WIPP CONSTRUCTION METHODS AND PROGRESS

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ABSTRACT

The Department of Energy is constructing the Waste Isolation Pilot Plant (WIPP) in southeast New Mexico. The facility will retrievably store transuranic waste from defense activities of the United States and conduct experiments with Defense High Level Waste which will be retrieved at the end of the experiments. This paper describes the progress and the present status of construction on WIPP.

WIPP BACKGROUND

The Waste Isolation Pilot Plant (WIPP), as authorized by Public Law 96-164, is a defense activity of the Department of Energy for the express purpose of providing a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States, exempted from regulation by the Nuclear Regulatory Commission. The WIPP Site is located in southeastern New Mexico, about 25 miles east of Carlsbad, as shown on Fig. 1.

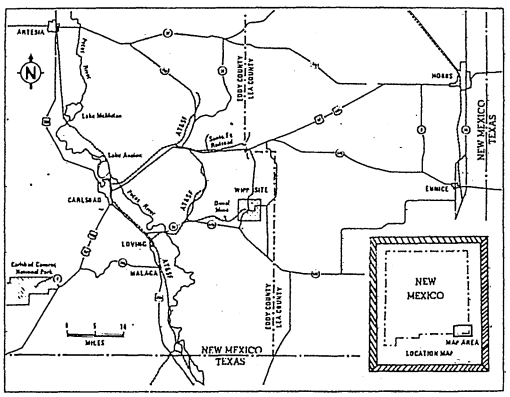

Fig. 1. WIPP Site Location.

The site is located in the midst of a very extensive bedded salt formation. The salt beds are approximately 3000 feet thick. The WIPP waste storage horizon is approximately in the center of these thick beds, at a depth of approximately 2150 feet below the surface.

CONSTRUCTION INITIATION

The site exploration and facility design progressed for several years and in April, 1979, the Draft Environmental Impact Statement,[1] was issued. After public hearings and receipt of written comments, the project responded to all comments, revised the Draft Environmental Impact Statement, and issued the Final Environmental Impact Statement.[2] After review, the Department of Energy issued a Record of Revision in January 1981, allowing the project to proceed. Then, after obtaining agreement with the Bureau of Land Management for use of the land, actual construction on site was initiated in April, 1981.

SPDV PHASE

The construction of the Waste Isolation Pilot Plant was planned in two phases. The first phase was termed the Site and Preliminary Design Validation (SPDV) Phase, and the second phase was termed Full Facility Construction. The SPDV Phase consisted of two shafts and necessary underground drifts and crosscuts to support in situ experimentation, an exploratory drift to the south, and a four room test panel to the north. This arrangement is shown in Fig. 2.

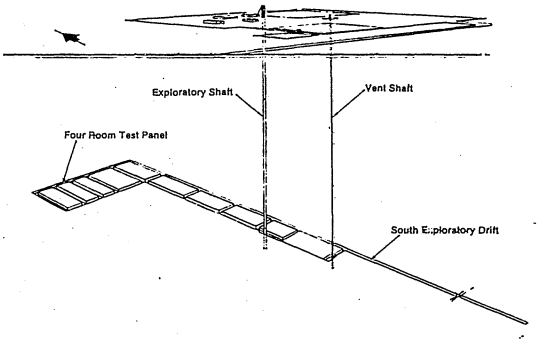

Fig. 2. Site and Preliminary Design Validation Arrangement.

The purpose of the SPDV program was twofold. First, it was to confirm that the subsurface geology was consistent with prior expectations based on the interpretation of surface investigations. Second, it was to provide for the initial in situ confirmations of the underground facility design, design criteria, and design bases which would permit the construction of the full facility on a safe, environmentally acceptable, timely, and cost effective basis.

Shaft Construction

The two shafts for the SPDV phase of WIPP were constructed using the down-hole shaft drilling (blind boring) technique. The first shaft, called the exploratory shaft, was drilled to a diameter of approximately 12 feet. The second shaft, called the ventilation shaft, was drilled to a diameter of approximately 6 feet.

Prior to drilling, a surface casing was installed to retain loose surface soils. Then an auger was

used to drill to a depth of about 100 feet, and a second casing was installed and grouted in place. This second casing was carefully aligned to vertical, and acted as a starter bore for the drill bit. The drill rig and drill bit were then assembled over the casing for the start of drilling as shown in Fig. 3.

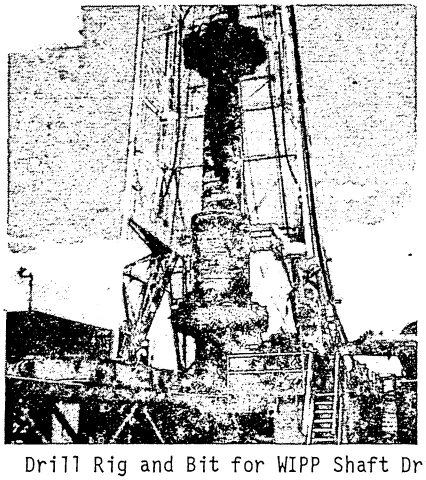

Fig. 3. Drill Rig and Bit for WIPP Shaft Drilling.

A drilling fluid pond was also constructed. For drilling, drilling fluid is circulated from the pond down the drill string and through the drill bit to remove the cuttings. It is then returned back up the drill string to the drilling fluid pond. In the drilling fluid pond, the cuttings settle out and the drilling fluid is reused. While drilling, drilling fluid is maintained in the shaft at a height of about 400 feet above the drill bit, with the remainder of the shaft remaining dry. The shafts were drilled to the facility storage horizon depth, nominally 2150 feet.

After the 12 foot diameter shaft was drilled, a 10 foot diameter steel liner was installed from the surface to the top of the bedded salt formation, a distance of about 850 feet. To install the liner, the shaft was filled with water, the bottom of the liner was sealed with a concrete plug, and the liner was floated into place, using the buoyancy of the water to limit the weight of liner that had to be carried by the drill rig. Liner sections were shipped to the site in 20 foot lengths, welded into 40 foot lengths, and as each 40 foot length was lowered into the shaft, an additional 40 foot length would be positioned above it over the shaft, and welded to the previously lowered sections. After the liner was in place, it was grouted in place to the full 850 foot depth.

The six foot diameter ventilation shaft is used only for ventilation. Therefore it did not require any lining. In a couple of small localized areas of the shaft where loose material was noted, liner plate was installed. The shaft walls of both shafts through the bedded salt were very sound, and no liner was required in that formation for either shaft.

Shaft Outfitting and Underground Development

After the shafts were completed, the shaft station was constructed at the base of the exploratory shaft and a small drift was mined over to the ventilation shaft to provide for flow through ventilation. This initial underground development was performed by drilling and blasting.

The exploratory shaft was outfitted with fixed guides, a salt storage bin was constructed at the base of the shaft, a head frame and hoist was installed over the shaft on the surface, and the salt skip was installed to permit efficient hoisting of salt from the underground to the surface.

A continuous mining machine and haulage *units* were lowered underground and assembled in the shaft station. The continuous mining machine was then used to complete the remainder of the underground development. Figure 4 shows the continuous miner in action.

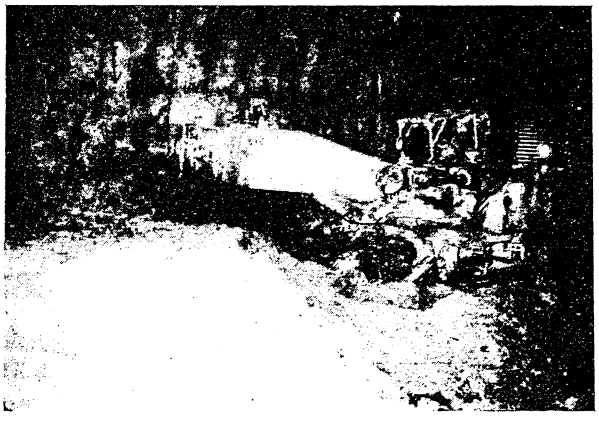

Fig. 4. Continuous Miner at WIPP.

The mining proceeded with development of the access drifts and crosscuts, mining of the south exploratory drift, and then mining of the four room test panel.

SPDV Completion

During SPDV, a large amount of investigation was conducted. Shafts and drifts were visually observed and mapped. Instrumentation was installed in shafts, drifts, crosscuts, and test rooms and data collected. Based on the data collected and its review by project participants, DOE published the Summary of the Results of the Evaluation of the SPDV Program.[3] That report was reviewed by the State of New Mexico and the public and public hearings were held. DOE reviewed and responded to all comments received. DOE then decided, in July of 1983, to proceed with Full Facility Construction.

FULL FACILITY CONSTRUCTION

The major effort at the start of full facility construction involves construction of the Waste Shaft, the Exhaust Shaft, and the non-radioactive Experimental Areas. That work is presently in progress at the site.

The Waste Shaft is being constructed by enlarging the existing six foot diameter ventilation shaft to 21 foot diameter and lining it with concrete from the surface to the top of the salt bed. This shaft is being constructed by drilling and blasting, using controlled blasting methods, *and allowing* the muck to fall to the bottom through the existing six foot diameter shaft. It is then moved to the existing outfitted shaft where it is hoisted to the surface and hauled to the salt storage pile.

The Exhaust Shaft is an entirely new shaft. This shaft is being constructed by drilling a pilot hole from the surface to the facility depth. Then, using the pilot hole, the shaft has been upreamed to a 6

foot diameter. Then, in the same manner as the waste shaft, the Exhaust Shaft will be drilled and blasted to a 15 foot diameter, and concrete lined to a 14 foot diameter from the surface to the top of the salt formation.

In conjunction with shaft sinking, the contractor will mine out the experimental areas except for five rooms which will be used for experiment with Defense High Level Waste and which will be mined later. The experimental areas will be used for a variety of geotechnial and simulated waste experiments and demonstrations. None of the experiments will use actual radioactive materials, however.

The underground layout for full WIPP is shown in Fig. 5. That figure shows the shafts and experimental areas and also the waste storage area. The waste storage area will be mined on an as needed basis during the operation of the facility. Prior to receipt of any waste, the first storage panel will be mined. Then, while waste is being stored in the first panel, the second storage panel will be mined. That will continue as storage panels are required.

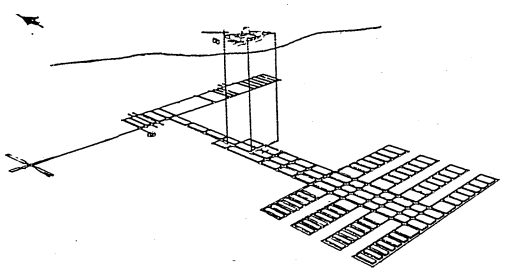

Fig. 5. Underground Layout of Full WIPP.

In addition to the shafts and underground development significant surface activities are in progress or completed. The arrangement of the surface facilities is shown on Fig. 6. The Warehouse and Shops Building has been completed and is presently being used for temporary office space and a visitors center. The water storage tanks, switchyard, and service building have also been complete.

Work is also in progress on 8 miles of railroad to bring rail service to the site, and a new access road to the north. A water pipeline is also being constructed from the north for a distance of 31 miles to provide a permanent water source.

Remaining Construction

The remaining major construction effort to be initiated is the Waste Handling Building and Support Building. The Waste Handling Building contains all the facilities for receipt, inspection, and handling of the radioactive waste including the waste hoist for transfer of the waste to the underground. One side of the building is used for handling waste with low surface dose rates (contact handled waste) and the other side is used for handling waste with high surface dose rates in a hot cell (Remote Handled Waste) The Support Building houses the major administrative and support facilities for the site such as engineering, administration, central monitoring facilities, computers, and personnel change and locker facilities. A single construction contract for the Waste Handling Building and Support Building is expected to be awarded in March, 1984.

The other major facility to be constructed is the Exhaust Filter Building. This facility has three large exhaust fans which provide ventilation for the underground. The air is normally exhausted directly from the underground to the environment, however, if radioactivity is detected in the air stream, the air is diverted through HEPA filters which are contained in the building to filter out the airborne radioactivity.

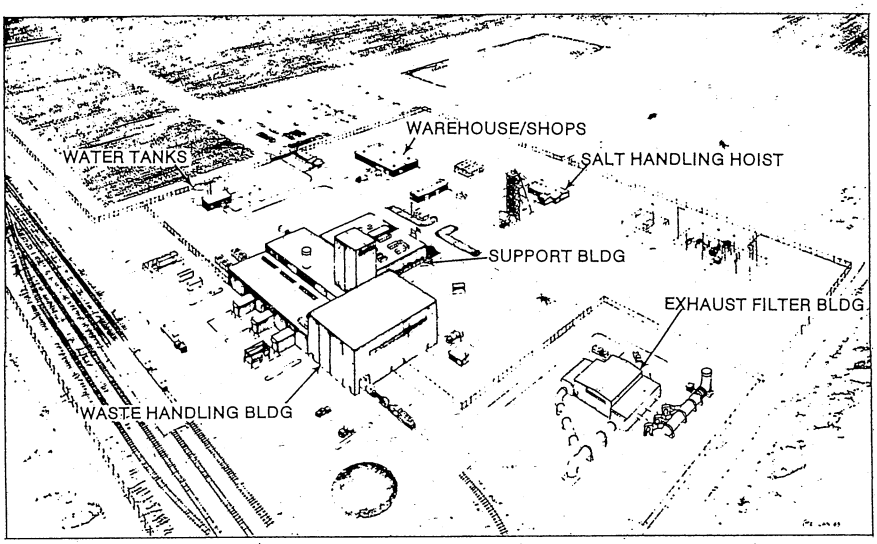

Fig. 6. WIPP Surface Facilities Arrangement.

Other remaining but less extensive construction will involve the permanent guardhouse and visitor center, the onsite water and power distribution system, and the Central Monitoring System.

CONCLUSION

Progress on WIPP to date has been excellent. Presently, WIPP construction is scheduled for completion in December 1986. This is approximately one year earlier than previously planned. After completion of construction, WIPP would complete a series of experiments, tests, checkouts, and demonstrations. The first actual radioactive waste is scheduled for receipt at WIPP in October, 1988.

REFERENCES

1. DOE/EIS-0026-D, Draft Environmental Impact Statement, Waste Isolation Pilot Plant, U.S. Department of Energy, April, 1979.

2. DOE/EIS-0026, Final Environmental Impact Statement, Waste Isolation Pilot Plant, U.S. Department of Energy, October 1980.

3. WIPP-DOE-161, Summary of the Results of the Evaluation of the WIPP Site and Preliminary Design Validation Program, U.S. Department of Energy, March, 1983.