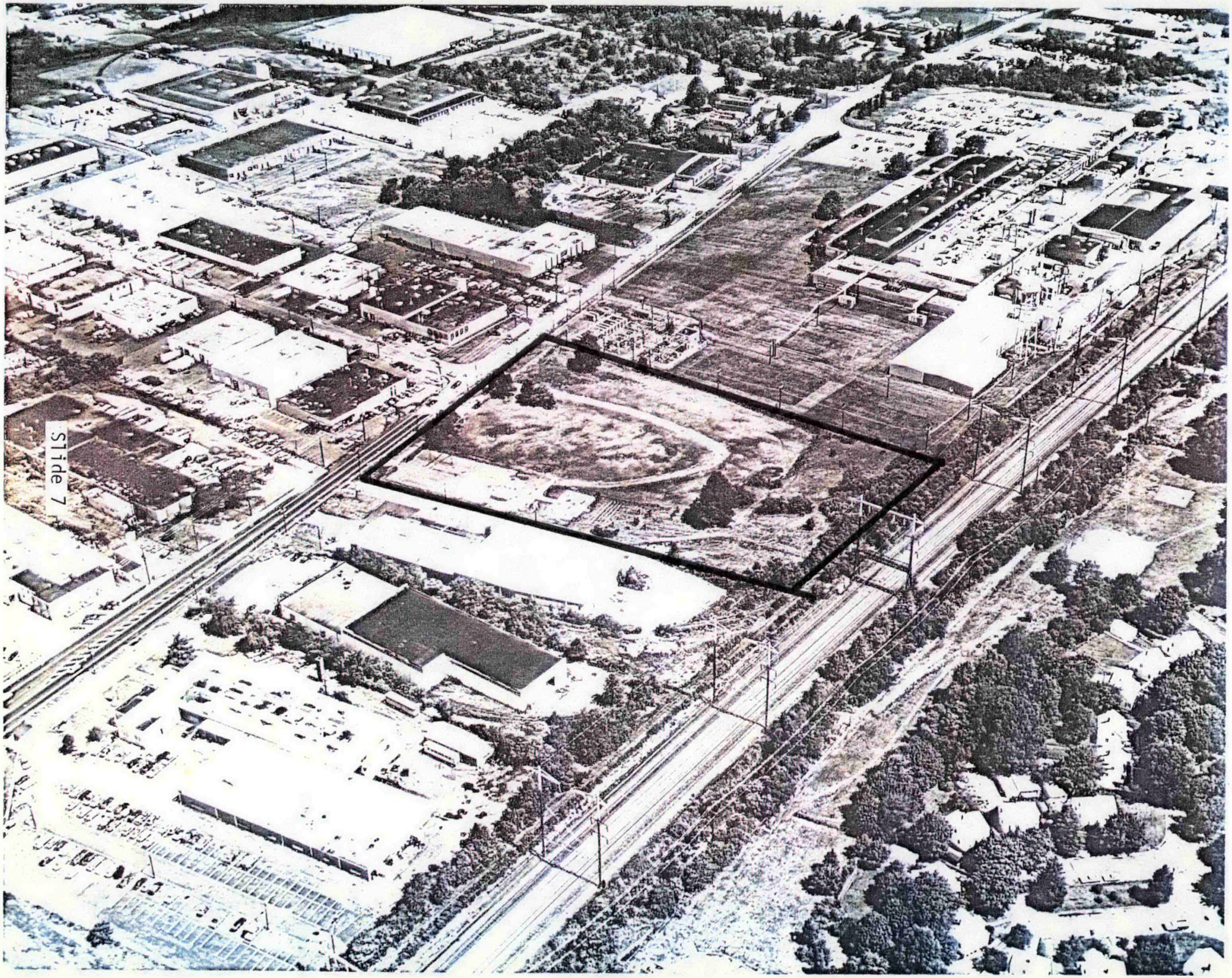
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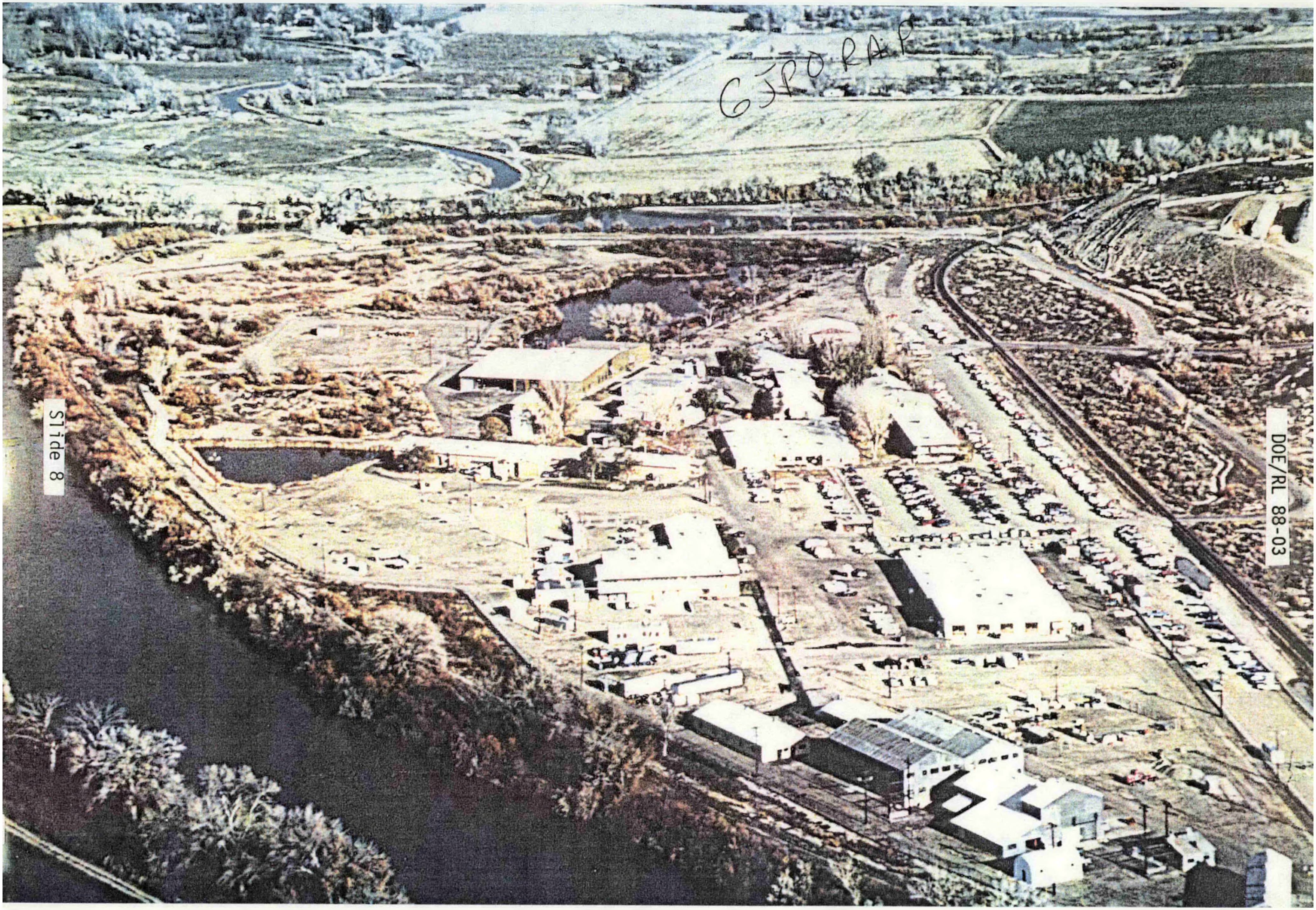

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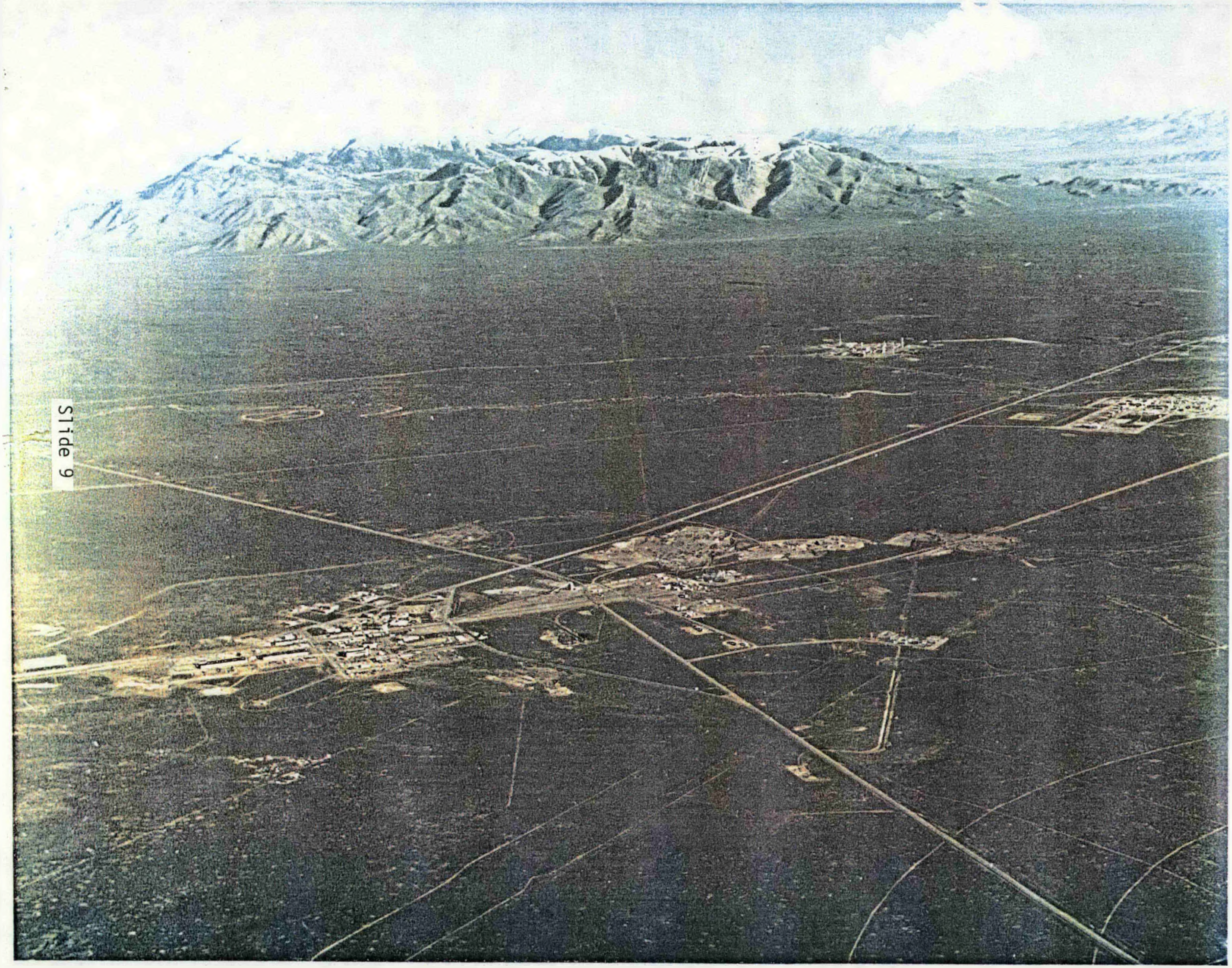

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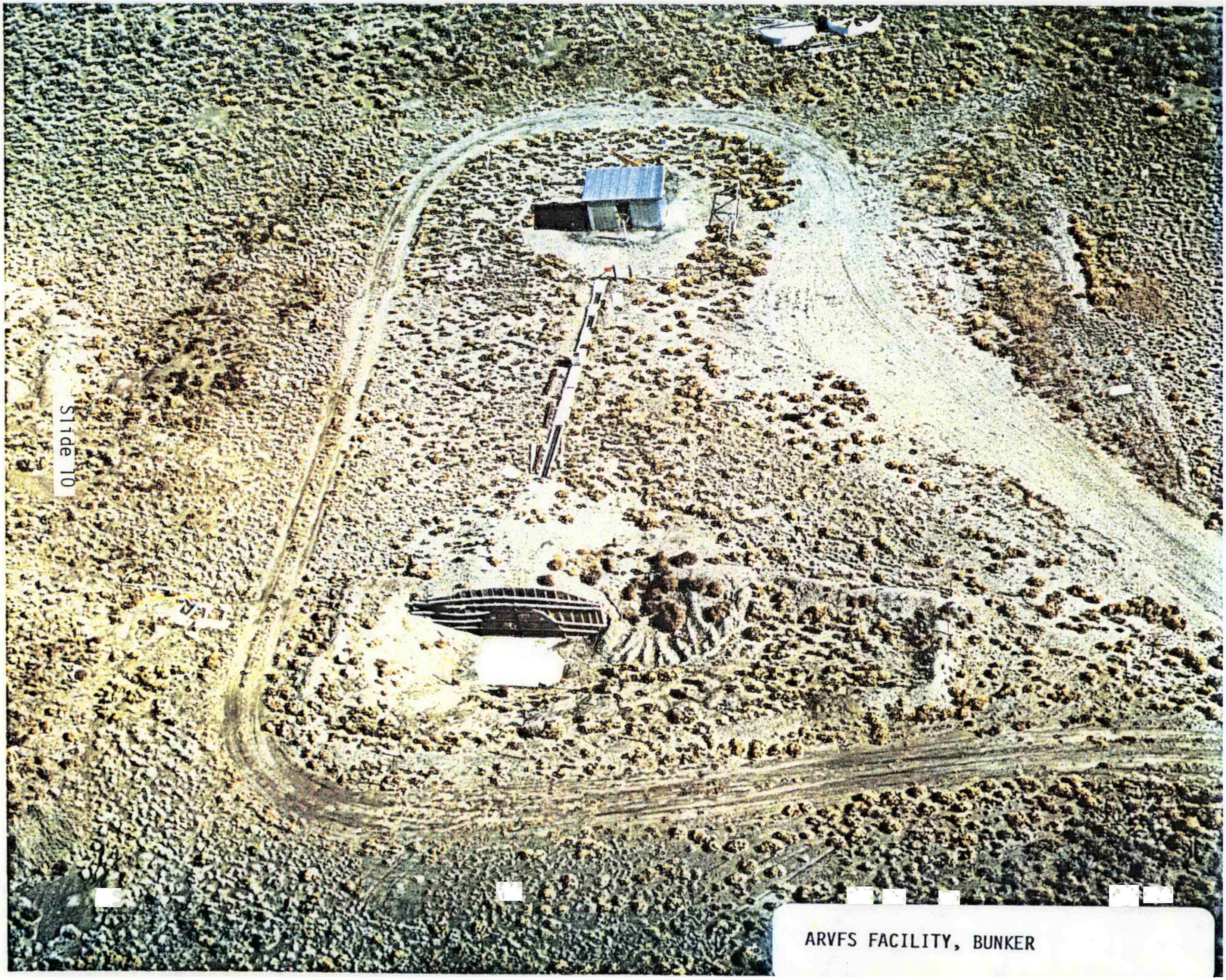

ARVFS FACILITY, BUNKER

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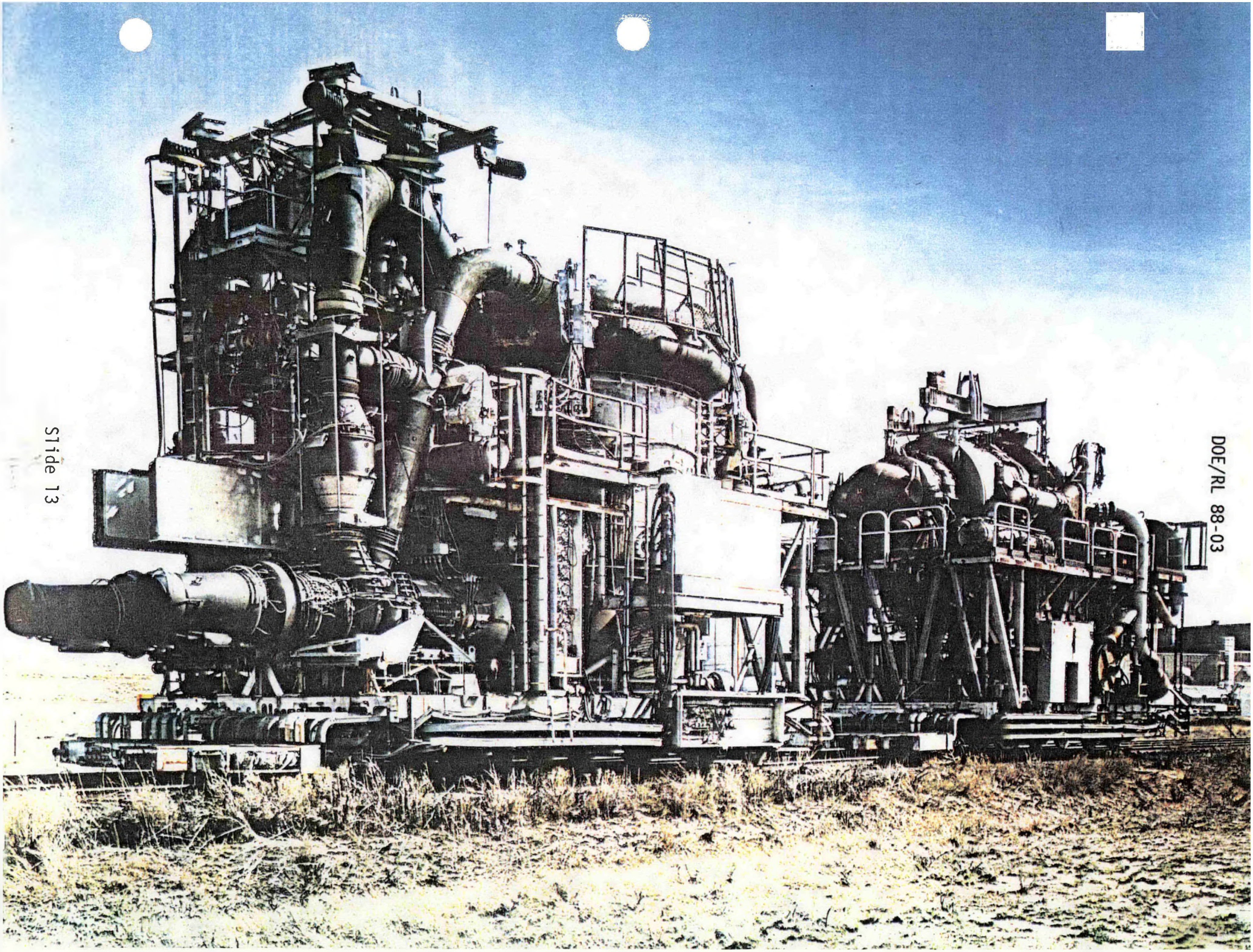

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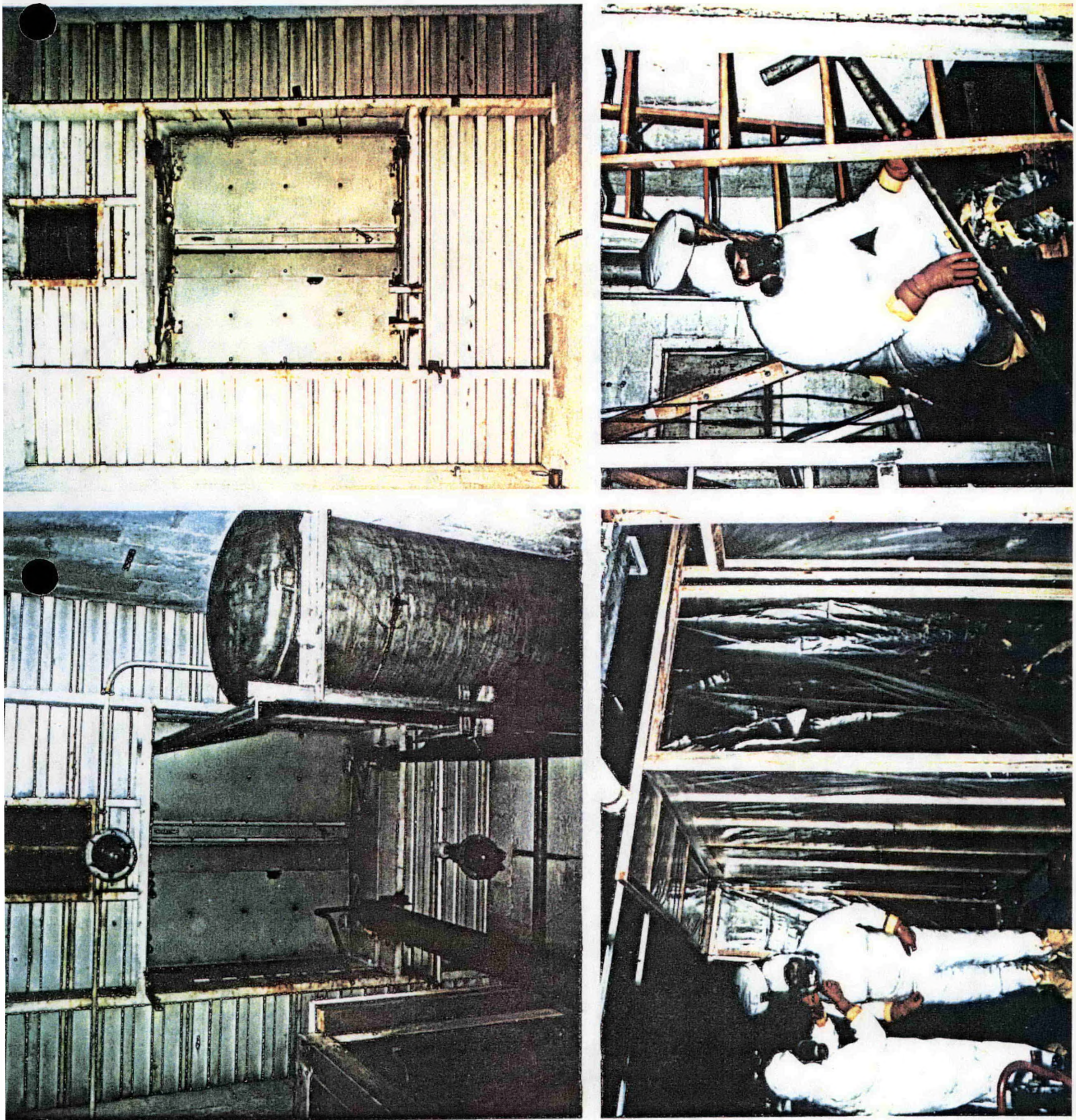

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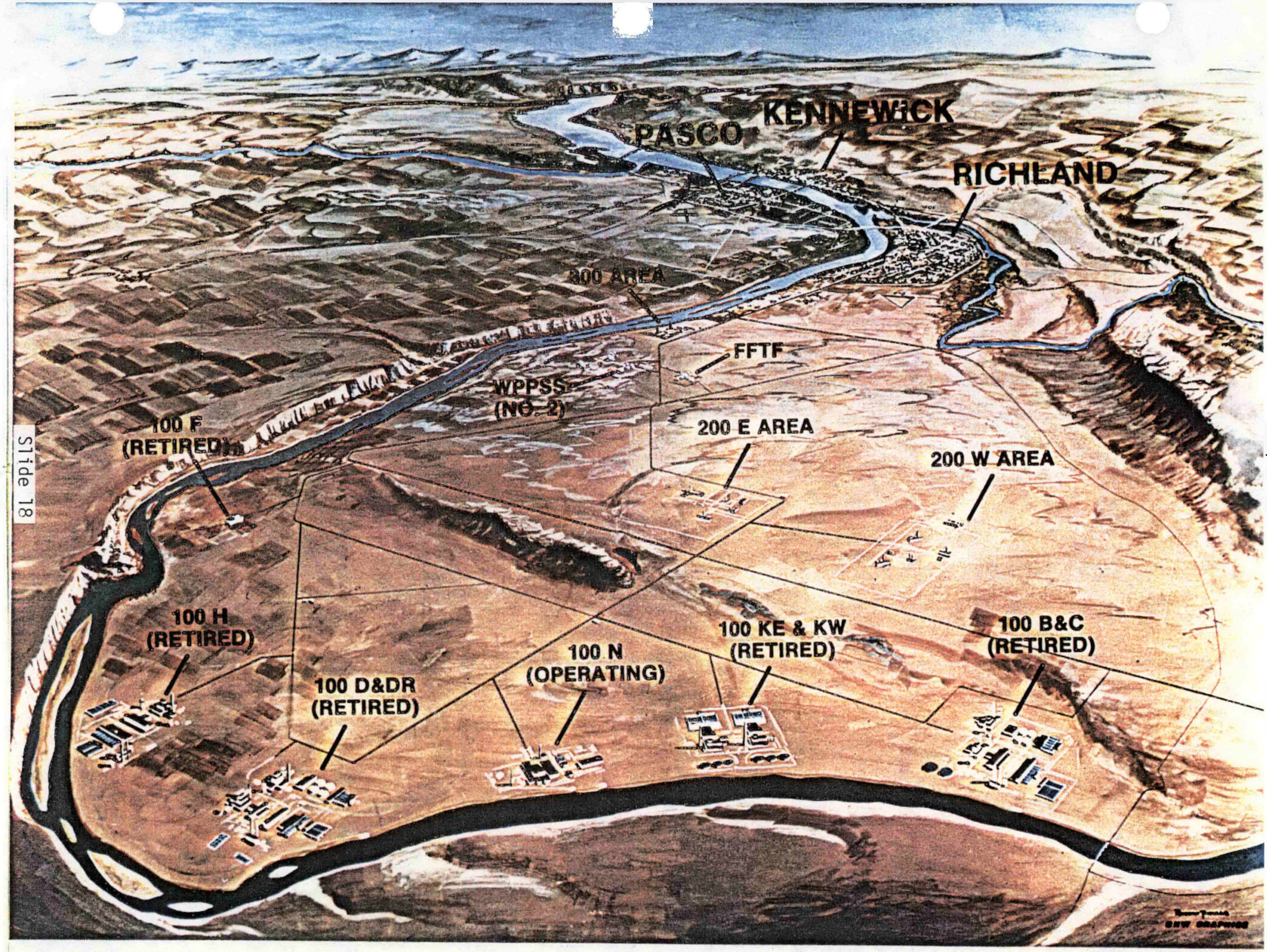

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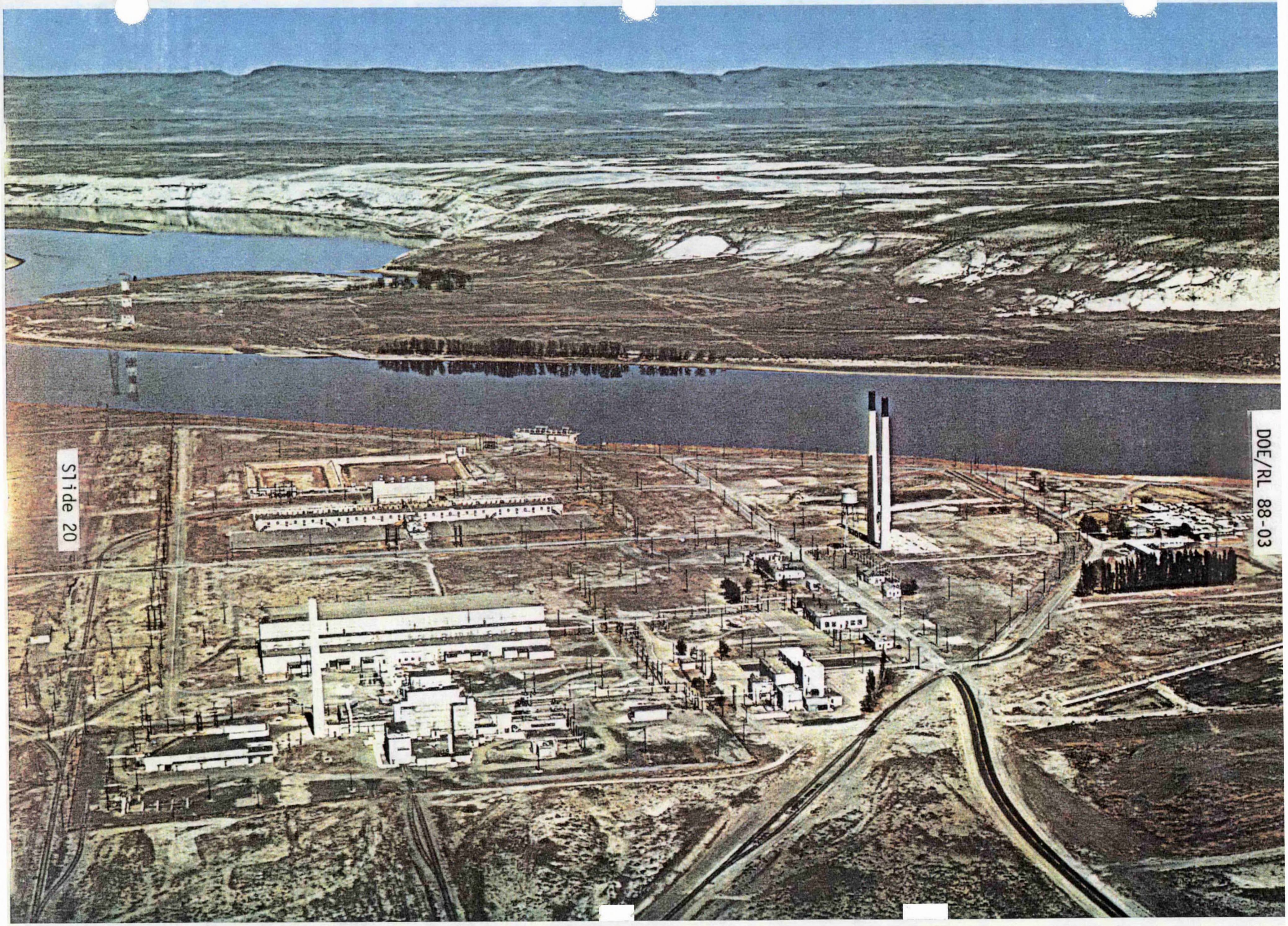

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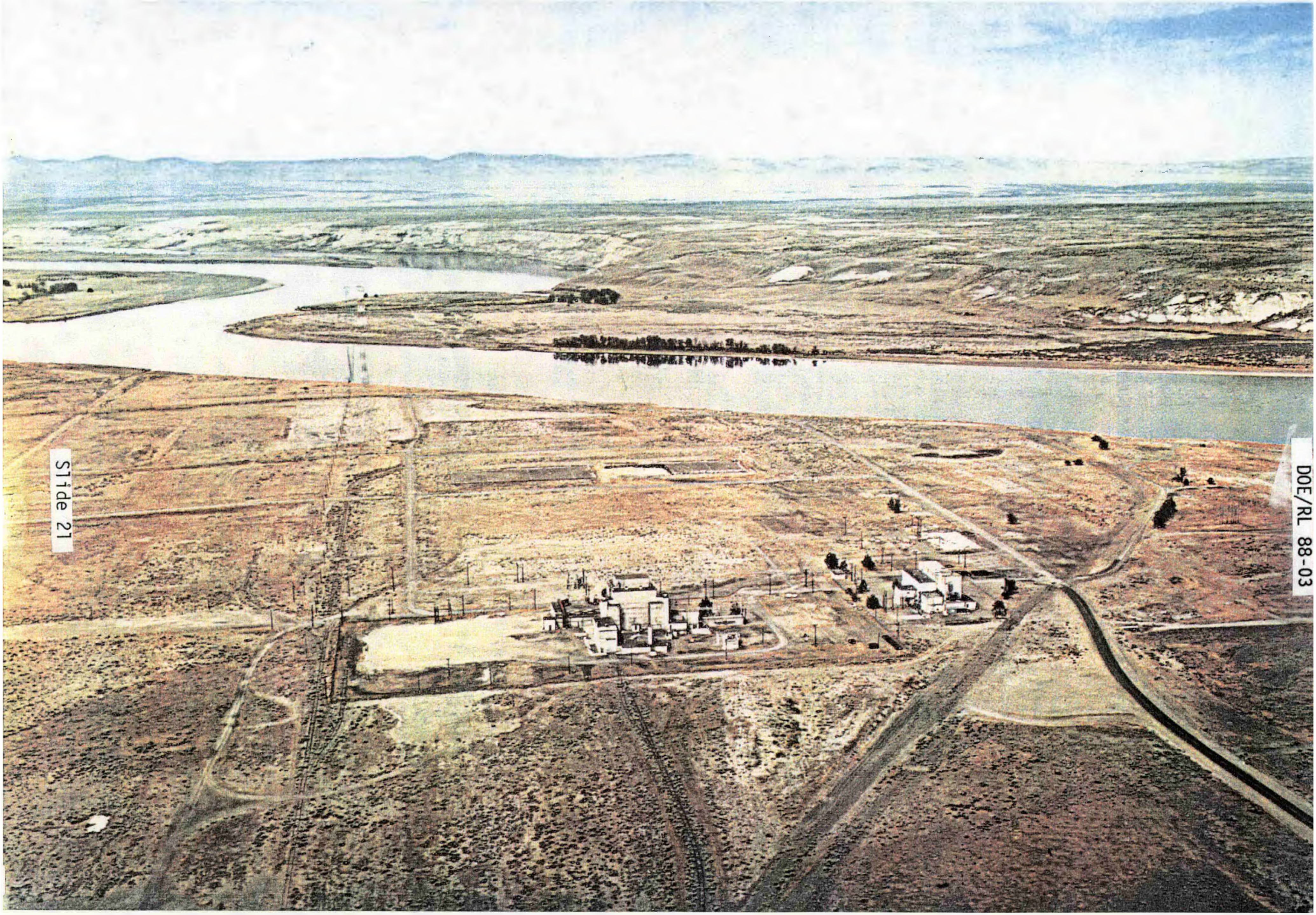

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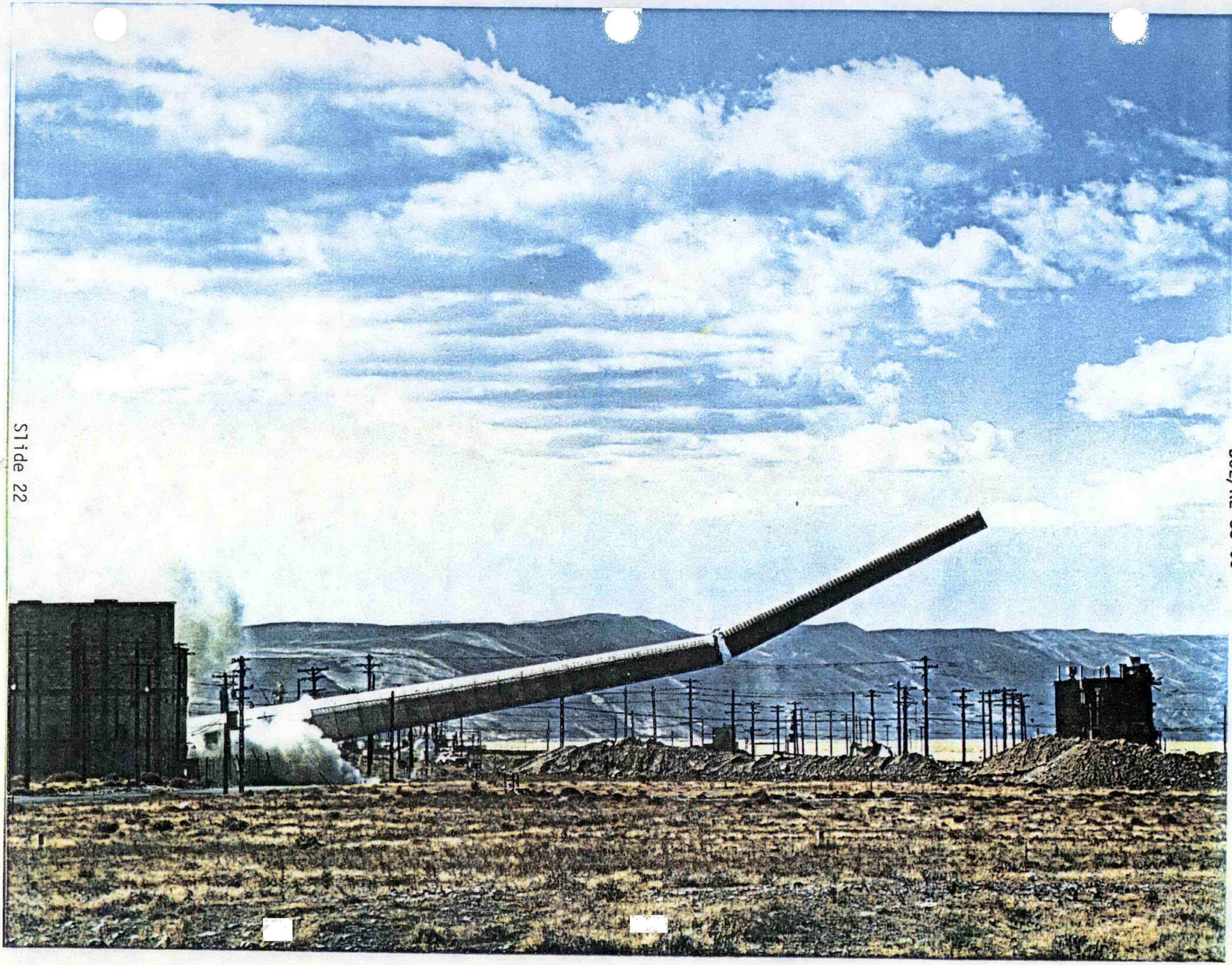

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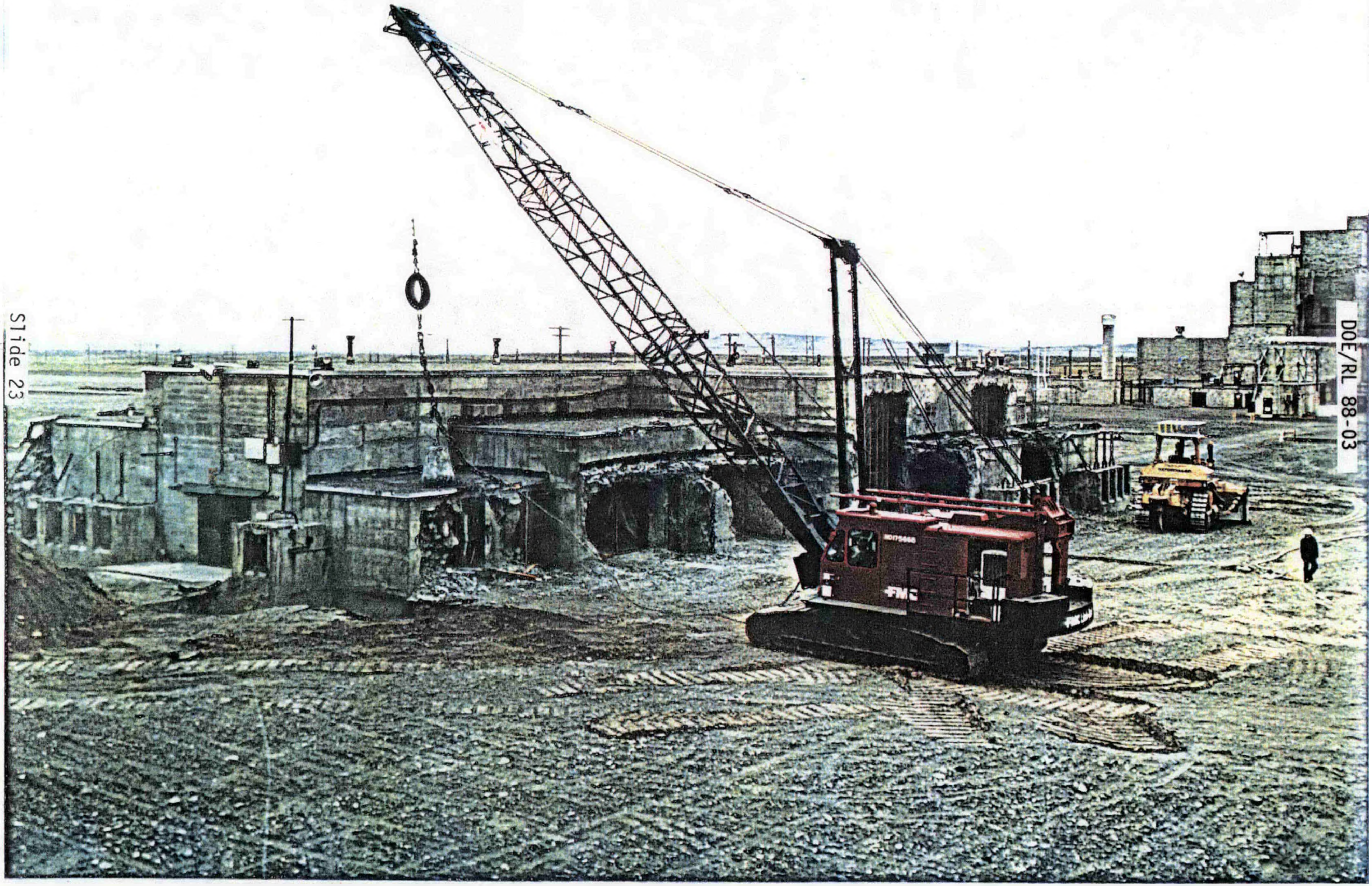

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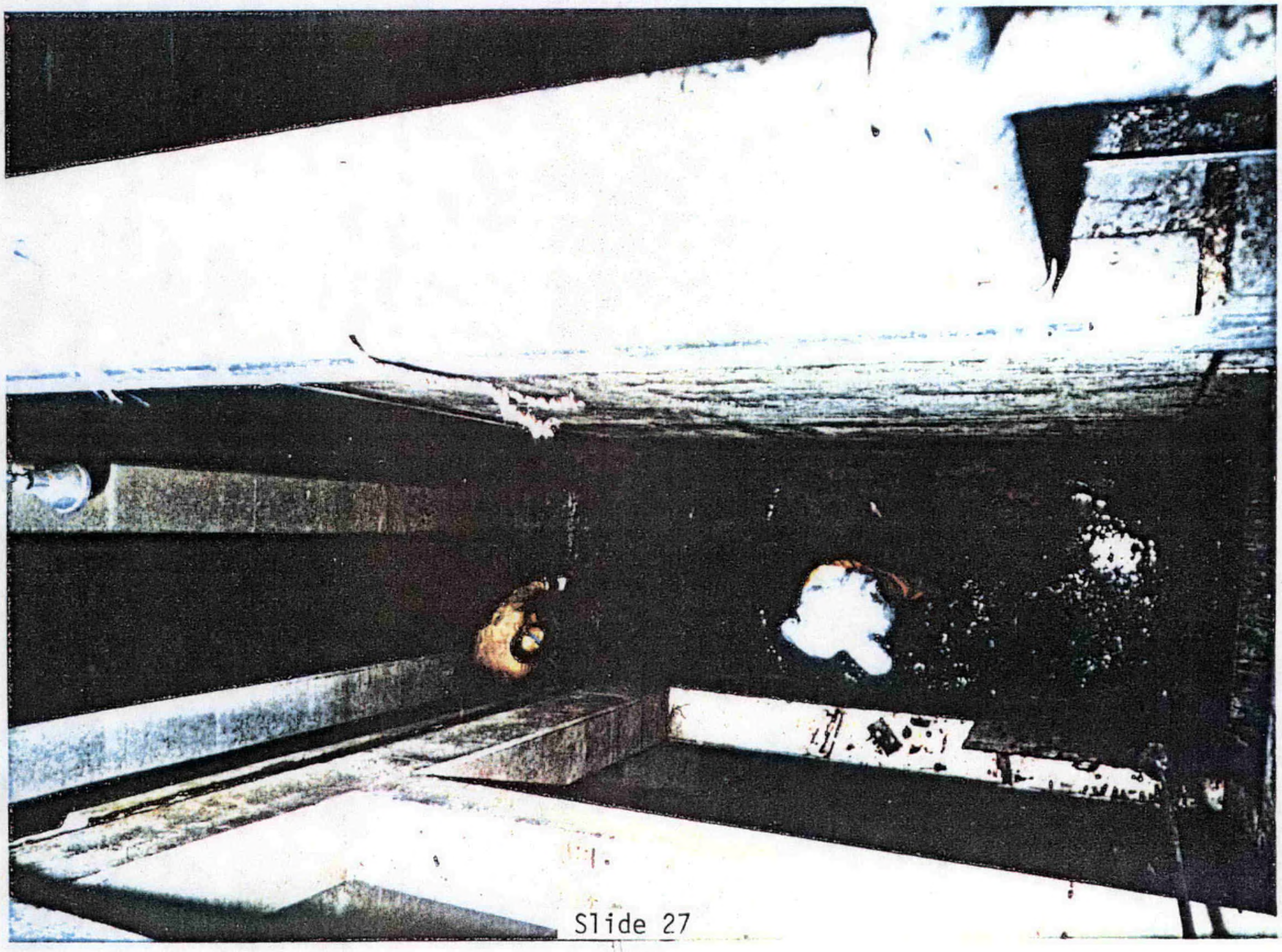

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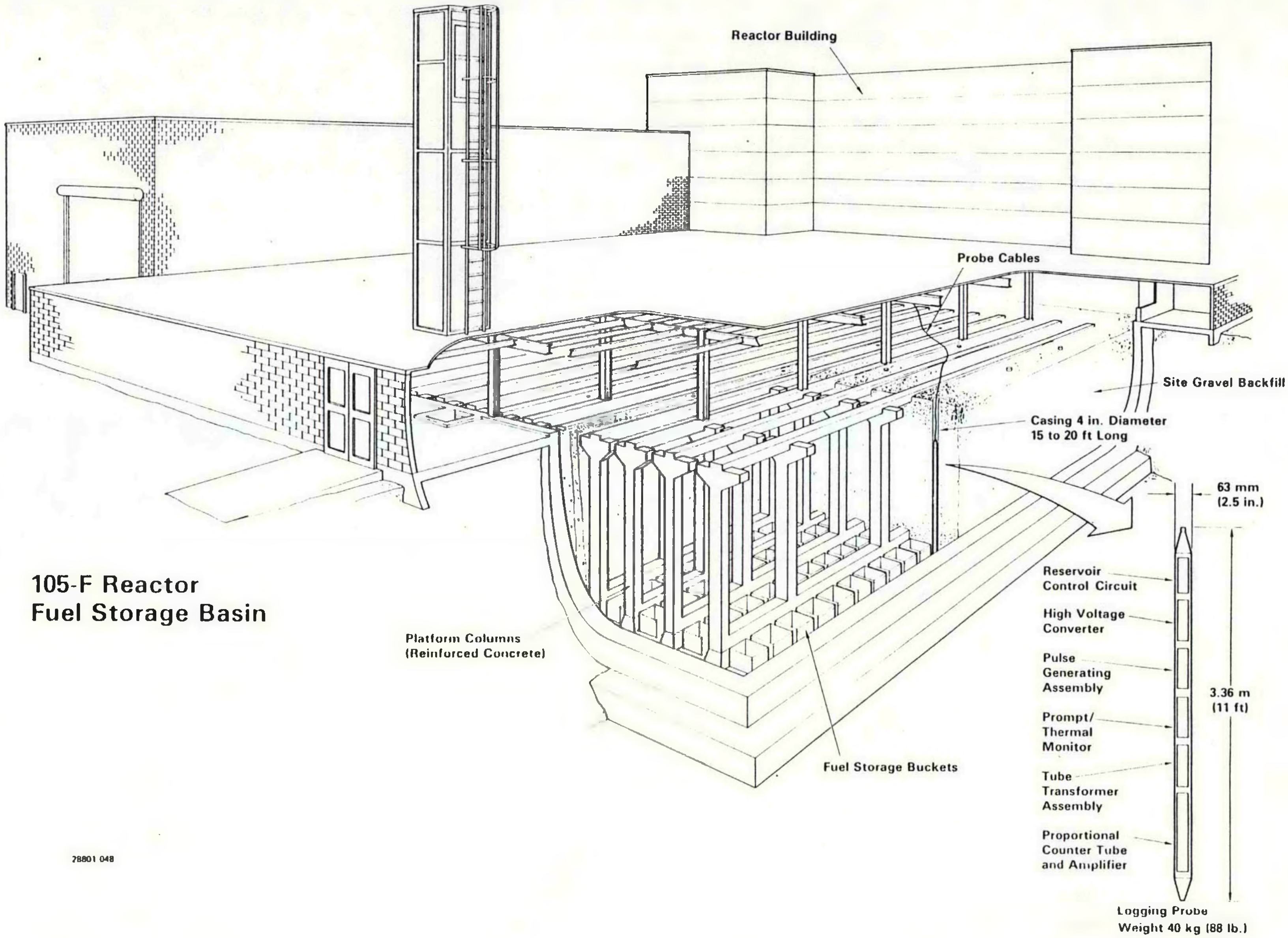
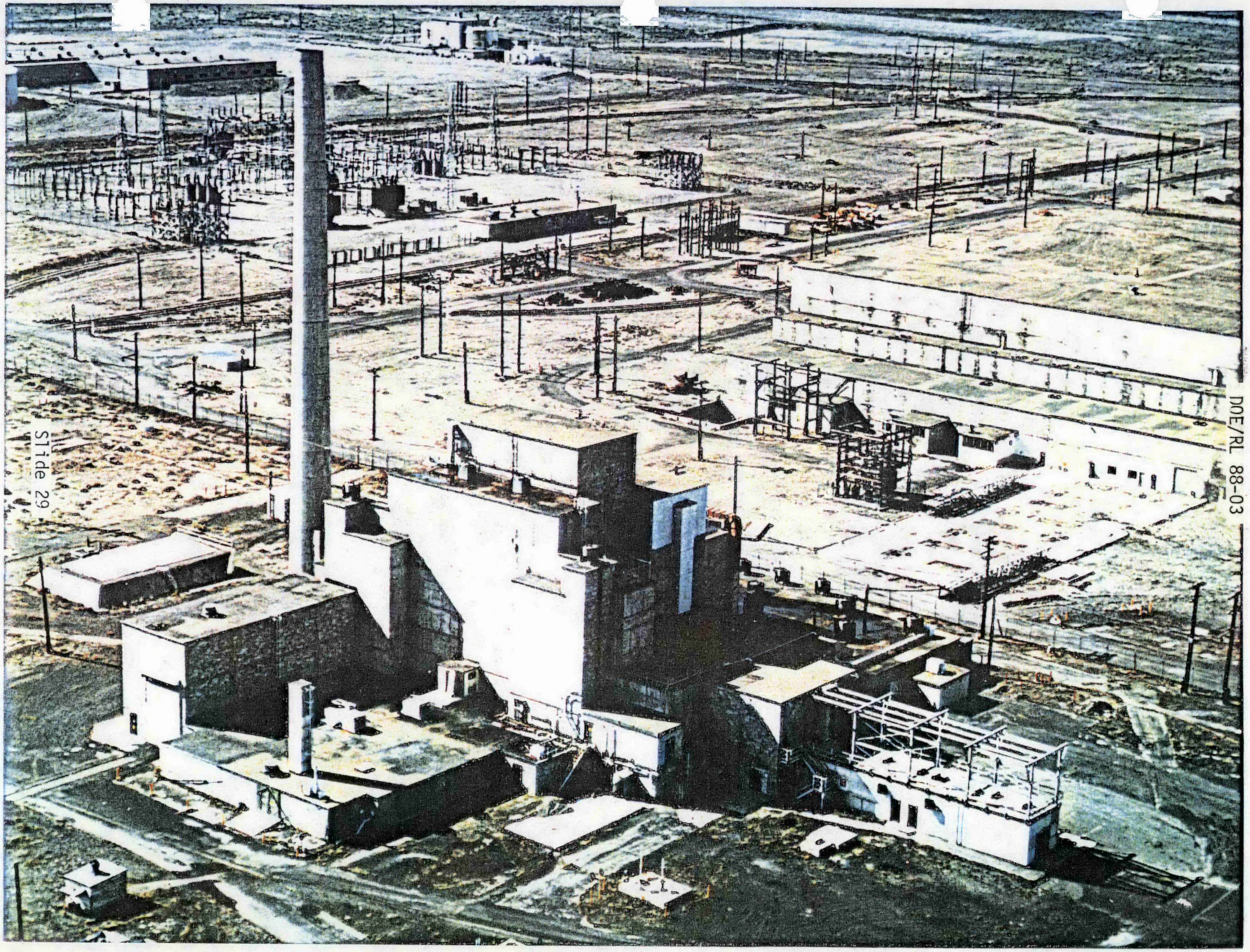
Neutron Interrogation



105-F Reactor
Fuel Storage Basin

28801 048



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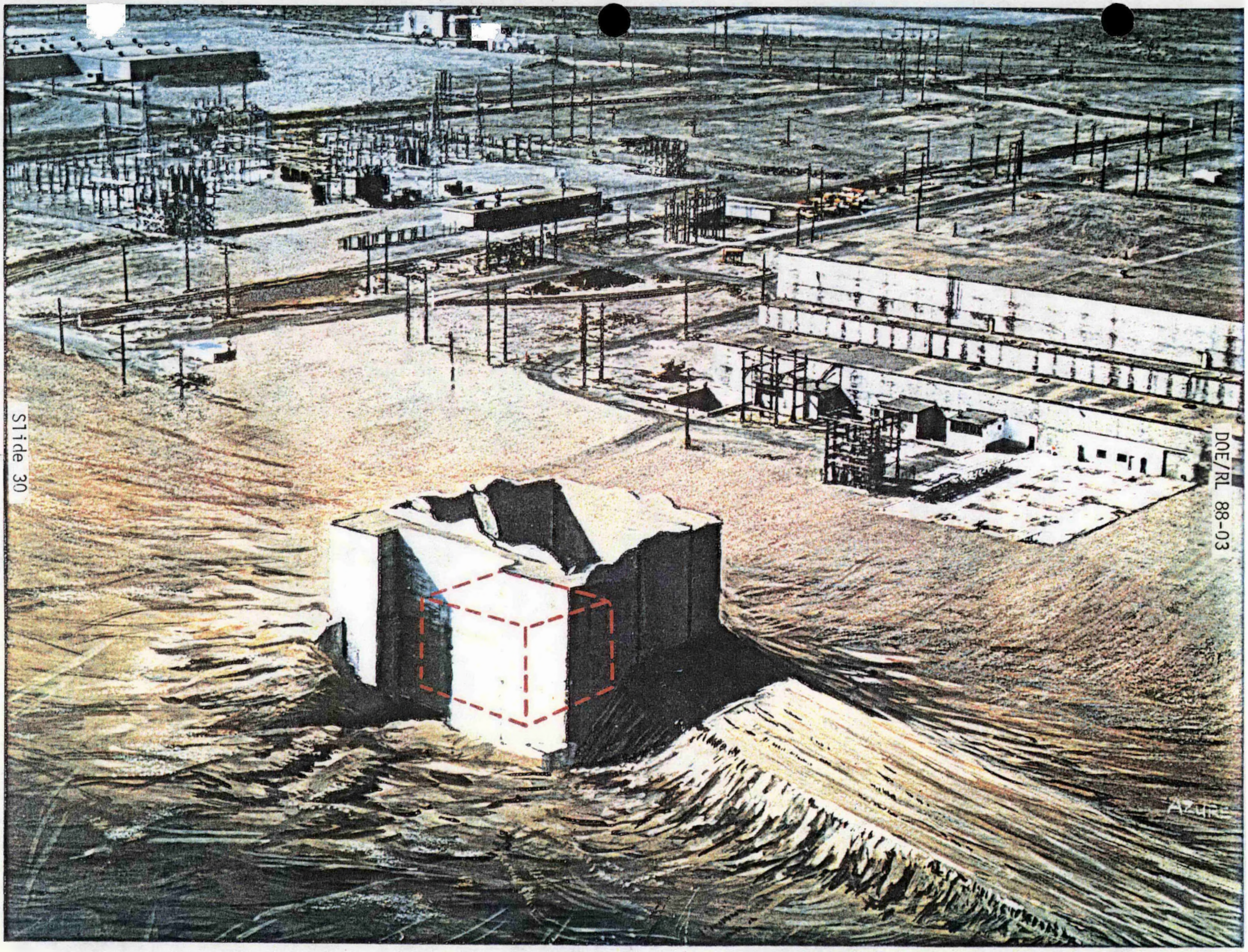

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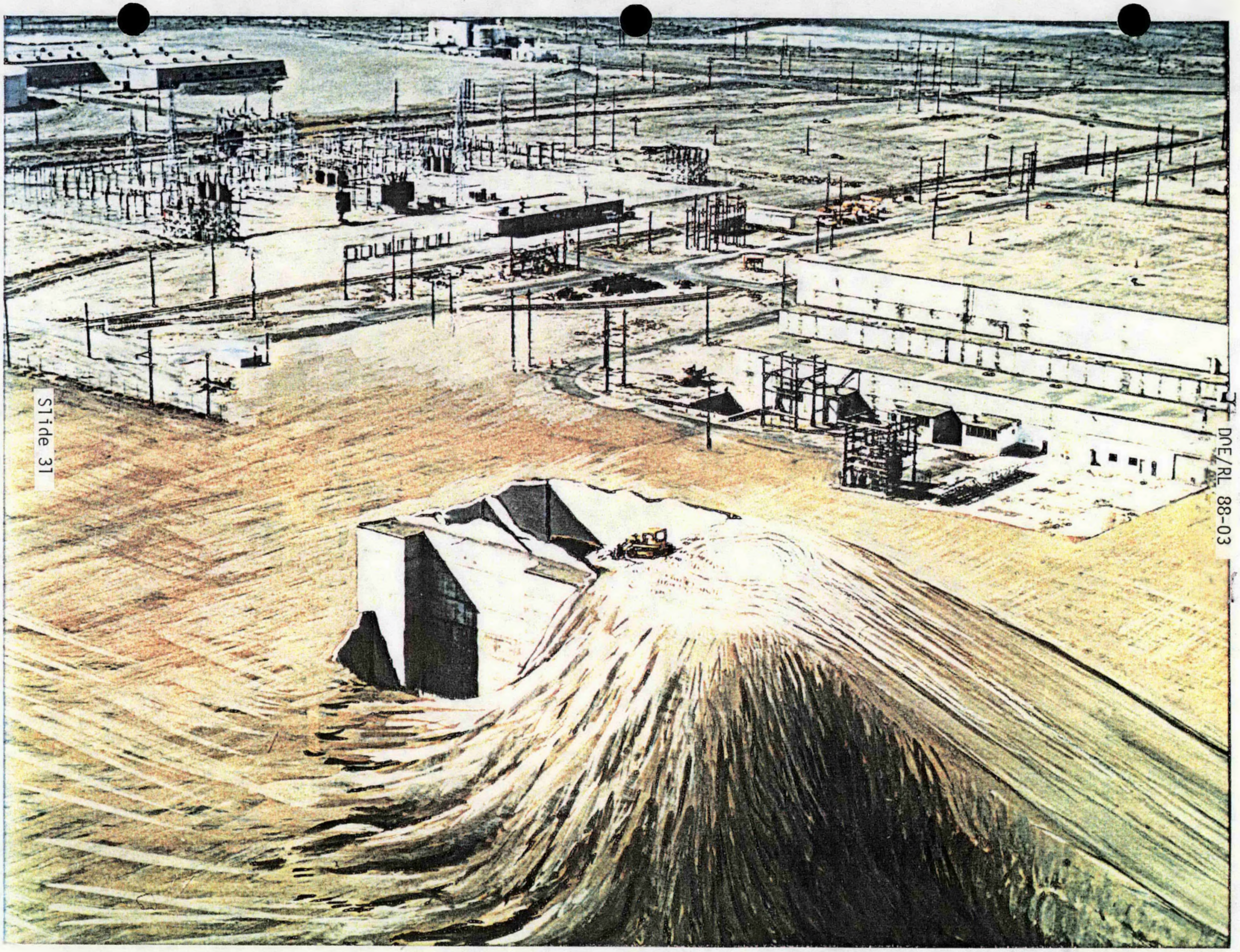

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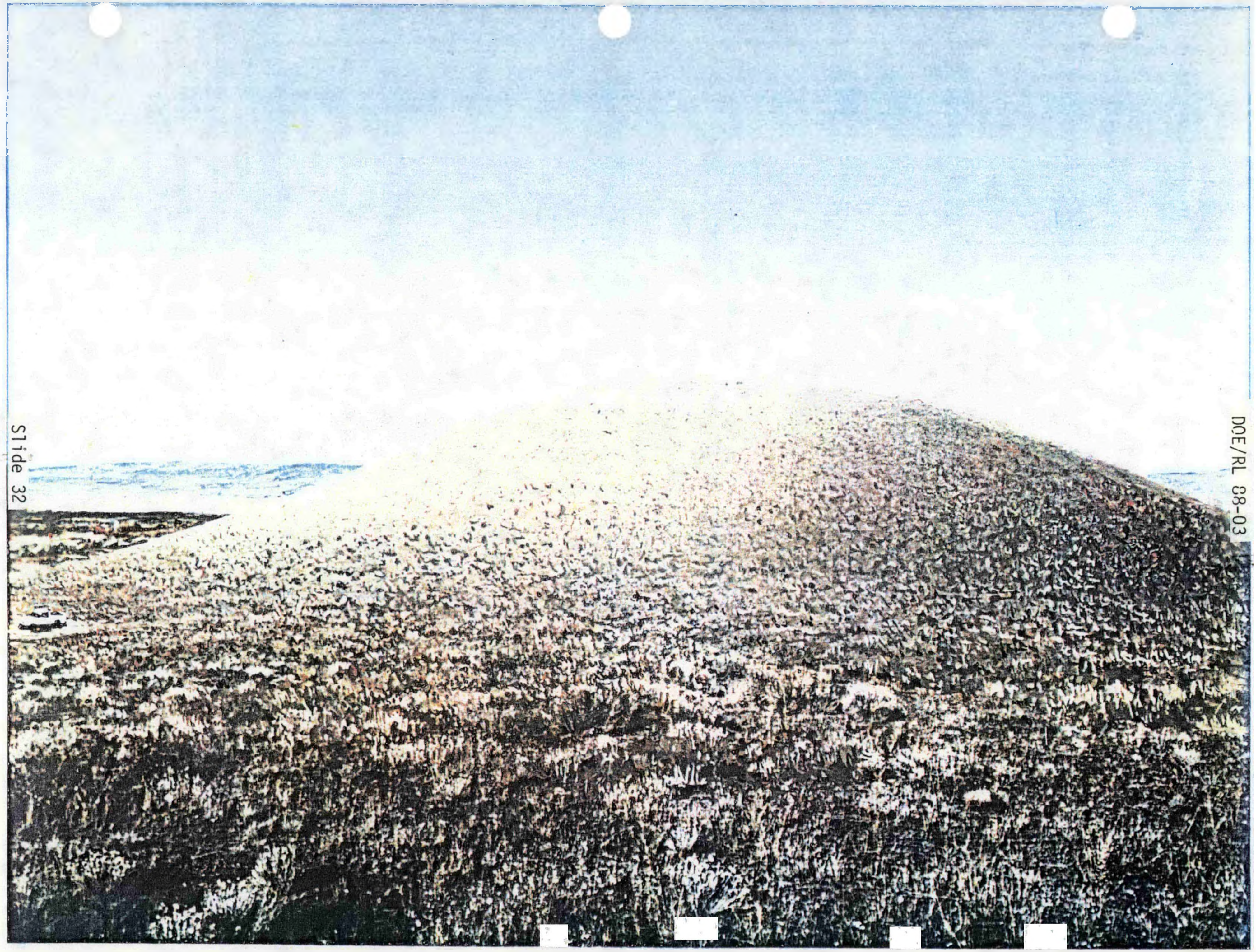

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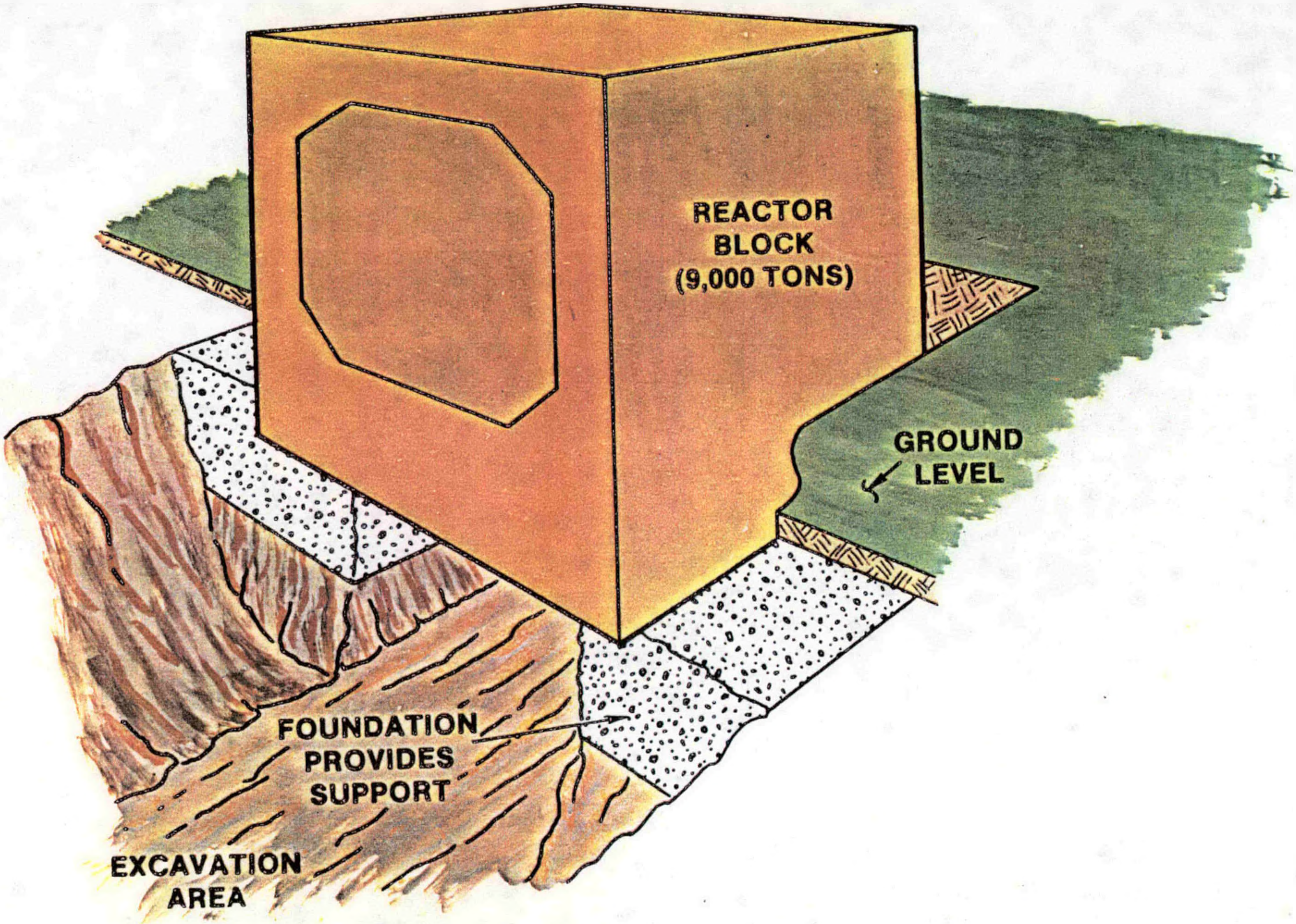

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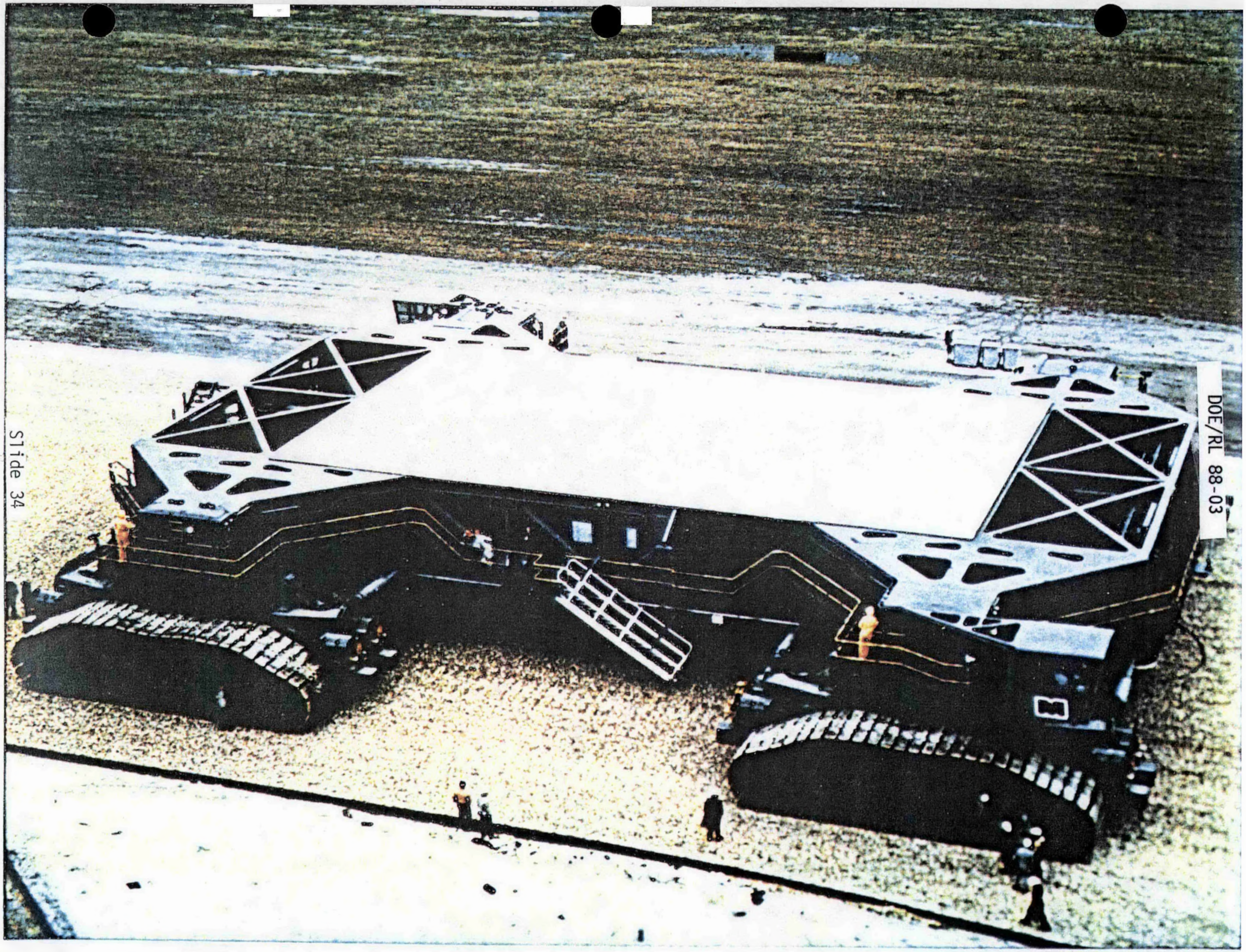

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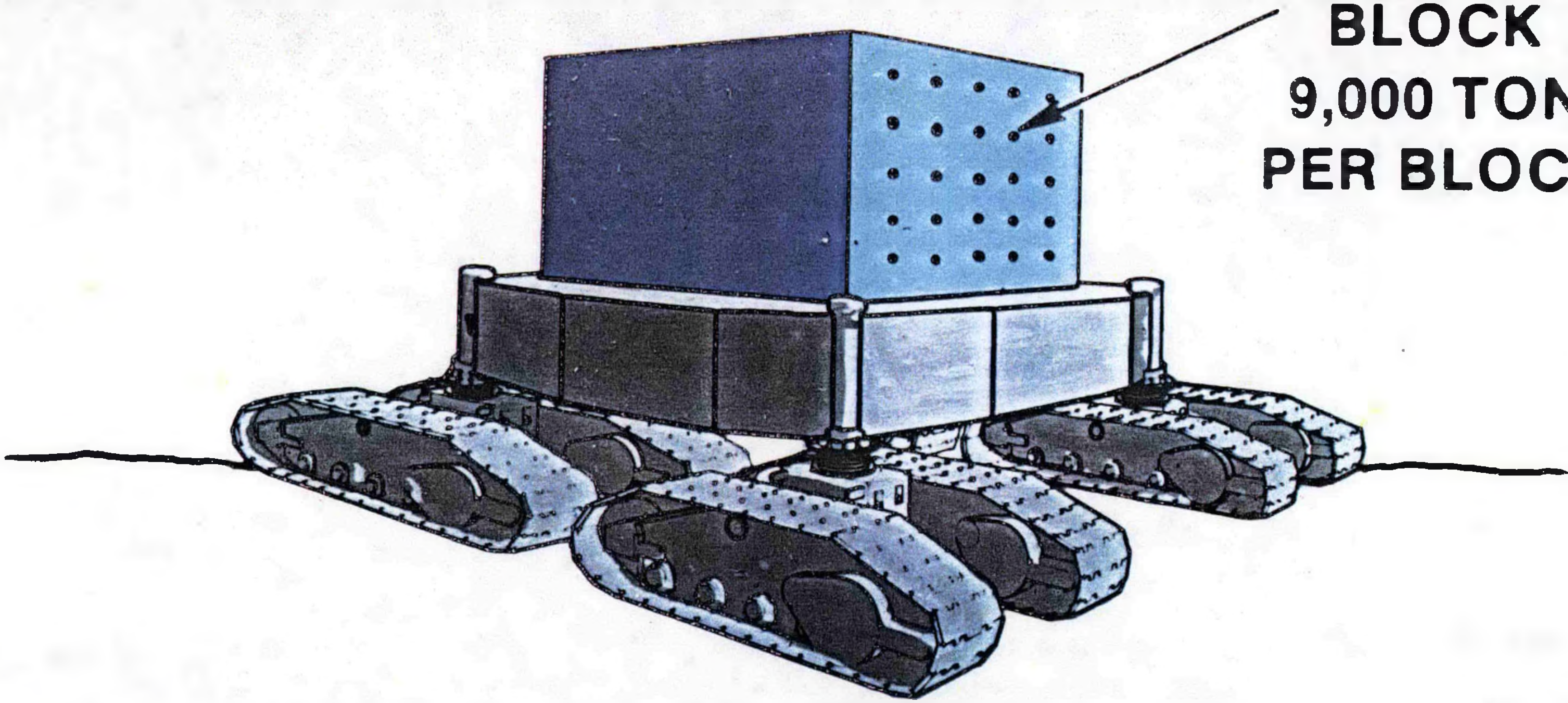
REACTOR 105 BUILDING

IMMEDIATE REMOVAL



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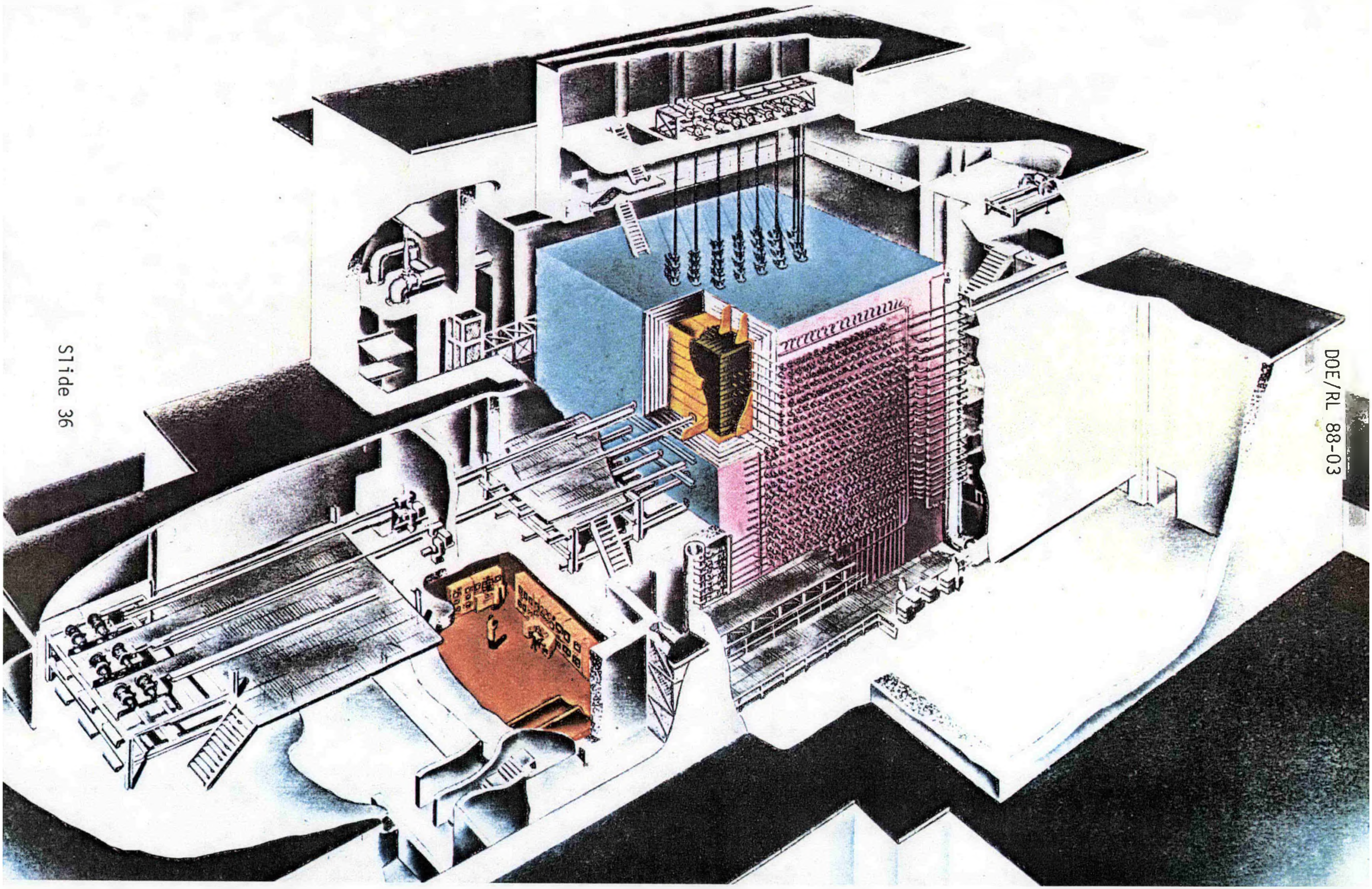
CUTAWAY OF TYPICAL REACTOR BUILDING



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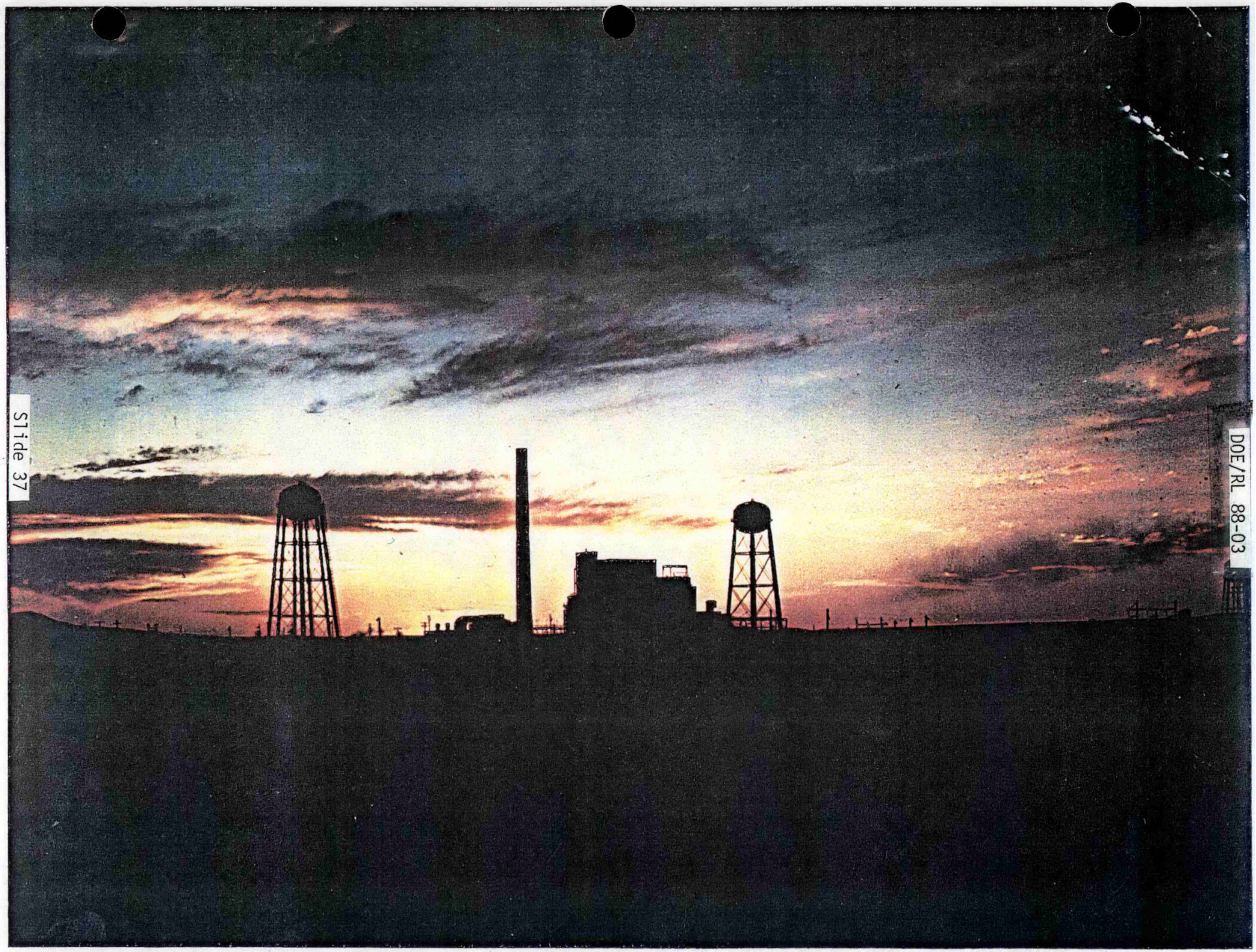
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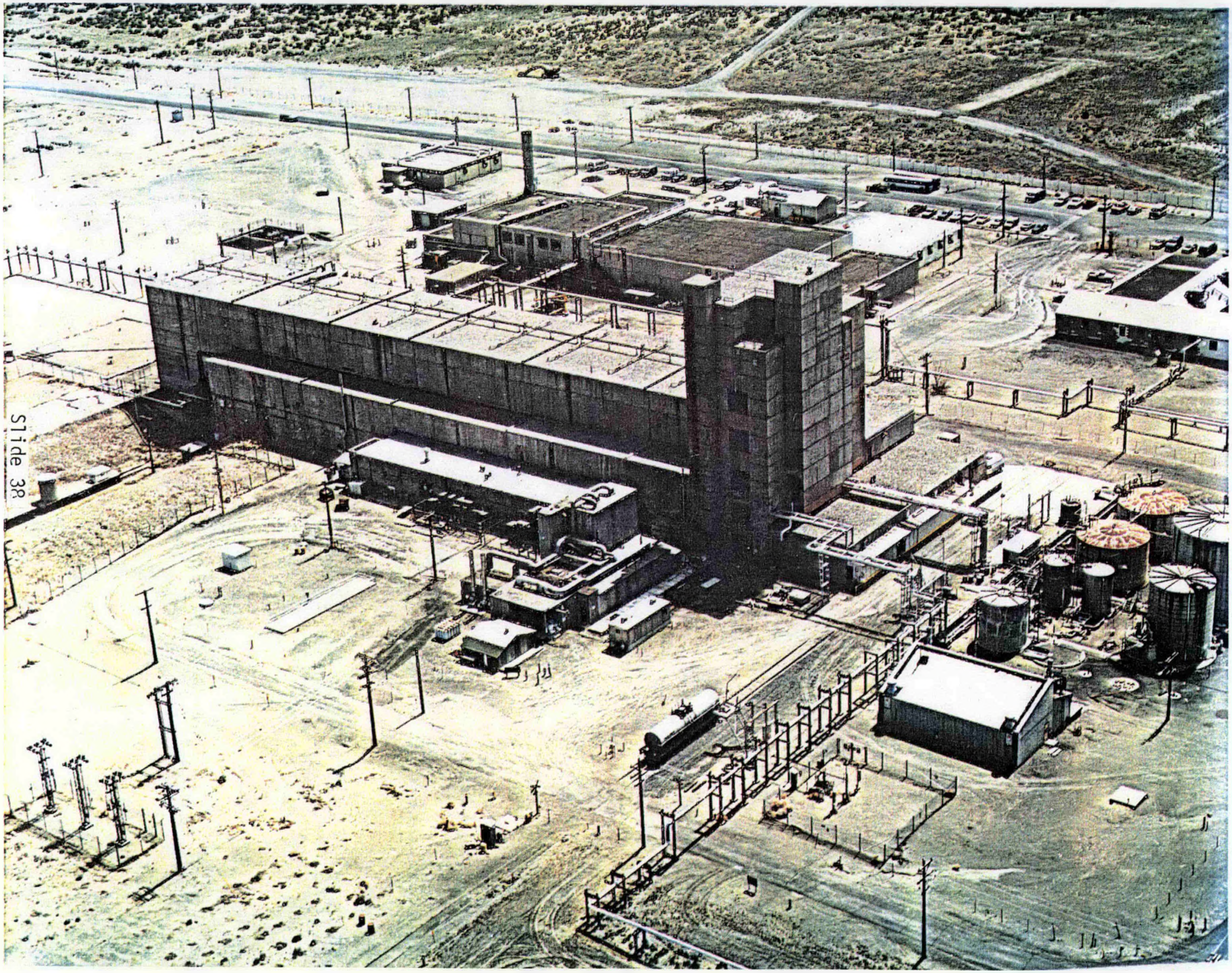

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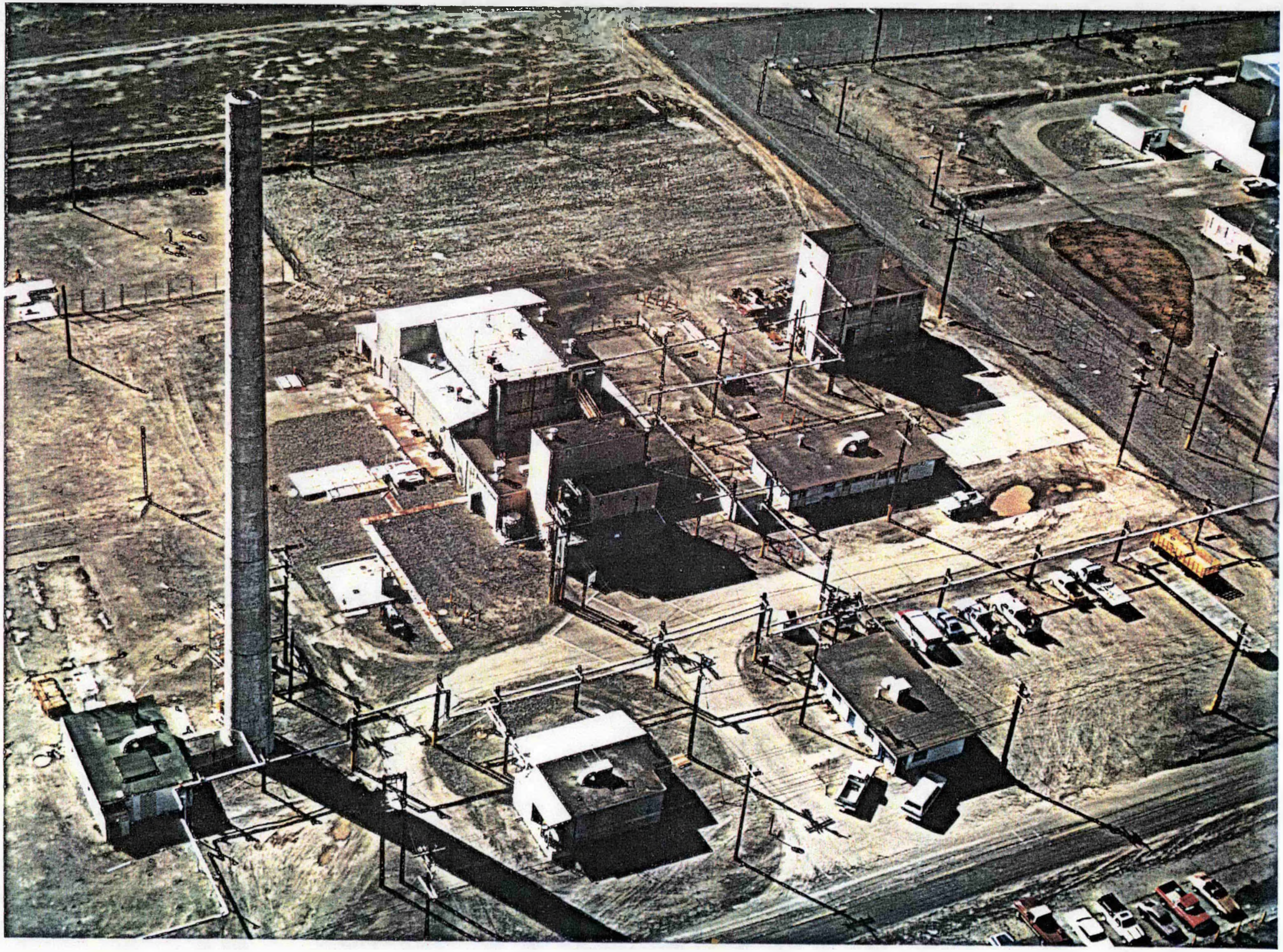

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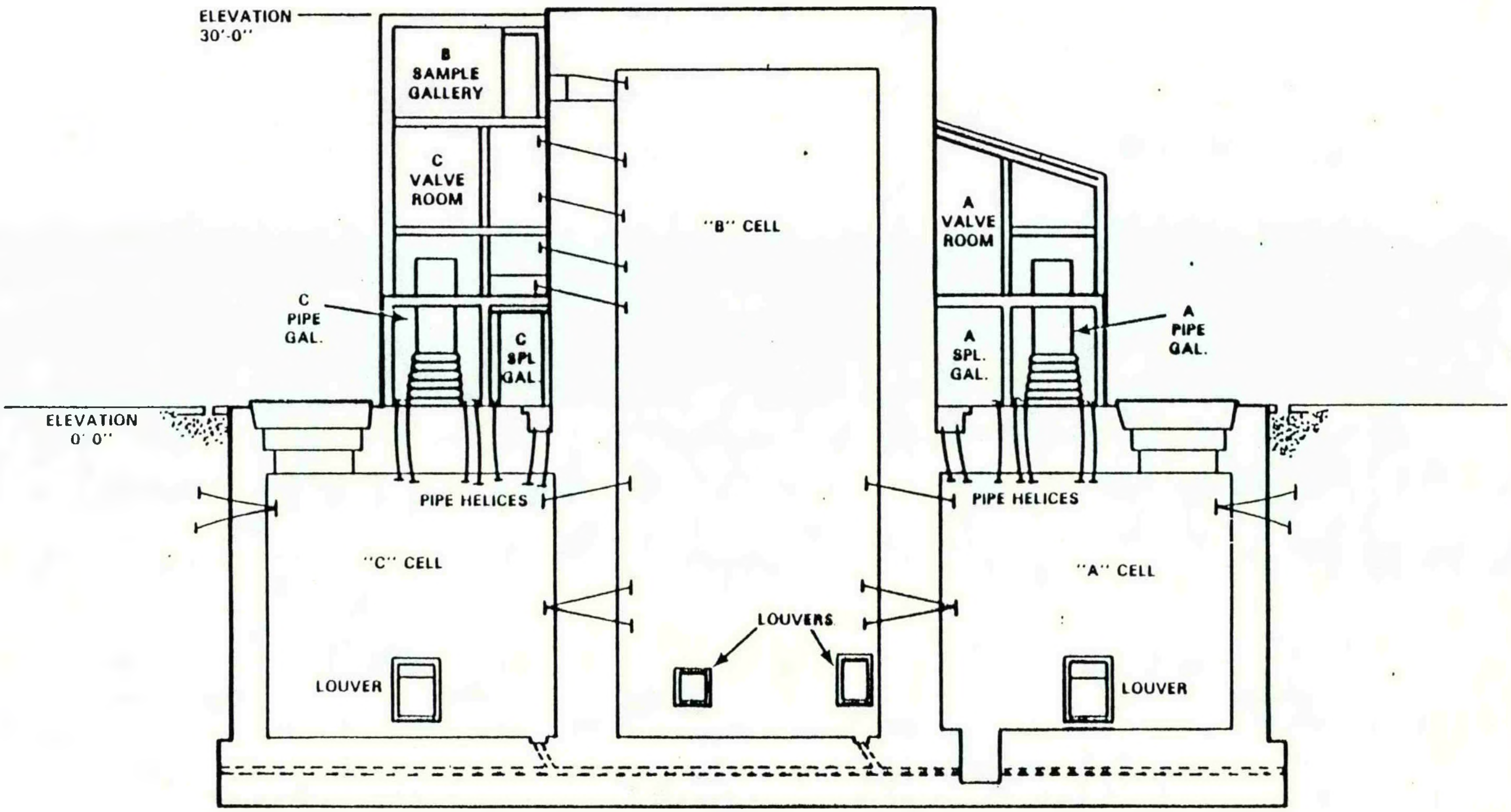
BLDG. 201-C SECTION VIEW



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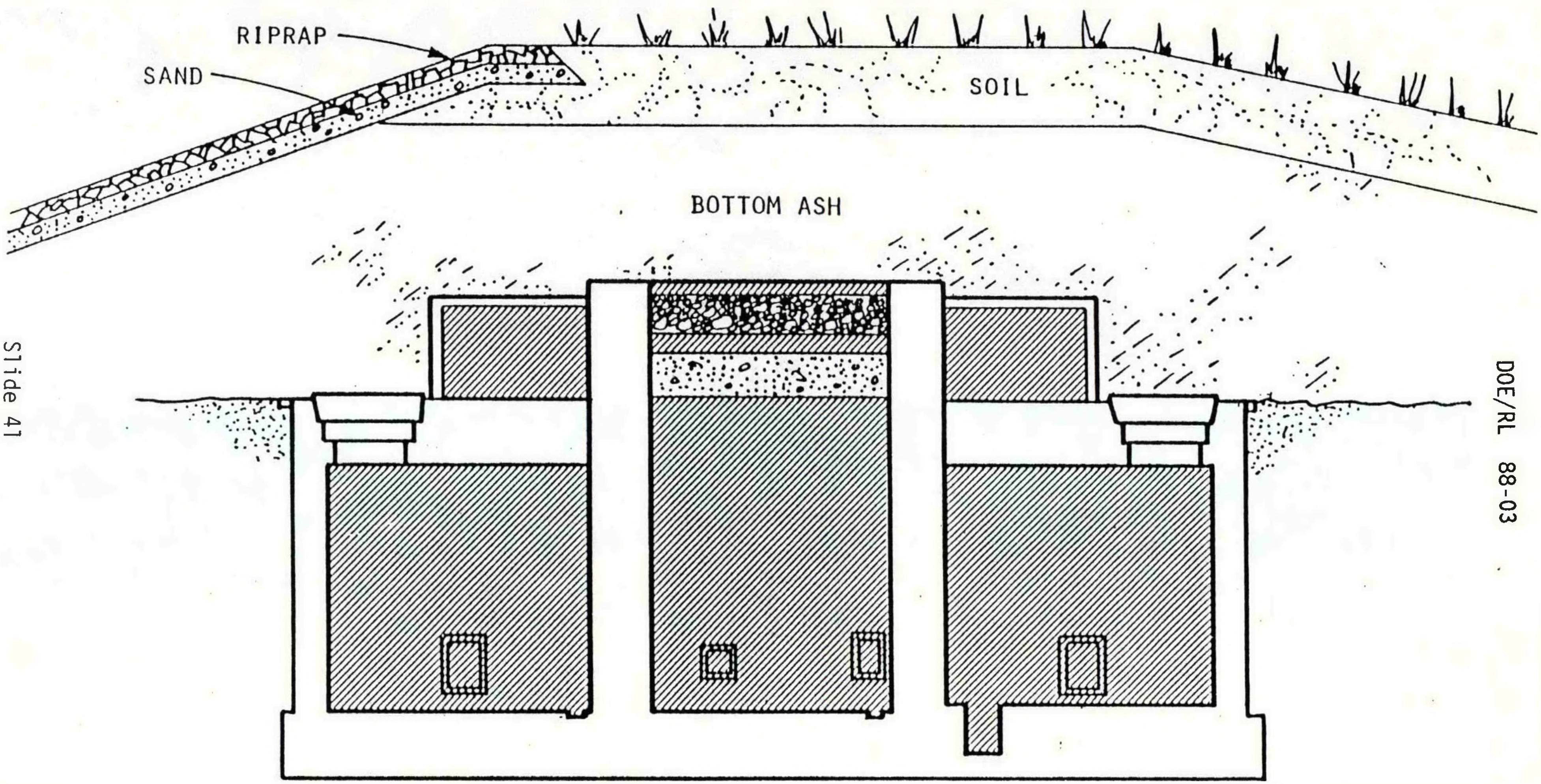
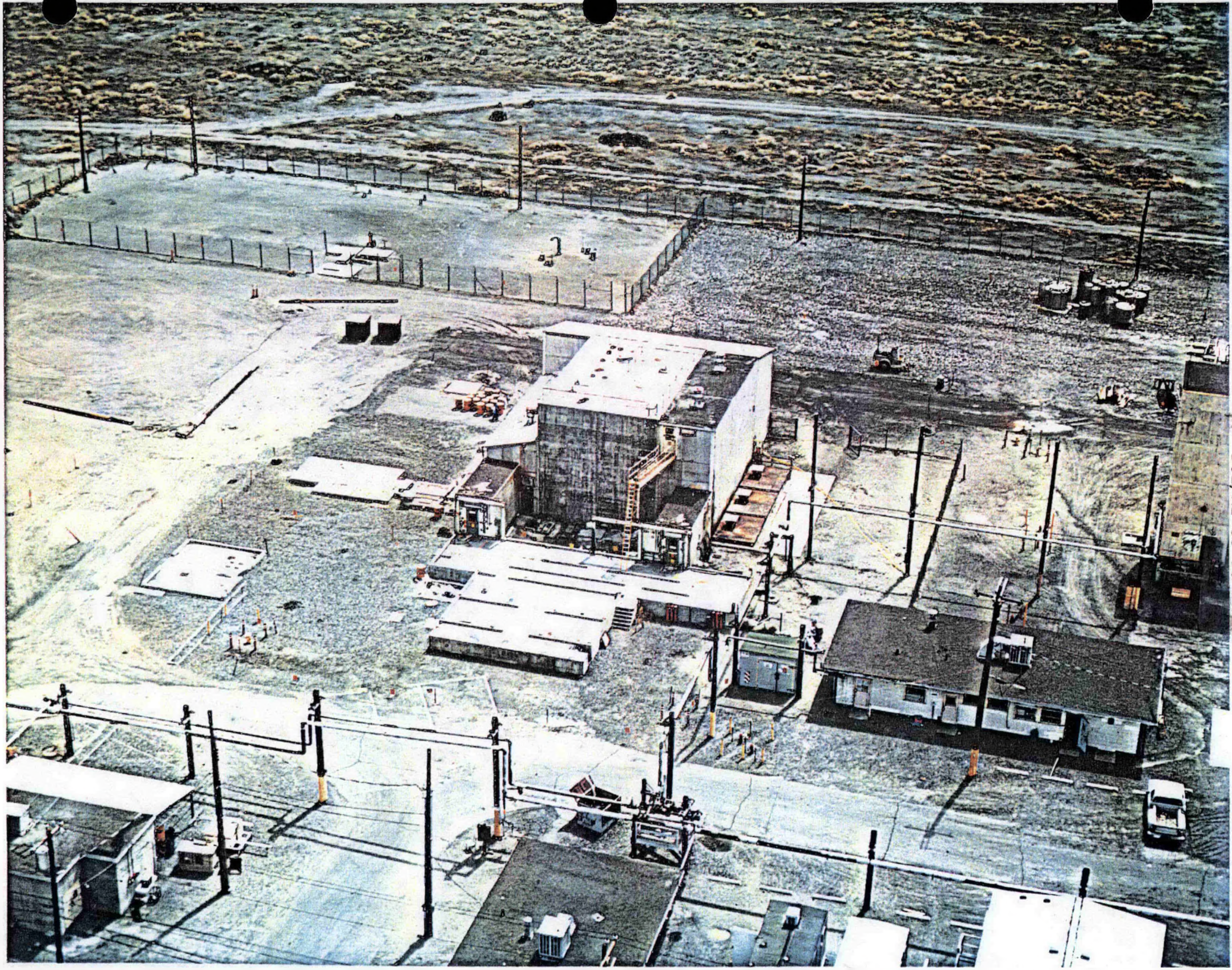
201-C SECTION VIEW AFTER BARRIER PLACEMENT



Slide 41

Slide 42



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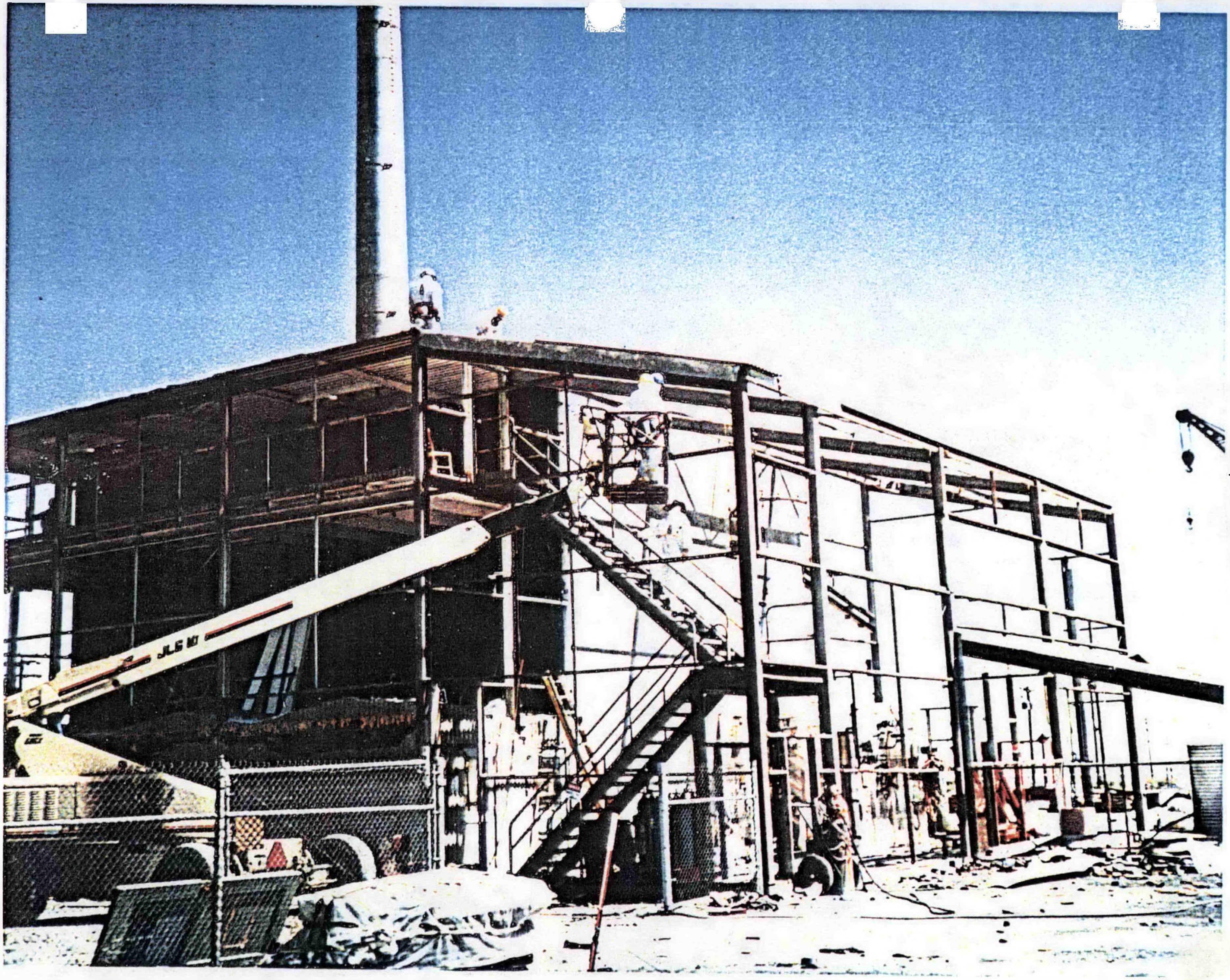
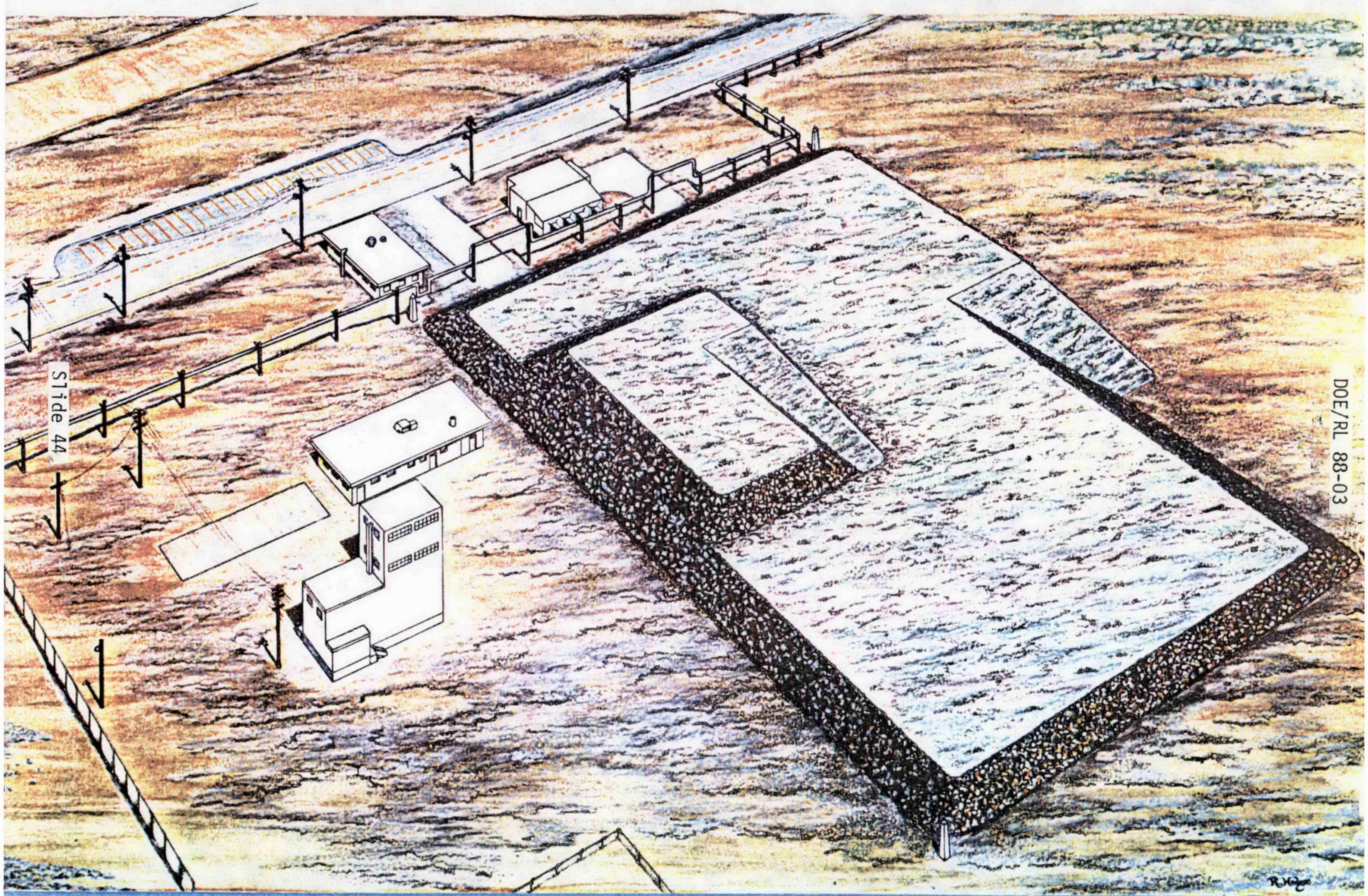


Slide 43

SEMIWORKS BARRIER



HANFORD 201-C COMPLEX - Shown is artist's conception of the complex after decommissioning.

HANDOUT

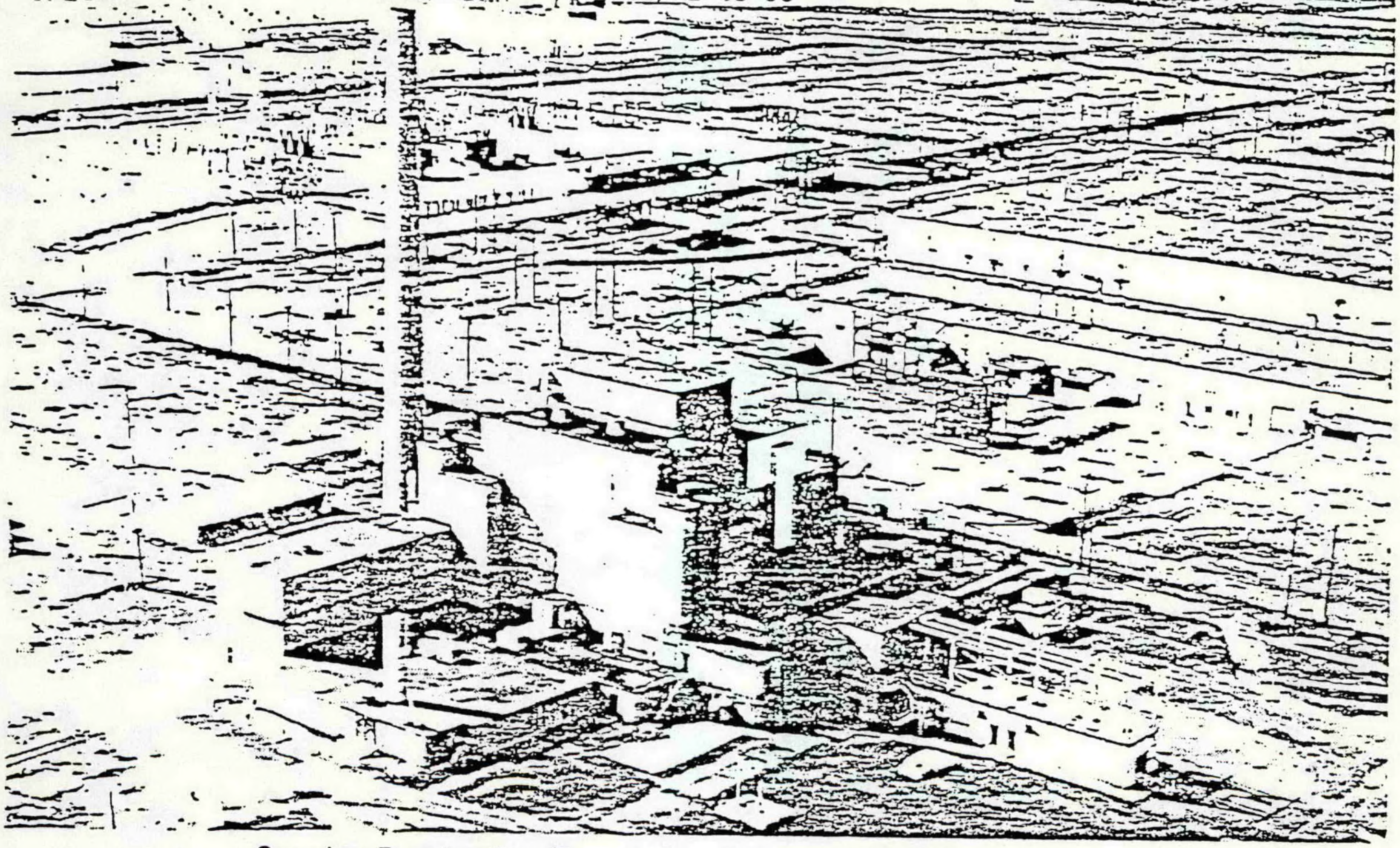
DOE/RL 88-03

U.S. DEPARTMENT OF ENERGY

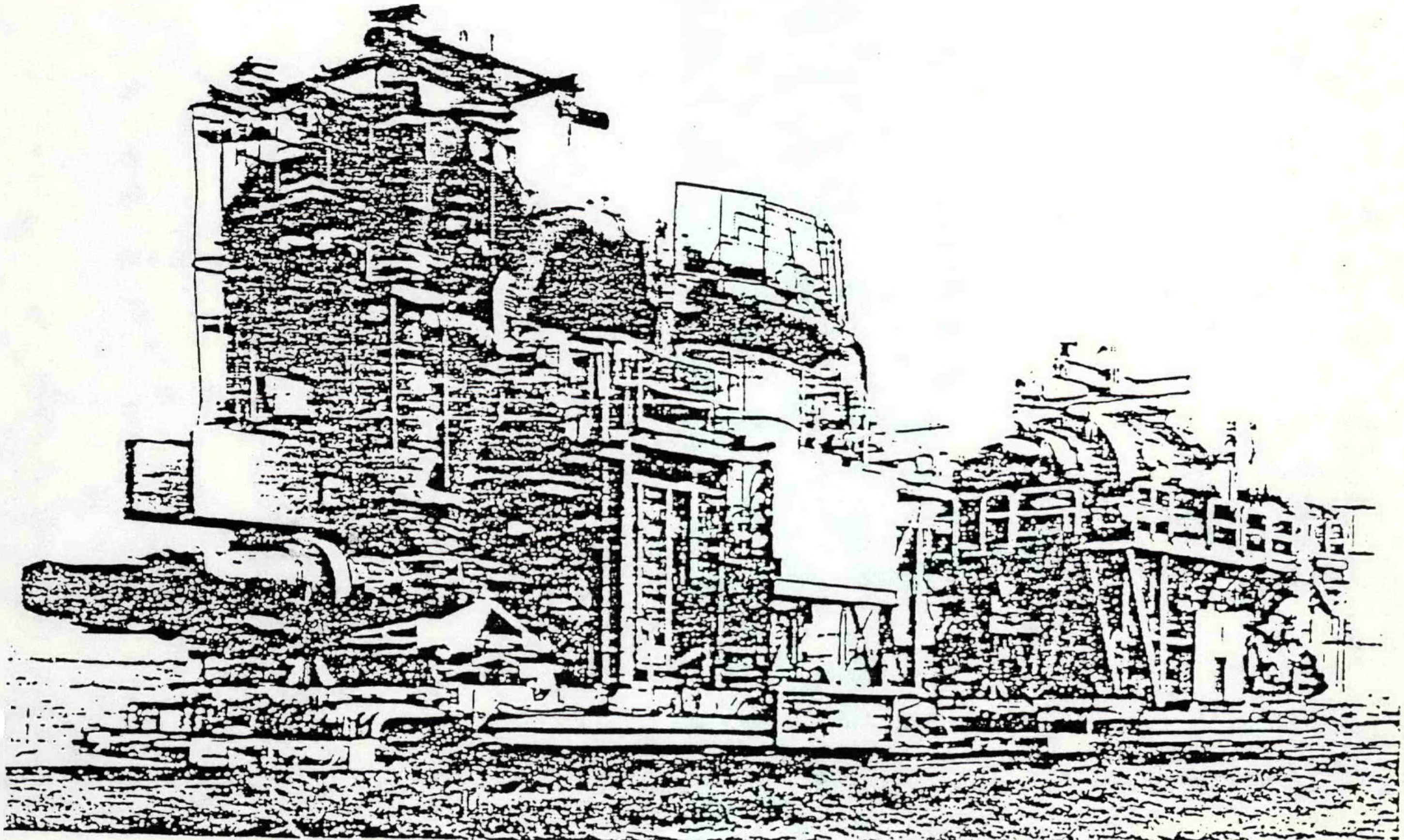
DEFENSE DECONTAMINATION AND DECOMMISSIONING (D&D) PROGRAM

WILLIAM F. HEINE

WESTINGHOUSE HANFORD COMPANY



Surplus Production Reactor and Support Buildings, Hanford



Heat Transfer Reactor Experiment (HTRE) 2&3, INEL

SUMMARY

After its creation in 1978, the U.S. Department of Energy (DOE) established several national programs to provide for the control, maintenance and eventual decommissioning of hundreds of shutdown, radioactively contaminated facilities that were part of government defense and energy development projects. DOE-owned facilities declared surplus after use in national defense programs, and with no current program sponsor, become the responsibility of the Defense Decontamination and Decommissioning (D&D) Program.

There are presently 223 facilities in the program inventory. Included are shutdown nuclear reactors, chemical processing plants, waste treatment systems, laboratories, and support facilities. These surplus facilities are located at seven sites across the country:

Mound Site (Ohio)	-	6
New Brunswick Laboratory Site (New Jersey)	-	1
Grand Junction Projects Office Site (Colorado)	-	8
Idaho National Engineering Laboratory (Idaho)	-	39
Oak Ridge National Laboratory (Tennessee)	-	43
Hanford Site (Washington)	-	119
Knolls Atomic Power Laboratory - Knolls Site (New York)	-	7

Many of the facilities in the Defense D&D Program contain significant quantities of both natural and man-made radioactive materials. Some of these facilities were constructed in the 1940's and have been shutdown for over 20 years. To assure control of contamination until D&D is completed, it is necessary to continue routine surveillance and maintenance of the aging structures, repairing such items as roofs, doorways, and ventilation systems.

Because the costs of surveillance and maintenance are high, and are increasing as the shutdown facilities continue to deteriorate, the Defense D&D Program is seeking long-term solutions to radiation control problems that are both practical and of minimum cost. Possible solutions range from decontaminating the facilities to allow reuse by other government programs, to complete dismantlement of all structures and restoration of the site for unrestricted use.

A major Department of Energy policy is that program activities be conducted according to applicable environmental protection regulations. Therefore, guidelines have been developed to ensure compliance of all project activities with the National Environmental Policy Act (NEPA); the Resource Conservation and Recovery Act (RCRA); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and the Superfund Amendments and Reauthorization Act (SARA).

Contractor operations at each site are supervised by the responsible DOE operations office. The operations offices prioritize, plan, and supervise the work of their contractors, and are accountable for meeting and complying with federal/local environmental regulations, program objectives, and the policies established by DOE Headquarters. Overall program administration is the function of the DOE-Richland Surplus Facilities Management Program Office.

Not only is decommissioning of retired nuclear facilities underway in the U.S. under DOE D&D programs, it is also being performed in several other countries. In order to benefit from the experience and technology developments of other D&D projects, the Defense D&D Program participates in technology exchange activities as part of DOE cooperative agreements with other U.S. government agencies and many foreign countries.

The duration of the Defense D&D program is expected to be approximately 30 years with an estimated total cost of close to $700 million.

PROGRAM OBJECTIVES

The long-range objectives of the Defense D&D Program are:

* Complete decommissioning activities of all surplus contaminated facilities accepted into the Defense D&D Program inventory, in accordance with applicable codes and standards.

* Maintain surplus facilities awaiting decommissioning in a safe, secure condition, eliminating potential hazards to the public and the environment.

* Reduce costs of maintenance, surveillance and decommissioning.

* Identify and make available for reuse valuable materials, equipment, facilities and property designated as surplus.

* Conduct planning and research and development in support of the Defense D&D Program.

* Provide a decommissioning information center and a facility record/archive center and disseminate decommissioning technology.

LOCATIONS OF DOE RADIOACTIVELY CONTAMINATED DEFENSE SURPLUS FACILITIES

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