Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

November 19, 2019

CERTIFIED MAIL

Mr. Nathan Coggeshall
[redacted]

Dear Mr. Coggeshall:

FREEDOM OF INFORMATION ACT REQUEST (FOI 2020-00206)

This office is in receipt of the electronic Freedom of Information Act (FOIA) request you submitted requesting information regarding the removal of plutonium-contaminated soil at the Hanford Site, specifically report WASH-1520. In a telephone conversation with me on November 14, 2019, you clarified your request and stated you were seeking a copy of Document No. WASH-1520 "Environmental Statement Contaminated Soil Removal Facility."

Your request is granted and the report is enclosed. For the purposes of assessment of any fees, we have determined that your request falls within Section 1004.9(b)(4), ("all other requestors") of our FOIA regulations. See 10 C.F.R. 1004.9(b)(4). You are thus entitled to two (2) free hours of search time and 100 pages of duplication at no cost. As costs associated your request fell under two hours, there is no charge for this request at this time.

You may contact the U.S. Department of Energy, Richland Operations Office, FOIA Public Liaison, Richard Buel, at (509) 376-3375, or by mail at P.O. Box 550, Richland, Washington, 99352 for any further assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, email at ogis@nara.gov; telephone at (202) 741-5770; toll free at 1-877-684-6448; or facsimile at (202) 741-5769.

If you have any questions regarding your request, please contact me at our address provided on page 1 or at (509) 376-6288.

Sincerely,

-Original Signed By-

Dorothy Riehle
Freedom of Information Act Officer
Hanford Office of Communications

HOC:DCR

Enclosure

Final environmental statement

WASH-1520

ENVIRONMENTAL STATEMENT

CONTAMINATED SOIL REMOVAL FACILITY

Richland, Washington

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APRIL 1972

UNITED STATES ATOMIC ENERGY COMMISSION

RESPONSIBLE OFFICIAL:

R. E. HOLLINGSWORTH
GENERAL MANAGER

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Hanford

WASH-1520

ENVIRONMENTAL STATEMENT

CONTAMINATED SOIL REMOVAL FACILITY

RICHLAND, WASHINGTON

APRIL 1972

UNITED STATES ATOMIC ENERGY COMMISSION

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I. SUMMARY

This Environmental Statement was prepared in accordance with the National Environmental Policy Act and in support of the Atomic Energy Commission's proposal for legislative authorization and appropriations for the design, construction and operation of the Contaminated Soil Removal Facility at Richland, Washington.

The U.S. Atomic Energy Commission plans to remove plutonium contaminated soil from the floor of an existing enclosed trench (Z-9) used between July 1955 and June 1962 as a subsurface disposal facility for plutonium contaminated liquids from the Plutonium Finishing Plant on the Hanford Reservation near Richland, Washington. It is estimated that the soil to be removed contains approximately 100 kilograms of plutonium in a volume of approximately 1800 cubic feet.

Liquid wastes from the Plutonium Finishing Plant (PFP) have been discharged to subsurface disposal facilities (enclosed trenches) since startup of the facility approximately 22 years ago. Most of the plutonium contained in these liquid wastes is sorbed (retained) by the soil and held within a few feet vertically of the point of release. The enclosed trenches are located in a fenced off area well within the boundaries of the controlled Hanford Plant. Careful surveillance using test wells has allowed this practice to be followed safely for 22 years. Due to the quantity of plutonium contained in the soil of the Z-9 enclosed trench, special precautions and emergency plans are required for Z-9 which are not required for other enclosed trenches.

It is proposed to construct facilities at Z-9 to permit excavation and packaging of contaminated soil, to add equipment to the existing Plutonium Finishing Plant to permit recovery of plutonium from the contaminated soil, and to construct an Underground Storage Vault fourteen feet wide by eight feet high by 400 feet long for interim storage of contaminated soil.

Removal of the plutonium contaminated soil will eliminate the need for special precautions and emergency plans necessary to assure the safe storage of the plutonium in the enclosed trench. Due to the quantity of plutonium contained in the soil of Z-9 it is possible to conceive of conditions which could result in a nuclear chain reaction. These conditions would be the rearrangement of the contaminated soil, flooding on the enclosed trench following a record snowfall and rapid melting (Chinook), and failure to implement planned emergency actions (pumping of flood waters from adjacent terrain and addition of neutron absorbing materials to the enclosed trench). Even though the probability of all these occurrences happening in sequence is extremely remote, removal of the Pu contaminated soil will eliminate any possibility of such an event.

It is estimated that 100 plus or minus a factor of two kilograms of plutonium are contained in the contaminated soil to be removed from the Z-9 enclosed trench. It is believed that more than three-fourths of the plutonium in the soil (worth approximately $3,000,000) can be economically recovered in the nearby Plutonium Finishing Plant. The proposed operation will also permit extensive evaluation of soil dissolution and plutonium extraction techniques. Residues from the extraction operations and contaminated soil with insufficient plutonium to permit economical extraction will be packaged in plastic bags, placed in steel drums and stored in a new Underground Storage Vault. Because the contaminated soil will be packaged in steel drums, the soil can be moved to another location if found to be superior for long-term storage.

The proposed operation will also permit the extensive evaluation of techniques for contaminated soil removal, and for measuring the plutonium content of the contaminated soil. Appropriate adjustments will be made in the excavation plans as the soil is removed and the plutonium measurements are made.

The Contaminated Soil Removal Facility and the Underground Storage Vault will discharge air through high efficiency filters which will release less than one microcurie of plutonium per day to the atmosphere of a controlled area at a concentration estimated to be less than three percent of the concentration guide for a controlled area as defined in applicable federal standards.*

The proposed facilities will be located at the site of the Z-9 enclosed trench in the 200-W Area in approximately the center of the Hanford Plant. The site is semiarid, and within the fenced 200-W Area, is interspersed with chemical separations facilities, underground pipe lines and tanks, and supporting facilities. The above-ground structures of the Contaminated Soil Removal Facility can be removed after completion of the soil removal operations expected to take about two years between 1974 and 1976. The facilities will be designed to avoid release of any contaminated soil during soil recovery and storage operations. No irreversible or irretrievalbe commitments of resources will be made other than the very minor commitment of 2,000 to 5,000 cubic feet of space where the soil will be safely stored in steel 55-gallon drums at suitable interim or long-term storage repositories and the utilization of a small supply standard building materials used in construction of the facilities.

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* AEC Manual Chapter 0524 (and its Appendix). These concentration guides are identical to Title 10 Code of Federal Regulations Part 20 and both are consistent with the Recommendations of the National Committee on Radiation Protection and the International Committee on Radiation Protection.

The land to be used by the Contaminated Soil Removal Facility and the Underground Storage Vault does not contain archeological or historical sites; the landscaping and architectural design will be strictly utilitarian and will harmonize with existing facilities; during construction a minimum of land clearing and excavating will be involved, and no site erosion is anticipated.

Alternatives to the proposed Contaminated Soil Removal Facility are (1) continued retention of the plutonium in the enclosed trench, and (2) changes in the scope of the recovery concepts (i.e., hand excavation vs. remote mechanical removal; and vault storage of the contaminated soil without leaching). Storage of plutonium contaminated soil and/or extraction residues in steel drums in an underground concrete vault removes the need for special precautions and emergency plans necessary to assure the safe storage of the plutonium in the Z-9 enclosed trench. Remote mechanical removal rather than hand excavation is considered prudent to protect operating personnel from existing measured radiation and to reduce the potential of plutonium intake by operating personnel. Leaching of the plutonium from the contaminated soil is warranted where favorable economics exist.

In assessing and balancing the benefits to be obtained from removing plutonium contaminated soil from the Z-9 enclosed trench against the environmental and economic costs, and after considering the range of alternatives and their environmental impact, the Atomic Energy Commission has concluded that the proposed action should be undertaken.

II. BACKGROUND

A. Detailed Description

Beginning in 1943 the Hanford Works were constructed in southeastern Washington State to produce plutonium for the Manhattan Project (see figures 1 and 2). The facilities at Hanford were transferred to the jurisdiction of the Atomic Energy Commission in January 1947 and nuclear related activities have continued at the site since that time without interruption.

The Plutonium Finishing Plant (PFP) was constructed in the controlled access 200-W area located in the center of the plant site in 1949. The PFP receives plutonium nitrate solution from a separations plant, purifies the plutonium and converts plutonium to metal. In recent years facilities for the recovery of plutonium from fabrication scraps and separations waste have been added. The PFP is operated for the AEC by the Atlantic Richfield Hanford Company (ARHCO).

Liquid wastes containing small quantities of plutonium have been discharged from the PFP to enclosed trenches within the 200-W area since startup of the facility approximately 22 years ago. (A new project has been proposed and authorized which would eliminate this practice). The liquid waste flows from a pipe onto the soil floor of the enclosed trench. While a portion of water percolates through the soil, the plutonium in the waste is sorbed (retained) by the soil and held within a few feet vertically of its point of entry into the soil. Careful surveillance using test wells has allowed this practice to be followed safely for 22 years.

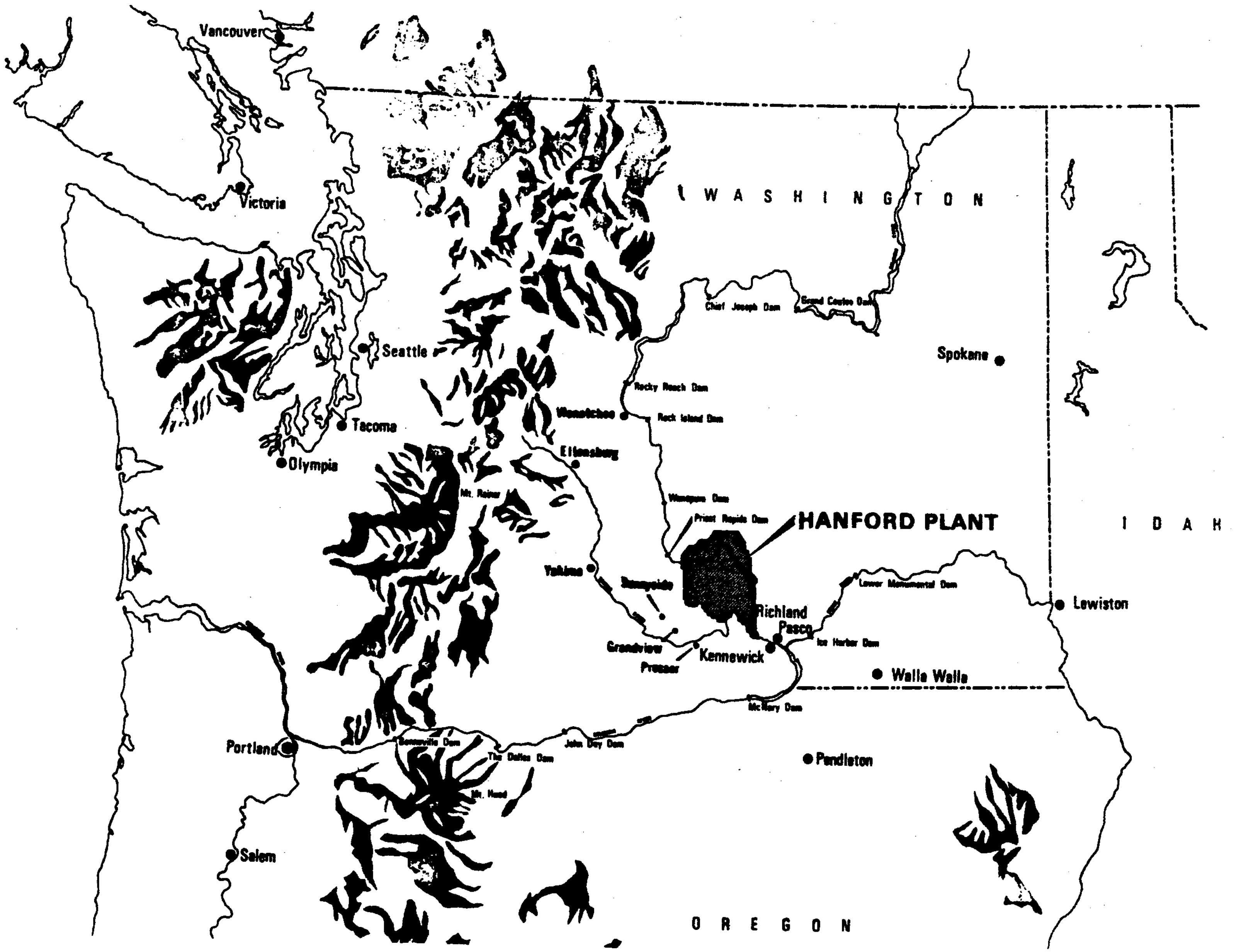


FIGURE 1
Washington State Map

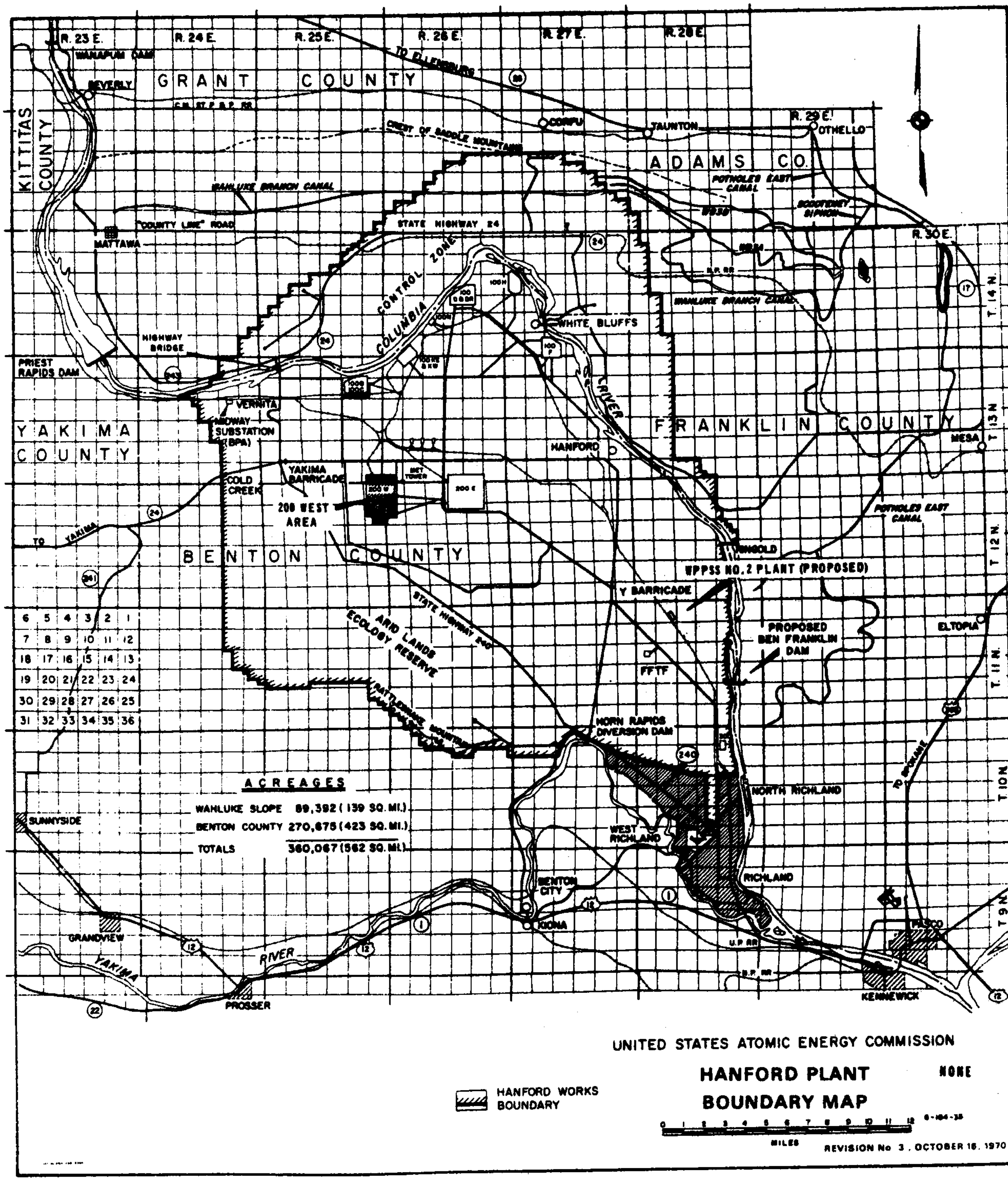


FIGURE 2
HANFORD MAP

One specific enclosed trench (Z-9) (see figure 3) was constructed in 1955 and safely received liquid waste from PFP between July 1955 and June 1962. Monitoring indicates that the Z-9 enclosed trench contains approximately 100 kilograms of plutonium in the upper twelve inches of its soil floor. Other enclosed trenches either have been or are being used to receive and contain plutonium bearing liquid waste from PFP, however, none have a plutonium inventory as high as the Z-9 enclosed trench.

Due to the quantity of plutonium contained in the soil of Z-9, it is possible to postulate conditions which could possibly lead to a nuclear chain reaction. These conditions would be (1) the rearrangement of the contaminated soil, (2) flooding of the enclosed trench following a record snowfall and rapid melting from a Chinook and (3) the failure to implement planned emergency actions (pumping of flood waters from adjacent terrain and addition of neutron absorbing material to the enclosed trench). Although the probability of all of these occurrences happening in sequence is extremely remote and, even if a chain reaction did occur, the radiation from a chain reaction would be primarily confined to the enclosed trench with no off-site effects, it is prudent to take special precautions for Z-9 which are not required for other enclosed trenches. Such precautions include the regular monitoring and sampling of the soil from Z-9, the routing of all liquid bearing pipes and trenches away from the vicinity of Z-9 and the ready availability of the necessary equipment to implement emergency plans for pumping and addition of neutron absorbing material to the Z-9 enclosed trench in case of flooding. Removal of the contaminated soil from Z-9 would eliminate the need for these procedures and emergency plans.

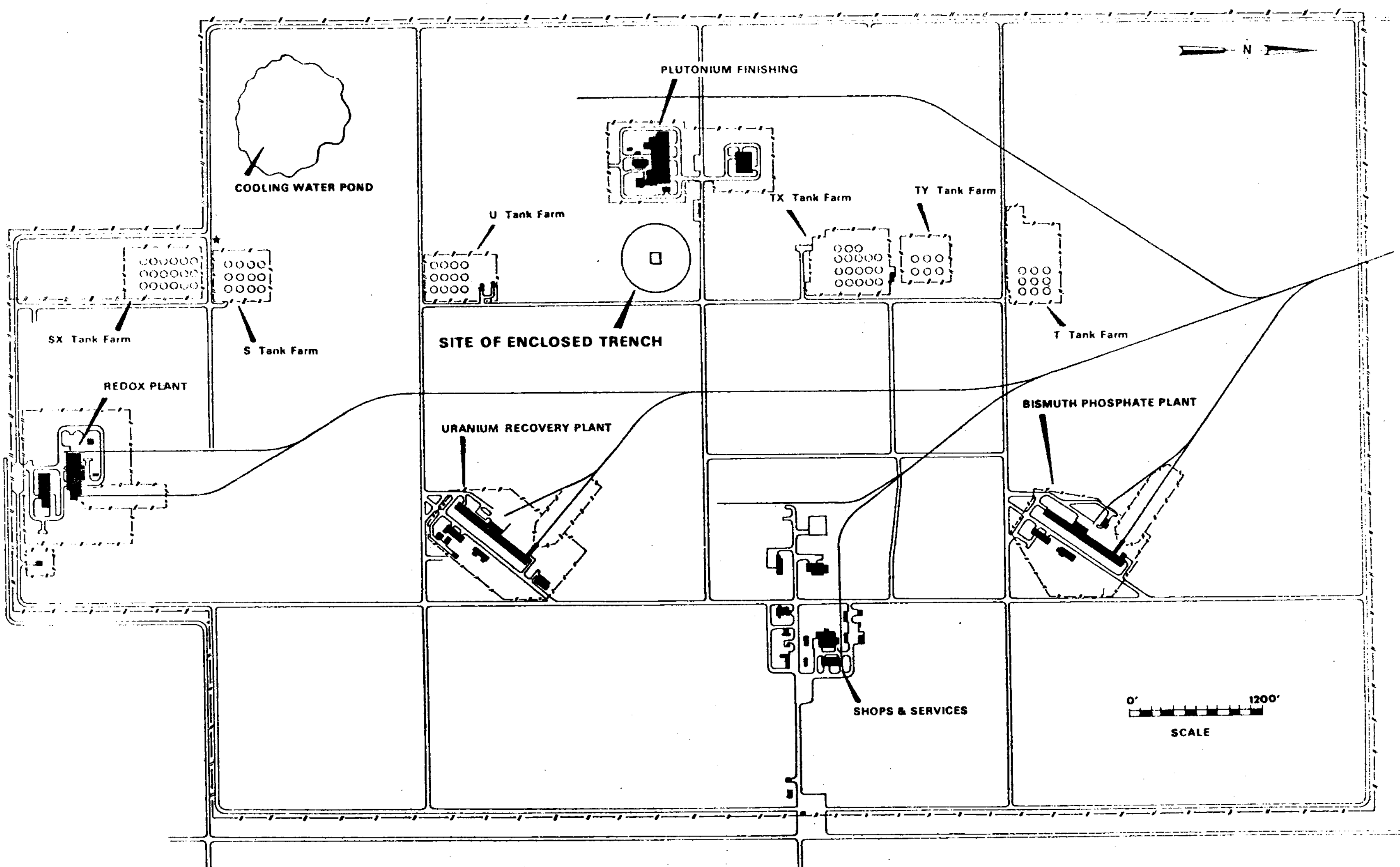
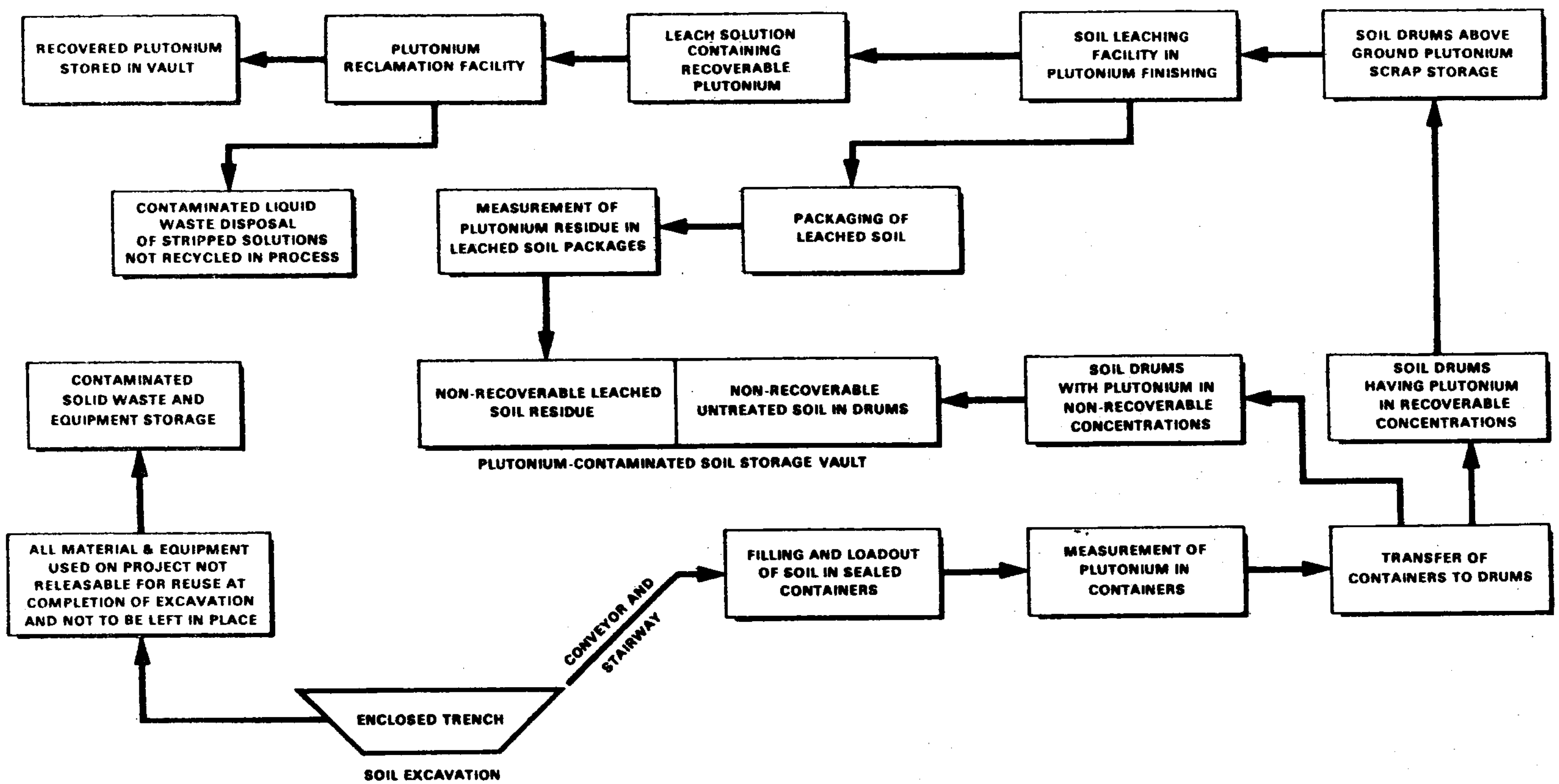


FIGURE 3
200 WEST AREA MAP

It is proposed to design, construct and operate a Contaminated Soil Removal Facility to remove plutonium contaminated soil from the floor of the Z-9 enclosed trench, to extract plutonium from the contaminated soil where economically justified, in new equipment in the PFP, and to store contaminated soil for an interim period in steel drums in a new Underground Storage Vault. A flow sheet for excavating and processing of the contaminated soil from Z-9 is shown in Figure 4. It is estimated that approximately $3 million worth of plutonium can be recovered from the contaminated soil.

The Z-9 is an excavation approximately 90 feet wide and 120 feet long at ground level and has equally sloping sides which terminate at the trench floor (see figure 5). The floor area is 30 feet wide and 60 feet long. The entire excavation is covered by a roof at ground level consisting of a 9 to 12 inch thick concrete slab which is supported by footings around the perimeter and by six columns located on the corners of the floor area and midway on each of the sixty foot sides. Figure 6 is a photograph of the site of Z-9 looking south.

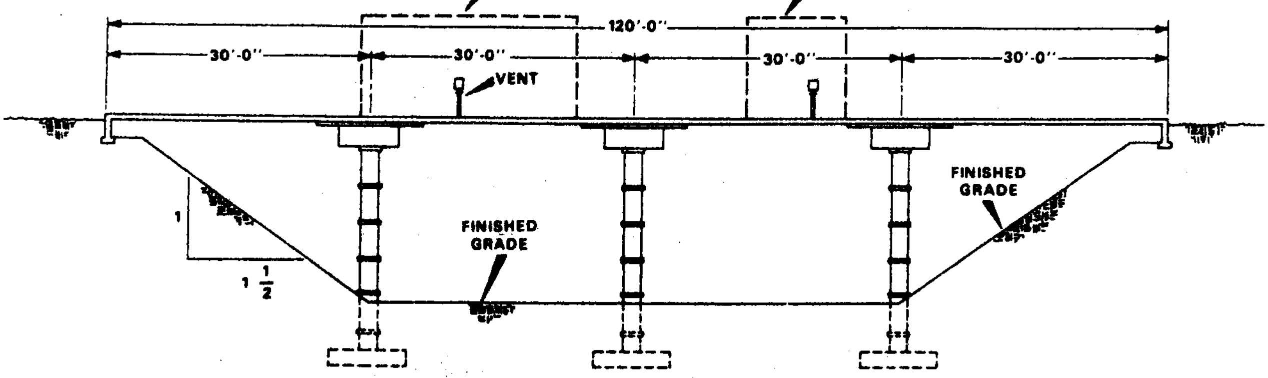
The Contaminated Soil Removal Facility will be located at the Z-9 site. It will consist of two prefabricated metal structures, a containment structure approximately 30' x 30' x 10' high and a fan house approximately 8' x 12' x 8' high. Both buildings will be constructed before entry is made into the enclosed trench. The buildings, which will be used for approximately two years, will be designed according to the Uniform Building Code -- Zone 2 for earthquake resistance and fifteen pounds per square foot for wind pressures to withstand earthquake shocks



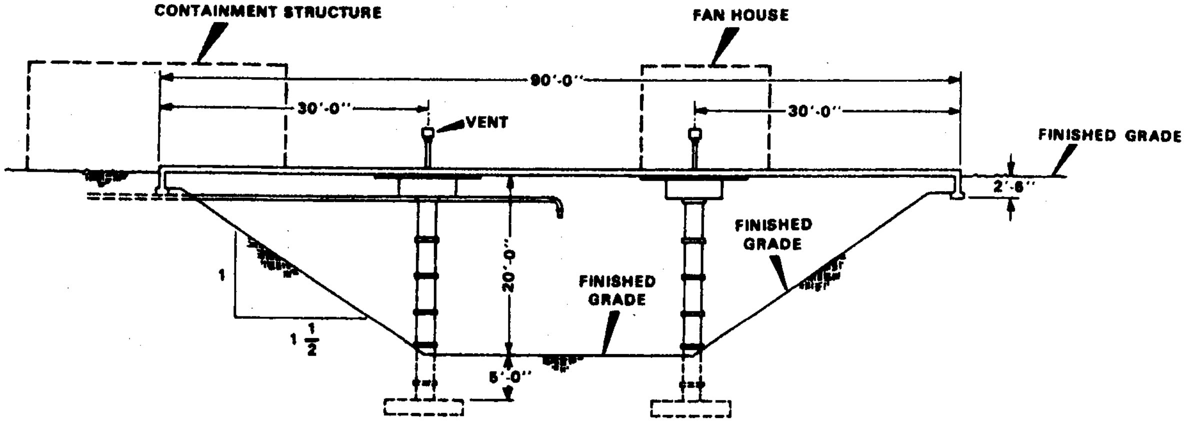
FLOW SHEET FOR EXCAVATING AND PROCESSING OF Z-9 ENCLOSED TRENCH SOIL

FIGURE 4

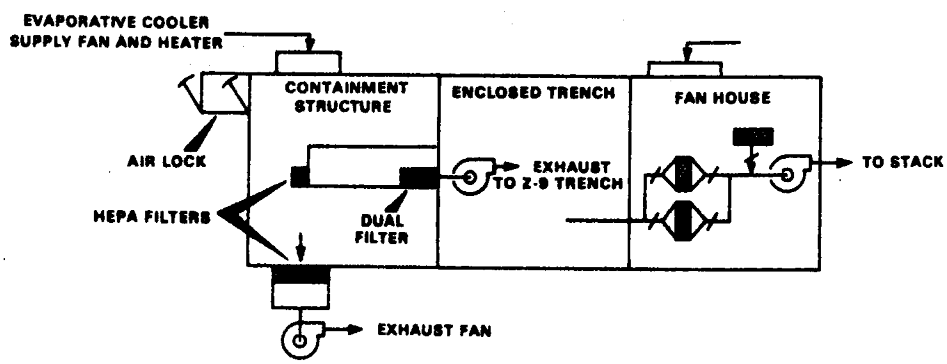
Z-9 ENCLOSED TRENCH



NORTH-SOUTH CROSS SECTION



EAST-WEST CROSS SECTION



VENTILATION DIAGRAM
FOR NEW FACILITY

FIGURE 5

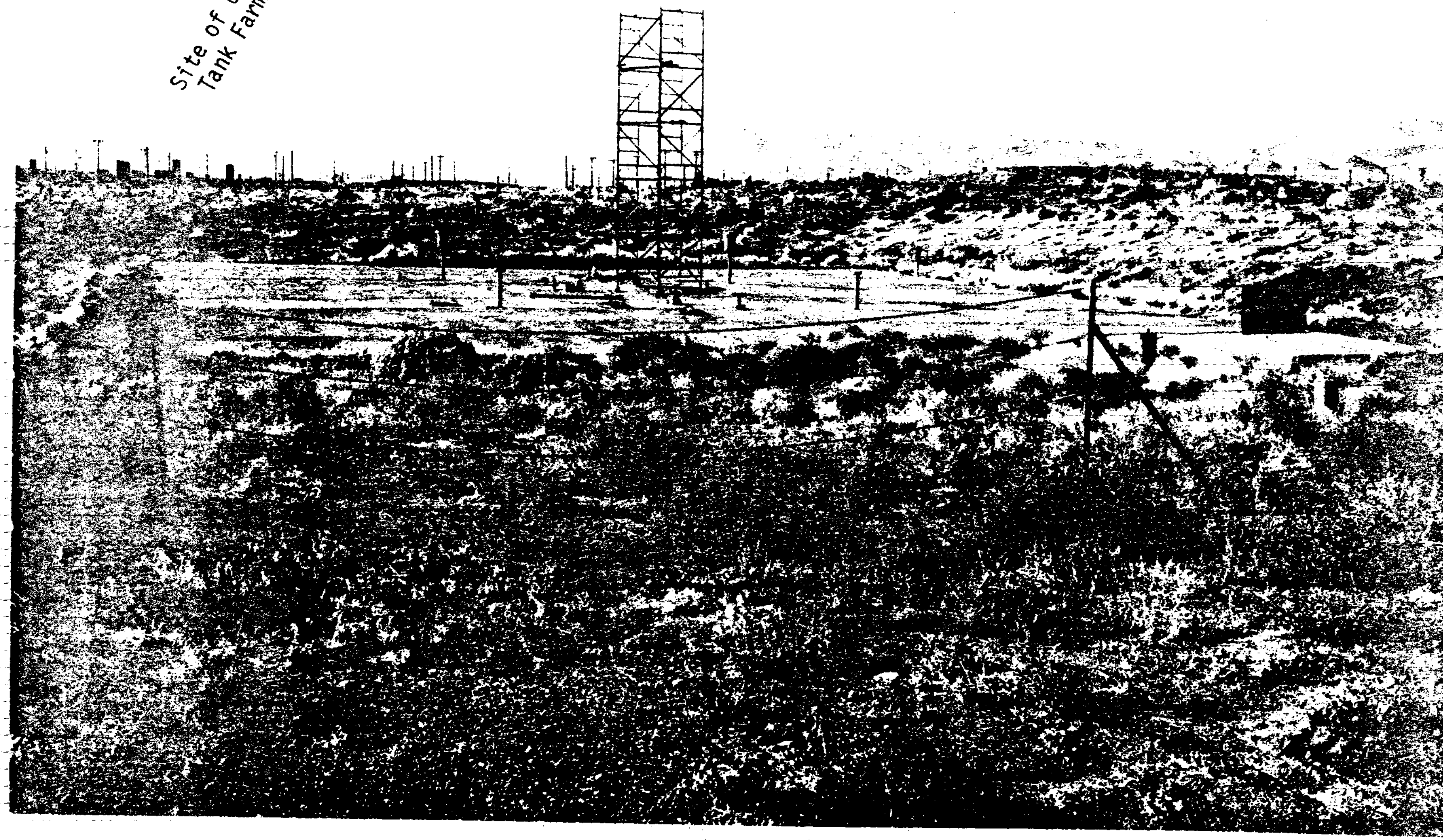


Figure 6

Z-9 Enclosed Trench, Looking South

and wind loadings that have been experienced in the 27-year history of the Hanford Plant.

The containment structure will be located near the edge of the concrete roof of Z-9 and will be used to house controls for the soil mining equipment, soil packaging and plutonium measuring equipment, and to provide contamination control barriers for the plutonium contaminated soil. Supporting services such as clothing change areas, air-locks, ventilation air, and maintenance areas will be provided. The fan house will be located on the concrete roof of Z-9 and will be used to house two high efficiency air filters, an exhaust fan, and a stack gas monitor. Figure 7 shows a cross section of the proposed equipment to mine and package the contaminated soil and the relative locations of the two structures.

The proposed plan for contaminated soil removal from the Z-9 enclosed trench has the following features:

1. Contamination Confinement - Structures will be provided for plutonium contamination confinement. These buildings will be constructed before openings for soil removal are made in the enclosed trench roof or walls and provide primary and secondary contamination confinement of the contaminated soil. The fan house, located on the enclosed trench roof, will contain a ventilation fan, two high efficiency (HEPA) filters in series, ductwork, dampers and associated equipment. Pressure differential will be maintained so that air flow through any opening in the walls of the maintenance and entry area will be inward from the operating area and the clothing change and

service area.

2. Soil removal by remotely operated digging and conveying equipment - A fully contained mechanism, within the enclosed trench and the containment structure will be provided for digging soil and for conveying the soil from the trench floor to the packaging equipment in the containment structure. A mechanical arrangement using either a bucket digger operated on a boom-mounted trolley or a clam shell bucket mounted on a jib crane will be utilized. (See figure 7).

   Approximately 1800 cubic feet of soil will be picked up mechanically from the Z-9 enclosed trench floor at a planned rate of 7.7 cubic feet per shift (one metal three-gallon container every 25 minutes). The soil will be transferred by conveyor to a loadout station where the soil will be packaged.

3. Entry into the enclosed trench by personnel for inspection and maintenance - The clothing change and service area of the containment structure will accommodate provisions for entry of personnel into the enclosed trench. The contamination barrier wall between the clothing change and service area and the maintenance and trench entry area will permit entrance by the work crew without any spread of contaminated material to the uncontrolled environment.

4. Packaging of the removed soil and loadout of the packages into sealed containers - Packaging of removed soil will be performed in a glove box in the operating area of the containment structure. The glove box will provide a contamination barrier between the

operating area and contaminated soil. An inclined conveyor will deliver the soil to the glove box where the soil will be loaded into plastic bags. Material access ports will be provided to deliver plastic bags into the glove box for convenient packaging of the soil. Soil in plastic bags will be loaded into three-gallon metal containers. The three-gallon volume limitation is imposed to assure that nuclear criticality cannot occur during subsequent handling operations.

Three-gallon metal containers and fifty-five-gallon metal drums are to be supplied in sufficient quantities to package 1800 cu. ft. of soil from the enclosed trench. The three-gallon metal containers will be loaded from the glove box into plastic bags in the operating area, the plastic bags will be sealed and then three sealed three-gallon metal containers loaded into a fifty-five gallon drum.

5. Measurement of the soil packages for plutonium content and sorting of packages - A neutron and a selective gamma-energy counter will be provided to determine the plutonium content of the soil containers as each is loaded.
6. Transport of soil packages - Those packages warranting plutonium recovery will be transported by truck to the PFP approximately 500 ft. away. Soil packages not warranting recovery will be sent by truck directly to the new Underground Storage Vault located approximately 250 ft. away. Trucks carrying contaminated soil packages will only travel on roads within the 200-W controlled access area.

ENCLOSED TRENCH SCHEMATIC MECHANICAL REMOVAL

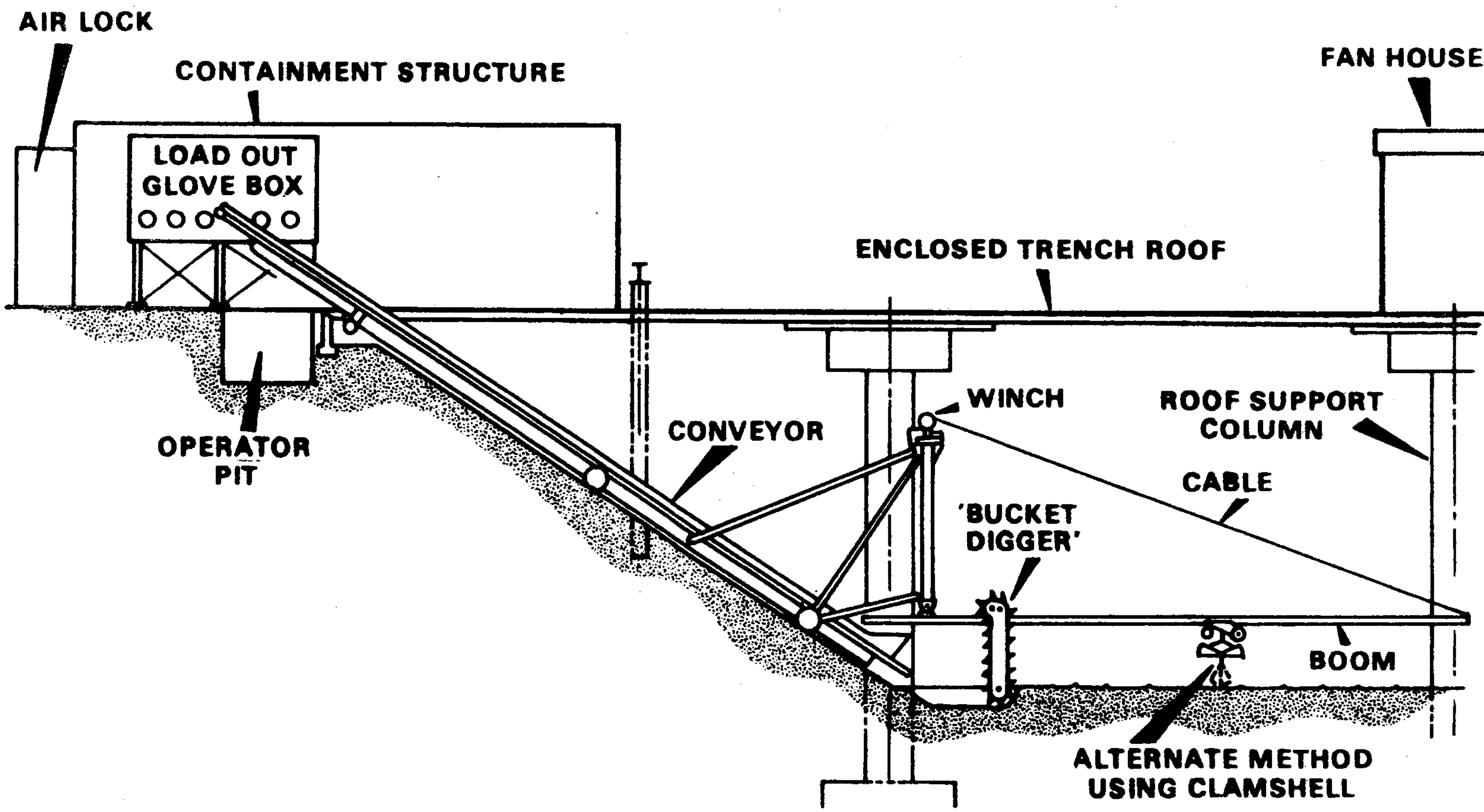


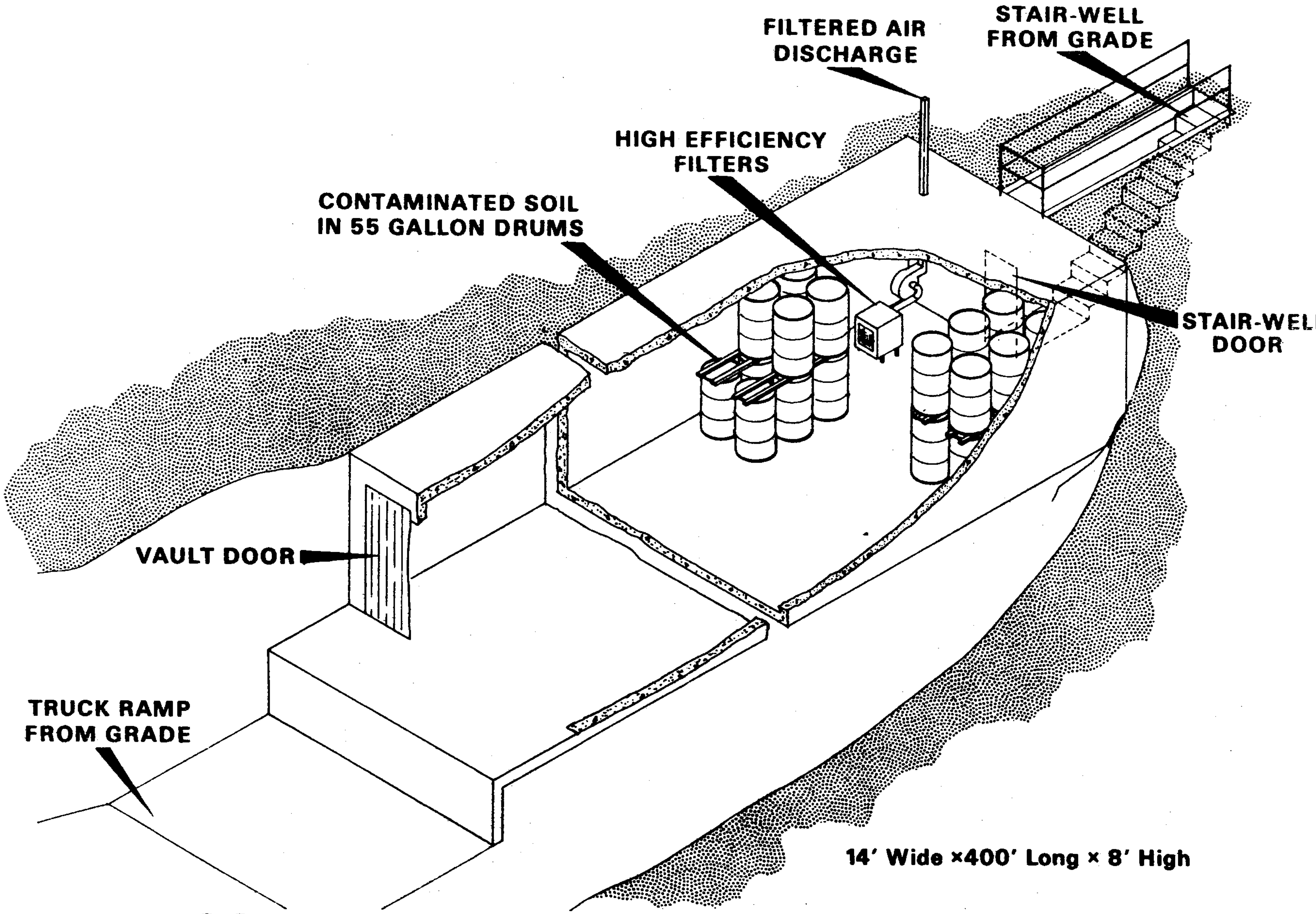
FIGURE 7

7. Leaching and recovery in the existing PFP of plutonium from the soil - It is presently estimated that 75 percent of the plutonium contained in the soil will be recovered. This material has a value of approximately $3 million. It is anticipated that further development of the chemical processes associated with the leaching operation may increase the leaching efficiency.

8. Storage of leached soil - A concrete Underground Storage Vault (figure 8) fourteen feet wide by eight feet high by 400 feet long is tentatively scheduled to be constructed between the Z-9 trench and PFP to contain approximately 1500 steel drums of 55-gallon capacity for storage of (a) mined but not leached soil and (b) leached soil residues. One end of the vault will be equipped with steel doors, an unloading dock, and truck approach. The approach is to be surfaced and drains provided to exclude water from the vault. A small fan is to be provided to pass about 500 cubic feet per minute of air through the vault which will exhaust through two high efficiency filters in series. Stack monitoring will be provided.

9. Packaging and storage of mining equipment, buildings and material which cannot be decontaminated, monitored, and released for other uses at completion of the project - Large equipment, such as the conveyor, will be constructed to facilitate dismantling at the conclusion of the work.

10. Sealing of openings in the Z-9 Enclosed Trench - Openings in the roof or walls of Z-9 for the containment structure and fan house will be sealed with concrete plugs prior to removing these



CONTAMINATED SOIL STORAGE VAULT

FIGURE 8

structures.

B. Anticipated Benefits

The proposed action will remove approximately 1800 cubic feet of soil containing about 100 kg of plutonium from the floor of the Z-9 enclosed trench and store this material in multiple steel containers in an underground storage facility. This will remove the need for special administrating and operating precautions and emergency action plans necessary to assure the continued safe storage of the plutonium in Z-9 and eliminate any possibility of an unplanned nuclear chain reaction in the enclosed trench.

Removal of the contaminated soil from the enclosed trench will provide for an evaluation of techniques for the safe removal and measurement of the plutonium content of the contaminated soil, and the extraction of plutonium from the soil. The distribution of plutonium in the soil may also be determined by this operation. Appropriate adjustments will be made in the excavation plans as the soil is removed and plutonium measurements are made to determine if additional soil removal is justified.

Though not a primary objectiveof the proposed work, recovery of plutonium from the contaminated soil is economically attractive. Plutonium will be recovered from the soil where economically justified. It is estimated that 75% or 75 kilograms from the estimated 100 kilograms of plutonium in the soil of Z-9 will be recovered and that 92% of the plutonium is fissionable. The value of this material is $43 per gram* and , therefore, the estimated total value of the recovered plutonium is $3 million.

*Federal Register Notice, May 29, 1963, (28FR5314) as amended October 16, 1968 (33FR1533), and as further amended May 24, 1969 (34FR8173).

C. Characterization of the Existing Environment

The Contaminated Soil Removal Facility site is located approximately 25 miles northwest of the center of Richland, in Benton County, Washington. This remote site is within the confines of the 562 square mile, Federally-owned Hanford Reservation and is about six miles from the south bank of the Columbia River. (See Appendix A.)

Hanford Reservation

The Hanford Reservation has been used for plutonium production and test reactor operations for over two decades. Due to national security, access to the site is restricted and controlled.

Plants and animals are, for the most part, naturally occurring species. Agricultural production is at least eight miles from the 200-W Area and consists of alfalfa, corn, potatoes, sugar beets, wheat, barley and others. Population in the area surrounding the site and the Hanford Reservation is sparse, consisting primarily of farms and farming communities to the north, east and west of the reservation. The Tri-Cities: Richland - 28,500; Kennewick - 16,500; and Pasco - 19,500; are located to the southeast of the site and represent the major population concentrations in the area.

Meteorology

Hanford has a relatively mild, continental steppe climate subject to a rather wide seasonal range in temperature. Twenty-five years of meteorological data (primarily from a 408-foot tall meteorology tower three miles east of the Contaminated Soil Removal Facility site) permit an accurate description of the climate.

The average summer temperature is 73.7°F, with temperatures greater than 100°F approximately 13 days per year. The average winter temperature is 32.4°F with temperatures below 0°F approximately four days per year. The minimum and maximum recorded temperatures in the area were -27°F in December 1919 and 115°F in July 1939.

Precipitation averages approximately seven inches per year occurring mainly during the winter months. The heaviest rainfall of record occurred in October 1957 with 1.68 inches in six hours. The greatest snow depth of record is 12 inches which occurred in December 1964.

Northwest winds predominate at the meteorology tower three miles east of the Contaminated Soil Removal Facility site. The average wind speed range is approximately 5-15 miles per hour. Over a twenty-five year period, the peak gust wind was measured as 80 miles per hour at the 50-foot level of the Hanford Meteorological Tower. The calculated extreme wind velocity at a 30-foot level on a 100 year mean recurrence interval is estimated to be 80 miles per hour. (H.C.S. Thom, "Journal of the American Society of Civil Engineers," July 1958, page 1794.)

The Pacific Northwest is one of the geographical areas of the country with the lowest frequency of tornadoes; none have been recorded on the Hanford Reservation. The probability of a tornado hitting the Contaminated Soil Removal Facility is approximately one in a million per year (H.C.S. Thom probability equation, "Monthly Weather Review", Oct.-Dec. 1963, pages 730-736.)

Hydrology

The Contaminated Soil Removal Facility site lies in the center of the Hanford Reservation on a plateau approximately 675 feet above mean sea level. Groundwater at the Facility site occurs at about 475 feet.

The flow of the Columbia River at the Hanford Reservation has been monitored for the past 21 years. River flow has varied from a minimum of 34,000 cubic feet per second (cfs) to a maximum of 659,000 cfs. The Corps of Engineers has estimated the maximum probable flood at the site to result in a river flow of 1,440,000 cfs and a river level of approximately 400 feet above mean sea level (approximately 275 feet below the surface of the Contaminated Soil Removal Facility.)

Geophysical Data

Basalt bedrock lies beneath the Hanford Reservation at a level ranging between 100 feet above and 100 feet below mean sea level. The basalt is part of the Mio-Pliocene Yakima Basalt Formation of the Columbia River Group which, with associated older sequences of basaltic lavas, aggregates to probably 12,000 feet thick.

The Ringold Formation sediments beneath the site are compact, locally indurated silts, sands, gravels and local clays, generally impure, poorly sorted and consequently of low permeability. They are Columbia River deposits laid down in Pliocene times as the result of continued down-warping of the Pasco Basin, and the uplift of the enclosing anticlinal ridges, particularly the Horse Heaven Hills. The uplift of those ridges, beginning roughly ten million years ago, evidently has continued at a slow and probably nearly steady rate concomitant with comparable basining to the present day. The load to which the sediments have been subjected, both by stratigraphically higher beds prior to their erosion, and the weight of the glacial Lake Messoula and related floods, has evidently compacted the sediments to very high densities. Therefore, it is reasonable to assume that settlements of these materials due to seismic effects would be negligible, soils below the very low watertable would have an ample factor of safety against liquification, and the permeability of the materials would be minimal.

Seismology

The Hanford Reservation is located in Zone 2 of the Seismic Probability Map (1949) of the Uniform Building Code and the Seismic Risk Map of the ESSA-Coast and Geodetic Survey (1969) and is situated between the active earthquake zones of the Puget Sound trough and the northern Rocky Mountains. (See Appendix B.)

The seismicity of the Pacific Northwest region (Washington, Oregon, and Idaho) is dominated by activity in the coastal areas, concentrated in the Willamette-Puget Sound earthquake belt. This belt is part of the Circum-Pacific earthquake zone, which accounts for most of the seismicity of the earth. The Willamette-Puget Sound belt is over 300 miles long and up to 80 miles wide, and its nearest approach to the reservation is about 120 miles. Three zones of lesser seismicity can be seen in the Pacific Northwest; 1) a broad zone of rather sparse seismic activity extending from the Olympic Peninsula to the Snake River Basin of Idaho; 2) a poorly defined zone extending about 100 miles NNE of Wenatchee Valley; and 3) a zone through the Rocky Mountains of Idaho. The Hanford Reservation is near an active section of the Olympic Peninsula-Snake River Plain zone and the seismicity of this zone is being studied extensively. (See Appendix B.) The zone is 510 miles long by about 50 miles wide. The trend of the zone is N58^{o}W in the vicinity of the site and becomes about N40^{o}W in Idaho.

Vegetation

The natural vegetation of the Contaminated Soil Removal Facility site and vicinity is dominated by desert shrubs, with big sagebrush and antelope bitterbrush especially abundant. Grasses consist especially of Sandberg bluegrass and cheatgrass brome.

Only the hardier, more adaptable, and therefore more common, plant species of this region are found at the Contaminated Soil Removal Facility site. Since the Contaminated Soil Removal Facility will occupy such a small fraction of the total area of the Hanford Reservation, no change in the ecological balance of the site is anticipated.

Wildlife

The mammals most commonly associated with the sagebrush-bitterbrush vegetation are pocket mice, deer mice, jackrabbits, coyote and mule deer. By far the most abundant of these is the pocket mouse, which subsists largely on the seeds of grasses. Mule deer utilize this vegetation type mostly during fall and winter and forage upon the shoots of cheatgrass and the leaves and smaller twigs of bitterbrush. A fence around the 200-W Area will effectively keep all large mammals away from the proposed operations.

Birds and reptiles are not abundant. Meadowlarks, horned larks and loggerhead shrikes appear to be the most conspicuous birds. The side blotched lizard is the most commonly seen reptile. The gopher snake and pacific rattlesnake are occasionally encountered.

Environmental Monitoring

An environmental monitoring program is conducted at the Hanford Reservation to obtain information on potential site, off-site and wild-life contamination. The program consists of radiochemical analysis of surface and ground water, the atmosphere and food consumed by humans and animals. Monitoring and sampling for abnormal radiation levels at various locations on and around the Hanford Reservation is also conducted. The results of the monitoring program are published annually in the report, "Evaluation of Radiological Conditions in the Vicinity of Hanford", prepared for the AEC by Pacific Northwest Laboratory (Battelle Memorial Institute). The report is available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151.

III. Environmental Impact

A. Probable Environmental Effects

It is estimated that operation of the Contaminated Soil Removal Facility and storage of the contaminated soil in the Underground Storage Facility will discharge less than one microcurie of plutonium per day to the atmosphere through high efficiency filters which will reduce the radioactivity as low a level as practicable. The radioactive discharge will be in concentrations estimated to be less than three percent of the concentration guide for releases to a controlled area as defined in applicable federal guidelines.*

The on-site storage of contaminated and leached soil in the Underground Storage Vault will utilize less than one half acre of land and will require approximately 45,000 cubic feet of space, however, the environmental effect from the utilization of this amount of space will be minimal since the Vault will be located within the restricted access 200-W area of the Hanford Reservation which contains numerous other areas for radioactive waste storage.

Finally, the proposed action could commit 2,000 to 5,000 cubic feet of space in a future long term radioactive material repository should it be determined advantageous to transfer this material to such a site once one is established.

B. Extraordinary Adverse Environmental Effects

A maximum credible accident postulated for the proposed action is the rupture of a container of plutonium contaminated soil outside a containment

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* AEC Manual Chapter 0524 (and its Appendix). These concentration guides are identical to Title 10 Code of Federal Regulations Part 20 and both are consistent with the Recommendations of the National Committee on Radiation Protection and the International Committee on Radiation Protection.

structure. Due to the double containment of all plutonium contaminated soil in steel containers and plastic bags such an accident is unlikely. However, if such an accident did occur, the resulting spread of contamination would be a local site problem limited in size by the relatively large particle size of the plutonium contaminated soil. Procedures and equipment will be available for the expeditious pickup of the contaminated soil should such an event occur.

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The operation of the Contaminated Soil Removal facility and Underground Storage Vault will discharge less than one microcurie of plutonium per day through high efficiency filters to the atmosphere of a controlled area. The discharge will be reduced to levels as low as practicable and will be in a concentration estimated to be less than three percent of the concentration guide for a controlled area as defined in applicable federal guidelines.*

The Underground Storage Vault will utilize less than one half acre of land and approximately 45,000 cubic feet of space in the restricted acess 200-W area.

The proposed action could commit 2,000 to 5,000 cubic feet of space in a future long term radioactive waste repository once such a repository is established.

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* AEC Manual Chapter 0524 (and its Appendix). These concentration guides are identical to Title 10 Code of Federal Regulations Part 20 and both are consistent with the Recommendations of the National Committee on Radiation Protection and the International Committee on Radiation Protection.

V. ALTERNATIVES

Alternatives to the proposed Contaminated Soil Removal Facility are (1) continued retention of the plutonium in the enclosed trench, and (2) changes in the scope of the recovery operation. The latter alternative involves consideration of hand excavation vs. remote mechanical removal and vault storage of the contaminated soil without leaching.

Due to special precautions currently being taken, there is no environmental impact associated with continued retention of the plutonium in the soil floor of the enclosed trench. Extensive monitoring has indicated that the plutonium has remained sorbed in the soil, primarily within 12 inches of the top of the soil floor. However, in view of the minimal environmental impact of the proposed soil removal and storage, it appears desirable to remove the contaminated soil from the trench in order to eliminate the need for the special precautions and emergency action plans necessary to ensure continued safe storage of the plutonium in the enclosed trench.

With regard to alternative recovery concepts, no environmental benefits are obtained by hand removal of the soil from the trench. However, due to the high level of radiation dose rates in the enclosed trench (300-400 mrer/hr), remote mechanical removal is considered prudent to protect operating personnel.

Storage of the contaminated soil without leaching to recover the plutonium would essentially have the same environmental impact as the proposed action with leaching. Recovery of the plutonium from the soil, when economically justified, will be performed in the existing Plutonium Finishing Plant and leaching of the contaminated soil will have no incremental environmental effect in the operation of this facility. In addition it is estimated that approximately $3,000,000 worth of plutonium can be recovered from the leaching operation.

Therefore, based upon economic and environmental impact considerations, removal of the contaminated soil with leaching is considered justified.

VI. RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The land to be used by the Contaminated Soil Removal Facility and Underground Storage Vault is desert land within the restricted access 200-W area of the Hanford Reservation which has already been committed for nuclear activities and at least part of the land in the 200-W area is already committed to the storage of radioactive waste.

The Contaminated Soil Removal Facility and the Underground Storage Vault can both be decontaminated upon completion of their operation and either returned to their present condition or used for other projects. Operation of the Contaminated Soil Removal Facility is expected to be completed in 1976. Reuse of the area utilized by the Underground Storage Vault would be possible upon shipment of the drums of contaminated soil to a suitable Federal Repository for radioactive waste. As of the present time the site for this repository has not yet been determined.

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Cons .ruc'ion and operation of the proposed Contaminated Soil Removal Facility and the Underground Storage Vault will involve the irreversible and irretrievable commitment of a relatively small supply of standard construction material such as concrete, steel, wood, etc. used in the construction of the facility. Although this material could be retrieved after the useful operation of the facility, it may not be economically justified to do so.

The utilization of less than one half acre of land for the Underground Storage Facility is not considered irreversible or irretrievable since this land could be reused if the contaminated soil drums to be stored here were shipped to a suitable Federal Repository at some later date. However, the 2,000 to 5,000 cubic feet of space required for the contaminated soil drums wherever they are stored is considered to be irreversible. It should be noted that this commitment of space has, in essence, already been made in that the 1800 cubic feet of contaminated soil already exist in the floor of the Z-9 enclosed trench.

VIII. COST BENEFIT ANALYSIS

A cost-benefit analysis has been performed for the proposed construction and operation of the Contaminated Soil Removal Facility and Underground Storage Vault. Environmental and economic costs were compared to the environmental, economic and technical benefits of the proposed action as well as those associated with available alternatives.

It is estimated that the proposed action will release approximately one microcurie of plutonium per day to the atmosphere of a controlled area. (Less than three percent of the concentration for release to controlled areas as defined in federal guidelines.) Facilities constructed for the project will require the use of less than one-half acre of land for less than twenty years, and 2,000 to 5,000 cubic feet of space could be required to store the soil in a future waste repository.

The Contaminated Soil Removal Facility will remove approximately 1,800 cubic feet of soil containing about 100 kg plutonium from the floor of the Z-9 enclosed trench and store this material in multiple steel containers in an underground storage facility. This action will remove the need for special precautions and emergency action plans necessary to assure the continued safe storage of the plutonium in Z-9 and eliminate any possibility, of an unplanned nuclear chain reaction in the enclosed trench.

The proposed operation requires $1,150,000 ($1,000,000 capital cost and $150,000 operating cost) to mine and store the plutonium contaminated soil plus approximately $760,000 ($400,000 capital cost and $360,000 operating cost) to recover plutonium from the soil. These costs, however, are expected to be offset by the value of the plutonium which will be recovered from the soil where economically justified. It is estimated that approximately 75 kilograms of plutonium valued at $3 million could be recovered. In addition, administrative costs for the Z-9 enclosed trench would be reduced by $20,000 to $50,000 per year by removing the contaminated soil.

Technology benefits from the proposed action are the evaluation of techniques for the safe removal and measurement of the plutonium content of plutonium contaminated soil, and the extraction of plutonium from the contaminated soil. The distribution of plutonium in the Hanford soil may also be determined by this operation.

Alternatives to the proposed action include continued retention of the plutonium in the enclosed trench or changes in the scope of the recovery operation such as hand excavation of the soil or removal and storage of the contaminated soil without leaching. Continued retention of the plutonium in the enclosed would have no environmental impact, however, this would require the continued use of special precautions and emergency action plans to ensure safe storage. Hand removal of the contaminated soil or removal and storage of the contaminated soil without leaching offer no environmental benefits over the proposed operation and are not considered acceptable due to reasons of personnel safety and economics.

In assessing and balancing the above environmental and economic costs against the projected environmental, technical and economic benefits and after considering the available alternatives and their environmental impact, it is concluded that the U.S. Atomic Energy Commission should proceed with the design, construction and operation of the proposed Contaminated Soil Removal Facility and the Underground Storage Vault at Richland.

SECTION IX DISCUSSION OF COMMENTS RECEIVED ON THE DRAFT STATEMENT

In general, comments received on the draft Environmental Statement stated that it was believed that the facility could be constructed and operated with minimal impact on the environment. No objections to the proposed action were expressed.

Several comments were received which were concerned with the radioactive discharges from the proposed facility. These comments involved the proximity of the operation to the nearest uncontrolled area and the calculations estimating the concentrations of radioactive releases. In our response to these comments it was pointed out that the entire Hanford Plant is considered a controlled area and concentrations given in the statement for releases to an uncontrolled area are at the nearest plant boundary approximately seven miles from the 200-W Area. It is estimated that radioactive releases from the proposed facility at the source of the discharge will be less than 3% of concentration guide for release to a controlled area and, in fact, less than the concentration guide for release to an uncontrolled area. At the plant boundary concentrations will be reduced to less than 0.04% of the guide for an uncontrolled area.

In response to a comment concerned with the packaging of the contaminated soil into 3 gallon containers and then placing 3 such containers into a 55 gallon drum it was pointed out that, assuming uniform distribution of the plutonium in the soil, this would average only 22.2 grams of plutonium per 3 gallon container. At this concentration there would be no criticality problems with the storage of the contaminated soil.

Section VII, Irreversible and Irretrievable Commitments of Resources, was revised in response to one comment to include a relatively small supply of normal building materials which probably would not be recovered due to economics.

APPENDIX A

The Hanford Plant Environment

The pristine vegetation (prior to the advent of settlers in the area) of the Hanford Plant was probably dominated by desert shrubs, especially big sagebrush, Artemisia tridentata, with lesser amounts of spiny hopsage, Grayia spinosa, green rabbitbrush, Chrysothamnus viscidiflorus and gray rabbitbrush C. nauseosus. For the most part these shrubs have little value as wildlife or livestock forage. The shrubs are mostly less than 1 meter tall and occupy 5 - 20 percent of the ground areas.

The herbaceous understory to the shrubs was probably dominated by a sparse cover of perennial grasses especially sandberg bluegrass, Poa sandbèrgii. Sandberg bluegrass like other perennial grasses is palatable to wildlife and livestock species. Other perennial grasses were conspicuous on local habitats especially needle and thread grass, Stipa comata, Indian rice-grass, Oryzopsis sp.* and thickspike wheatgrass, Agropyron dasystachyum.

Forbs are conspicuous, when in full bloom. The most showy are Carey balsamroot, Balsamorhiza, careyana, and longleaf phlox, Phlox longifolia. Small annual plants were present expecially Festuca octoflora and Descurainea pinnata. The ground beneath shrubs supported a crusted soil surface that was maintained by intermingled growth of low growing mosses and lichens and filamentous soil dwelling algae.

With the advent of settlers to the region in the late 1800's and the introduction of grazing livestock the palatable grasses and forbs declined in abundance and were replaced in part by alien weeds especially cheatgrass,

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* Variable species

Bromus tectorum, Tumble mustard, Sisymbrium altissimum and Russian thistle, Salosola kali.

In the absence of grazing livestock for nearly 30 years alien weeds still form a large part of the herbaceous understory. Cheatgrass provides forage for wildlife and is palatable to livestock.

The soil and climate are such that when irrigated the land can produce a variety of crop plants, i.e., alfalfa, corn, potatoes, sugar beets, wheat, barley and others.

Under pristine conditions aquatic plants were not a part of the ecological system in the 200-W Area, however, cooling water ponds have been in existence for up to 26 years and presently support plants that are not a part of the surrounding desert vegetation. Over the years, trees, especially peach-leaf willow, Salix amygdaloides and Cottonwood, Populus trichocarpa have become established around the margins of the ponded areas. Cattails, Typha latifolia and bullrushes, Scirpus sp. have become established in the shallow water portions of the ponds. Other weedy species particularly Russian knapweed, barnyard, rabbitfoot and reed canary grass sometimes form rank growths in the moist soil surrounding the ponds. The ponds also support various species of algae and free-floating water plants like duck-weed, Lemna sp.

There are no rare or endangered species of vascular plants that are restricted to the environs of the 200-W Area.

Birds are not abundant in desert shrub vegetation. The most important are the meadowlark and horned lark. Other birds that nest in shrub vegetation are the sagesparrow, burrowing owl and loggerhead shrike, sagethrasher and the long-billed curlew. The most important game birds are the mourning dove and the chukar partridge.

The ponded areas with surrounding riparian vegetation is attractive to many kinds of wetland birds including magpies, swallows, blackbirds, starlings, killdeer, sandpipers, coots, grebes, phalaropes, gulls, terns, herons, yellowlegs and most species of ducks and geese normally found in southeastern Washington.

Large birds of prey utilize the entire Hanford Reservation as foraging ground, i.e., Swainson's hawk, Red-tailed hawk, Marsh hawk, Sparrow hawk, Bald eagle, Golden eagle, Osprey and Great-horned owl.

The mammalian fauna of the 200-W Area is dominated by the small mammals Rodents are the most widely distributed and most numerous land animals. Pocket mice, Perognathus parvus, deer mice, Peromyscus maniculatus, harvest mice, Reithrodontomys megalotis, pack rats, Neotoma cinerea, and ground squirrels, Spermophilus townsendii are important species inhabiting the area. These animals are seldom a nuisance and their presence near industrial activities is rarely observed.

The black-tailed jackrabbit, Lepus californicus, is an abundant medium-sized mammal that can become a pest during population highs. Disturbances of native vegetation can contribute to population explosions of jackrabbits, at which time the animals may become pests.

Coyotes, Canis latrans, bobcat, Lynx rufus, and the badger, Taxidea taxis are important predators in the area and they will adapt to man's activities if they are not harassed.

Ponds and ditches afford excellent habitat for the muskrat, Ondatra zibethica, and an occasional beaver, Castor canadensis. Both species use aquatic habitats for food and cover, and both do a great deal of digging into ditch banks.

Mule deer, Odocoileus hemionus, are the most important large game animal in the vicinity, and approximately 25 live in the immediate vicinity of the 200-E and W areas. There are approximately 200 - 400 mule deer on the Hanford Reservation.

There are no known species of rare or endangered mammals in the area.

There are few species of reptiles and only one amphibian in this locale. The spade-footed toad, Scaphiopus intermontanus, is the single amphibian species which has been able to adapt to the rigorous extremes of this environment. Prairie rattlesnakes, Crotalus viridus, gopher or bull snakes, Pituophis melanoleucus, and the yellow-bellied racer, Coluber constrictor are common snakes, and the most abundant lizard is Uta stansburiana. There are no rare or endangered reptiles or amphibians on the proposed site.

The insect fauna of the Hanford Reservation is virtually unknown and existing data are not sufficient to justify even a description of common species.

APPENDIX B

Seismic Activity At The Hanford Reservation

SUMMARY

The geology and seismicity of the Hanford area have been discussed in many reports by competent authors. Recent information now in the literature stating the earthquake potential at Hanford, is given in the following two reports;

1. Waldron, H. H., and Bonilla, M. G., Field Review of Possible Young Faulting in the Hanford Area, U.S. Geol. Survey Interagency Rept., 1968.

2. Seismic and Geologic Siting Evaluation: Fast Flux Test Facility Near Richland, Washington, John A. Blume and Associates, Engineers, April 1970.

The conclusion from these reports is that the Hanford Reservation (in the 200 Areas vicinity) is bounded by two major geologic structures. The largest of these is the Olympic-Wallowa Lineament, a series of anticlinal structures, striking in a northwesterly direction and passing southwest of the Reservation. The lineament is contiguous with the purported Rattlesnake-Wallula Fault located southeast of Rattlesnake Mountain. The other major structure is the Saddle Mountain Fault striking in a east-westerly direction and passing north of the Reservation. The two structures described here are the most probable loci for major earthquake activity near Hanford.

The Olympic-Wallowa Lineament is nearest the 200 Area Control Zone, but the extension of a fault along this structure beyond the Yakmia River or even Wallula Gap has not been demonstrated conclusively. However, for earthquake resistant design analyses of structures for construction projects for current and proposed nuclear facilities at Hanford, a northwest fault extension beyond the Yakima River (passing about 9 miles south from the Fast Flux Test Facility (FFTF) and about 9-1/2 miles south from 200 East Area) has been assumed. A maximum credible earthquake of magnitude 6.8 is postulated on this possible extension of the fault, with a focal depth of 6 miles.

Geologic Structures, Pasco Basin

A close correlation between faulting and earthquakes in the western U.S. is generally recognized. Most authorities agree that earthquakes in the western states are caused by or related to movement along faults.

The structural geology of the Pasco Basin, particularly that portion of the basin in and around the Hanford Reservation, has been the subject of much study and discussion. Most of the pertinent literature has been reviewed and summarized by Jones and Deacon (Reference 1).

The structures of particular interest in the Hanford Reservation are westerly trending anticlines formed in basalt. The northernmost anticline forms the Saddle Mountains, trending in an east-west direction. Smyrna Bench is a prominent plateau on the north slope of the Saddle Mountains. Gable-Butte and Gable Mountain are formed by a subparallel and coalescing alignment of anticlines trending WNW through the north central part of the Reservation. The Rattlesnake Hills are formed by an anticline trending northwestward which passes southwest of the Reservation.

The most recent and thorough study of these features has been conducted by Bingham, a USGS geologist. The following information is a summary of Bingham's report.

Smyrna Bench - Saddle Mountains. The subsurface geology at Smyrna Bench was investigated by trenching, field mapping, and drilling. Evidence in the form of drilling logs, geologic cross-sections, and geologic maps is presented by Bingham. His conclusions are briefly as follows: Smyrna Bench is a large landslide from the face of a fault scarp; the fault itself is largely obscured by landsliding but was definitely identified; no evidence of recent fault movement was found but the fault could be active.

Gable Butte - Gable Mountain. These anticlinal features were investigated by surface mapping and trenching. The presence of previously mapped faults at Gable Butte could not be substantiated.

A well defined thrust fault with about 70 feet of displacement was exposed by trenching at Gable Mountain. This fault is known to be older than 10,000 years and probably is 40,000 years old. It was concluded that faulting there is inactive.

Rattlesnake Hills - Wallula Gap Fault. This feature was identified as an active fault with recent movement at its southeast extension. It was mapped over a strike length of 27 miles and has a probable exposed length of 47 miles. It could not be projected with certainty across the Yakima River. Over much of its length, it has a breccia zone from 100 to 200 feet wide where exposed in basalt.

Earthquake Distribution Hanford Region

The seismicity of the Pacific Northwest region (Washington, Oregon, and Idaho) is clearly dominated by activity in the coastal areas, concentrated in the Willamette-Puget Sound earthquake belt. This belt is part of the Circum-Pacific earthquake zone, which accounts for most of the seismicity of the earth. The Willamette Puget Sound belt is over 300 miles long and up to 80 miles wide, and its nearest approach to the site is about 120 miles. Three zones of lesser seismicity can be seen in the Pacific Northwest; 1) a broad zone of rather sparse seismic activity extending from the Olympic Peninsula to the Snake River Basin of Idaho; 2) a poorly defined zone extending about 100 miles NNE of Wenatchee Valley; 3) a zone through the Rocky Mountains of Idaho. In previous reports of seismicity of the Hanford Reservation, the Olympic Peninsula-Snake River Plain zone has been largely discounted or ignored. However, the Hanford Reservation is near one of the more active sections of the zone, and the seismicity of the zone therefore requires further consideration. The zone is 510 miles long by about 50 miles wide. The trend of the zone is N58^{o}W in the vicinity of the site and becomes about N40^{o}W in Idaho. The tectonic flux map of Ryall and others (Reference 2, p. 1109) shows this zone rather well.

Tectonic Structures

As stated previously, the most significant area of seismicity in the Pacific Northwest is the Willamette-Puget Sound zone This zone is coincident with the Willamette and Puget Downwarps, which form a continuous structural trough that is currently active.

The Olympic Peninsula-Snake River Basin seismic zone described earlier is coincident with, and extends beyond the Olympic Wallowa Lineament, a structural feature whose tectonic significance is poorly understood.

The lineament was first described by Raisz (Reference 3) a northwesterly trending alignment of topographic features extending from the Olympic Peninsula to the Wallowa Mountains of Oregon. The Tectonic Map of the United States shows a strong alignment of anticlinal fold axes along the length of the Olympic-Wallowa Lineament, which is flanked on both sides by structural basins of Quaternary or somewhat older age. Skehan (Reference 4), using the results of deep resistivity surveys and his own field work in the Wallula Gap area, concluded that the lineament is related to a deep crustal transition associated with tectonics (primarily uplift) of the Columbia Plateau basalts, and with historic seismicity.

Inspection of the Tectonic Map of the United States suggests that the Olympic-Wallowa Lineament may be connected with a belt of structural basins bounded by normal faults extending from Wallula Gap into the Snake River Basin near Boise, Idaho. This suggests that normal faulting is characteristic of the Olympic-Wallowa Lineament.

Local Earthquakes

History and Distribution. Due to the very low population density and notable lack of seismograph stations in eastern Washington, earthquake history for this region is not as complete as for other areas of the U.S. The threshold of earthquake reporting for southeastern Washington was probably around magnitude 5.0 (Richter) in earlier time.

Rasmussen (Reference 5, p. 9) reports only five earthquakes within 75 miles of the Reservation for the period 1866 to 1918. The only one of these given an intensity rating was the 1893 Umatilla, Oregon earthquake, rated at intensity VII (Modified Mercalli). The average rate of occurrence of reported earthquakes for the period 1866 to 1918 is 10 per century. Forty-four shocks within 75 miles of the Reservation are listed (Reference 5, p. 9) between 1918 and 1961, and so the rate of occurrence of reported shocks for this period is 100 per century. This indicates an inconsistency in the reports of earthquakes in this area over the two periods. However, this is most likely explained by the fact that earthquakes with intensity as high as V (magnitude 4.5) probably went unreported until 1918. Since then most earthquakes of at least intensity V and sometimes less were reported.

Damaging and Potentially Damaging Earthquakes. As mentioned earlier, the Hanford Reservation lies within the Olympic-Snake River Basin seismic zone; future earthquakes within 75 miles of the site and in this zone are believed to constitute the principal seismic hazards to the proposed site. Therefore, descriptions of damaging and potentially damaging historic earthquakes within this area are useful.

Umatilla, Oregon earthquake (1893). This event is reported to have caused some damage to buildings in Umatilla; its estimated intensity was VII, and its approximate location was three miles south of Wallula Gap, 33 miles southeast of Hanford.

Corfu earthquake (1918). The Corfu earthquake had an intensity of V to VI, shook goods from shelves in Corfu, and caused landslides for several miles along the north slope of the Saddle Mountains near Corfu. Its location is not accurately known, but is described as being 8 miles south of Corfu, or about 19 miles NNE of Hanford. Many aftershocks were felt at Corfu.

Milton-Freewater earthquake (1936). This earthquake had a reported intensity of VII which has been estimated to be equivalent to a Richter magnitude of 5.8 and was located about 57 miles southeast of the Hanford Reservation. Effects of the earthquake were described as follows: "The earthquake was destructive at Freewater, State Line, and Umapine, Oregon. At Freewater, plaster and windows were broken, chimneys were shifted at the roof line, and there was various damage to schoolhouses and other buildings. At Umapine, walls and chimneys were cracked. At Walla Walla movable objects were shifted and a few chimneys were wrecked. In the central region there was much cracking of the ground .... There were numerous aftershocks .... The shock was felt over a large area in Washington, Oregon, and Idaho" (Reference 6, p. 80). The ground cracking mentioned above may have been tectonic in origin; however, this is not certain (Reference 1).

Felt earthquakes. Many earthquakes smaller than those described above have been reported in the greater Hanford region, from Ellensburg to Walla Walla. Jones and Deacon's epicenter map (Plate 3) shows 34 epicenters of felt earthquakes with intensities up to V, all of which lie generally along the Olympic-Wallowa Lineament within 90 miles of the site, with particularly active spots reported at Ellensburg, Yakima, and Walla Walla. Neumann (Reference 7) describes a swarm of "highly localized" shocks felt in Ellensburg (65 miles northwest of the site) in 1934, some of which reached intensity VI, and a swarm felt in Othello (28 miles north of site) in 1957. Rasmussen (Reference 5, p. 472) reports 200 shocks for the latter swarm, and states that they were due to a rising water table. Four felt shocks located 6 miles south of the Reservation are shown on Deacon and Jones' epicenter map (Plate 1).

Microtremors near Hanford. The U.S. Geological Survey began a study of microtremors in the Hanford region on March 23, 1969. Between that date and September 1971 over 500 shocks with magnitudes up to 3.0 were recorded within 135 miles of the site, but most of those within a radius of 60 miles (Reference 8) were less than magnitude 1.5. Three concentrations of events may be seen on preliminary maps issued by the USGS: 1) along the Saddle Mountains, 2) near Othello, and 3) near Wooded Island in the Columbia River 8 miles north of Richland. Focal depths of microtremors, located with good depth control, are generally shallow, in the range of one to five miles.

Tectonic Structures and Local Seismicity. Seismicity local to the Hanford Reservation is associated with the relief of strain in nearby tectonic structures. The most important structures are: 1) the purported Rattlesnake Hills-Wallula Gap Fault; 2) the Horse Heaven Hills Anticline, 3) the Umtanum Ridge-Gable Mountain Anticline, and 4) Saddle Mountains Anticline. Of these, the first is most significant. Several reports on the geology of the Hanford Reservation deal with the subject of faulting through Quaternary time in and around Pasco Basin. Although the most recent report by Bingham (Reference 11), concludes that the only certain Quaternary surface faulting in the area occurs in the Saddle Mountains (also an area of high microseismicity), recent work by the U.S. Geological Survey identifies the Rattlesnake Hills-Wallula Gap fault as an active fault with recent movement at its southeast extension. A map by Jones and Deacon (Plate 3) shows a fault extending about five miles on either side of Wallula Gap, and en echelon fault extending from Wallula Gap to a point about 12 miles west of the epicenter of the 1936 Milton-Freewater earthquake. Clustering of historic earthquakes about a southeast projection of the Rattlesnake Hills-Wallula Gap fault strongly indicates the likelihood of future earthquakes and displacements in this zone.

Based on these findings and correlation of regional seismicity with the Olympic-Wallowa Lineament, the Design Basis Earthquake (DBE) is assigned to the point on the purported Rattlesnake Hills-Wallula Gap fault nearest any proposed site for nuclear facilities on the Hanford Reservation. This method of locating the DBE is in accordance with the tentative AEC criteria (Reference 9). Location and magnitude of the DBE is discussed as follows.

Design Basis Earthquake

On the basis of the previous discussion of local seismicity and tectonic structures, the Design Basis Earthquake (DBE) has been located on the Rattlesnake Hills-Wallula Gap fault with a focal depth of six miles (southwest 9 miles of the FFTF and about 9-1/2 miles of the 200 Areas). This focal depth is characteristic of deeper microtremors of the area which have been accurately located in current studies by the U.S. Geological Survey. Most of the microtremors in the Hanford area have been quite shallow (about three miles deep), but experience gained in recent earthquake studies in California and Nevada indicates that large earthquakes are likely to occur at depths somewhat greater than those of most microtremors. An average depth of six miles appears to be characteristic of larger shocks occurring in the western United States.

The magnitude of the DBE has been estimated by comparison of the site region with areas in which earthquakes occur more frequently and in which seismicity is, therefore, better defined. This approach is justified by studies of seismicity in different regions of the earth. Regional differences of seismicity have been found to be characterized chiefly by variation in the frequency of earthquake occurrence within given magnitude intervals, rather than by variation in magnitude distribution. Recent studies (Reference 2) have shown that this is true of regional variations in the western United States.

High-magnitude earthquakes have occurred, and can be expected to occur, in regions of moderate seismicity. Thus, the Hanford Reservation, situated in such a region, is considered subject to effects of local high-magnitude earthquakes.

In the western United States, where major earthquakes (of magnitudes greater than 6.0) are nearly always accompanied by surface faulting, there appears to be a correlation between probable maximum magnitudes and type of faulting (i.e., normal, strike-slip, or reverse). Normal faulting at the surface is generally associated with moderate magnitude earthquakes, while strike-slip, combinations of strike-slip and normal, and reverse faulting are often accompanied by earthquakes of magnitude greater than 7.0 (Reference 10). Eight earthquakes in the western United States accompanied by normal faulting at the surface have had magnitudes of 5.6, 6.3, 6.4, 6.6, 6.8, 7.1, and 7.6 (Reference 10, Table 1). All but one of these earthquakes occurred in the Basin and Range province of Nevada and eastern California -- the exception occurred at Hebgen Lake, Montana and had a magnitude of 7.1. The median and mean magnitudes for the seven earthquakes occurring in the Basin and Range province are both 6.6, and six of these fall in the range 5.6 to 6.8.

The tentative concept that Pasco Basin is situated in a Basin and Range tectonic environment is assumed to be a reasonable working hypothesis. On this basis, characteristics of Basin and Range province earthquakes are attributed to earthquakes in the Hanford region. The largest magnitude reported in the proposed site area is 5.8, for the 1936 Milton-Freewater earthquake. However, in view of the limited number of historic earthquakes in the vicinity of Hanford, this magnitude is not considered to represent a probable maximum value. The Basin and Range province of Nevada is seismically more active than the Hanford region, and thus, provides a more representative sample of magnitude distribution for potential earthquakes in the Hanford area.

The maximum magnitude recorded for an earthquake occurring in Nevada is 7.6 (Pleasant Valley earthquake, 1915). However, this value is not considered to approximate a possible maximum magnitude for earthquakes which could occur in the Hanford region, in view of the relatively low structural relief of the Hanford region in comparison to that of the Basin and Range province, together with the fact that major earthquakes (of magnitudes greater than 6.0) usually occur in mountainous regions.

As noted previously, six out of seven earthquakes associated with normal faulting at the surface in the Basin and Range province had magnitudes in the range 5.6 to 6.8, thus 6.8 represents a reasonable upper bound magnitude for these earthquakes. On this basis, 6.8 is considered a maximum possible magnitude for earthquakes in the Hanford area, and the magnitude of the DBE is accordingly designated 6.8.

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3. Fifer, N. F,. Earthquake Studies in the Hanford Area, February, 1968, DUN-3625.

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APPENDIX C

Radiochemical Reprocessing Facilities

Radiochemical reprocessing facilities at Richland, Washington, remove plutonium, neptunium, uranium, cesium and strontium from irradiated fuels. These radiochemical reprocessing facilities are located near the center of the Hanford Works in terrain which has proven to be near-ideal for this type of activity. The radiochemical reprocessing site is isolated, being about eight miles from the project boundary and twenty-five miles from the city of Richland. The groundwater lies approximately 200 feet below the ground surface and moves slowly toward the Columbia River. Precipitation, which averages approximately seven inches per year, evaporates; percolation to the water table is near zero. In addition, the soil has ion exchange properties and tends to sorb and hold most radioactive materials with which it comes in contact. Since start of plant operation, these favorable chemical reprocessing site characteristics have been utilized to protect the environs outside the Hanford site from radioactive contamination.

In view of the favorable site characteristics described above, solid wastes have been placed in trenches about 20 feet deep and covered with 4 or more feet of soil. There has been no detectable migration of radioactivity from these buried wastes. The amount of radioactivity normally permitted in effluent liquid streams has been closely regulated since startup of the plants. The water streams sent to ponds are largely uncontaminated cooling water; steps are taken to limit the radionuclides in the pond to less than 5×10^{-5} microcuries per milliliter, an empirically determined level to control radioactivity pickup and reconcentration by vegetation and wildlife. Other effluent streams with intermediate levels of radioactivity (less than 100 microcuries per milliliter) are sent to structures, about 20 feet below the surface, called covered trenches, where the soil retains most of the radionuclides while the water percolates to the water table. Of the two most mobile radionuclides, tritium and ruthenium, all of the tritium and a small fraction of the ruthenium do enter the groundwater flow system (below the Hanford site) which is monitored but not used, where the radionuclides decay and are diluted as they flow with the groundwater. Tritium in the groundwater near the Columbia River cannot be detected above the tritium concentration in the river resulting from fallout and naturally occurring tritium; ruthenium at the same point has remained below the lower limit of detection with the instrumentation being used (about one-hundredth of the maximum permissible concentration guide for uncontrolled areas as defined in applicable federal standards*).

Gaseous wastes from radiochemical separations plants have been treated as appropriate (e.g., radioiodine removal), filtered through high efficiency filters (HEPA, sand, deep-bed fiber glass), and discharged through tall stacks to the atmosphere. Measured activities at the project boundary are less than the maximum permissible concentrations for uncontrolled areas as defined in applicable federal standards*.

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* AEC Manual Chapter 0524 (and its Appendix). These concentration guides are identical to Title 10 Code of Federal Regulations Part 20 and both are consistent with the Recommendations of the National Committee on Radiation Protection and the International Committee on Radiation Protection.

APPENDIX D

COMMENTS ON THE DRAFT ENVIRONMENTAL STATEMENT FOR THE CONTAMINATED SOIL REMOVAL FACILITY

The following letters were received by the AEC in response to a request for comments on the Contaminated Soil Removal Facility Draft Environmental Statement. AEC's reply follows each letter.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (WS)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: 202-426-2262

Mr. Julius H. Rubin
Assistant General Manager for
Environment and Safety
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

This is in response to your letter of 25 January 1972 addressed to Mr. Herbert F. DeSimone, Assistant Secretary for Environment and Urban Systems, Department of Transportation, concerning the draft environmental impact statement on the Contaminated Soil Removal Facility at Richland, Washington.

The concerned operating administrations and staff of this Department have reviewed the environmental impact statement for this project.

The Office of Hazardous Material of the Department of Transportation noted that the transport of radioactive materials appears to be completely well controlled and is within the confines of a U. S. Government reservation. They had no further comments to offer relative to impact on the environment.

It appears that the impact of this project upon transportation is fairly minimal and this Department can find no objections to the facility.

The opportunity for this Department to review and comment on the draft environmental impact statement for the Contaminated Soil Removal Facility at Richland, Washington is appreciated.

Sincerely,

W. L. Burkitt

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Rear Admiral W. M. Benkert, USCG
Chief, Office of Marine Environment and Systems
U.S. Coast Guard
400 Seventh Street S.W.
Washington, D.C. 20590

Dear Admiral Benkert:

Thank you for the review and comments of the Department of Transportation on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. Enclosed is a copy of the final statement. Modifications have been made to take into consideration comments received on the draft.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of Final Environmental Statement -
Contaminated Soil Removal Facility,
Richland, Washington

cc: Herbert DeSimone

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

FEB 28 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C.

Dear Mr. Rubin:

We have reviewed the draft environmental impact statement for the Contaminated Soil Removal Facility, Richland, Washington, sent to us with your letter of January 25, 1972.

Based on the information contained in the Statement, it appears there is no basis for recommending a delay or rejection of the project because of its environmental impact.

Three copies of the statement are returned herewith.

Sincerely,

T. C. Byerly

T. C. BYERLY
Coordinator, Environmental
Quality Activities

3 Enclosures

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Mr. T. C. Byerly, Coordinator
Environmental Quality Activities
Department of Agriculture
Office of the Secretary
Washington, D. C. 20250

Dear Mr. Byerly:

Thank you for the review and comments of the Department of Agriculture on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. Enclosed is a copy of the final statement. Modifications have been made to take into consideration comments received on the draft.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of Final Environmental Statement - Contaminated Soil Removal Facility, Richland, Washington

OFFICE OF THE ASSISTANT SECRETARY OF COMMERCE
Washington, D.C. 20230

March 3, 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment & Safety
Room B-312
U.S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

The draft environmental statement titled "Contaminated Soil Removal Facility, Richland, Washington," reference WASH-1520, which accompanied your letter of January 25, 1972, has been received by the Department of Commerce for review and comment.

The Department of Commerce has reviewed the draft environmental statement and has the following comments to offer for your consideration.

From the description of the facility operation we have concluded that the only release of radioactivity to the atmosphere is via vents from the Contaminated Soil Removal Facility and the Underground Storage Facility (apparently called the Contaminated Soil Storage Vault in figure 8). Neither facility is located on figure 3, but since the text states that they are within 250 feet of the Plutonium Finishing Plant, we have estimated a distance of 250 meters from the point of effluent release westward to the nearest fence surrounding the 200-W Restricted Area. We have assumed that the 200-W Restricted Area is considered controlled, while outside the fence is an uncontrolled area, access to which is not restricted for reasons of radiation safety.

The text does not describe the assumptions used to arrive at the conclusion (page 26) that "the radioactive discharge will be in concentrations estimated to be less than 3 percent of the concentration guide for releases to a controlled area as defined in applicable Federal Guidelines." Our interpretation of these guidelines is that only the 200-W Area can be considered as controlled.

In our analysis of downwind average annual concentrations we have assumed a 250 meter distance to the nearest uncontrolled area, a frequency of 5 percent of wind blowing in a 22 1/2 degree sector from the east, an average speed of 5 m/sec, a Pasquill diffusion rate of Type D, and an effective ground source. The resulting annual concentration, assuming a release of $1x10^{-6}$ curies of plutonium per day (see page 26), is $1x10^{-17}$ μc/ml. This is a factor of 6000 less than the standard for plutonium 238 and 239 in uncontrolled areas, which for air is $6x10^{-14}$ μc/ml.

On page 7 - reference is made to flooding by a record snowfall and rapid melting. No evaluation can be made since the estimates are not given.

On page 21 - the tornado probability should be 1 in 12,000 per year. The reference to H. C. S. Thom should be Proceedings of the American Society of Civil Engineers.

We hope these comments will be of assistance to you in the preparation of the final statement.

I apologize for the delay in responding to your request.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Mr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
Department of Commerce
Washington, D.C. 20230

Dear Mr. Galler:

Thank you for the review and comments of the Department of Commerce on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. Enclosed is a discussion of the Department's comments on the draft statement as well as a copy of the final statement. Modifications have been made to take into consideration comments received on the draft.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosures:
1. Discussion of Comments
2. Copy of final Environmental Statement - Contaminated Soil Removal Facility, Richland, Washington

ENCLOSURE

DISCUSSION OF COMMENTS BY THE DEPARTMENT OF COMMERCE ON THE DRAFT CONTAMINATED SOIL REMOVAL FACILITY ENVIRONMENTAL STATEMENT

Comment: "From the description of the facility operation we have concluded that the only release of radioactivity to the atmosphere is via vents from the Contaminated Soil Removal Facility and the Underground Storage Facility (apparently called the Contaminated Soil Storage Vault in figure 8). Neither facility is located on figure 3, but since the text states that they are within 250 feet of the Plutonium Finishing Plant, we have estimated a distance of 250 meters from the point of effluent release westward to the nearest fence surrounding the 200-W Restricted Area. We have assumed that the 200-W Restricted Area is considered controlled, while outside the fence is an uncontrolled area, access to which is not restricted for reasons of radiation safety."

Reply: Both the Contaminated Soil Removal Facility and Underground Storage Facility will be located within the circle marked "Site of Enclosed Trench" on figure 3. The entire Hanford Plant (as shown on figure 2) is considered a controlled area and concentrations given in the statement for releases to an uncontrolled area are calculated at the plant boundary approximately seven miles from the 200-W Area.

Comment: "The text does not describe the assumptions used to arrive at the conclusion (page 26) that 'the radioactive discharge will be in concentrations estimated to be less than 3 percent of the concentration guide for releases to a controlled area as defined in applicable Federal Guidelines.' Our interpretation of these guidelines is that only the 200-W Area can be considered as controlled."

Reply: The concentration in the exhaust at the point of release is expected to be less than 3% of the concentration guide for release to a controlled area and less than the concentration guide for release to an uncontrolled area. Assuming a wind of 1 meter/sec, the concentration at the site boundary would be less than 0.04% of the concentration guide for release to an uncontrolled area.

Comment: "On page 7 - reference is made to flooding by a record snowfall and rapid melting. No evaluation can be made since the estimates are not given."

Reply: The greatest snow depth of record is 12 inches which occurred in December 1964. During a "Chinook" wind, significant temperature increases can occur in a few minutes. Melting of snow can occur in several hours.

Comment: "On page 21 - the tornado probability should be 1 in 12,000 per year. The reference to H. C. S. Thom should be Proceedings of the American Society of Civil Engineers."

Reply: H. C. S. Thom's equation $P = \frac{\bar{z}\,\bar{t}}{A}$ was used to calculate the probability of a tornado type wind striking the Contaminated Soil Removal Facility. A mean face path, $\bar{z}$, of 0.1018 square miles was used based on four storms classified as tornados in a twenty-year period ($\bar{t}$ = 4/20 = 0.2 per year) in a sixty mile area surrounding the site of the Contaminated Soil Removal Facility ($A = \pi\ (60)^2 = 11{,}309.7$ square miles).

$$P = \frac{0.1018 \text{ square miles} \times 0.2 \text{ per year}}{11{,}309.7 \text{ square miles}}$$

$$= 1.8 \times 10^{-6} \text{ per year}$$

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION X
ARCADE PLAZA BUILDING
1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101

February 18, 1972

OFFICE OF THE REGIONAL DIRECTOR

Mr. Julius H. Ruben
Assistant General Manager
for Environment and Safety
United States Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Ruben:

Subject: Draft Environmental Statement, Contaminated Soil Removal Facility, Richland, Washington

The subject draft statement was sent to this Region Office by the Office of the Assistant Secretary for Health and Scientific Affairs in Washington for review and comment. We are happy to have this opportunity to review your statement.

This office has no comment on the safety and health aspects of the statement. The long established monitoring and safety practices at the site, if continued to be enforced as described in the statement, should provide a safe, healthy, working climate.

We do not, however, find an adequate discussion on the irreversible and irretrievable commitments of resources. The construction of the facility will commit resources that will not be retrievable. We feel this should be included as part of the discussion.

Also, in Section VIII, it is stated that the project will require the use of less than one-half acre of land for less than twenty years. Could one conclude from this that the one-half acre of land could be used for other facilities, without fear of contamination, after a period of twenty years?

Thank you for the opportunity to review the draft environmental impact statement and to coordinate our mutual environmental interests.

Sincerely yours,

Bernard E. Kelly
Regional Director

PI 1063
FEB 2 _ 1972

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Mr. Bernard E. Kelly
Regional Director
Region X
Department of Health, Education, and Welfare
Arcade Plaza Building
1321 Second Avenue
Seattle, Washington 98101

Dear Mr. Kelly:

Thank you for the review and comments of the Department of Health, Education, and Welfare on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. With regard to your comment concerning the irreversible and irretrievable commitment of resources, this section of the statement has been modified to incorporate your comments.

As stated in your letter, you are correct in assuming that the one half acre of land for the Underground Storage Vault could be utilized for some other operation at a later date if the drums of contaminated soil stored in the vault were shipped to a suitable Federal Repository.

Enclosed is a copy of the final environmental statement. Modifications have been made to incorporate comments received on the draft.

Sincerely,

J. H. Rubin

J. H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of final Environmental
Statement - Contaminated Soil
Removal Facility, Richland, Washington

cc: Dr. Merlin K. Duval

ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF THE ADMINISTRATOR

MAR 2 0 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Rubin:

The Environmental Protection Agency has reviewed the environmental statement for the Contaminated Soil Removal Facility proposed for operation on the Hanford Reservation at Richland, Washington. I am pleased to provide you with the enclosed report which contains our comments.

This Agency has concluded that the operations proposed for soil excavation and the subsequent disposal of nonrecoverable leached soil residue and untreated soil should have a minimal impact on the environment and the public health. This conclusion is not applicable to the potential impact of leaching operations at the Plutonium Finishing Plant (PFP) since such operations were not addressed in the subject statement. Our report recommends that information regarding current and future disposal practices of liquid waste containing plutonium be presented. Such a presentation should include information on the overall amount of plutonium discharged to enclosed trenches from all site operations.

It is also suggested that the Commission consider an evaluation of the environmental impact of the overall waste discharge and storage practices at the Hanford Plant. Such an evaluation would permit a determination of the impact of individual proposed projects as they relate to the overall impact of the facility.

Our Office of Radiation Programs would also appreciate receiving any information regarding plutonium distribution in soil and recovery process effectiveness which results from the proposed operations since such data would contribute to the overall knowledge on plutonium behavior in the environment.

We will be pleased to discuss any of our comments with you.

Sincerely yours,

Sheldon Meyers

Sheldon Meyers
Director, Office of Federal Activities

Enclosure

ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE CONTAMINATED SOIL REMOVAL FACILITY AND UNDERGROUND STORAGE VAULT

INTRODUCTION AND CONCLUSIONS

This report summarizes an evaluation of the draft environmental statement for the Contaminated Soil Removal Facility submitted by the Atomic Energy Commission for formal review on January 25, 1972. This facility is to be constructed on the Hanford Reservation near Richland, Washington. The purpose of the facility is to recover plutonium from soil within an enclosed trench into which liquid wastes containing this element have been deposited over the last two decades.

Our evaluation of information obtained from the draft environmental statement leads us to the conclusion that the soil excavation and ultimate disposal operations involving leached and untreated soil can be performed with minimal environmental impact. The more important questions regarding (1) current and future practice regarding disposal of plutonium bearing liquid waste and (2) the overall amounts of plutonium discharged to trenches during past operations should be discussed. Additional information, as specified in this report should be included in the final environmental statement so that the impact of these operations can be more adequately documented.

RADIOACTIVE RELEASES

The only source of radioactive release from the routine soil excavation operations within the Z-9 enclosed trench is associated with the excavation process. Material which becomes airborne is passed through high efficiency filters before being discharged to the atmosphere through the facility stack. Discussion of the expected chemical form and size distribution of any airborne plutonium; the effectiveness of the high efficiency filters in removing the material; and details of the exhaust system (flow rates and physical description) should be presented. A dose calculation is also warranted at the nearest site boundary and in the Richland area (considering the fact that the predominant northwest winds would carry any release from the 200W area toward the Tri-Cities).

CRITICALITY PREVENTION

On page 16 of the draft statement it is stated that a three-gallon volume limitation is imposed (through use of three-gallon metal containers) to assure that nuclear criticality cannot occur during soil handling operations. The basis for this limitation as well as the limitation on the number of three-gallon containers per fifty-five gallon drums should be referenced or included, most logically as appendix material, in the final statement. This information would place in better perspective the potential criticality hazard associated with this operation. Any criticality prevention measures, if required, for material sent to the Underground Storage Vault should also be presented.

TRANSPORTATION AND ACCIDENTAL SPILLAGES

The distances involved in the transportation of excavated soil from the Contaminated Soil Removal Facility to the Plutonium Finishing Plant and of the leached soil from the Finishing Plant to the Underground Storage Vaults are so short (total of 750 ft) that the likelihood of an accidental spillage appears extremely remote. We would however, appreciate information on the environmental consequences of such an accident including details of the equipment and procedures to be utilized in any recovery operation (as referred to on page 27 of the statement). The capabilities of the Underground Storage Vault to prevent releases of plutonium to the environment following unlikely natural events such as tornadoes and earthquakes should also be discussed.

OVERALL PROCESS REVIEW

The information regarding the environmental impact of the relatively limited operations proposed at the Z-9 trench is generally adequate. However, the environmental impact of past, present, and future waste disposal practices for plutonium bearing liquids is not assessed in sufficient detail. The amounts of plutonium discharged to enclosed trenches in the past and present disposal practices, especially with regard to plutonium remaining in the trenches, and any proposed similar decontamination efforts at other trenches should be discussed. Any changes proposed for future disposal operations, potentially as a result of improved chemical processes which limit production of plutonium waste, should also be addressed. The new project referred to in the statement which would eliminate trench disposal practice should be discussed in greater detail.

It seems desirable that the environmental consequences at this project should be considered as a part of a total evaluation of the overall waste discharge and storage practices at the Hanford Plant. It should be noted, in this connection, that an environmental statement for operations involving the radioactive waste evaporator and auxiliaries at Hanford is also under review.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Mr. Sheldon Meyers, Director
Office of Federal Activities
Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Meyers:

Thank you for the review and comments of the Environmental Protection Agency on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. A discussion of the Agency's comments which pertain to the proposed facility is enclosed.

The suggestion that we consider an evaluation of the environmental impact of the overall waste discharge and storage practices at the Hanford Plant including past, present, and future waste disposal practices for plutonium bearing liquid exceeds the scope of this environmental statement and is not discussed. However, we would like to discuss this consideration with you at some future date.

In response to the request of the Office of Radiation Programs, the results of the proposed action will be published and made available upon completion of the project.

A copy of the final statement is enclosed. Modifications have been made to incorporate comments received on the draft.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosures:
1. Discussion of Comments
2. Copy of final Environmental Statement - Contaminated Soil Removal Facility, Richland, Washington

Enclosure

Discussion of Comments from EPA on the Contaminated Soil Removal Faciltiy Draft Environmental Statement

Comment: Discussion of the expected chemical form and size distribution of any airborne plutonium; the effectiveness of the high efficiency filters in removing the material; and details of the exhaust system (flow rates and physical description) should be presented. A dose calculation is also warranted at the nearest site boundary and in the Richland area (considering the fact that the predominant northwest winds would carry any release from the 200-W area toward the Tri-Cities).

Reply: The plutonium to be removed from the Z-9 enclosed trench will consist primarily of oxides and nitrates of plutonium adsorbed on sand, silt, and clay. Nominal dusting is expected since the particles of sand, silt, and clay are large (1 - 10 microns in diameter). Each of the high efficiency filters is rated at 99.97% efficiency for particles 0.3 microns in diameter or larger. The exhaust system for the enclosed trench is expected to have a capacity of 2,000 - 10,000 cubic feet per minute. Lung dose calculations at the site boundary are less than 0.02 mrem per year of operation of the Contaminated Soil Removal Facility. At Richland, the lung dose calculation is one-third of that for the site boundary.

Comment: Criticality prevention. On page 16 of the draft statement it is stated that a three-gallon volume limitation is imposed (through use of three-gallon containers) to assure that nuclear criticality cannot occur during soil handling operations. The basis for this limitation as well as the limitation on the number of three-gallon containers per fifty-five gallon drums should be referenced or included, most logically as appendix material, in the final statement. ... Any criticality prevention measures, if required, for material sent to the Underground Storage Vault should also be presented.

<u>Reply</u>: It is estimated that 100 kilograms of plutonium are contained in a volume of approximately 1800 cubic feet of soil. If uniformly distributed in the soil, the concentration of plutonium would be 55.6 grams per cubic foot, 7.4 grams per gallon, or 22.2 grams per three-gallon container. At this concentration there would be no criticality problems with the proposed loading of three three-gallon containers per 55-gallon drum or the proposed array of 55-gallon drums (four wide by two high). A neutron and a selected gamma-energy counter will be provided to determine the plutonium content in the three-gallon containers. Non-uniform distribution of plutonium in the contaminated soil will require special critical mass controls. A preliminary conservative evaluation has been used to establish the following criteria for stacking the 55-gallon drums in an infinite array: If any three-gallon container contains between 22.5 and 100 grams of plutonium, it may only be placed in a drum with two containers of low plutonium content. In no case will a container contain more than 100 grams of plutonium.

<u>Comment</u>: Transportation and accidental spillages. The distances involved in the transportation of excavated soil from the Contaminated Soil Removal Facility to the Plutonium Finishing Plant and of the leached soil from the Finishing Plant to the Underground Storage Vaults are so short (total of 750 ft.) that the likelihood of an accidental spillage appears extremely remote. We would however, appreciate

information on the environmental consequences of such an accident including details of the equipment and procedures to be utilized in any recovery operation (as referred to on page 27 of the statement). The capabilities of the Underground Storage Vault to prevent releases of plutonium to the environment following unlikely natural events such as tornadoes and earthquakes should also be discussed.

Reply: Should a container of plutonium contaminated soil rupture outside a containment structure, workmen would don protective clothing and face masks and pick up the contaminated soil using shovels and other tools. A large vacuum cleaner with filtered exhaust could also be used. The site of the spill would be monitored for plutonium contamination. Prompt and efficient cleanup would limit the spread of contamination to the localized site of the accident. The Underground Storage Vault will be designed to withstand a Design Basis Earthquake (DBE) of 0.25g horizontal ground acceleration so that it will not collapse when subjected to credible natural forces from earthquakes or high velocity winds. This integrity plus storage of plutonium contaminated soil in steel drums will protect the environment should such natural forces be encountered.

Comment: The amounts of plutonium discharged to enclosed trenches in the past and present disposal practices, especially with regard to plutonium remaining in the trenches, and any proposed similar decontamination efforts at other trenches should be discussed. Any changes proposed for future disposal operations, potentially as a result of improved chemical processes which limit production of plutonium waste, should also be addressed. The new project referred to in the statement which would eliminate trench disposal practice should be discussed in greater detail.

Reply: Since the proposed action involves the removal of contaminated soil from one particular enclosed trench, Z-9, only the amount of plutonium discharged to this trench is presented (see page 7). No other decontamination efforts at other trenches are proposed at this time.

As mentioned in the draft statement, a new project has been proposed and authorized which would eliminate the discharge of plutonium bearing liquid waste into enclosed trenches. This project will divert these waste streams from the enclosed trenches to existing waste storage tanks where the liquid waste will be stored and eventually converted to retrievable solids in the existing in-tank-solidification systems.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
1519 ALASKAN WAY SOUTH
SEATTLE, WASHINGTON 98134

NPSEN-PL-ER

23 MAR 1972

Glenn Seaborg, Chairman
Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Seaborg:

We appreciate the opportunity to review the draft environmental statement entitled, "Contaminated Soil Removal Facility." This project appears to have no direct or indirect impact on Corps of Engineers projects or studies.

We suggest that the Bureau of Sport Fisheries and Wildlife be contacted regarding fish and wildlife impact.

Sincerely yours,

H. W. MUNSON
Lt. Colonel, Corps of Engineers
Deputy District Engineer

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Lt. Colonel H. W. Munson, USA
Corps of Engineers
Deputy District Engineer
Seattle District
Department of the Army
1519 Alaskan Way South
Seattle, Washington 98134

Dear Colonel Munson:

Thank you for the review and comments of the Department of the Army on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. A copy of the final statement is enclosed. Modifications have been made to incorporate comments received on the draft.

Regarding your suggestion, a copy of the draft statement was provided for review to the Department of the Interior of which the Bureau of Sport Fisheries and Wildlife is a part.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of final Environmental
Statement - Contaminated Soil
Removal Facility, Richland, Washington

cc: Dr. Louis M. Rousselot

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 2 4 1972

Lt. Colonel H. W. Munson, USA
Corps of Engineers
Deputy District Engineer
Seattle District
Department of the Army
1519 Alaskan Way South
Seattle, Washington 98134

Dear Colonel Munson:

Thank you for the review and comments of the Department of the Army on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. A copy of the final statement is enclosed. Modifications have been made to incorporate comments received on the draft.

Regarding your suggestion, a copy of the draft statement was provided for review to the Department of the Interior of which the Bureau of Sport Fisheries and Wildlife is a part.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of final Environmental
Statement - Contaminated Soil
Removal Facility, Richland, Washington

cc: Dr. Louis M. Rousselot

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

DANIEL J. EVANS
GOVERNOR

JOHN A. BIGGS
DIRECTOR

March 28, 1972

Mr. Julius H. Rubin
General Manager for Environmental Safety
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Rubin:

We appreciate the opportunity of reviewing the Atomic Energy Commission's Draft Environmental Statement regarding construction and operation of a contaminated soil removal facility, plus underground storage vault, at the Hanford Plant at Richland, Washington,

The proposal has been sufficiently described and we believe that you presented a comprehensive and objective picture. Construction of the design proposal should not present a technical problem. It is not likely that adverse environmental impacts, including excessive radiation hazards and airborne release, or ground discharge of radioactive material of any significance, or at a dangerous level outside of the reservation area will occur should the design proposal be implemented.

It has been adequately demonstrated that at present removal of the highly contaminated soil from the floor of an infiltration trench and its processing in the plutonium finishing plant, plus storage of certain types of nuclear fuel bearing soils in an underground vault, is paramount in as far as such action would eliminate the need for long-term special plans to assure the continued safe storage of plutonium at its present site, and to remove any possibility of an unplanned nuclear chain reaction.

In addition, the cost-benefit analysis warrants project implementation. Apparently, the total net gain from the proposed operation may exceed one million dollars.

On the basis of the submitted information, we agree to the conclusion in the Draft Environmental Statement that the Atomic Energy Commission should proceed with the design, construction and operation of the projected contaminated soil removal facility and the underground storage vault at Richland.

We advise that due care must be used in all cases of designed release of airborne or ground discharge of radioactive or other hazardous contaminants, and that highest applicable standards be met or, if possible, exceeded. In the event of emergency situations, or equipment failures, such precautionary measures have to be taken immediately so as to minimize, and later on, restore any resources that have been adversely affected.

Thank you for your cooperation.

Sincerely,

Fred D. Hahn

Fred D. Hahn, Assistant Director
Planning and Program Development

FDH:jl

cc: Paul T. Benson, OPP&FM

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 24 1972

Mr. Fred D. Hahn
Assistant Director
Planning and Program Development
State of Washington
Office of the Governor
Department of Ecology
Olympia, Washington 98501

Dear Mr. Hahn:

Thank you for the review and comments of the State of Washington on the draft environmental statement - Contaminated Soil Removal Facility, Richland, Washington. We would like to assure you that we will operate the facilities in the safest possible manner and that any emergency situation would be handled expeditiously to minimize impact on health, safety and the environment.

Enclosed is a copy of the final statement. Modifications have been made to take into consideration comments received on the draft.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Copy of final Environmental
Statement - Contaminated Soil
Removal Facility, Richland, Washington

cc: Gov. Daniel J. Evans