RAS 14505

Army Anagnostopoulos Exh. # 1-D

[Originally Attached As EXHIBIT HWA # 5 to Witness Anagostopoulos' pre-filed testimony]

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of US ARMY (JEFFERSON PROVING GROUND)

Docket No. 40-8838-MLA Official Exhibit No. ARMY EXH. # 1-D

OFFERED by Applicant/Licensee Intervenor ______

NRC Staff Other ______

IDENTIFIED on ______ Witness/Panel ______

Action Taken: ADMITTED REJECTED WITHDRAWN

Reporter/Clerk ______

Review of the Environmental Quality Aspects of the TECOM DU Program at Jefferson Proving Ground, Indiana, Abbott, et. al., Monsanto Research Corp., 1988. (section 2.1.4.2, page 2-25 and section 4.4.2.2, page 4-28)

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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Docket No. 40-8838-ML

TEMPLATE = SECY-028

SECY-02

Review of the Environmental Quality Aspects of the TECOM DU Program at Jefferson Proving Ground, Indiana

Prepared by Monsanto Research Corporation, Dave Abbott, Todd Gates,
Allen Hale, Miamisburg, Ohio 1984.

Encl 3

obtained through the Indiana State Air Pollution Division. Variances are requested to allow for controlled burning in connection with the management of wildlife populations, for fire training purposes and for burning of waste propellant. No open burning is conducted which is not authorized by appropriate variances or permits.

2.1.4.2 Site Specific Characteristics

Diffusion Characteristics - Atmospheric mixing and air pollution potential - A high air pollution potential is a state of the atmosphere conducive to the accumulation of particulates and gaseous pollutants. This condition is primarily a function of mixing depth and windspeed. Generally, when windspeed and mixing depth are low, the atmosphere has the greatest potential for pollutant buildup. A high air pollution potential is most likely to occur under a stagnant anti-cyclone (a stationary high pressure area). Generally, the Jefferson Proving Ground area experiences this condition in the late summer-fall period.

Surface Inversions - Surface inversions are principally the result of radiative heat loss from the earth's surface and lower layers of the atmosphere. With the exception of inversions greater than 1,500 feet in depth, which are probably a function of synoptic or large-scale circulation features, nocturnal radiation inversion depth normally ranges from 600 to 1,200 feet at Louisville. Generally, radiation inversions are deepest and most frequent during the summer months at Jefferson Proving Ground when the average wind speed is lightest and turbulent mixing is negligible (Table 2.5).

TABLE 2.6

INVERSION FREQUENCY (AT OR BELOW 500 FT.)

SEASON	PERCENT NIGHTTIME	PERCENT TOTAL TIME
Winter	45	25
Spring	65	30
Summer	75	30
Fall	75	40
Annual	65	30

Elevated Inversions - An elevated inversion or capping inversion can confine the vertical dispersion of a contaminant, resulting in slightly higher ground-level effluent concentrations. While nocturnal radiation inversions occur most frequently during the summer, elevated inversions in the absence of surface inversions are most common in the winter within the Jefferson Proving Ground area. Strong thermal instability in summer is usually sufficient to eliminate elevated inversions based less than 5,000 feet.

Air Pollution Potential - In order to assess the potential for "worst-case" conditions (fumigation and limited mixing situations), certain assumptions were required. Fumigation occurs when an effluent is emitted into a stable layer and when heating later erodes the stable layer to the height of the effluent plume. Convective eddies then transport the plume to the surface, resulting in high concentrations for short time periods. Fumigation was assumed to occur when a surface inversion greater than 200 feet in depth at 0600 local time was eliminated by 1800 local time. To account for re-establishment of the nocturnal radiation inversion at 1800, inversions less than 200 feet at that time were considered in fumigation situations.

If a surface inversion is of sufficient depth, a fumigation situation could transform into a limited mixing situation as the inversion is eroded to a height above that of the pollutant plume. The severity and duration of such a phenomenon depends on surface heating and inversion depth and, therefore, cannot be readily determined with available data (Jefferson Proving Ground; Madison, Indiana). Of greater concern, are those limited mixing conditions if they were assumed to exist throughout the day. Such conditions were assumed to exist if there was an elevated inversion below 2,000 feet at 1800 local time in the absence of a surface inversion or with a surface inversion below 200 feet. Although elevated inversions between 2,000 feet and 5,000 feet may slightly increase ground-level effluent concentrations, those inversions based below 2,000 feet should have a more significant effect. Because accuracy firing is anticipated at the DU range, and hard target impact will not be likely, the potential for atmospheric exposure to DU through fumigation or inversion related phenomena remains minimal. Field burning is not permitted during periods of high pollution potential; thus inversions should have little impact on exposure to DU from smoke.

2.1.5 Hydrology

The following sections describe the surface and groundwater hydrology at the Jefferson Proving Ground site.

2.1.5.1 Surface hydrology at Jefferson Proving Ground is made up of major and minor drainages which traverse the site in a general east-north-east to west and southwest direction. The major drainages include Otter Creek, Big Graham Creek, Marble Creek, Big Creek, Middle Fork Creek and Harberts Creek. These major drainages in a network with numerous minor or unnamed streams and creeks serve to drain the entire 65,254 acres within Jefferson Proving Ground. Surface water quantity information for the installation is scant owing to the fact that most of the streams are not instrumented. Surface hydrologic information (U.S.G.S.) is available for Harberts Creek from which Tables c· tamination, which can be a problem when sampling o .er more epigeous species. Lichens, particularly reindeer moss, tend to derive their nutrients by trapping airborne particulates and concentrating material dissolved in precipitation and throughfall. Functionally, lichens are similar in the terrestrial environment to clams in the aquatic. They both obtain the bulk of their nutrients by filtering the fluid medium surrounding them. They have often been used as indicator species of airborne pollution and apparently are fairly sensitive to such toxic compounds as fluorine, lead, sulfur dioxide and fly ash. Lichens were also implicated in the critical pathway to man (Eskimos) for fallout cesium and strontium in the tundra biome. These fungal-algal symbionts are sensitive long term integrators of airborne contaminants. Unfortunately, it is not possible to quantitatively derive airborne concentrations from them. Nevertheless, they should be very sensitive indicators of any suspended DU generated by the testing program at Jefferson Proving Ground.

4.4.2.2 Leaf Litter - Leaf litter was sampled because it had been implicated in active uranium transport at Aberdeen Proving Ground. The results appear in Table 4.13. The concentrations observed were surprisingly high, although they were low relative to lichens. It is unlikely that the relatively elevated levels are the result of soil contamination. The ash content is consistent with relatively uncontaminated leaf litter, and it was collected in litterfall traps from current litterfall. We doubt if the levels of uranium found in fresh litterfall reflect enhanced levels in other tree tissues, but this possibility is amenable to direct investigation if such be desired. A more

TABLE 4.13

LEAF/LITTER SAMPLES

Errors are 2 sigma counting

Sample	U-238 pCi/g Ash	U-234 pCi/g Ash	U-235 pCi/g Ash	% Ash
W-S	0.133 + 0.018	0.116 + 0.017	<LDL	5.9
W-MID	0.289 + 0.031	0.310 + 0.032	<LDL	5.0
W-N	0.284 + 0.036	0.287 + 0.036	<LDL	5.9
E-S	0.082 + 0.016	0.095 + 0.017	<LDL	6.6
E-MID	0.316 + 0.020	0.332 + 0.021	0.0094 + 0.0035	3.4
E-N	0.113 + 0.014	0.111 + 0.014	<LDL	6.0
LDL pCi/sample	0.05	0.08	0.02	

likely explanation, in view of the concentrations also found in lichens, is that an airborne source of uranium exists in the immediate vicinity of Jefferson Proving Ground. Foliar deposition of particulates with uranium concentrations somewhat greater than local soil could account for the higher than expected leaf litter values. These particulates cannot have much mass however, or the ash content of leaf litter and lichens would both have been elevated. Direct foliar uptake of uranium dissolved in precipitation is another possibility which would not appreciably increase ash content. Whether this hypothesized source involves wet or dry deposition, it would likely be an intermittant source since the high volume air sampling on two dates did not detect it. Possible intermittant local sources would include the coal-fired power plant near Madison and phosphate fertilizer applications by local farmers. As long as uranium concentration in leaf litter ash is less than soil uranium concentration there should be little concern for biomagnification. These higher than expected uranium values for terrestrial vegetation do raise concern relative to operational data interpretation, however. Since the operant pathway remains unknown it may prove worthwhile to initiate an investigation of seasonal precipitation and dryfall. Since leaf litter at Aberdeen Proving Ground also showed elevated uranium concentrations, such an investigation may have implications for depleted uranium activities at all pertinent DOD sites, besides having obvious value to Jefferson Proving Ground personnel.