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SUMMARY OF ENVIRONMENTAL CONTAMINATION INCIDENTS AT HANFORD, 1958 - 1964

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SUMMARY OF ENVIRONMENTAL CONTAMINATION INCIDENTS AT HANFORD, 1958 - 1964

I. INTRODUCTION

This report was written as a supplement to HW-54636, Summary of Environmental Contamination Incidents at Hanford, 1952 - 1957, and includes a summary of the incidents which caused measurable ground deposition of radioactive materials at Hanford during the period 1958 through 1964. This information was obtained from various incident investigation and monitoring reports.

II. ABSTRACT

100 Areas

Five incidents were reported where contamination escaped beyond the limited areas. There were no instances where contamination, attributable to the 100 Areas, was detected beyond project boundaries. Three of the incidents resulted when high winds occurred while 107 basins were dry for clean-up and repair. Two incidents resulted when fuel elements partially burned as they were discharged from the reactor. Radioactive material escaping from the ventilation stack was estimated to be < 2 curies in both instances.

This report does not include information on radioactive material discharged to the river since such releases are covered in periodic reports issued by the Irradiation Processing Department.

200 Areas

One stack emission of note occurred when some "short cooled" fuel elements were inadvertently charged in the Purex dissolver. Some 60 curies of I-131 were discharged before it was possible to discontinue

the dissolving operation. The fuel was left in place until the quantity of I-131 decayed to a level where it was possible to continue processing the fuel without exceeding the established I-131 release guides. Milk concentrations from the zones which were most highly contaminated were an order of magnitude higher than normal but the maximum thyroid exposure was estimated to be very small.

Eight instances occurred where contamination was spread beyond the area fences but not off project. The contamination spread occurred from two burial operations, four entries into diversion boxes or vaults, a leaking UNH truck traveling from 200-West to 200-East, and a process cooling coil leak that allowed radioactive materials to enter two cooling water "swamps".

Other Locations

There were no significant spreads outside of the 300 limited area fence. There were a few incidents where contaminated equipment was discovered outside of controlled zones, but none of these posed an environmental contamination problem.

III. TERMINOLOGY

Survey results were reported in terms of particle frequencies and radiation instrument readings. Portable GM meter readings were recorded in units of counts per minute (c/m) per particle. GM meter response for energy ranges involved in this report was approximately 100 c/m per 5000 disintegrations per minute.

Instrument readings in units of mrad/hour per particle were obtained with Hanford type "CP" meters. These were uncorrected surface readings, taken under field conditions, and do not necessarily represent true dosage rates.

The term "filterable gross beta", as used in this report, refers to beta particle emitters collected by drawing stack effluents through H-70 asbestos filter paper.

The reactor buildings at Hanford are designated 105, and in this report, the ventilation air exhaust stacks for these buildings are referred to as 105 stacks. The 107 basins are the basins for temporary detention of the reactor effluent cooling water before it is released to the river.

The chemical processing buildings at Hanford are designated as 200. Waste from these buildings is transported through underground lines and diversion from one location to another is accomplished in "diversion boxes". Diversion boxes are concrete structures which are below grade. Vaults are also below-grade concrete structures and contain tanks in which liquid radioactive waste is sometimes temporarily stored.

IV. DISCUSSION

A. 100 Area Incidents

1. 105-KE Reactor

On April 14, 1958, during a discharge operation, a small fraction of a ruptured fuel element apparently burned. Stack samples indicated that 0.05 curies of filterable radioactive materials

were released to the atmosphere via the ventilation stack. Particulate contamination was deposited outside of the limited area at approximately two particles per 100 square feet. Average particle readings were 10,000 to 20,000 c/m. A maximum reading of 250 mrads/hr (uncorrected) was obtained on one particle.

2. 105-KW Reactor

On April 29, 1959 during a discharge operation a small fraction of a ruptured fuel element apparently burned. Stack samples indicated that 1.3 curies of filterable radioactive materials were released to the atmosphere via the ventilation stack. No particulate contamination was found within the immediate vicinity of the limited area. A few widely dispersed particles were located on Wahluke Slope, generally northeast of the KW reactor. The readings of five particles that were located were from 3000 c/m to 60,000 c/m. No radioactive particulates were located beyond the project boundary.

3. 107-KE Basins

On June 7, 1963 the KE basins became nearly dry because of extended reactor shutdown. High winds spread contaminated particles within the limited area and, to a considerable extent, beyond the limited area fence. The maximum reading found on a particle was 300 mrads/hr inside the limited area fence. A maximum of 20,000 c/m was measured on a particle outside the fence. The density of particles ranged from five per 100 square feet,

near the fence, to two per 100 square feet at the central fire station. No contamination was detected off the project.

4. 100 KW Basins

On July 11, 1963 when the 100 KW basins were dried for basin repair work, high northeast winds spread particulate contamination beyond the limited area fence. The particles read from 1000 to 8000 c/m on a portable GM meter. No contamination was detected off-project.

5. 107-F Basin

On January 17, 1964 when the 107-F basin was empty for major repairs, high winds caused spreads of particulate contamination beyond the limited area fence. The particles were contaminated to levels of 80,000 c/m.

B. 200 Areas

1. 241-S-151 Diversion Box (202-S)

On September 12, 1958 a contamination spread occurred at the 241-S-151 diversion box during an attempt to replace the D-8 waste line. A narrow strip of ground south of the diversion box and out to about 100 yards beyond the limited area fence was contaminated. Radiation levels within 100 feet of the diversion box were up to 50 mrads/hr. The particles outside of the fenced area read on the order of 5000 c/m.

2. 200-W Industrial Burial Ground

On January 8, 1959 a burial box containing Redox (202-S) processing equipment collapsed during a trench backfilling operation. Contamination was spread generally east from the burial ground. Contamination levels ranged from 50 mrads/hr at the burial site to 60,000 c/m at T-Plant. Readings up to 400 c/m were obtained east of the limited area fence. One private vehicle was contaminated during the incident. No contamination attributable to the incident was found off-project.

3. 200-E Industrial Burial Ground

During a burial of Purex equipment on June 10, 1960 a severe contamination spread occurred when the burial box collapsed during the backfilling operation. Contamination was spread in a generally east-southeast direction. Contaminated particles were located as far as three miles beyond the 200-E limited area fence. Contamination levels ranged from 60 mrad/hr near the burial trench to -- 1000 c/m on particles outside of the limited area. Two private vehicles located in the Purex parking lot were contaminated in the incident. No contamination attributable to this incident was found off-project.

4. 241-A-151 Diversion Box (202-A)

During jumper testing in the 241-A-151 diversion box on September 5, 1960, steam was released through the diversion

box and contamination spread southwest of the Purex Building. Contaminated particles were located 200 feet beyond the limited area fence. The average ground deposition was approximately five particles per 100 square feet, and the contamination level per particle was as high as 100,000 c/m. Seven of ten plant buses at the 200-E badge house were contaminated on the outside. No private vehicles were involved.

5. 241-CR Vault

On November 1, 1960 during work in the 241-CR vault, winds spread contaminated particles from the vault generally east and out to several hundred feet beyond the limited area fence. Contamination levels around the vault were on the order of 50 to 100 mrad/hr. Particles outside the fence read as high as 10,000 c/m on a GM meter. No private vehicles were involved.

6. UNH Truck

The tank truck used to transport Uranyl Nitrate Hexahydrate (UNH) from Purex to the 224-U Building left the 224-U Building on January 10, 1961 dripping UNH. Contamination levels of 4000 c/m were located along the path it traveled from U-Plant to the 200-E parking area. No private vehicles were contaminated.

7. 241-A-151 Diversion Box

The 241-A-151 diversion box was opened on October 7, 1961 and steam that was present in the box escaped, spreading contamination over the Purex exclusion area. In spite of very little

wind, contamination was detected east of Purex out to the west bank of the Columbia River. Particle deposition was ~ two particles per hundred square feet. The contamination levels in the vicinity of the Purex building were 40,000 to 100,000 c/m. Contamination levels immediately outside of the limited area fence were an order of magnitude lower and had decreased to 1000 c/m a short distance from the east fence of the limited area.

C. Purex (202-A)

A total of 62 curies of I-131 was released from the Purex stack over a three-day period beginning on September 3, 1963. This release resulted from the inadvertent charging of "short cooled" fuel elements into a dissolver. The abnormal condition was quickly recognized and immediate action was taken to retain as much of the I-131 as possible within the plant. Temporary increases were noted of the amount of I-131 in the environs. Several milk samples contained on the order of 100 pCi I-131 per liter, an order of magnitude greater than normal. The best estimate of the maximum milk concentration that occurred from this emission was ~ 500 pCi per liter. The total thyroid radiation exposure which could have been received by a four year old child drinking milk from this source would have been about 0.04 rem.

9. Cooling Coil Leak (202-A)

On June 12, 1964 a leak in the cooling coil of the waste sampling tank (T-15) allowed on the order of 10,000 curies of mixed fission products to escape to B-Swamp and Gable Mountain Swamp. The area surrounding the swamps was not contaminated during or after the incident. Some of the radioactive material reached the ground water below the swamps but presented no radiological problem. The bulk of the radioactive material that has not decayed at the writing of this report remains associated with the bottom sediments of the swamps. Soil sterilization programs have been conducted to prevent plant growth in and around the swamps; since activity would be taken up into plants that normally grow there. Further soil sterilization will very probably be needed.

Two other incidents that occurred in the 200 Areas had some potential for environmental radiation exposure. Although the actual environmental consequences were minimal, the incidents are worthy of brief comment.

a. Recuplex Nuclear Excursion

On April 7, 1962 a nuclear excursion occurred in the Recuplex Operation of the 234-5 Building. The actual nuclear reaction lasted for approximately 36 hours. The vessel in which the reaction took place was under vacuum,

and the vacuum pumps discharged to a 200 foot stack. Some 10^4 curies of short-lived noble gases probably were discharged during the reaction period. This quantity was too small to have caused more than incidental personnel exposure. The reaction was not violent enough to cause other fission products to escape.

b. 233-S Building Fire

On November 6, 1963 resin in a plutonium extraction column caught fire causing a severe spread of plutonium contamination throughout a major portion of the 233-S Building interior and to a small degree in the immediate vicinity of the outside of the building. Some additional outside contamination occurred in the course of controlling the incident. There was no indication of significant plutonium spread beyond the immediate area. Even if the fire were more severe, it does appear probable that the contamination spread would have been considerably aggrevated.

Miscellaneous

There were other minor incidents that caused significant spreads of contamination to areas exterior to building but not outside of limited areas. The more frequent spreads occurred from burial of contaminated equipment in all the 100, 200 and 300 Area burial sites. The burning of uranium scrap also caused spreads in the 300 Area on two occasions.

The following table gives a breakdown of the number of incidents reported, where contamination was fairly wide spread but did not extend beyond the limited area fences.

	100 Areas	200 Areas	300 Area
1958	2	1	-
1959	2	1	-
1960	3	2	-
1961	1	-	3
1962	3	2	1
1963	-	1	3
1964	-	-	-
Total	11	7	7