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ENVIRONMENTAL ANALYSIS
COST REDUCTION PROPOSALS

waste Isola

ENVIRONMENTAL ANALYSIS
WASTE ISOLATION PILOT PLANT (WIPP)
COST REDUCTION PROPOSALS

JULY 1982

U.S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

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1.0 PROPOSED ACTION AND ALTERNATIVES

The Waste Isolation Pilot Plant (WIPP) is a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States Government. The facility is planned to be developed in bedded salt at the Los Medanos site in southeastern New Mexico (Figure 1-1). The environmental consequences of construction and operation of the WIPP facility are documented in "Final Environmental Impact Statement, Waste Isolation Pilot Plant" (DOE, 1980a).

The proposed action addressed by this environmental analysis is to simplify and reduce the scope of the WIPP facility as it is currently designed. The proposed changes to the existing WIPP design are listed below:

- Limit the waste storage rate to 500,000 cubic feet per year
- Eliminate one shaft and revise the underground ventilation system
- Eliminate the underground conveyor system
- Combine the Administration Building, the Underground Personnel Building and the Waste Handling Building office area
- Simplify the central monitoring system
- Simplify the security control systems
- Modify the Waste Handling Building
- Simplify the storage exhaust system
- Modify the above ground salt handling logistics
- Simplify the power system
- Reduce overall site features
- Simplify the Warehouse/Shops Building and eliminate the Vehicle Maintenance Building
- Allow resource recovery in Control Zone IV

1.1 Need for the Proposed Action

As of June 1979, the total construction cost for the WIPP was estimated to be $440.6 million. By December 1981, this estimated cost had escalated to $651.7 million. The principal reasons for this increase were attributed to schedule slippage and inflation.

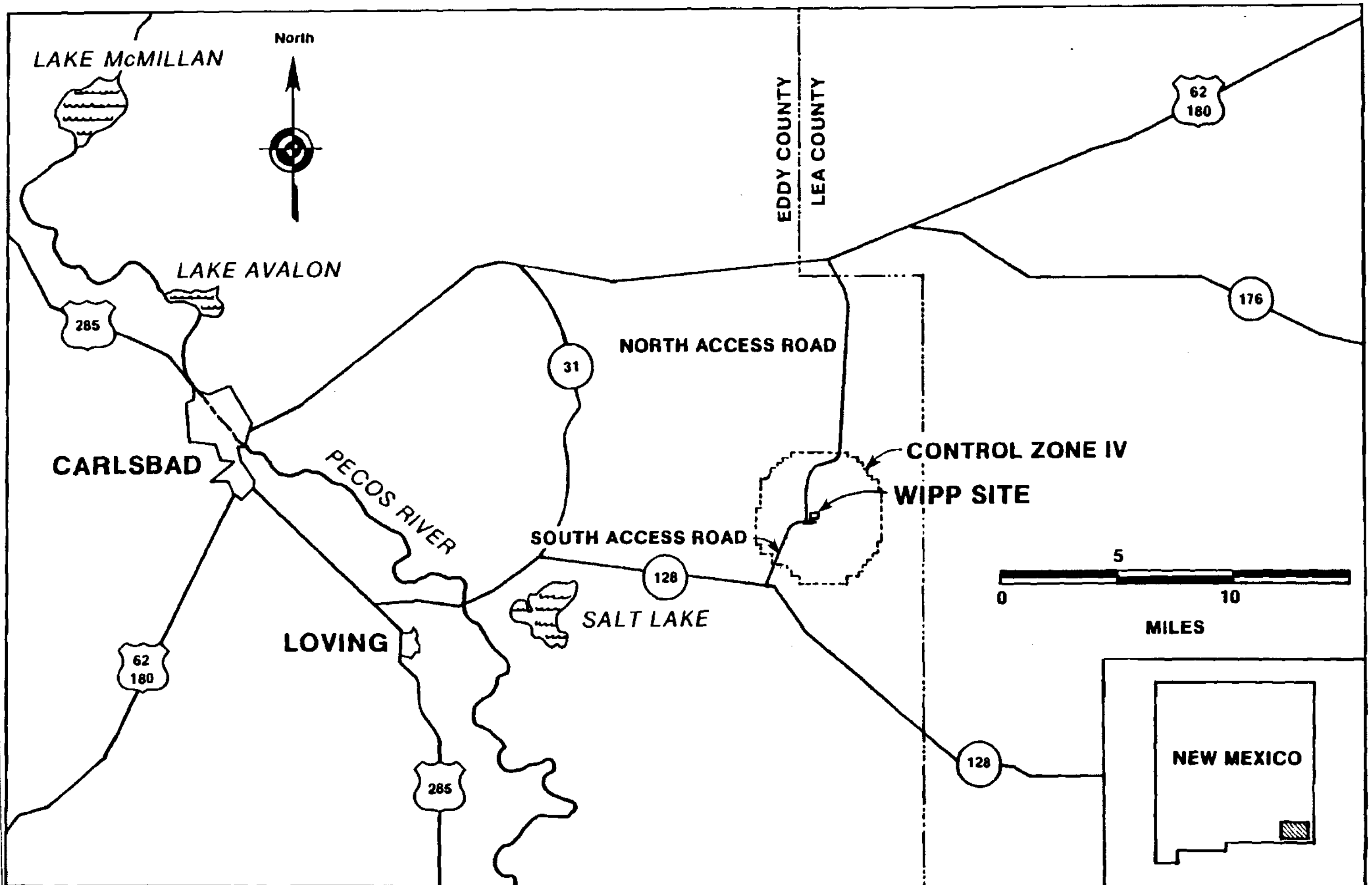

FIGURE 1-1: SITE LOCATION MAP

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The Energy System Acquisition Advisory Board evaluated WIPP costs in late 1981. Subsequently, the Assistant Secretary for Defense Programs directed the WIPP Project Office to conduct an aggressive cost reduction analysis and recommend cost reduction options. Implementation of these options is expected to reduce the construction and initial operations expenses by about $200 million. Additional savings will be realized during the operational lifetime of the facility.

1.2 Cost Reduction Objectives and Guidelines

In order to arrive at a reduced cost design, a set of objectives was formulated and certain guidelines were followed to achieve these objectives:

- Retain only those elements which are necessary to the mission of the facility.
- Reduce or eliminate facilities and processes wherever possible.
- Combine facilities, buildings and processes wherever possible.
- Implement changes in design, design criteria or operating concepts as required.

The guidelines followed to achieve these objectives are:

- The plant must be capable of meeting fully its stated mission [P.L. 96-164, Sec. 203(a)].
- Safety of the workforce and the public shall be maintained.
- There shall be no significant change in impact on the environment.

1.3 Description of the Proposed Action

Each of the cost reduction proposals under consideration is described in the following sections. These descriptions include a summary of the existing design or policy and explanation of how the existing plans will be modified to reduce project costs.

1.3.1 Reduce the Waste Storage Rate

1.3.1.1 Existing Design

Under the existing facility design, the WIPP will be capable of handling up to 1,200,000 cubic feet per year of CH waste. To achieve this capacity, the plant will run on three shifts per day with both mining and waste storage operations occurring on the same shift. The single shift designed throughput of the plant is 500,000 cubic feet per year.

1.3.1.2 Proposed Change

A detailed evaluation of the amount of waste to be processed by WIPP appears in the draft Long Range Master Plan for Defense Transuranic (TRU) Waste Management (DOE, 1982a). This report presents low and high bounding values for the amount of contact handled (CH) waste to be transported to WIPP. For the high bounding values, the amount of CH waste to be processed per year after full WIPP storage operations are reached (1992) is as follows:

Newly generated CH waste	3900 m^3/yr
Stored/precertified CH waste	2700 m^3/yr
Stored/not precertified CH waste	4200 m^3/yr
Total	10,800 m^3/yr

This corresponds to 381,000 cubic feet per year. A proposed waste storage capacity of 500,000 cubic feet per year for the cost reduced design would therefore be adequate.

This reduced storage rate would permit other cost reduction design changes. Split shift operation with its attendant reduction in the number of shafts and simplification of the underground system would become possible because mining and storage operations need not occur during the same shift. This would also reduce the required workforce so that surface facility areas could be reduced. Cost reduction changes that could reduce the storage rate (such as the simplification of the power system) would become possible because the desired storage rate could still be met. The proposed reduction in annual storage capacity is therefore a key change because it makes many other changes feasible.

1.3.2 Eliminate One Shaft

1.3.2.1 Existing Design

The existing design provides for four shafts from the surface to the underground horizon. Two of the four shafts have already been drilled as part of the Site and Preliminary Design Validation (SPDV) program. One of these shafts is the 12-foot-diameter SPDV Exploratory Shaft drilled to a depth of approximately 2304 feet. It provides primary access to the underground exploratory area. It is lined with a 10-foot-diameter steel casing to a depth of about 850 feet and the remaining length, that portion in the Salado salt, is unlined. The 12-foot shaft is equipped with a headframe and hoist to haul personnel, equipment, materials, and excavated salt. A six-foot-diameter ventilation shaft, extending to a depth of 2194 feet, is located about 400 feet south of the Exploratory Shaft. This shaft is equipped with a temporary hoist and is unlined throughout its depth except for wire mesh and rock bolts which are installed at locations where loose ground conditions exist.

The four shafts planned for the existing design are:

- Storage Exhaust (SE) Shaft
- Waste Shaft
- Construction Exhaust and Salt Handling (CE&SH) Shaft
- Ventilation Supply and Service (VS&S) Shaft

These shafts will be developed as follows:

- The SPDV Exploratory Shaft will be used for the waste area Storage Exhaust Shaft.
- The SPDV Ventilation Shaft will be enlarged to form the Waste Shaft.
- The Construction Exhaust and Salt Handling and the Ventilation Supply and Service shafts will be new and sunk conventionally.

Surface buildings in the vicinity of the shafts will be used to support the shaft functions. The Storage Exhaust Filter Building will be located at the Storage Exhaust Shaft. The Waste Handling Building will be built around the Waste Shaft. The Underground Personnel Building will be erected near the Ventilation Supply and Service Shaft. The Salt Handling Hoist Building will be erected at the Construction Exhaust and Salt Handling Shaft.

The underground areas will be on one mined level laid out in a conventional "room and pillar" arrangement (Figure 1-2). They will include areas for contact handled (CH) and remotely handled (RH) transuranic (TRU) wastes and separate areas for research and experiments on simulated waste, TRU waste, and defense high level waste (HLW), as well as areas for geotechnical and rock mechanics research and development activities.

The Waste Shaft, which will be constructed by enlarging the SPDV Ventilation Shaft, will be about 19 feet in diameter and will be used to transfer CH and RH TRU waste from the Waste Handling Building to the underground storage areas. The Waste Shaft hoist cage will accommodate the RH waste facility casks and the CH waste containers to be handled at the plant.

The Ventilation Supply and Service Shaft will be used to move personnel, materials, and equipment between the surface and underground areas. In addition, the shaft will supply fresh air for the underground ventilation system. Underground workshops, warehouses, offices, decontamination areas, and sanitary facilities will be located near this shaft.

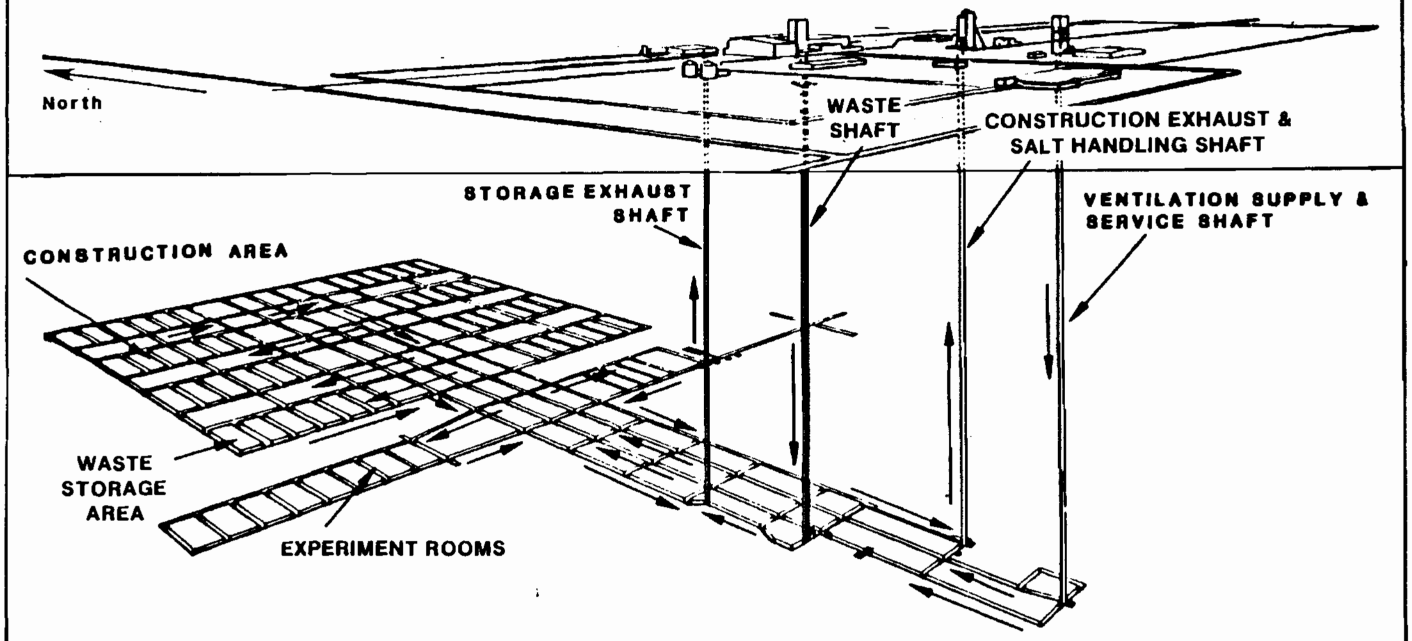

FIGURE 1-2: UNDERGROUND DESIGN AND VENTILATION ARRANGEMENT

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The Construction Exhaust and Salt Handling Shaft will be used to bring mined rock to the surface and to exhaust air from the mining operations area. The Storage Exhaust Shaft will exhaust air from the underground storage areas to the Storage Exhaust Filtration Building.

The air supply for the underground areas will enter through the Ventilation Supply and Service Shaft and then divide into two separate air streams: one that supports the construction (mining) activities, where there is no possibility for the release of radioactivity from waste, and one that supports the waste storage operations, where there is a potential for the release of radioactivity. The air that flows down the Waste Shaft will flow immediately back up through the Storage Exhaust Shaft so that potential Waste Shaft contaminants will be exhausted to the Storage Exhaust Filter Building without passing through the other underground areas.

The separated air streams will allow waste storage and construction activities to proceed simultaneously. Bulkheads will maintain the independence of the two air streams. Pressure differences across the bulkheads will be provided to ensure that all leakage through them will flow from the construction area to the storage area, eliminating the possibility of contamination of the construction area.

The construction air stream will ventilate the construction areas, the experimental areas that do not contain radioactive waste and the underground shops and warehouses. This air stream will be exhausted through the Construction Exhaust and Salt Handling Shaft to the atmosphere.

The waste storage area air stream will ventilate the waste storage and experimental areas that will contain radioactive materials. This stream will exhaust through the Storage Exhaust Shaft to the Storage Exhaust Filter Building.

Should radiation monitors detect airborne radioactivity above maximum permissible concentrations, the number of fans in operation will be reduced and the high efficiency particulate air (HEPA) filter bypass valves will close, directing the exhaust air through the HEPA filtration units. The air flow will drop to about one half normal flow. The shaft and underground air flow directions will not change, but all the storage exhaust air will be diverted through the HEPA filters.

In the event of a fire emergency, the direction of the air flow through the construction area can be reversed. During an air flow reversal, the Ventilation Supply and Service Shaft will exhaust air from the construction operations area and the Construction Exhaust and Salt Handling Shaft will become the main intake. The air flow in the construction side will be reduced by 50 percent.

A diagram showing ventilation air flow in the underground area in the vicinity of the shafts appears in Figure 1-3. Entry to the underground construction, storage and experimental areas from the shaft area will be made via four entry drifts. One entry pair will provide access to the waste storage area and the other pair will provide access to the construction area. For each entry pair, air will enter via one drift and exhaust via the other. Air entering the underground at the bottom of the Ventilation Supply and Service Shaft will split into two paths and enter the underground storage and construction areas at entryways two and three.

Just after the air splits, air directed toward the construction entryway will pass through an underground booster fan. This will increase the air pressure in the construction area so that any underground air leakage will flow from the construction area to the waste area. Air exhausted through the two separate exhaust entryways, one and four, will remain in separate paths and exhaust through the two separate exhaust shafts.

1.3.2.2 <u>Proposed Change</u>

The cost reduction design provides for three shafts from the surface to the underground horizon. These shafts would be located in the same general vicinity as the existing design shafts. Two of the three shafts would be the existing SPDV shafts while the third shaft would be located farther east.

The shaft that would be eliminated in the cost reduction design is the Ventilation Supply and Service Shaft. The SPDV Exploratory Shaft would be retained for ventilation supply, salt handling and service for full WIPP operations. The SPDV Ventilation Shaft, as in the existing design, would be enlarged and used as the Waste Shaft. The third shaft would be used as a common exhaust for all underground areas.

The three shafts planned for the cost reduction design are:

- Construction and Salt Handling (C&SH) Shaft
- Waste Shaft
- Exhaust Shaft

These shafts would be developed as follows:

- The SPDV Exploratory Shaft would be used as the Construction and Salt Handling Shaft.
- The SPDV Ventilation Shaft would be enlarged to form the Waste Shaft.

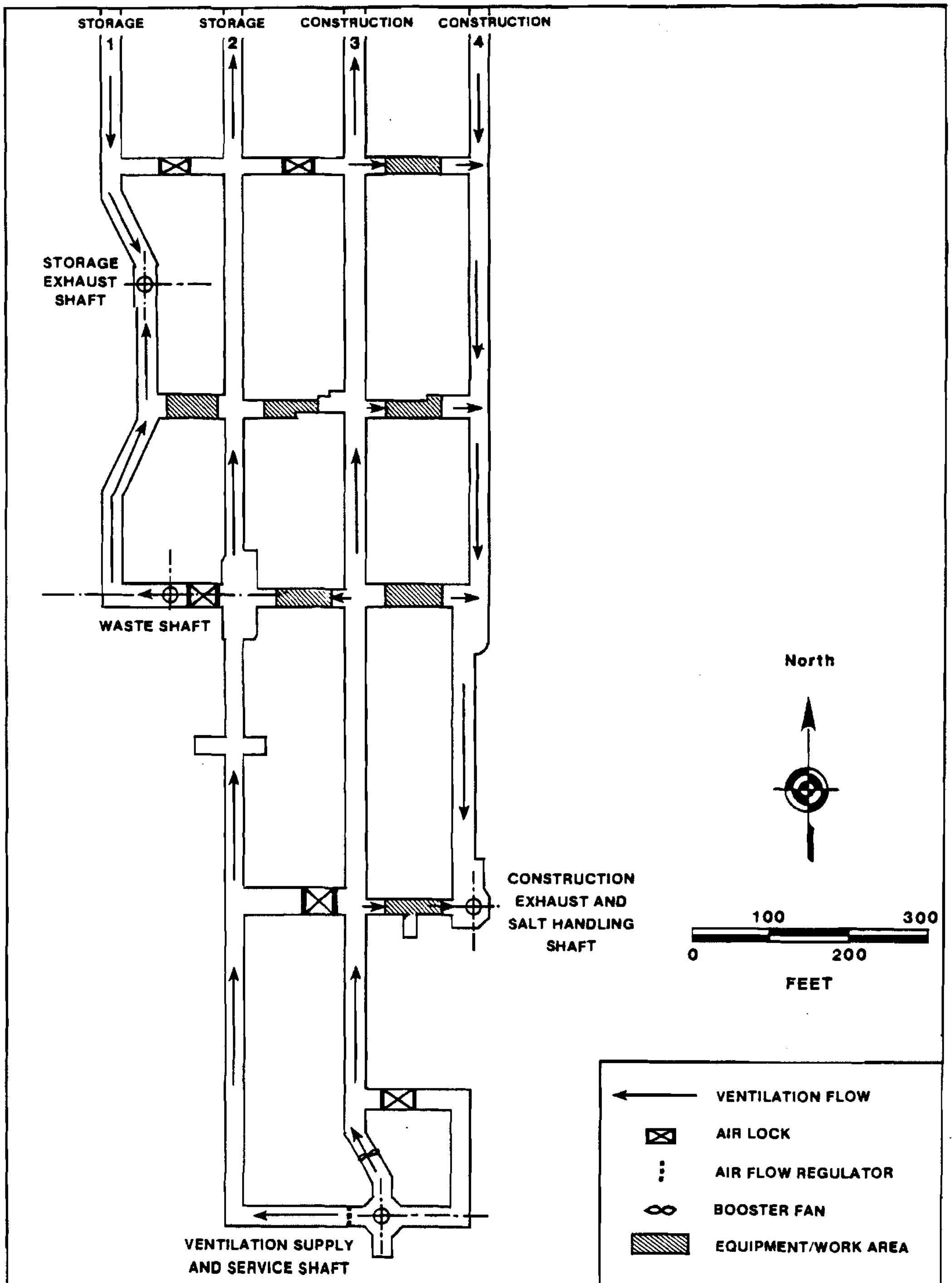

FIGURE 1-3: VENTILATION AIR FLOW, SHAFT VICINITY

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- The Exhaust Shaft would be a new shaft.

Surface buildings in the vicinity of the shafts would be used to support the shaft and underground functions. The Exhaust Filter Building would be located at the Exhaust Shaft. The Waste Handling Building would be built around the Waste Shaft.

The underground areas would be similar to those planned for the existing design except for some minor changes to accommodate the new shaft arrangement and to reduce costs. These changes are:

- A reduction in cross-section of three of the four entryways.
- A reduction in the size of bulkheads.
- A reduction in the size of underground shops and warehouses.

The experimental test area would be used for waste storage once the experiments are completed and before final decommissioning of the facility. The experimental areas would be reversed in the east-west direction as shown in the composite view of the revised shaft and ventilation system arrangement (Figure 1-4).

The Waste Shaft, constructed by enlarging the SPDV Ventilation Shaft, would be about 19 feet in diameter and would be used to transfer CH and RH TRU waste from the Waste Handling Building to the underground storage areas. The Waste Shaft hoist cage would accommodate the RH waste facility casks and the CH waste containers to be handled at the plant. It would also be used to transport underground waste handling personnel and construction materials and equipment underground.

The Construction and Salt Handling Shaft would be used to move underground construction personnel, materials and equipment between the surface and underground areas. It would also be used to bring mined rock to the surface. In addition, the shaft would supply fresh air for the underground ventilation system. Underground workshops, warehouses, offices, and sanitary facilities would be located in the shaft pillar area.

The ventilation air flow in the vicinity of the shafts is shown in Figure 1-5. The Exhaust Shaft would exhaust the combined flows from the mining area and the waste storage area and carry it to the Exhaust Filter Building. In the underground area, the main intake flow will be split into two separate flows; one would support construction activities and the other would support storage activities. Construction activities and waste storage activities would be conducted on different work shifts.

The principal underground air flow after the main split would be through either the construction area or the waste storage area

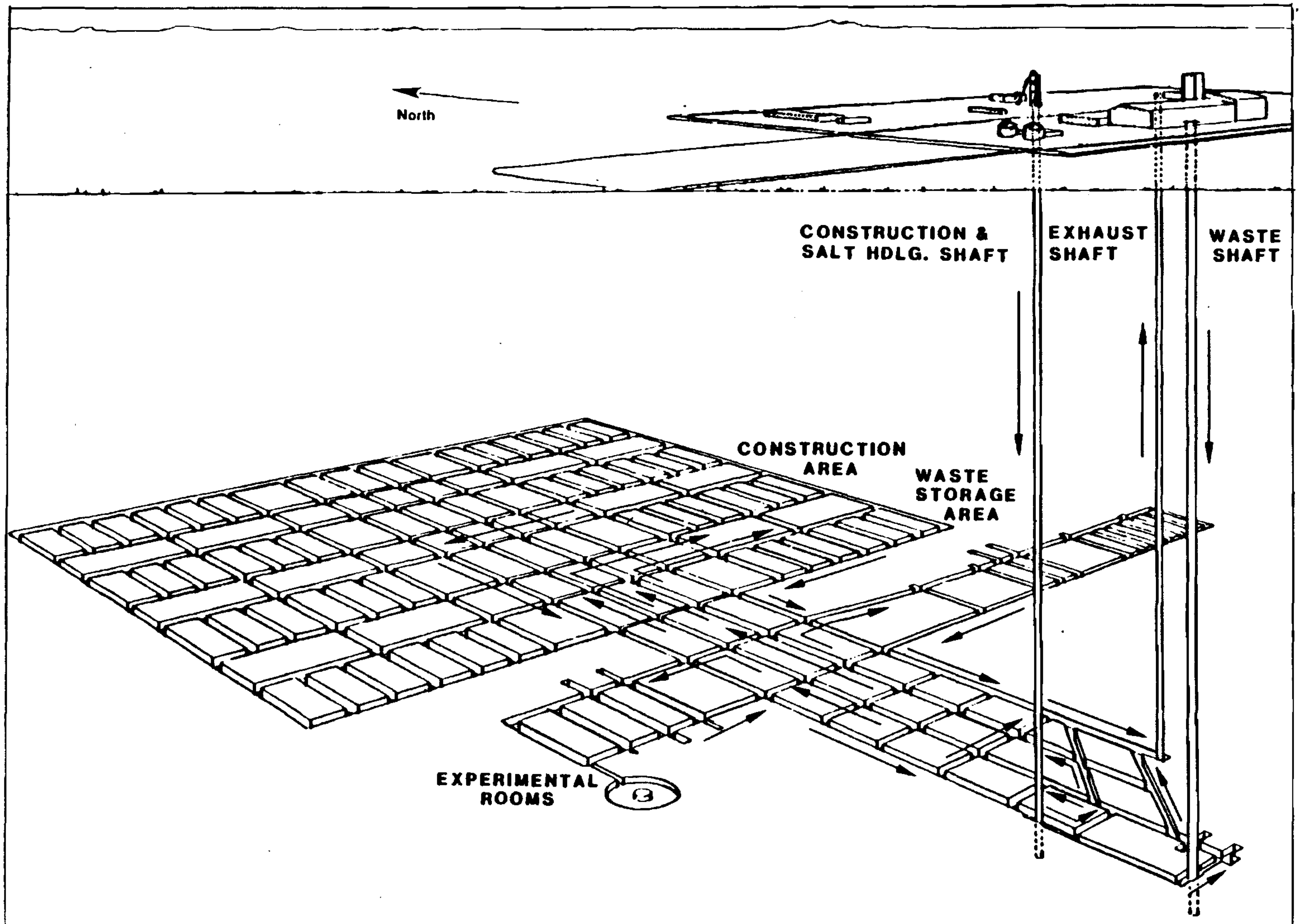

FIGURE 1-4: REVISED UNDERGROUND DESIGN AND VENTILATION ARRANGEMENT

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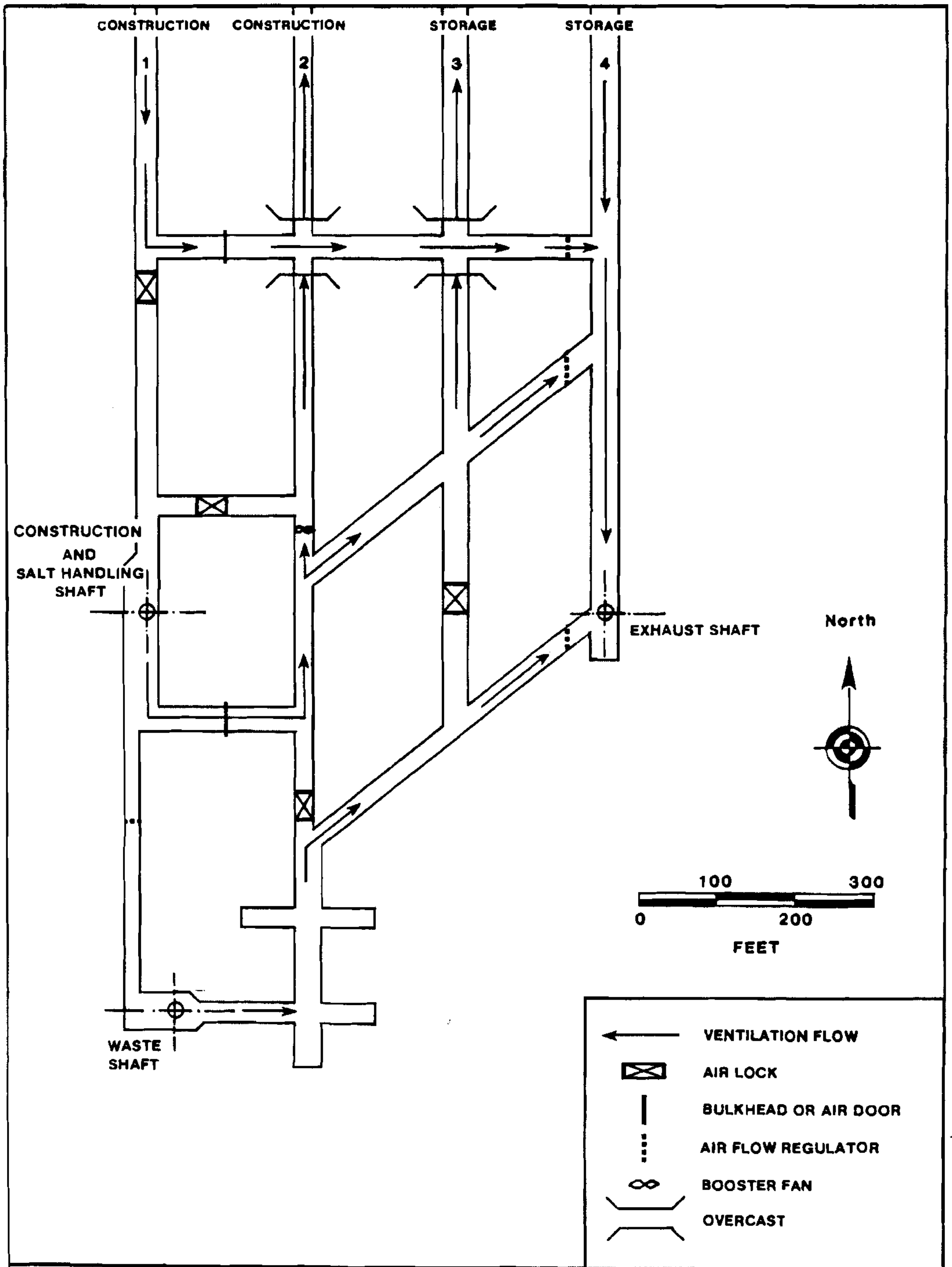

FIGURE 1-5: REVISED VENTILATION AIR FLOW, SHAFT VICINITY

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depending on the shift being worked. The flow path would be established by appropriate positioning of air doors in the vicinity of the entries at shift change time. A minimum flow of air would be maintained in the off-shift area to support maintenance and to ensure that the leakage flow would be directed towards the storage side.

The ventilation system separation would commence near the Construction and Salt Handling Shaft and would be maintained throughout the air distribution systems up to the common exhaust shaft. This system independence would minimize congestion and limit the number of people exposed to any accident-induced environment.

The waste storage ventilation system would be designed so that personnel would not be downstream from stored radioactive material during the performance of their normal duties. The air that flows down the Waste Shaft would be exhausted to the Exhaust Filter Building without passing through other underground areas.

The Construction Shaft inlet air stream would also ventilate the non-waste experiments, underground workshops, warehouses and offices and exit the underground via the Exhaust Shaft. The waste storage area air stream would ventilate the waste storage and experimental waste areas and exhaust through the Exhaust Shaft to the Exhaust Filter Building.

Should radiation monitors detect airborne radioactivity above maximum permissible concentrations, the number of fans in operation would be reduced and the diversion valves would close, directing the exhaust air through the HEPA filtration units. In the event of a fire emergency in the construction area, the direction of the air flow through the construction area could be reversed. During reversal, the flow path would change so that the Waste Shaft would become the main intake shaft and air would exhaust through the Construction and Salt Handling Shaft. The Exhaust Shaft would continue to exhaust air and the construction side air flow would drop to one half of the normal flow.

1.3.3 Eliminate the Underground Conveyor System

1.3.3.1 Existing Design

The underground conveyor system will move the salt from the vicinity of the mine face to the vicinity of the Construction and Salt Handling Shaft. Salt will be excavated from the mine face by an electrically powered continuous miner. The mined salt will be conveyed to the rear of the continuous miner where it will be transferred into the loading bucket of a diesel powered load haul dump (LHD) vehicle.

The LHD will haul the mined salt to the electrically powered crushing and belt feeding plant which may be up to 400 feet away from the mine face. The crusher plant will consist of two mobile units, a dump bin with scalper and a crusher. The two units will be connected by portable conveyors on wheels which will direct material flow between the units and a backfill bin. Mined salt will be dumped into a bin and conveyed to the scalper which will sort the mined rock by size. Undersized rock will be conveyed to the backfill bin where it will be stacked for backfilling. Only about ten percent of the mined salt will be used for backfill. Oversized rock will be fed to the crusher which will reduce its size and discharge it to the conveyor system.

The conveyor will be a high capacity continuous flow material handling system. It will consist of four separate conveyor belts. The first conveyor will be a gathering belt running north-south in a storage room. Its maximum length will be that of one storage room, 300 feet. The gathering conveyor will transfer rock to the panel conveyor which will run in an east-west direction carrying rock from the panel to the main north-south conveyor. It will be up to 1200 feet long. There will be two main conveyors, one about 2000 feet long and one about 1800 feet long. The conveyor system will be electrically driven and equipped with numerous safety features such as pull cord stops and automatic shut-downs.

The conveyor system will empty the salt into a 600-ton capacity surge pocket located near the shaft station. A feeder conveyor will transport rock to the skip measuring and loading hoppers for hoisting to the surface.

1.3.3.2 Proposed Change

Under the cost reduction design, the conveyor system would be replaced by rubber-tired diesel powered trucks. The continuous miner and LHD would be used as in the existing design. The LHD would haul the mined salt rock to the truck. The truck would transport the salt to a bin located at the shaft. A single drum, lower capacity hoist would be used instead of a double drum hoist. A portion of the salt would be stockpiled underground as backfill for the stored waste. The salt from the backfill pile would be processed by a crushing plant prior to backfilling. The distance travelled by the loaded LHD would vary with operating conditions.

1.3.4 Combine the Administration Building, the Underground Personnel Building and the Waste Handling Building Office Area

1.3.4.1 Existing Design

The existing site design includes the buildings and facilities shown in Figure 1-6. The Waste Handling Building will be about 230 feet wide, 575 feet long and 50 feet high (except for a 125-foot-high bay

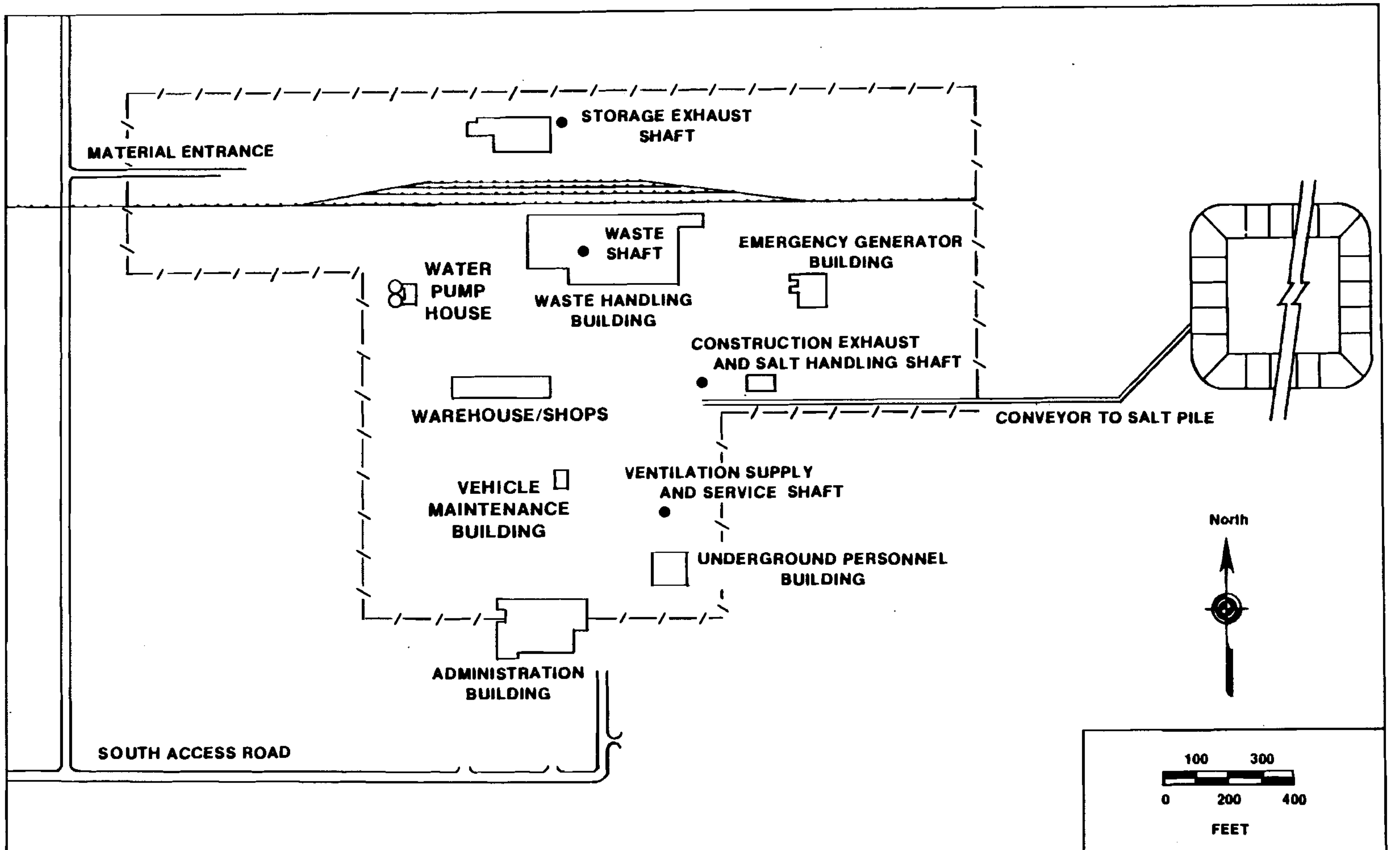

FIGURE 1-6: BASELINE SITE PLAN

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area). The building will have separate areas for the receipt, inventory, inspection and transfer of CH and RH TRU waste. It also will contain offices, change rooms, a health physics laboratory and equipment for ventilation and filtration. The design of the building includes safety equipment and measures for controlling radiation exposures. The Waste Handling Building will be built to meet design basis earthquake (DBE) and design basis tornado (DBT) specifications.

The Underground Personnel Building will contain facilities for personnel working underground in construction and waste-handling operations. This building will be about 110 feet wide, 110 feet long and 14 feet high. These facilities will include locker areas, showers, and offices for the underground managers and mining engineering administration.

The Administration Building (about 45,000 square feet) will include office space, the Central Monitor and Control Room, the Computer Room, a personnel dosimetry laboratory, a radiological control area, and instrument rooms. The Central Monitor and Control Room and Computer Room will meet DBE/DBT requirements.

1.3.4.2 Proposed Change

The Administration Building, the Underground Personnel Building and the Waste Handling Building office area would be combined under the revised design (Figure 1-7). These facilities would be housed in the Support Building which would be located adjacent to the Waste Handling Building.

The laboratory and office facilities formerly planned to be located in the Waste Handling Building and Administration Building would be consolidated into the Support Building office and laboratory areas. The underground support functions formerly served by the Underground Personnel Building would be incorporated into the Support Building. The Central Monitoring Room and the Computer Room would also be located in the Support Building.

Personnel preparing to enter the underground facility would first enter the Support Building. The Support Building would house change rooms, showers, equipment storage areas and offices for all people working underground. Workers would exit the Support Building when they are prepared to go underground and enter the underground area by way of the Construction and Salt Handling Shaft. In an emergency situation, workers could enter the underground via the Waste Shaft.

The Support Building would not be designed to meet DBE or DBT specifications; however, the DBE and DBT criteria would still be applied to the Waste Handling Building.

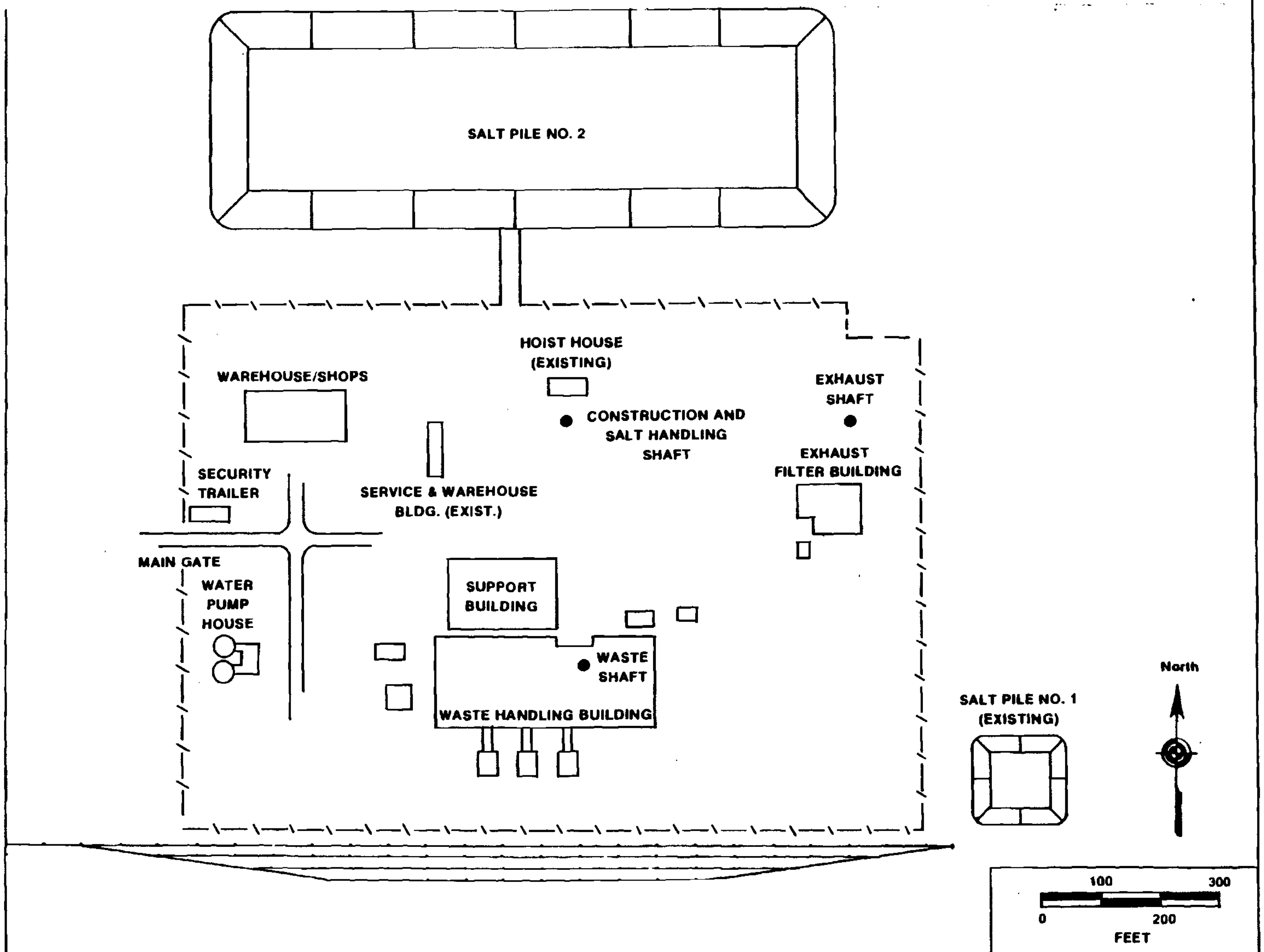

FIGURE 1-7: REVISED SITE PLAN

1.3.5 Simplify the Central Monitoring System

1.3.5.1 Existing Design

The Central Monitor and Control System (CMCS) will be located in the Central Monitor and Control Room (CMCR) in the Administration Building. The CMCS will employ two computers, one for fire and security and the other for process, radiation and environmental monitoring and control. By using two separate computers, the fire and security functions can remain independent of the other facility control and monitoring functions.

The CMCS will be connected to a system of local processing units (LPUs), controllers, and an alarm panel which will perform the basic monitoring and control functions and generate the alarms. All control functions will be performed locally. The CMCS will be used for monitoring the LPU functions and will act as a supervisory controller, supplying commands and setpoints to the local control devices. Because it will be the one location that displays the most information concerning the plant condition, the CMCR will also serve as the emergency operations center. It is designed to withstand DBE and DBT conditions and will receive its power from the emergency bus via an uninterruptible power supply (UPS).

The CMCS will also monitor access to the hoist, the Waste Handling Building entrance, underground areas, and the emergency assembly point, acting as a backup for brass-tag access monitoring.

1.3.5.2 Proposed Change

Under the cost reduction design, the Central Monitor System (CMS) would be in the Central Monitoring Room (CMR) in the Support Building and its computer would be located in the adjacent Computer Room. The CMS would employ one computer to monitor the following:

- Environmental and air quality
- Mechanical and heating, ventilation, and air conditioning (HVAC) operating systems
- Radiation levels and radionuclide concentrations
- Fire alarms
- Security systems

The CMS would perform essentially the same monitoring functions as the CMCS in the existing design, but would perform no control functions except for controlling the HEPA filter diversion and isolation valves in the Exhaust Filter Building. Control functions would be performed locally and local operators could be instructed by the CMS operator via telephone or PA. The CMS would not be designed to meet DBE and DBT conditions but could be energized by the diesel generator in the event of loss of utility power.

1.3.6 Simplify Security Control Systems

1.3.6.1 Existing Design

The entry of unauthorized personnel into the cleared area is considered undesirable and must be prevented. This concept is based on the potential damage intruders could inflict either intentionally or unintentionally on the facility, themselves, or the general public. The site will be secured by guards, perimeter intrusion alarms, closed circuit television (CCTV), remote actuated door locks and door and window alarms.

CCTV cameras will be located at access gates. The security station will be located within the Administration Building. Alarm annunciators for doors and windows and the CCTV monitors will be contained in the Central Monitor and Control Room (CMCR). Selected annunciators will be repeated at the security station. Selected entry-ways, such as the door to the records storage vault, may be remotely locked from the CMCR to prevent unauthorized entry.

1.3.6.2 Proposed Change

Under the cost reduction program, the site would be secured by a chain link perimeter fence, guards, CCTV, and door and window alarms as in the existing design. The security station would be located within a trailer at the main gate. Alarm annunciators for doors and windows and the CCTV monitor would be contained in the Central Monitor Room (CMR). Selected annunciators would be repeated at the security station and the CCTV monitor would be located at the security station. The complexity of the system would be reduced commensurate with the consolidation of site facilities.

1.3.7 Modify the Waste Handling Building

1.3.7.1 Existing Design

The existing design of the Waste Handling Building provides for separate CH and RH waste handling facilities, both having access to the Waste Shaft for conveying waste underground. The RH area will consist of a receiving area for either railcar or truck shipments. Experimental defense high level waste (DHLW) will be handled within the RH area.

A 120 ton crane will be provided to lift the shipping casks off the carrier and set them upright on an air pallet for further mobility. An area for cask preparation and decontamination will also be provided so that the cask can be readied for unloading of its contents into the hot cell. The waste canisters will be handled, inspected, decontaminated, or overpacked as required, prior to being lowered into a transfer cell which will also provide temporary shielded surge storage. A facility cask loading room will contain equipment for lifting the canisters out of the transfer cell while shielding the workers. The facility cask will transport the canister to the Waste Shaft and will be used in emplacing the canister in the underground storage room.

The CH area will be much larger than the RH area because of the volume of waste to be handled. The carriers will be brought into the area through airlocks and a 40-ton crane will be used to offload the TRUPACTs (CH waste shipping containers) from the railcars to the receiving area floor, where they may be opened and unloaded. TRUPACTs arriving on truck trailers will not need to be off-loaded by the crane since the fork lifts used for handling will have direct access to the TRUPACTs on the trailer.

Any TRUPACTS found to be contaminated will be loaded onto an air pallet by the 40-ton crane and moved into the overpack and repair room for decontamination and careful unloading under close surveillance. The main CH waste handling area will be used for handling individual waste containers, inventory, palletizing, and preparing them for storage. Damaged or contaminated containers will be taken to the overpack and repair room for decontamination, repair, or overpacking. A loading car on rails will be used to move the palletized waste containers onto the cage in the Waste Shaft for lowering them underground.

The Waste Handling Building will be designed to meet DBE/DBT conditions and will be a steel truss design with column support. The columns in the CH area will be on approximately 30 foot x 30 foot centers, requiring two rows down the length of the building. The ventilation system will be divided into separate areas and will incorporate HEPA filters to remove any airborne radioactive contaminants.

1.3.7.2 <u>Proposed Change</u>

Under the revised design the Waste Handling Building RH area would be unchanged but the CH waste shipping and receiving area would be reduced in size and the 40-ton unloading crane would be eliminated. The reduction in size is possible because space would not be needed in the building for rail cars and trucks. The TRUPACTs would be offloaded outside and brought in on air pallets through airlocks. The TRUPACTs would remain on the air pallets during waste handling operations. The CH waste handling would then proceed as described for the existing design. A single row of columns would be used in the CH waste handling area instead of the double row because of the reduction in area and a change in the roof design. This would improve handling operations maneuverability so that less space would be required to accommodate CH waste operations.

As a result of this change, TRUPACTs may be used for surge storage until they are moved inside the Waste Handling Building. The Waste Handling Building DBE/DBT design features and the HEPA filtration devices incorporated in the ventilation system would be retained.

1.3.8 Simplify the Storage Exhaust System

1.3.8.1 Existing Design

The main underground storage area ventilation and filtration equipment will be housed in the Storage Exhaust Filter Building located adjacent to the Storage Exhaust Shaft. The storage exhaust fans will be designed to provide adequate ventilation of the underground storage areas. HEPA filtration units will be provided to remove airborne radioactive particulates in the event of an underground accident.

The storage exhaust ventilation system is designed to function during both normal and emergency modes of operation. During normal operating conditions, there will be no measurable radiological contaminants in the storage exhaust air stream and the HEPA filtration units will be bypassed. The storage exhaust fans will draw air up the Storage Exhaust Shaft, through the open diversion valves, and into the exhaust filter plenum to be discharged through the exhaust stack. Two of the three axial flow fans will be required to provide ventilation through the underground waste storage area. During this mode of operation the HEPA filtration unit isolation valves will remain closed.

Should radiation monitors detect airborne radioactivity above maximum permissible concentrations, the system will be switched to the emergency operating mode (Figure 1-8). This will entail closing the diversion valves located between the Storage Exhaust Shaft and the filter exhaust plenum and opening the filter unit isolation valves allowing air leaving the Storage Exhaust Shaft to flow through a duct to the filter intake plenum. This plenum will connect to the inlet isolation valves for each of the three filter trains. The air flow paths for each of these filter trains will be separate and isolated from the flow paths through the other trains. The rated air flow capacity for each filter train is approximately 33 percent of the total air flow. Air flowing from the filter trains will enter the filter exhaust plenum, flow through one axial flow fan and then to the stack to be exhausted to the atmosphere.

When the HEPA filtration units are utilized, the system air flow will be reduced to prevent exceeding the rated filter capacity. This reduction will be accomplished in two ways:

- The number of fans in operation will be reduced, and

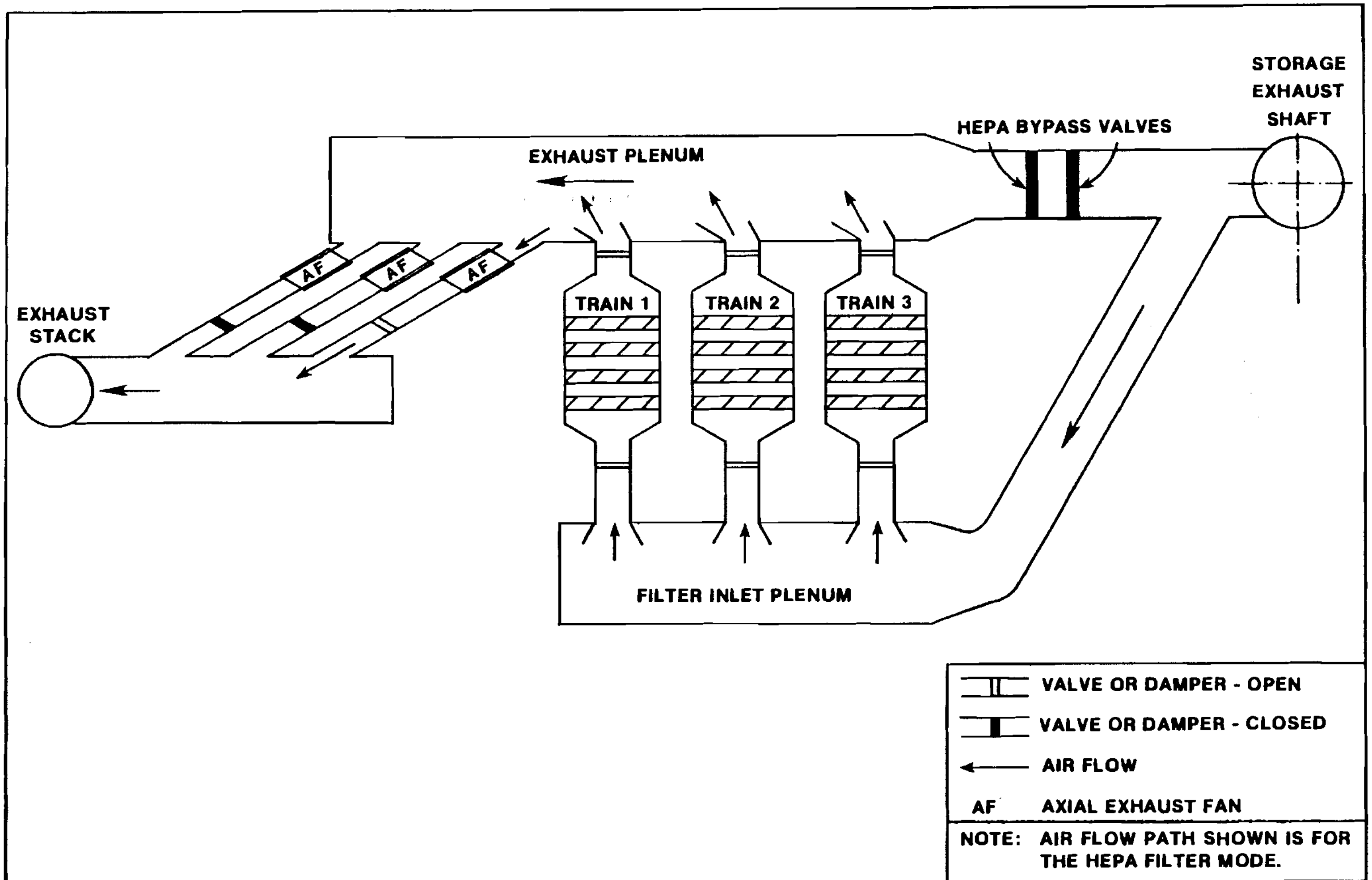

FIGURE 1-8: STORAGE EXHAUST FILTER BUILDING AIR FLOW

- the resistance to flow will be increased by insertion of the filters into the air stream.

The resultant air flow during this mode of operation will be reduced to approximately one half normal flow.

1.3.8.2 Proposed Change

Under the cost reduction program, the Exhaust Filter Building would be located adjacent to the Exhaust Shaft. Its function would be essentially as described for the existing design except that air from both the waste storage area and the construction area would be exhausted through it.

There would be three fans in the Exhaust Filter Building, as in the existing design, and all three would be operating under normal conditions. The principal change would be the reduction of the number of HEPA filtration trains from three to two, reducing the filtration capacity from 100,000 to 66,000 CFM (Figure 1-9). The DBE/DBT requirements on the building would be deleted. The exhaust fans would be changed from axial flow to centrifugal and they would be located outdoors. The flow diverter valves and actuators would also be located outdoors and would be weather protected. The flow diversion valves and filter isolation valves would be fail-safe so that on loss of electrical power the exhaust air flow would be directed through the HEPA filtration units. These changes would result in a substantial reduction in building size.

The only condition for which the reduction in the number of filter trains could affect operation is the failure of one filter train. Should the HEPA filters be activated with only one train, they would still be operable. The increased flow resistance compared to the flow resistance offered by two filter trains would result in a decreased air flow.

1.3.9 Modify Above Ground Salt Handling Logistics

1.3.9.1 Existing Design

Under the existing design, mined rock, consisting primarily of salt, will be brought to the surface through the Construction Exhaust and Salt Handling Shaft. Once at the surface, the mined rock will be moved by conveyor to the mined rock pile, located to the east of the center of the site. It is estimated that the pile will reach a maximum height of about 80 feet and cover about 30 acres.

1.3.9.2 Proposed Change

The cost reduction design calls for the development of two salt piles. The salt storage pile developed during the Site and

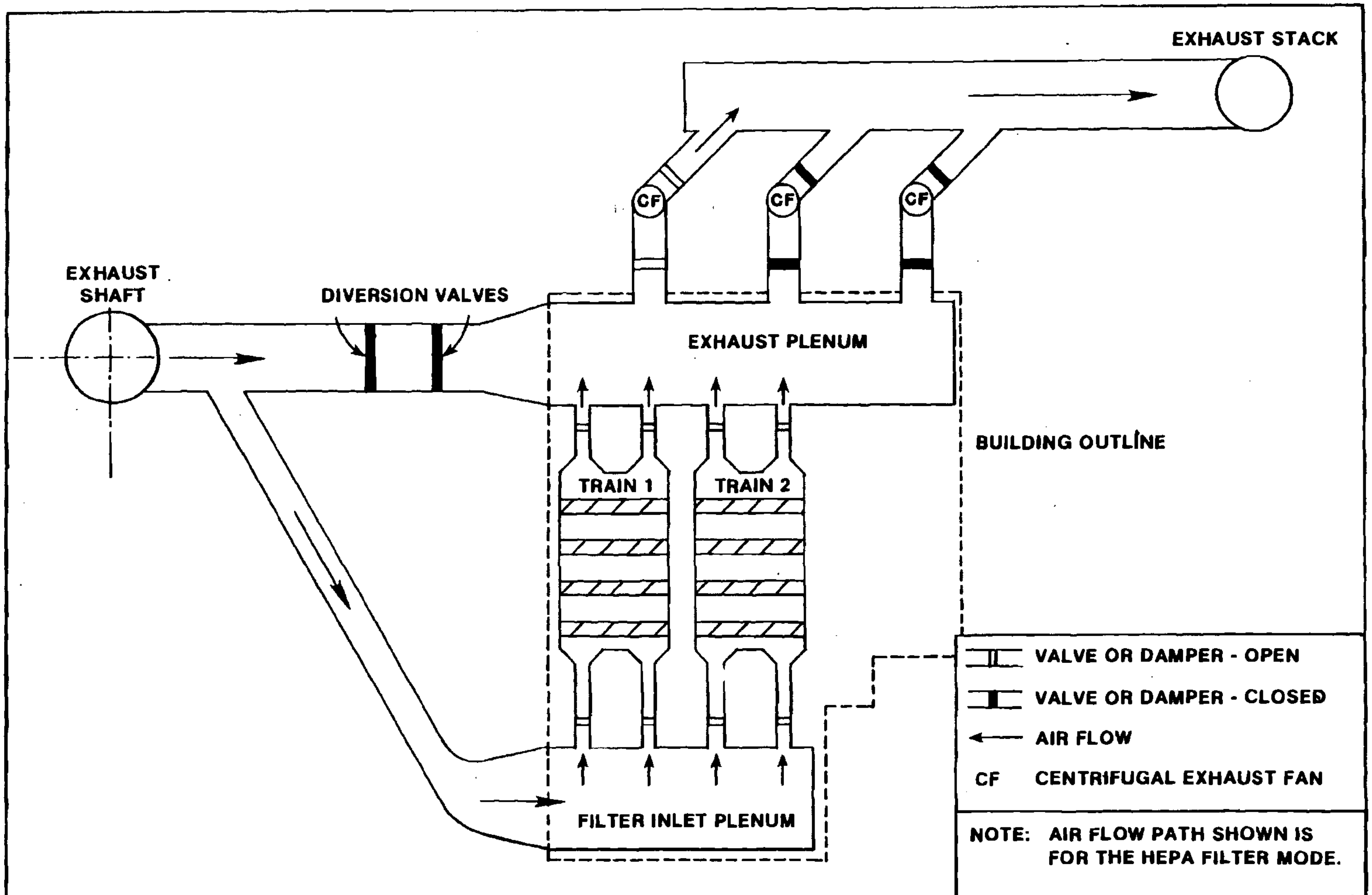

FIGURE 1-9: REVISED EXHAUST FILTER BUILDING AIR FLOW

Preliminary Design Validation (SPDV) program would remain as it is at the end of SPDV operations and an additional salt pile would be developed to the north of the center of the site (Figure 1-7). Development of the second salt pile would reduce hauling distances. The surface salt conveyor system would be eliminated under the revised design and salt would be trucked to the storage pile.

1.3.10 Simplify the Power System

1.3.10.1 Existing Design

Under the existing design, power to the plant electrical loads will be obtained from two sources, the utility transmission line entering the plant site and the two diesel generators. The diesel generators will be used only if off-site power is lost. The electrical equipment used to distribute the power from the two sources to the various electrical loads will constitute the plant power system. The system will include substations, transformers, load centers, switchgear, circuit breakers, and cables. Flexibility is a key design feature. All of the loads may be energized via multiple paths so that if a part of the system fails or is otherwise inoperative it may be bypassed and plant operations may then proceed with only a short interruption, if any. This will reduce plant downtime but require a relatively sophisticated system.

All plant loads will be connected to one of two sets of busses. One set will constitute the normal busses and the other set will constitute the emergency busses. During normal operation, both sets of busses will be connected and all the loads will be energized by utility power. When off-site power is lost, the two sets of busses will be separated and the normal busses will not be energized. The emergency busses will be energized by the diesel generators.

Two criteria determine which loads will be connected to the emergency busses:

- Loads which must remain energized to assure that the plant can be shut down if conditions require.

- If shutdown is not required, the plant must continue storage operations but on a reduced scale.

Two diesel generators will be contained in the Diesel Generator Building. They will start automatically upon sensing a loss of off-site power.

Two feeder cables from the emergency busses will supply power to the underground horizon. One cable will descend through the Ventilation Supply and Service Shaft and the other will descend through the Construction Exhaust and Salt Handling Shaft. Loads will be automatically energized when the emergency diesel generator starts, except for mining equipment which will require operator action.

In the event of a loss of off-site power, automatic diesel generator startup will be initiated, thereby energizing the emergency loads. The emergency loads will include ventilation exhaust fans, emergency lighting in surface buildings, the service hoist, storage exhaust fans and all power to the underground including the experimental area.

Since vital instrument loads must operate continuously, they will connect to the emergency bus via uninterruptible power supplies (UPS). The UPSs will be battery-rectifier-inverter devices. When energized by AC power, they will operate in the rectifier-inverter mode. Upon loss of off-site power, they will operate in the battery-inverter mode. The loads that are supplied by the UPSs will include the Central Monitor and Control System (CMCS), radiation detectors, and continuous air monitors.

1.3.10.2 Proposed Change

The cost reduction design calls for power to the plant electrical system to be obtained from two sources: the utility transmission line entering the plant or the diesel generator. The plant power system would include substations, tranformers, load centers, switchgear, circuit breakers, and cables. Simplicity would be a key design feature.

The Diesel Generator Building and the two indoor diesel generators with automatic starting would be deleted from this design. They would be replaced by one manually-starting diesel located inside a weather protection enclosure. This unit would not be built to DBE/DBT requirements. This diesel would be of sufficient capacity to operate the underground ventilation system or the waste hoist.

Two feeder cables would supply either normal or emergency power to the underground horizon. One cable would descend through the Waste Shaft and the other would descend through the Construction and Salt Handling Shaft.

During normal operation all loads would receive power from the incoming utility line. The generator would not be operating.

In the event of a loss of off-site power, the diesel generator would be started manually. The circuit breaker connecting the normal loads to the normal busses would be opened. After the diesel generator is ready for a load, its circuit breaker would be closed to supply power to the Waste Handling Building hoist and other loads on a selected basis. The selected loads would include ventilation exhaust fans and experimental loads. None of these loads is considered essential for achieving a safe shutdown.

The principal operating differences between the existing design and the cost reduction design would be decreased operational flexibility due to required operator action upon loss of utility power, possible increased time required to supply diesel generator power to loads, and reduction in available power upon loss of utility power.

Waste processing would stop upon loss of utility power since many of the electrical loads required to process waste, such as the Waste Handling Building ventilation system, would not be energized. Loads such as the waste hoist would be operable and would be used to send the cage to the surface or waste to the storage horizon. The waste hoist could then be used to evacuate personnel, if necessary. If the waste hoist is not energized, power would be available for continuing mine ventilation and mine experiments.

1.3.11 Reduce Overall Site Features

1.3.11.1 Existing Design

The surface facilities to be developed under the existing design are shown in Figure 1-6. Surface structures will include the Waste Handling Building for receiving and preparing radioactive waste for transfer underground, the Underground Personnel Building to support underground operations, the Storage Exhaust Filter Building, the Administration Building, the Warehouse and Workshop Building, the Emergency Generator Building, the Vehicle Maintenance Building, a sewage treatment plant and a water supply system. In addition, there will be a mined rock pile and an evaporation pond for runoff from the mined rock pile. A construction spoils disposal area and a sanitary landfill are also included in the design. A perimeter security fence will surround the facility.

1.3.11.2 Proposed Change

The surface facilities revised design, which is shown in Figure 1-7, would reduce the area disturbed by facilities development. The area to be paved and graded would be reduced due to the smaller facility area. The parking lot would be smaller since the number of operating personnel would be reduced from about 400 people to about 275 people. As a result, the area occupied by buildings and support facilities would be reduced from about 113 acres to about 27 acres. A perimeter security fence would enclose the 27 acre surface facility and a barbed wire cattle fence would replace the existing security fence enclosing about 160 acres.

1.3.12 Simplify the Warehouse/Shops Building and Eliminate the Vehicle Maintenance Building

1.3.12.1 Existing Design

The Warehouse/Shops Building will provide personnel and equipment space. It will contain office space for supervisory and maintenance personnel, showers, lockers, and toilets. Shop areas will contain separate rooms dedicated to specific crafts (i.e., painting, plumbing, etc.). The warehouse and dock area will provide space for the receipt, storage, and distribution of materials required for WIPP operation.

The Vehicle Maintenance Building will accommodate maintenance and repair services for all WIPP facility vehicles. It will contain service bays for maintenance of all plant vehicles as well as a tool storage area, office space, and workshop area. An outdoor pump station will contain two fuel pumps, water and compressed air. Underground gasoline and diesel fuel tanks will supply fuel for the pumping station.

1.3.12.2 Proposed Change

Under the cost reduction design, the Warehouse/Shops Building would be simplified and reduced in size. The showers, lockers, and toilets would be deleted and their functions replaced by facilities in the Support Building. The office space would be reduced and separate rooms for specific crafts would be deleted from the design since all these tasks could be performed in a general purpose common shop area.

The Vehicle Maintenance Building would be deleted from the design and most vehicle maintenance functions would be performed off-site. The underground fuel tanks and the pumping station would remain on-site but they would be moved to a new location near the Support Building.

1.3.13 Eliminate Solar Domestic Hot Water and Heat Recovery Systems

1.3.13.1 Existing Design

Under the existing design, active solar domestic hot water systems will be utilized in conjunction with the operation of the Administration Building, Waste Handling Building (laboratory/office area), Underground Personnel Building, and the Warehouse/Shops Building. Ventilation systems of the Waste Handling Building serving the CH area, RH area, hot cell, and battery recharge area will contain heat recovery devices.

1.3.13.2 Proposed Change

The cost reduction program would eliminate the use of solar domestic hot water and heat recovery systems. Due to the simplification of the Warehouse/Shops Building (Section 1.3.12.2), the solar domestic hot water systems would be no longer required and therefore eliminated.

1.3.14 Allow Resource Recovery in Control Zone IV

1.3.14.1 Existing Policy

The WIPP FEIS (DOE, 1980a) includes a detailed evaluation of the quantity and quality of mineral and hydrocarbon resources underlying the WIPP Site (FEIS Sections 7.3.7 and 9.2.3). This evaluation includes an estimate of the percentages of the resources that could be recovered by allowing extraction activities in Control Zone IV (Figure 1-10).

At the time of the preparation of the FEIS, the final DOE policy on resource extraction in Control Zone IV was uncertain:

> The DOE has found no technical or safety reason to prohibit drilling and mining in Control Zone IV of the type now practiced in the area. Therefore, the DOE may allow such drilling and mining; if it does, the impacts of withdrawing mineral resources and reserves will be reduced from those indicated for the total site. As shown in detail in (FEIS) Section 9.2.3.7, the exploitation of Control Zone IV would recover a significant fraction of the minerals - 73% of the langebeinite reserves and 53% of the natural gas, for example. (FEIS page 9-18).

1.3.14.2 Revised Policy

A report evaluating the consequence of allowing resource recovery in Control Zone IV has recently been prepared (DOE, 1982c). The results of this study served as input for the development of DOE's policy concerning resource extraction. Specific conclusions drawn from this study follow:

> The DOE policy for natural resource recovery is only important when considering communication events that could occur during the time period when this policy is in effect. After the loss of institutional controls, the types and magnitudes of events that could occur, such as those analyzed in the Safety Analysis Report (SAR) are fundamentally independent of former resource restrictions at the site. Considering waste decay and geosphere transport rates, the DOE resource recovery policy has little influence on the time of waste isolation before a plausible waste-release event could occur and/or on the radiation dose consequence of such an event.

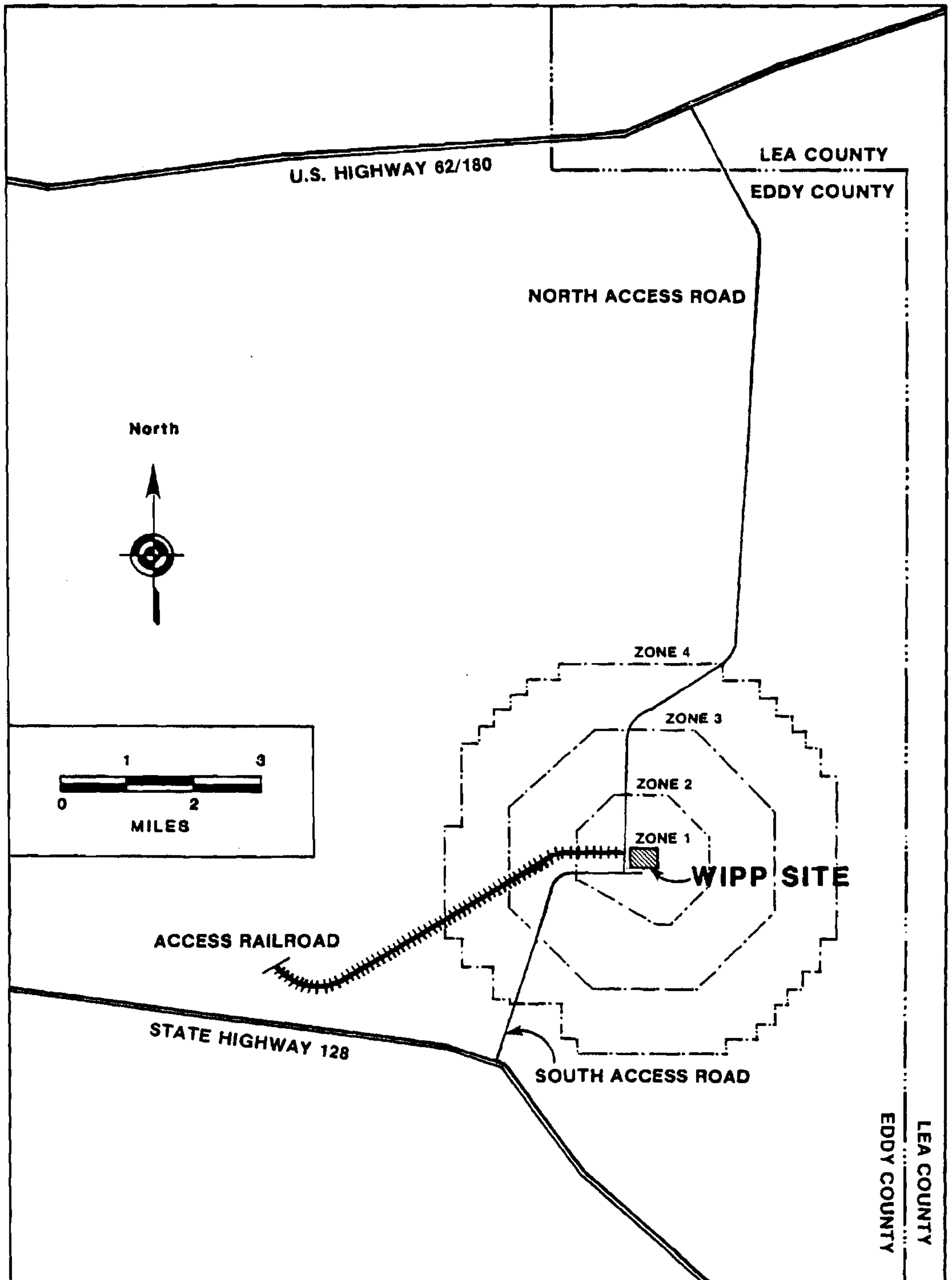

FIGURE 1-10: CONTROL ZONES

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The disturbances induced by potash exploration and mining in Control Zone IV are physically too far removed to affect the integrity of the WIPP facility. Breaching the repository by these activities is not credible and induced changes in host rock permeabibility are not discernible.

Exploration and production of hydrocarbons from within Control Zone IV likewise would not affect the waste emplaced in the WIPP facility. The extent of disturbance induced by production stimulation in the form of hydrofracing or acidizing is controlled by the specific design and execution of this operation. Evaluation of what can be considered typical operations indicates no threat to the integrity of the WIPP facility.

The communication events analyzed in the WIPP SAR provide representations of the types of breaching mechanisms, flow paths, and driving forces that could be affected by applying current extraction technology to the resources underlying Control Zone IV at the site. The SAR events represent, in fact, the potential effects of developing resources within the area of the WIPP facility itself, after institutional controls are lost.

Based on the conclusions given above, the DOE has developed a policy regarding resource recovery at the WIPP site (DOE, 1982c). This policy is paraphrased below. This information is included here for completeness only and does not constitute the legal document from which the DOE negotiates with other governmental, industrial or citizens groups.

It is the policy of the DOE to maximize the opportunity for resource recovery at the WIPP site, consistent with the requirements to isolate the emplaced radioactive wastes from the biosphere. Within five years after the first emplacement of each type of TRU waste (i.e., contact and remotely handled), separate decisions will be made about the retrieval of each kind of waste. If the DOE decides that all waste is to be retrieved, the WIPP site will become available for complete resource recovery once retrieval and facility decommissioning is accomplished.

The criterion for the final DOE policy is that permanent denial of resources should be limited to those areas in which extraction activities could potentially lead to unacceptable radiation dose consequences or whose protection is needed to satisfy institutional requirements. With the exception of those areas required by institutional considerations, all extraction activities that will not lead to unacceptable effects are defined as "allowable" under the DOE policy.

Potash (sylvite and langbeinite) and hydrocarbons (natural gas and distillate) comprise the resources present at the WIPP site that are of interest considering the technology and market conditions in the foreseeable future.

The DOE has determined that extraction of potash within Control Zone IV will be allowable if traditional underground mining methods are employed. Such methods include drill-and-blast, continuous mining, shortwall, and longwall techniques. Since mining of potash is allowed, it is not reasonable to prohibit those mining techniques that make such an activity economically viable. To prohibit such activities is, in effect, to preclude mining. Accordingly, it has been concluded that extraction ratios can be maximized in any mines developed within Control Zone IV of the WIPP site, consistent with mine safety considerations and other state and federal requirements. Solution mining is not now and will not be allowable within the limits of the WIPP site. This restriction does not affect langbeinite recovery because langbeinite is less soluble than the surrounding minerals (i.e., halite, sylvite) so that solution mining for this material will be ineffective. The lack of existing solution mining for sylvite in the Carlsbad potash district suggests that this restriction does not place a significant hardship on the producers nor significantly affect state revenues.

The DOE has determined that recovery of hydrocarbon resources from Control Zone IV is allowable. This activity includes drilling, production stimulation, and, possibly, secondary recovery. Resources located beneath Zone IV may be accessed by vertical drilling; resources located beneath the inner three control zones may be accessed by drilling vertically to a depth of 6,000 feet and then deviating from vertical at the angle required to reach the target resource zone. It is not realistic to allow drilling for hydrocarbon resources and, if oil or gas is found, to prohibit those techniques available to the producer that maximize recovery. It is the position of the DOE that enhancing the production from drilled wells by hydraulically fracturing the reservoir rock, acidizing the formation, or other applicable techniques will be acceptable. These types of production stimulation are used primarily to increase the permeability of the rock that contains the hydrocarbons. Secondary recovery methods (techniques used to enhance or replace the natural driving force that "pushes" the oil to the production well) and tertiary methods (techniques used to decrease the viscosity of heavy crude oils) may also be employed but, because the resources present are natural gas and not crude oil, are not expected to be useful unless significant technological advances and adaptations are made.

All resource recovery operations at the WIPP site should be reviewed by the DOE WIPP Project Office, in cooperation with the U.S. Department of the Interior, Bureau of Land Management (BLM), before any exploration or extraction activities are begun. This review will be coordinated with regulatory approvals.

1.4 No Action Alternative

The no action alternative would be to proceed with WIPP construction and operation plans as detailed in the Final Environmental Impact Statement (DOE, 1980a), the WIPP Safety Analysis Report (DOE, 1982b) and the WIPP Title I Design Report (DOE, 1980b). As indicated in Section 1.1, implementation of this alternative would result in excessive costs. Consequently, the no action alternative will be the subject of no further analysis.

1.5 Other Alternatives Considered

Other design modifications were considered during the process of developing the current cost reduction proposals. Each of these options was rejected, however, for one or more of the following reasons:

- The design modification would not have been cost effective;
- The design modification would have made operations too inflexible;

- The design modification would have caused unacceptable environmental and/or safety risk.

The following sections briefly describe the most significant options that were considered and rejected. The reasons for rejecting each option are also outlined.

1.5.1 Accelerate the Project Schedule

One of the proposed alternatives was to accelerate construction, thereby minmizing escalation of costs. This would be accomplished by beginning construction at a much earlier date, before the design is completed (i.e., "fast tracking"). This alternative was rejected because of the inherent financial risk involved.

1.5.2 Waste Handling Building Modifications

It was proposed that the Waste Handling Building be a prefabricated structure, not meeting DBE/DBT specifications. Furthermore, it was proposed that the building have a simplified ventilation system with no HEPA filters in the CH waste handling area. It was also proposed that the shielded storage area be eliminated and that the number of airlocks in the building be reduced. Other proposals included reducing the height and floor area of the RH waste hot cell housed in the Waste Handling Building and eliminating the bridge mounted remote manipulator located within the hot cell.

The option of using prefabricated construction not meeting DBE/DBT specifications was rejected because of the potential hazard associated with a radiological release during earthquake or tornado conditions. It was also determined that elimination of the CH waste handling area HEPA filtration system is undesirable because of the possibility of slow contamination buildup in the area as well as the increased hazards associated with an accidental release. Elimination of the shielded storage area was rejected because this would not meet safety requirements (ALARA). The RH waste handling area changes and associated RH waste hot cell changes were rejected because these options would prohibit flexibility for handling larger than normal packages or packages having unusual shapes. Reduction in the number of air locks was rejected because this would restrict the volume of waste that may enter the Waste Handling Building during each shift.

1.5.3 Reduce the Size of the Vehicle Maintenance Building

Another cost reduction proposal was to reduce the size of the Vehicle Maintenance Building. However, after further consideration, it was determined that elimination of the building altogether would be a more cost effective option.

1.5.4 Reduce the Capacity of the Underground Conveyor

It was proposed that the capacity of the underground conveyor system be reduced. However, like the Vehicle Maintenance Building, it was determined that complete elimination of the system would be a more cost effective alternative.

1.5.5 Eliminate One of the Four Underground Entries

Elimination of one of the four shafts required redesign of the underground layout in the vicinity of the shafts. It was proposed that one of the four underground entries be eliminated, thus reducing the volume of salt to be excavated and eliminating the need for some crosscuts and bulkheads. This would require that one of the remaining entries provide ventilation supply to both the construction area and the storage area.

The option of removing one entry was rejected because of the possibility that the entryway common to both the construction and storage ventilation systems could become contaminated. This could lead to contamination of the construction area and exposures to additional workers.

1.5.6 Reduce the Number of Underground Shops and Eliminate the Underground Warehouse

Another proposed cost reduction option considered was to reduce the number of underground shops and to eliminate the underground warehouse. An evaluation of this option showed that it would have considerable effect upon the efficiency of underground operations. The option would require excessive time and effort to distribute parts to underground areas from the surface warehouse. Set-up time for various shop procedures would be increased with a reduced shop size.

2.0 AFFECTED ENVIRONMENT

The WIPP is proposed to be developed at a site in southeastern New Mexico named Los Medanos. The existing environment at the Los Medanos site is described in detail in the WIPP Final Environmental Impact Statement (DOE, 1980a) in Chapter 7 and Appendix H. The following sections summarize the FEIS site description.

2.1 General Description

2.1.1 Biophysical Environment

The Los Medanos site is located in Eddy County, New Mexico, about 26 miles east of Carlsbad. The site is on a plateau east of the Pecos River, an area of rolling sand-covered hills and dunes. There is no site surface drainage connected with the Pecos River and rain generally soaks into the sand or evaporates directly.

2.1.1.1 Climate

The climate is semiarid, with generally mild temperatures, low precipitation and humidity, and a high evaporation rate. Winds are most commonly from the south to southeast and of moderate speeds. Temperatures are moderate throughout the year, although seasonal changes are distinct. Mean annual temperatures are near 60°F. Rainfall is light and unevenly distributed throughout the year, averaging about 12 inches. Winter is the season of least rainfall and approximately half of the yearly precipitation occurs during intense summer thunderstorms. Climatic conditions relating to the dispersion of potential air pollutants have been extensively studied at the Los Medanos site.

2.1.1.2 Air Quality and Noise

The air quality in the region of the Los Medanos site meets State and Federal standards except locally near industries where excessive dust occurs.

The Los Medanos site is relatively remote from man-induced noise and the site area is generally quiet. Noise sources include animals, aircraft, wind, occasional road traffic and intermittent use of heavy equipment in the distance.

2.1.1.3 Background Radiation

The observed background radiation in 1977 averaged eight microroentgens per hour (Brewer and Metcalf, 1977). This radiation level means that the external whole-body radiation exposure of a person at the site is about 75 millirem per year. This level of background radiation is about the average observed throughout the United States.

2.1.1.4 Terrain and Soils

The land surface at the Los Medanos site is a relatively flat plain covered by small, sporadic depressions and an abundance of sand ridges and dunes.

The site terrain consists of wind eroded sandy soils. These soils are particularly sensitive to wind erosion in the spring. Water seeps quickly through the surface layer of soil but more slowly in the subsoil. The site soils are only suitable for grazing and wildlife habitat.

2.1.1.5 Vegetation

The Los Medanos site lies within a transition region between the Chihauhuan Desert (desert grassland) and the Southern Great Plains (short-grass prairie); it shares the floral characteristics of both. Vegetation at the site is not a true climax, at least in part because of past grazing management. Vegetation near the site center is a stabilized dune area supporting a shinnery oak, sand sagebrush and dune yucca association. Mesquite is not a prominent shrub here, although it is a frequent dominant elsewhere in the dune areas.

2.1.1.6 Fauna

The semiarid climate makes water a limiting factor for fauna in the region. The amount and timing of rainfall greatly influence plant productivity and therefore the food supply available for wildlife and livestock. Significant fluctuations in the abundance and distribution of plants and wildlife are typical.

No endangered plant or animal species are known to occur within the site area (Hart et al., 1980a and 1980b).

Thirty-nine mammal species representing five mammalian orders have been observed in a 72-square-mile study area at the Los Medanos site. Many species are restricted to specific habitats. The desert cottontail and the black-tailed jackrabbit are common in all habitats, as is the most frequently sighted predator, the coyote. Two big-game species, the mule deer and the pronghorn, are present.

Reptiles present in the area include the side-blotched lizard, the western box turtle, the western whiptail lizard and several species of snakes.

Amphibians are restricted by the availability of aquatic habitat. The green toad, the plain's spadefoot and the tiger salamander are common around stock tanks and ponds.

A total of 123 species of birds representing 37 families has been observed within the 72-square-mile study area. The densities of birds in the study area show considerable annual and seasonal variations. Common species at the site include scaled quail, mourning dove, loggerhead shrike, pyrrhuloxia, black-throated sparrow, and western meadowlark.

About 1000 species of insects have been collected in a 72-square-mile study area at the site. Vast colonies of subterranean termites are located across the study area.

Aquatic habitats within the site area are limited. Stock-watering ponds and tanks constitute the only permanent surface waters. At greater distances, seasonally wet, shallow, usually salty lakes (playas) and permanent salt lakes are found. The Pecos River, approximately 14 miles from the site, is the nearest permanent watercourse.

2.1.2 Sociocultural Environment

2.1.2.1 History and Archaeological Resources

The first inhabitants of the site region were American Indians. Spanish explorers passed through during the sixteenth century, but the area was used almost entirely by Indians until cattlemen began arriving around 1886. Trading posts appeared in the late nineteenth century and Carlsbad was founded in 1889. Potash, oil and gas development has occurred in the twentieth century, and the area population has increased eightfold in the last 50 years.

The region has not been considered a fruitful area for archaeological research because the wandering inhabitants left few traces that remain today. Surveys at the Los Medanos site found about eight archaeological sites per square mile. The evidence found at the sites was usually stone tools, fragments of pottery, or dark stains in soil where hearths were once located. The remains of at least one permanent structure was found on the site. The archaeological sites at the Los Medanos site are believed to be the remains of an eastward extension of the Jornada Branch of the Mogollon culture. Most of these sites are attributable to the A.D. 900 to 1300 period.

Thirty-three sites located in an archaeological survey of portions of the Los Medanos site were determined eligible for nomination to the National Register of Historic Places. This determination was made because the 33 sites constitute an archaeological district and investigation of these sites may significantly contribute to the understanding of the prehistory of the area.

2.1.2.2 Land Use

The main uses of the land around the Los Medanos site are grazing, oil and gas production, and potash mining. Approximately six to nine cattle graze on each 640-acre section. The only agricultural land within 30 miles is irrigated farmland along the Pecos River, near Carlsbad and Loving.

Grazing rights at the Los Medanos site are owned by local ranchers. Potash mining and oil and gas development leases owned by various companies are located throughout the site.

2.1.2.3 Population

Sixteen people live within ten miles of the Los Medanos site and approximately 102,245 persons live within 50 miles. Most of these people live in Artesia, Carlsbad and Loving in Eddy County, and Eunice, Hobbs, Jal and Lovington in Lea County.

2.1.2.4 Housing

Housing is available but not abundant in the local communities of Carlsbad, Hobbs, and Loving. Mobile homes constitute approximately ten percent of the housing units within these communities.

2.1.2.5 Economy

Basic industries of the region are mining, manufacturing and agriculture. Potash mining and processing and oil and natural gas production are the principal mining activities. Manufacturing activities include food processing, meat packing, chemical production, and metal parts fabrication. Agriculture accounts for less than four to five percent of the total personal income of the two-county area; primary products are cotton and livestock. Tourism, primarily attracted by Carlsbad Caverns National Park, also contributes to the economy of the area.

The per capita income in Lea and Eddy counties is higher than the statewide average and higher than the national average for counties which are not associated with major metropolitan areas.

2.1.2.6 Transportation

Portions of New Mexico Highways 31 and 128 are within 10 miles of the site. These are both two-lane roads connecting communities in the region to larger, more distant U.S.

highways. U.S. Route 62/180, the main route between Carlsbad and Hobbs, is about 10 miles north of the site. Numerous dirt roads are maintained in the area for ranching, pipeline maintenance, and access to oil and gas drilling sites. There are no railroad tracks within five miles of the site and the nearest airstrip is 12 miles north of the site.

2.1.2.7 Community Services

Educational opportunities, health care facilities, and other community services available in the area communities are typical of those of other U.S. cities of their size.

2.2 Geology

2.2.1 Introduction

A great deal of geologic research has been conducted to evaluate the suitability of the Los Medanos site for a radioactive waste disposal facility. A detailed description of the geological characteristics of the site and surrounding area is beyond the scope of this document; however, a general summary of the geology with emphasis on topics germane to this study is included in the sake of completeness. Detailed discussions of the regional and site geology can be found in the WIPP Geological Charcaterization Report (Powers et al., 1978), Final Environmental Impact Statement (DOE, 1980a) and Safety Analysis Report (DOE, 1982b).

2.2.2 Site Geology

The site geology is characterized by a thick section of Permian evaporites, which include thick anhydrite units interbedded with massive halite layers. The WIPP underground facilities are to be located in an approximately 2000-foot-thick salt layer known as the Salado Formation. In general, the strata in the area exhibit a slight easterly dip, perturbed in some areas by mild, broad, anticlinal and synclinal features that diminish up-section. No surface faulting has been detected at the WIPP site and the area is believed to be tectonically stable.

2.2.3 Seismology

Seismic studies have been conducted at the Los Medanos site to gather information on the consequences of ground motion on surface and underground structures and to evaluate the effects of faulting on the salt beds and/or shaft seals. A record of earthquakes in southern New Mexico (dating since 1923) and recent seismic studies indicate that the Los Medanos site is located in a zone expected to receive only minor damage to structures. An analysis of seismic risk indicates that the possibility of significant faulting at the site is extremely low.

2.2.4 Energy and Mineral Resources

Potential mineral resources at the Los Medanos site have been investigated. Of the mineral resources expected to occur beneath the site, five are of practical concern: the potassium salts sylvite and langbeinite, which occur in strata above the potential repository level, and the hydrocarbons, crude oil, natural gas and distillate (liquids associated with natural gas), which occur in strata below the possible repository level. Table 2.1 summarizes the energy and mineral resources at the Los Medanos site.

Table 2.1 Total Mineral Resources at the Los Medanos Site

RESOURCE	QUANTITY	DEPTH (ft.)	RICHNESS
Sylvite ore(1)	133.2 million tons	1600	8% K_2O, 4-ft thickness
Langbeinite ore(1)	351.2 million tons	1800	3% K_2O, 4-ft thickness
Crude oil(2)	37.50 million bbl	4000-20,000	31-46° API(3)
Natural gas(2)	490.12 billion ft^3	4000-20,000	1100 Btu/ft^3
Distillate(2)	5.72 million bbl	4000-20,000	53° API(3)

[1]Low grade resource and better. Data from John, et al. (1978).
[2]Data from Foster (1974).
[3]The degrees API unit has been adopted by the American Petroleum Institute as a measure of the specific gravity of hydrocarbons.

The significance of these resources is discussed in Section 9.2.3.1 of the WIPP FEIS (DOE, 1980a).

2.3 Hydrology

Considerable effort has been expended in characterization of the hydrology of the WIPP site area. A detailed discussion of the hydrological characteristics of the site is given in Powers et al. (1978) and DOE (1980a, 1982b). A brief summary of the surface and subsurface hydrology of the site is given below.

2.3.1 Surface Hydrology

There are no perennial streams or surface-water impoundments on the site, nor are there any wells yielding more than a few gallons per minute. The closest river, the Pecos, is perennial throughout the region with the exception of a few reaches where the flow percolates into the stream bed. The maximum historical flood height of the Pecos is 500 feet below the lowest elevation of the land surface at the Los Medanos site.

2.3.2 Subsurface Hydrology

The WIPP site is located within a region typified by aquifers of low productivity. These aquifers produce small quantities of saline water to wells and are not suitable for domestic water usage. Fluid flow in aquifers above the Salado Formation is generally to the south or southwest from the site toward the Pecos River. Flow in aquifers immediately below the evaporite sequence is very slow, due to low permeability, but is thought to be from the WIPP site toward the north or northwest. The shallowest aquifer at the site is about 600 feet below the surface so the potential for contamination from the surface is very minimal.

3.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this chapter is to provide an evaluation of the environmental impacts which may result from implementation of the cost reduction program. Emphasis is placed upon changes in the environmental consequences described in the WIPP Final Environmental Impact Statement (DOE, 1980a). A summary matrix identifying the anticipated environmental consequences of the cost reduction program is presented in Figure 3-1. This impact analysis evaluates the interrelationships of the proposed action (as described in Chapter 1) and the existing environment (as described in Chapter 2).

3.1 Air Quality

Several of the proposed cost reduction measures will have some impact on the types and quantities of air pollutants generated during construction of the WIPP. These include the elimination of one shaft, elimination of the underground conveyor system, combination and elimination of buildings, modification of above ground salt handling procedures and reduction in overall site features.

An analysis was conducted to estimate the quantities of air pollutants that would be eliminated by deleting and reducing site features. Emission increases were also estimated. The results of this analysis are summarized in Table 3.1. The cost reduction program's cumulative impact upon airborne emissions will be to create a net decrease in fugitive dust emissions and fuel combustion emissions.

Fugitive dust emissions will decrease as a result of the reduction in overall site features. An estimate of the reduction was made using the EPA emission factor for heavy construction operations, the size of the construction area and the duration of construction. An emission factor of 0.6 tons per acre per month (1.2 tons per acre per month adjusted by one-half to account for dust control measures) was used for both the current design and the cost reduced design. The construction area for the current design is about 100 acres and the area is reduced to about 30 acres for the cost reduced design. The construction effort is estimated to require about 64 months for the current design and 57 months for the cost reduced design. Using these data, the total reduction in fugitive dust emission is about 2814 tons for the full WIPP construction or about 592 tons per year.

The pollution emissions anticipated during SPDV and full facility construction are listed in the WIPP FEIS (DOE, 1980a) Table 9-7. None of the emissions will increase pollutant concentrations to levels approaching ambient air quality standards. These levels will be sufficiently low to cause no discernible secondary impacts such as reduced visibility or damage to vegtation. Implementation of the cost reduction program will reduce the pollutant emissions and concentrations listed in Table 9-7 by a small amount.

● INCREASED ENVIRONMENTAL IMPACT
○ DECREASED ENVIRONMENTAL IMPACT
◒ NEUTRAL ENVIRONMENTAL IMPACT
— NOT APPLICABLE

COST REDUCTION PROPOSALS	AIR QUALITY	TOPOGRAPHY	VEGETATION	SOILS	WATER RESOURCES	WILDLIFE	LIVESTOCK GRAZING	RECREATION & WILDERNESS	CULTURAL RESOURCES	NOISE	SOCIOECONOMICS	RESOURCES CONSUMPTION	RESOURCES DENIAL	HOUSING & LAND USE	TRAFFIC & TRANSPORTATION	OCCUPATIONAL SAFETY	RADIOLOGICAL RELEASES
Reduce the waste storage rate.	—	—	—	—	—	—	—	—	—	—	○	○	—	○	○	○	◒
Eliminate one shaft.	○	○	○	○	—	—	—	—	—	○	○	○	—	○	○	●	◒
Eliminate the underground conveyor system.	●	—	—	—	—	—	—	—	—	—	—	◒	—	—	—	◒	—
Combine the Administration Building, the Underground Personnel Building and the Waste Handling Building office area.	○	○	○	○	—	○	—	—	—	○	○	○	—	○	○	—	—
Simplify the Central Monitoring System.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	◒	◒
Simplify security control systems.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	◒
Modify the Waste Handling Building.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○
Simplify the storage exhaust system.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	◒	◒
Modify above ground salt handling logistics.	●	◒	●	●	—	—	—	—	—	●	—	◒	—	—	—	◒	—
Simplify the power system.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	◒	◒
Reduce overall site features.	○	○	○	○	—	○	—	—	—	○	○	○	—	○	○	—	—
Simplify the Warehouse/Shops Building and eliminate the Vehicle Maintenance Building.	○	○	○	○	—	○	—	—	—	○	○	○	—	○	○	—	—
Eliminate solar domestic hot water and heat recovery systems.	—	—	—	—	—	—	—	—	—	—	—	●	—	—	—	—	—
Allow resource recovery in Zone IV.	—	—	—	—	—	—	—	—	—	—	○	—	○	—	—	—	●

FIGURE 3-1: ENVIRONMENTAL CONSEQUENCES MATRIX

82:04:05/14.1

Table 3.1 Estimated Airborne Emission Changes Resulting from Implementation of the Cost Reduction Program (Tons)(1)

Change	Fugitive Dust	Combustion Particulates	Other Combustion Emissions(2)
Eliminate One Shaft	-2.9	-2.0	-104.9
Eliminate Above Ground Conveyor	+265.1	+0.2	+8.7
Reduce Site Area	-2814.0	-1.8	-94.5
Combine/Eliminate Buildings	--(3)	-0.1	-7.8
Modify Underground Salt Handling	--	+0.3	+14.3
Net Change	-2,551.8	-3.4	-184.2

1. These construction-related emission changes will occur over a 57 month period.
2. Includes sulpher oxides, nitrogen oxides, carbon monoxide, and hydrocarbons
3. Included in site area reduction above.

3.2 Topography

Some of the cost reduction proposals are expected to effect the project's impact upon local topography. These include the elimination of one shaft, combination and elimination of buildings, modification of the above ground salt handling logistics, and reduction in overall site features. Elimination of one shaft will reduce the amount of waste rock to be stored on the surface by about 25,000 tons. This represents a waste rock volume of about 500,000 cubic feet, which is about one percent of the total volume of rock to be excavated during construction of the full facility.

Modification of the surface salt handling logistics will result in the creation of two salt storage piles instead of one. Under the original design, a single salt storage pile will cover a 30-acre area to a maximum height of 80 feet. The revised design includes the salt storage pile created during the SPDV program and a second pile which will be used to store rock excavated during full facility construction. The SPDV storage pile will cover about eight acres to a maximum height of about 25 feet and the pile created during full facility construction will cover about 12 acres to a maximum height of about 75 feet.

The combination and elimination of buildings and reduction of overall site features will reduce effects upon topography. The amount of caliche and cut and fill material required will be reduced. Excavation of this material would have impacted topography at the construction site and at the caliche quarry areas.

3.3 Vegetation

Combining and eliminating buildings and reducing the area occupied by facilities will reduce adverse impacts upon site vegetation. Current vegetative biomass production at the site is approximately 224 pounds per acre per year (Neuhauser, 1979). About 80 acres that would have been cleared under the original design will remain undisturbed. This represents a biomass production rate of about 18,000 pounds per year.

The types of vegetative communities that would be destroyed by construction of facility structures include creosote bush, shinnery oak, sand sagebrush and dune yucca dominated dunes. Stands of mesquite and broom snakeweed are also found in this area.

Creation of a second salt storage pile will have some adverse impacts upon vegetation. Although the total volume of salt rock to be stored on the surface will be decreased, salt will probably be dispersed over a larger area than previously anticipated. This may increase the extent of vegetation die off; however, there is evidence that the local vegetation may be adaptable to a more saline environment than it is now experiencing (Intera Environmental Consultants, Inc., 1978).

3.4 Soils

As is true for vegetation, implementation of the cost reduction proposals will result in decreased impacts upon soils. Elimination of some buildings and consolidation and reduction of other facilities will decrease adverse soils impacts. The WIPP FEIS (DOE, 1980a) reports that about one million cubic yards of soil will be scraped and dumped during full facility site grading operations. For each cubic yard of soil stripped and dumped, about 0.1 pound is expected to be dispersed (PEDCo, 1976). Accordingly, the 100,000 pounds of soil expected to be dispersed during full facility construction will be reduced to about 24,000 pounds by reduction of overall site facilities.

The amount of soil sterilized by surface storage of salt rock will not be changed significantly by the cost reduction program. However, soils will be sterilized by salt at two separate locations instead of at one, as previously planned.

3.5 Water Resources

No impacts upon water resources are expected as a result of implementation of the cost reduction proposals. This is because no waterborne discharges are anticipated during full WIPP construction and the cost reduction program will create no discharges.

3.6 Wildlife

Reducing the overall site features will reduce the magnitude of adverse impacts upon wildlife. The use of trucks to haul salt on the surface instead of a conveyor system will increase noise levels and cause increased species disturbance, however.

3.7 Livestock Grazing

Under the existing design for the WIPP facility, 1,072 acres will be excluded from grazing. This includes areas cleared, graded, covered with structures and areas used but not cleared or graded. Although the cost reduction program would reduce the area occupied by surface structures, the location of the perimeter fence will not change. Thus, the cost reduction program will have no effect upon grazing.

3.8 Recreation and Wilderness

Implementation of the cost reduction program will have little effect upon recreation and no effect upon wilderness. The recreational use of primary interest in the site area is hunting. Hunting opportunities should not be affected significantly by implementation of the cost reduction program.

No existing or proposed wilderness areas are located within the vicinity of the WIPP site so no impacts upon wilderness will result from implementation of the cost reduction program.

3.9 Cultural Resources

Implementation of the cost reduction program is expected to have very little impact upon cultural resources. No archaeological sites are located within the area in which the new salt storage pile will be located or in the areas that would have been disturbed by construction of other surface facilities. (MacLennan and Schermer, 1979; Schermer, 1980).

The Department of Energy has consulted with the New Mexico State Historic Preservation Officer and the Federal Advisory Council on Historic Preservation in compliance with the National Historic Preservation Act. A program to mitigate adverse impacts to cultural resources resulting from development of the SPDV program has been developed and approved by these agencies. A similar program will be developed prior to the commencement of full WIPP construction activities.

3.10 Noise

Cost reduction proposals expected to change noise levels during construction of the facility include the elimination of one shaft, combination and elimination of buildings, modification of the salt handling procedures, and reduction of overall site features. The overall change in noise levels is difficult to predict; however, it is expected that noise generation will be reduced to a small extent. The elimination of blasting noise during the sinking of one shaft will probably be the most significant result.

3.11 Socioeconomics

As indicated in Section 1.1, implementation of the cost reduction proposals is expected to result in a savings of about $200 million during the construction and initial operations phases of the WIPP project (a period of about five years). It is expected that about 47 percent of this amount would have affected directly the economy of the Eddy County/Lea County area (DOE, 1980a). Therefore, it can be estimated that about $94 million that would have entered the local economy under the original design will not be spent if the cost reduction program is implemented.

Furthermore, it is estimated that the cost reduction program will reduce operational labor requirements by about 125 workers. If the average annual income of these workers is assumed to be $30,000, it can be estimated that the annual payroll in the area will be reduced by about $3.75 million. Over the 25 year operational lifetime of the facility, the local payroll is expected to be reduced from about $300 million to about $206 million if the cost reduction program is implemented.

In addition to direct employment, indirect jobs will be created as a result of project construction and operations activities. Based upon the ratio of direct to indirect jobs used in the WIPP FEIS (DOE, 1980a), it is estimated that the number of indirect jobs created during operations will be reduced from about 514 jobs to about 368 jobs if the cost reduction program is implemented.

The two-county-area population increases predicted in the FEIS (DOE, 1980a) will be smaller if the cost reduction program is implemented. The maximum number of new residents in the two-county-area was predicted to be 2250, occurring in the fourth year of full WIPP construction. This number will be reduced to about 1550 persons if the facility plan is scaled down. The total population change resulting from the project during operations should be an increase of about 700 persons instead of 1,000, as predicted in the FEIS (DOE, 1980a). The estimated population increases presented in the FEIS may be reduced further due to current higher unemployment rates in Eddy and Lea Counties. In March of 1982, unemployment in Eddy County was 5.0 percent and it was 2.6 percent in Lea County (University of New Mexico, 1982).

Allowing resource recovery in Control Zone IV of the WIPP Site will reduce the economic impacts associated with the denial of access to hydrocarbon and mineral resources. As shown in Table 9-19 of the FEIS (DOE, 1980a), significant fractions of hydrocarbons and potash minerals can be recovered by allowing exploitation of resources in Control Zone IV. Nearly three fourths of the langbeinite reserves (the most significant potash mineral within the site) and over two thirds of the total potash resources would become available. More than half of the hydrocarbons within the site can be obtained by vertical drilling in Control Zone IV and the rest of the hydrocarbons (i.e., beneath the inner three zones) can be reached by directional drilling from Zone IV.

3.12 Resources Consumption

The WIPP FEIS (DOE, 1980a) includes estimates of materials and energy consumption during WIPP construction and operations (FEIS Sections 9.2.2 and 9.3.3). The consumption of materials and energy resources during construction with the existing design and with the proposed design changes are presented in Table 3.2. As indicated in this table, consumption of most of the required materials and energy resources is expected to decrease with implementation of the cost reduction program. Consumption of electricity and water during construction is not expected to change significantly.

During WIPP operations, implementation of the cost reduction program is expected to reduce the normal electricity demand from about 20,000 kilowatts to about 12,000 kilowatts. Diesel fuel consumption for the emergency generators is expected to be reduced from an average of about 140 gallons per day to about five gallons per day; however, diesel consumption will be increased by the use of trucks to haul salt instead of conveyors. Total water consumption is estimated to decline from 25,000 gallons per day to 20,000 gallons per day.

Table 3.2 Estimated Consumption of Materials and Energy During WIPP Construction, Existing Design and Proposed Changes[1]

Material/ Energy Source	Estimated Consumption with Existing Design	Estimated Consumption with Cost Reduction Proposals
Concrete	125,000 bbl	100,000 bbl
Steel	15,000 tons	10,000 tons
Copper	150 tons	50 tons
Lumber	0.5 million board feet	0.4 million board feet
Water	22 million gallons	22 million gallons[2]
Electricity		
Total	40 million kilowatt-hours[3]	40 million kilowatt-hours[2]
Peak demand	1700 kilowatts	1700 kilowatts
Normal demand	850 kilowatts	850 kilowatts
Propane	140,000 gallons	100,000 gallons
Diesel Fuel	900,000 gallons[4]	750,000 gallons
Gasoline	940,000 gallons	500,000 gallons

1. Including SPDV development.
2. Consumption of water and electricity is not expected to change during construction; a decrease in water and electricity consumption is expected during operations.
3. Incorrectly reported as four million kilowatt-hours in the WIPP FEIS (DOE, 1980a).
4. Revised estimate of current design usage.

3.13 Resource Denial

Although the possibility of allowing potash mining and hydrocarbon extraction in Control Zone IV of the WIPP site was being considered, the FEIS (DOE, 1980a) clearly states that "the development of the WIPP will deny access to portions of local deposits of hydrocarbons and potash minerals, at least temporarily" (FEIS Section 11.2). Accordingly, the maximum impact of the WIPP Project on mineral resources recovery is denial of access to hydrocarbons and potash minerals at the WIPP site. To reduce the potential impacts of the WIPP Project, the DOE expressed its intent to allow resource extraction in Control Zone IV provided that such action had no adverse effect on the integrity of the underground storage facility.

In the cost reduced design, the DOE would allow potash mining (if traditional underground mining methods are employed) and hydrocarbon recovery in Control Zone IV. Solution mining would not be permitted; however, this restriction has no significant effect since solution mining for langbeinite is ineffective and no such mining techniques for sylvite are currently used in the Carlsbad potash district. Hydrocarbon resources located beneath Zone IV can be accessed by vertical drilling; resources beneath the inner three control zones can be accessed by drilling vertically to 6000 feet and then deviating from vertical at the angle required to reach the target resource zone. To ensure that the integrity of the underground storage facility is protected, all resource recovery operations at the WIPP site must be approved by the DOE, in coordination with the U. S. Department of the Interior, Bureau of Land Management which will continue to manage the overall use of lands not under exclusive DOE control.

Allowing resource recovery within Control Zone IV will reduce the potential adverse impacts of the WIPP with regard to denial of access to potash minerals and hydrocarbons. As indicated in the FEIS (Section 9.2.3.7), over two thirds of the potash resources (nearly three fourths of the langbeinite reserves -- the most significant potash mineral at the site) and all of the hydrocarbons (approximately half beneath Control Zone IV and half beneath the inner three control zones) can be recovered from Control Zone IV. Hydrocarbons beneath the inner three control zones can be accessed by directional drilling from Control Zone IV; however, the cost of directional drilling is significantly higher than the cost of vertical drilling.

3.14 Housing and Land Use

The WIPP FEIS (DOE, 1980a) include estimates of the housing demand that will be induced by WIPP construction and operations. The maximum expected annual demand induced directly and indirectly by the project is estimated to be 880 units, occurring in the fourth year of construction. The smallest annual induced demand is 50 units, occurring during the first year of construction. During operations, the induced housing demand is expected to be about 360 units.

Implementation of the cost reduction program is expected to reduce the operational workforce by about 31 percent. If the construction workforce is estimated to be reduced by about the same amount, the direct and indirect project induced housing demand can be expected to decline by this same percentage. This would result in a reduction in the maximum project-related housing demand of about 273 units. The project-related housing demand during the operations phase would be reduced by about 112 units with implementation of the cost reduction program.

The WIPP FEIS (DOE, 1980a) presents the estimate that an average of 0.25 acre will be required for each new housing unit. The maximum annual land requirement for residential development will therefore be reduced by about 68 acres if the cost reduction program is implemented. The land requirement for housing residents attracted by WIPP operations will be reduced by about 28 acres.

3.15 Traffic and Transportation

Reduction in the scale of the project and the number of required personnel will reduce traffic volumes generated by the construction and operation of the facility.

3.16 Occupational Safety

Some of the cost reduction changes will result in slightly enhanced safety conditions while other changes may slightly increase the potential for occupational accidents. The net result of implementation of the entire cost reduction program is not expected to be significant in terms of occupational safety, however.

If the rate of waste storage is reduced, the number of storage workers will also be reduced. This could result in some reduction in the probability of occurrence of accidents involving the release of waste materials. This change in accident probability is expected to be small.

Elimination of one shaft will require some radiological workers to enter and exit the underground areas through the same shaft in which waste is transported underground. However, waste and personnel will not be transported at the same time. This could result in potential worker exposure to residual contamination subsequent to a radiological release in the shaft or the shaft vicinity. This potential will exist because it is not possible to ensure complete removal of radioactive materials from the shaft area during cleanup operations. These potential exposures to radiological workers are not expected to be large, however.

Simplification of the electrical system will require that normal operations cease upon loss of utility power. Deletion of emergency generator automatic start has not impacted the safe shutdown capability of the facility in the event of loss of utility power. It will however, interject a short delay in the ability to take remedial action following loss of utility power. This delay is not significant in comparison with the expected response time associated with remedial actions themselves. Safety will be enhanced by this option to the extent that smaller quantities of diesel fuel are required on site and the fire potential is reduced somewhat. In summary, no significant impact is projected.

The potential use of dispersed UPSs in lieu of a central UPS located on the surface has a potential adverse impact on occupational safety in that the number of systems is increased and some of these systems may be located underground. Critical safety monitoring functions will be provided with UPS power in the proposed design.

Elimination of the underground conveyor system will eliminate the potential hazard of conveyor belt fire as well as the significant personnel hazards associated with equiment of this type. The use of diesel trucks underground, however, will increase the amount of diesel fuel used underground and the potential for underground fire.

Other cost reduction proposals that will likely enhance occupational safety conditions include modification of the Waste Handling Building design and elimination of the Vehicle Maintenance Building. The use of air pallets to handle CH waste, in place of an overhead crane, will eliminate the potential for injuring workers by dropping waste containers. In addition, off-loading of TRUPACT shipping containers external to the Waste Handling Building will eliminate diesel powered equipment from the CH area of the building thereby precluding this potential source of fire. Elimination of on-site vehicle maintenance activities will eliminate the potential for injury of maintenance personnel. The potential for fire will also be reduced somewhat.

3.17 Radiological Releases

Only two of the proposed cost reduction measures will have some impact on the radiological consequences of the project. The design changes associated with modification of the Waste Handling Building and alternate handling procedures will reduce the probability of radioactivity release. Non-restricted use of Control Zone IV by the public could increase the impact of such a release.

The proposed modifications to the Waste Handling Building and handling procedures will reduce the potential for radiological accidents because improved handling methods would be employed and the potential for a diesel fire which could involve waste in the CH unloading area of the Waste Handling Building would be precluded.

The proposed reduction of the number of HEPA filter trains in the Exhaust Filter Building from three to two would eliminate the standby train but would not change the effectiveness of the system to respond to a radiological accident. A shutdown of the system would be instituted when filter changeout is required.

The removal of all restrictions to the use of Control Zone IV would result in an increase by 1.4 of the projected dose to the public at the site boundary. The factor of 1.4 was determined by the analysis included in Appendix A. The resulting doses are listed in Appendix A, Table 9-52. This is clearly not a significant increase in light of the conservatism of the analysis and the extremely small dose impact of WIPP operations. No increase in population dose is projected unless a large population moves into the Zone IV area. If occupancy in the Zone IV area is limited to an average of 16 hours per day per year, then there is no increase in the dose to the public.

An increase of 1.4 in the very low doses projected for WIPP operations would be lost in the background radiation dose. The existing dose calculations are sufficiently conservative so that the increase in dose by a factor of 1.4 is already compensated for in the existing values. Thus, allowing access to Control Zone IV does not significantly alter the impact of WIPP operations on the public.

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APPENDIX A

EVALUATION OF THE IMPACT OF ALLOWING ACCESS TO CONTROL ZONE IV

This analysis uses the weighted meteorological conductions described by Table H-48 of the WIPP FEIS (DOE, 1980).

Type of Meteorology	Probability of Occurrence	X/Q Zone III Boundary (3.2 km)	X/Q Zone IV Boundary (4.8 km)
A	.367	6.8-7(1)	4.6-7
B	.011	9.0-7	6.4-7
C	.006	2.5-6	1.3-7
D	.042	7.8-6	4.6-6
E	.092	1.3-5	8.4-6
F	.124	1.2-5	1.0-5
G	.357	7.8-9	6.7-8

1. 6.8-7 = 6.8×10^{-7}

Population doses and the maximum off-site individual doses are the only ones which assume the existence of Zone IV. The dose D(x) at position x is:

$$D(x) = K * \sum_{i=A}^{G} P_i * X_i/Q_i(x)$$

where K is a constant with respect to position x,
$P_i(x)$ is the probability of occurrence of meteorological condition i,
$X_i/Q_i(x)$ is the value of of X/Q for meteorological condition i and at position (x).

Therefore

$D\ (4.8\ \text{km}) = K * 2.41 \times 10^{-6}$

$D\ (3.2\ \text{km}) = K * 3.29 \times 10^{-6}$

The increase in dose (Fd) is:

$$Fd = \frac{D(3.2\ km)}{D(4.8\ km)} = 1.4$$

Therefore, if Zone IV were totally released, the doses to the public living at the new outer boundary (Zone III) would be a factor 1.4 times the dose originally projected. In other words, Tables 9-24 and 9-52 of the FEIS (DOE, 1980) might be revised as follows:

Table 9-24 Dose Commitment Received by an Individual Residing at the Site Boundary(1)

Organ	Retaining Zone IV 50-Year Dose Commitment (rem)	Releasing Zone IV 50-Year Dose Commitment (rem)
Bone	6.5-6	9.1-6
Lung	3.0-7	4.2-7
Whole Body	1.6-7	2.3-7

1. These changes assume a residence is established at the Zone III boundary. This change is not probable, even with no Zone IV controls.

In addition, if a significant number (hundreds) of people moved into the Zone IV area, there would be a slight increase in the population doses presented in the FEIS (DOE, 1980). The movement of a large number of people into this area is extremely improbable.

Table 9-52 Dose and Dose Commitment Received by a Person Living at the Site Boundary

Accident Scenario	Retaining Zone IV Dose or Dose Commitment (rem) Bone	Lung	Whole Body	Releasing Zone IV Dose or Dose Commitment (rem) Bone	Lung	Whole Body
	CH-WASTE AREA			CH-WASTE AREA		
Surface fire (C7)[1]	1.4-7	6.8-9	3.3-9	1.96-7	9.5-9	4.6-9
Surface container failure (C10)	7.7-9	2.0-10	1.9-10	1.08-8	2.8-10	2.7-10
Hoist drop (C13)	6.0-7	1.5-8	1.5-8	8.4-7	2.1-8	2.1-8
Underground fire (C22)	4.4-6	1.0-7	1.0-7	6.2-6	1.2-7	1.4-7
	RH-WASTE AREA			RH-WASTE AREA		
Canister drop in transfer cell (R16)	1.2-8	6.0-10	3.6-10	1.7-8	8.4-10	5.0-10
Hoist drop (R15)						
RH TRU waste	2.1-7	1.0-8	6.2-9	2.9-7	1.4-8	8.7-9
High-level waste for experiments	1.6-6	7.3-7	7.8-7	2.2-6	1.0-6	1.1-6
Natural background[2]	5.0	9.0	5.0			
5-hour jet flight[3]			2.5-3			

1. This designator corresponds to accident scenarios evaluated in the WIPP SAR (DOE, 1982)
2. Data from the National Council on Radiation Protection and Measurements (NCRP), 1975.
3. Mid-latitudes at 38,000 feet.

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