WESTON®
MANAGERS DESIGNERS/CONSULTANTS
WESTON WAY
WEST CHESTER, PA 19380
PHONE: 215-692-3030
TELEX: 83-5348

January 22, 1992

Gerald F. Hoover
Project Engineer, Code 142
Environmental Restoration Branch
U.S. Navy, Northern Division
Naval Facilities Engineering Command
U.S. Naval Base, Bldg. 77Low
Philadelphia, PA 19112-5094

RE: NWS EARLE Risk Assessment Addenda

Dear Mr. Hoover:

The following documents are the ecological risk assessment and human health risk assessment addenda that you requested. If you have any questions concerning these documents please feel free to call Patricia Thomson (430-7242) or Bill Romano (430-7223).

Very truly yours,

ROY F. WESTON, INC.

for
Richard C. Johnson, P.G.
Senior Project Manager

Robert O. Warwick /PRT
Robert O. Warwick, Ph.D.
Section Manager, Risk Assessment

Post-It™ brand fax transmittal memo 7671	# of pages ▸ 12
To Jerry Hoover	From Richard Johnson
Co. US Navy	Co. WESTON
Dept. Bldg 77Low	Phone #
Fax # [illegible]	Fax #

Exposure Assessment - Human Health Addendum

Potential current and future use scenarios and pathways are listed below for the NWS Earle site. All pathways listed below may not be applicable for each type of site (abandoned landfill, ordnance disposal, ordnance maintenance). Site-specific pathways are described below on a site-by-site basis. Adults are evaluated in the hunter, current worker, and future resident scenarios. A child (age 6-11) is evaluated in the trespasser scenario and a child (age 1-6) is evaluated in the future resident scenario.

Current Use Scenarios

68

Hunter Scenario (Abandoned Landfills)

- Air Pathway
  1) Inhalation of airborne soil
- Soil Pathways
  1) Incidental ingestion
  2) Dermal contact
- Sediment Pathways
  1) Incidental ingestion
  2) Dermal contact
- Surface Water Pathways
  1) Incidental ingestion
  2) Dermal contact
- Game
  1) Ingestion of deer meat

Worker Scenario (Ordnance Maintenance and Disposal Sites)

- Air Pathway
  1) Inhalation of airborne soil
- Soil Pathways
  1) Incidental ingestion
  2) Dermal contact
- Sediment Pathways
  1) Incidental ingestion
  2) Dermal contact
- Surface Water Pathways
  1) Incidental ingestion

2) Dermal contact

Future Use Scenarios

Trespasser (Abandoned Landfills) (child 6-11)

- Air Pathway
  1) Inhalation of airborne soil
- Soil Pathways
  1) Incidental ingestion
  2) Dermal contact
- Sediment Pathways
  1) Incidental ingestion
  2) Dermal contact
- Surface Water Pathways
  1) Incidental ingestion
  2) Dermal contact

Residential Scenario (Ordnance Maintenance and Disposal Sites)

- Air Pathway
  1) Inhalation of airborne soil
- Soil Pathways
  1) Incidental ingestion
  2) Dermal contact
  3) Fruit/vegetable ingestion
- Groundwater Pathways
  1) Drinking water ingestion
  2) Inhalation while showering
  3) Dermal contact while showering
  4) Incidental ingestion while swimming
  5) Dermal contact while swimming
- Sediment Pathways
  1) Incidental ingestion
  2) Dermal contact
- Surface Water Pathways
  1) Incidental ingestion
  2) Dermal contact

Site 2 - Ordnance Disposal Site

Site 2 is an ordnance disposal site that is seldom used. Nevertheless, risk from exposure to site 2 will be evaluated using the current worker and future resident scenarios. Potentially contaminated media at this site include soil, sediment, surface water, and groundwater. Data are available for groundwater, soil and sediment. Based on the potential exposure pathways and sampled media, risk to the current worker will be evaluated for air, soil, and sediment. Risk to the future resident will be evaluated for air, soil, sediment, and groundwater.

Site 3 - Abandoned Landfill

Site 3 is a closed landfill that is overgrown with vegetation and rarely visited by NWS Earle staff. Because of the limited potential for exposure to site 3, the site is most appropriately evaluated using the hunter and trespasser scenarios. Potentially contaminated media at the site include groundwater and soil. Because only groundwater data are available for site 3, neither the trespasser nor the hunter can be evaluated.

Site 4 - Abandoned Landfill

Site 4 is an abandoned landfill where individuals may have a high potential for exposure because of the presence of access roads near the site. The site would be evaluated using the hunter and trespasser scenarios because no one currently works there and it is highly unlikely that someone would build a house on an abandoned landfill. Potentially contaminated media include groundwater, soil, surface water, and sediments. Data are available for surface water, sediment, and groundwater. Only those routes of exposure listed under surface water and sediment will be evaluated for the hunter and the trespasser, because soil data are unavailable and there is no exposure to groundwater for the hunter or trespasser. Ingestion of contaminated game will also be evaluated for the hunter.

Site 5 - Abandoned Landfill

Site 5 is an abandoned landfill at which municipal and industrial wastes were disposed over a ten year period. The site is located at the southern end of NWS Earle, is reportedly seldom visited, and therefore best evaluated with the hunter and trespasser scenarios. However, site 5 cannot be evaluated because only groundwater data are available and neither the hunter nor the trespasser will be exposed to this medium.

Site 7 - Abandoned Landfill

Site 7 is an abandoned landfill that is located along the waterfront, approximately ten miles from the main station. Approximately 2,500 tons of refuse were disposed at this site on an annual basis. Disposed refuse included shipping material such as glass and wood, and small amounts of waste paint, solvents, and thinners. Site 7 is an abandoned landfill, and the hunter and trespasser scenarios are most applicable. This site cannot be evaluated because only groundwater data are available and neither the hunter nor the trespasser will be

exposed to this medium.

Site 10 - Abandoned Landfill

Site 10 is a two-acre site at which aluminum and steel containers, spent casings, paint chips, and blasting grit were disposed. Potentially contaminated media include groundwater, soil, surface water, and sediment. Data available for the site include surface water, sediment, and groundwater. Of the potential pathways listed above for the hunter and the trespasser, exposure to soil and air cannot be evaluated because soil data are not available. Although groundwater data are available for this site, exposure to this medium is not evaluated because neither the hunter nor the trespasser will be exposed to groundwater. As a result, the hunter will be evaluated for exposure to surface water, sediment, and contaminated game, and the trespasser will be evaluated for exposure to surface water and sediment.

Site 11 - Ordnance Disposal Site

Site ll is a two-acre ordnance disposal site that had been used as a fire training area for approximately three years. The exposure scenarios that would be most applicable to this site are the current worker and future resident. Potentially contaminated media include soil and groundwater. Data are available for soil and groundwater. Of the potential pathways listed above for the current worker and future resident, only groundwater can be evaluated under the future residential scenario. Although soil data are available for this site, only total petroleum hydrocarbons were analyzed and these cannot be evaluated in a risk assessment because the types of hydrocarbons are unknown.

Site 19 - Ordnance Maintenance Site

Site 19 is largely paved over and is currently used for the storage of containers and cable reels. Because the site is currently used, the current worker and future resident would be most appropriate for evaluating the site. Media sampled at the site include soil, sediment, and groundwater; therefore, the surface water pathway will not be evaluted for either the current worker or the future resident.

Site 20 - Ordnance Maintenance Site

Site 20 is an ordnance maintenance site where 53 gallons of paint were disposed. The most applicable scenarios for this site are the current worker and future resident. Potentially contaminated media include groundwater, soil, surface water, and sediment. Data are available for soil and sediment. Of the exposure pathways described for the current worker, surface water will not be evaluated. Of those listed under the future resident, surface water and groundwater will not be evaluated.

Site 22 - Ordnance Maintenance Site

Although site 22 is an ordnance maintenance site that is rarely used, the site will be evaluated using the current worker and future residential scenarios. Potentially

contaminated media for this site include groundwater, soil, surface water and sediment. Data are available for soil and sediment. As a result, surface water exposure cannot be evaluated for the current worker, and the groundwater and surface water exposure pathways cannot be evaluated for the future resident.

Site 26 - Ordnance Disposal Site

Site 26 is an infrequently used disposal site that will be evaluated using the current worker and future residental scenarios. Potentially contaminated media include groundwater, soil, and sediment. These media will be evaluated for the current worker and future resident using the routes of exposure described for these receptors.

Exposure Assessment - Ecological Addendum

The purpose of this addendum is to provide a more detailed description of the potential exposure pathways available to the selected target species on a site by site basis for this ecological risk assessment.

In choosing a representative species for this evaluation several factors were considered. First, the potential exposure pathways available to an organism were considered. A species with more potential exposure pathways can provide for a more accurate assessment of exposure. Second, a representative species was chosen. Even though a species might not be specific for a given site, it may be a representative species for a particular region or habitat nearby. The relative sensitivity of an organism to a particular chemical is not necessarily an important factor on which to base the choice of a target species. Organisms respond to chemicals in different ways. For the NWS Earle site, the chemical contaminants differ from site to site, so the choice is difficult especially if the evaluation is limited to one target species.

The selection of a target species was also based upon the availability of published toxicity data and life history data (i.e. home ranges, diet composition, ingestion rates, habitat preference). Toxicity data must be chemical-specific and species-specific (target species or a similar species). If toxicity data are limited, the total estimated risk for the target species will not be accurate. Toxicity data for amphibians and reptiles are extremely limited so these species and thus were eliminated from the possible choices for target species even though they may be prevalent or representative of the site. Toxicity data for birds are also very limited. Toxicity data for birds are available for a small group of pesticides and metals but were not available for most of the chemicals of concern for this study. Toxicity data for mammals are typically more available, especially for laboratory test species. As a result, two target species were chosen for this ecological risk assessment, the white-tailed deer and the shrew.

Potential routes of exposure for the white-tailed deer include: soil ingestion, sediment ingestion, surface water ingestion, and browse ingestion. Browse concentrations are calculated using a model based on log Kows and sediment/soil concentrations.

Potential routes of exposure for the shrew include: soil ingestion, sediment ingestion, invertebrate (earthworm) ingestion, surface water ingestion. Invertebrate concentrations are calculated based on published bioaccumulation factors (BAFs) specific for each chemical and sediment or soil concentrations. Bioaccumulation factors are not available for all the chemicals of concern for this ecological risk assessment.

The evaluation of the effects of the chemicals of concern on soil/sediment invertebrates will be included in this ecological risk assessment only if sufficient information is available in the published literature concerning the toxicity of these specific chemicals on invertebrates. The same approach will be used for the vegetation on the sites.

Site 2 - Ordnance Demilitarization

Site 2 is approximately 11 acres in size. This site is characterized by a low, sandy ditch bordered by a mixed coniferous/deciduous stand of trees. A small brook is located on the eastern border of the site. Sediment and soil samples were collected from this site, in addition to groundwater. Little or no vegetation is available on the immediate site where the sediment, soil, or groundwater samples were taken and therefore exposure to the white-tailed deer will not be evaluated for site 2. Due to the lack of vegetation, the contribution of chemicals from the groundwater to plant tissue is also not applicable for evaluation. In addition, reliable models are not currently available to estimate the transport of chemicals in groundwater to overlying vegetation.

Estimated daily doses for the shrew would be estimated based on published sediment and invertebrate ingestion rates, published bioaccumulation factors for invertebrates (earthworms), estimated chemical concentration in the earthworms, and sediment and soil concentrations. Based upon the quality of the habitat at site 2, the shrew would not be expected to obtain 100% of its daily diet from this site. The estimated daily doses would be calculated based on a percentage of diet obtained from site 2.

Site 3 - Landfill

Site 3 is approximately 5 acres in size and is characterized by mixed forest and open grassy areas. The soils located at this site are highly permeable sandy soils. The ground water table averages 15 feet below the ground in this area. Only groundwater samples were collected from this site and therefore exposure to the white-tailed deer and the shrew could not be evaluated.

Site 4 - Landfill

Site 4 consists of approximately 5 acres of mixed forest, open grassy areas and a nearby lake. A drainage ditch runs through the middle of the site surrounded by low brush and small pines. Groundwater, surface waters, and sediment samples were collected from this site. All chemicals analyzed for in the surface water samples collected were below the detection limits and therefore this potential source of exposure was not evaluated for this site. Exposure pathways for the deer and the shrew may include: sediment ingestion, browse ingestion, and invertebrate ingestion.

Estimated daily doses for the deer would be estimated based on sediment and browse ingestion rates, sediment concentrations, and estimated concentrations in browse. The potential home range of the deer exceeds the 5 acres of exposure at this site and therefore the estimated daily doses for the deer will have to be adjusted. The deer exposure will be

estimated based on a limited exposure scenario.

Estimated daily doses for the shrew will be estimated based on invertebrate and sediment ingestion rates, sediment concentrations, and estimated concentrations in invertebrates (earthworms). The home range for the shrew is within this site area and therefore it will be assumed that 100% of the estimated daily dose will be obtained from this site.

Site 5 - Landfill

Site 5 consists of approximately 13 acres of mixed forest and a drainage ditch in addition to several open areas with low lying vegetation and sandy to sandy loam soils. Only groundwater samples were collected at this site and therefore exposure to the white-tailed deer and shrew could not be evaluated. Contribution of chemicals from groundwater to overlying vegetation or organisms could not be evaluated due to lack of an appropriate model.

Site 7 - Landfill

Site 7 is located over 8 miles from any of the other NWS sites. Only groundwater samples were collected at this site and therefore exposure to the white-tailed deer and shrew could not be evaluated. Contribution of chemicals from groundwater to overlying vegetation or organisms could not be evaluated due to lack of an appropriate model.

Site 10 - Scrap Metal Landfill

Site 10 consists of approximately 2 acres of mixed forest, open areas with grass and shrub vegetation, and sandy to sandy loam soils. The site is bordered by a shallow stream ranging from approximately 4 to 10 feet in width. A couple of deer stands were observed on the site. Sediment, groundwater, and surface water samples were collected. Chemical concentrations analyzed for in the surface water samples were below detection levels and therefore this potential source of exposure was not evaluated. Possible exposure pathways for the deer and shrew include: sediment ingestion, invertebrate ingestion, and browse ingestion.

Estimated daily doses for the deer would be estimated based on sediment and browse ingestion rates, sediment concentrations, and estimated concentrations in browse. The potential home range of the deer exceeds the 2 acres of exposure at this site and therefore the estimated daily doses for the deer will have to be adjusted. The deer exposure will be estimated based on a limited exposure scenario.

Estimated daily doses for the shrew will be estimated based on invertebrate and sediment ingestion rates, sediment concentrations, and estimated concentrations in invertebrates (earthworms). The home range for the shrew is within this site area and therefore it will be assumed that 100% of the estimated daily dose will be obtained from this site.

Site 11 - Ordnance Disposal

Site 11 consists of approximately 2 acres of sparse, low lying grasses and shrubs bordered by a mixed forest. Soil and groundwater samples were collected from this site. Only nitrates and petroleum hydrocarbons were detected in the soil samples. Nitrates were present in the soils at concentrations (< 1.0 mg/kg) below suspected toxic levels and therefore were not considered to be a chemical of concern for site 11. In addition, petroleum hydrocarbons were analyzed as a class of chemicals and therefore could not be evaluated in terms of their potential toxicity to selected target species. Contribution of chemicals from groundwater to overlying vegetation or organisms could not be evaluated due to lack of an appropriate model. This site was not included in the NWS ecological risk assessment.

Site 19 - Ordnance Maintenance/Paint Chip and Sludge Disposal

Site 19 consists of approximately 5 acres. Approximately 2.5 acres of the site is made up of buildings, asphalt driveways, and stone piles. The remaining acreage consists of a mixed forest with a well defined wetland area containing brush and pine vegetation. The drainage area runs along the site and connects back up to the barricade structure. Soil, sediment, and groundwater samples were collected from the site. Possible exposure pathways for the deer and the shrew include: soil ingestion, sediment ingestion, invertebrate ingestion, and browse ingestion. Contribution of chemicals from groundwater to overlying vegetation or organisms could not be evaluated due to lack of an appropriate model.

The estimated daily doses for the white-tailed deer would be estimated based on sediment and browse ingestion rates, sediment concentrations, and estimated concentrations in browse. The potential home range of the deer exceeds the 5 acres of exposure at this site and therefore the estimated daily doses for the deer will have to be adjusted. The deer exposure will be estimated based on a limited exposure scenario.

Estimated daily doses for the shrew will be estimated based on invertebrate and sediment ingestion rates, sediment concentrations, and estimated concentrations in invertebrates (earthworms). The home range for the shrew is within this site area and therefore it will be assumed that 100% of the estimated daily dose will be obtained from this site.

Site 20 - Ordnance Maintenance/Grit Blast Disposal Area

The grit blasting disposal area at site 20 consists of a 15 x 100 square foot area behind Building 544. This area is located adjacent to a drainage ditch and grassy field. Sediment and soil samples were collected at this site. Chemical concentrations analyzed in the soil samples were below the chemical detection levels and were not included in the ecological evaluation. Evaluation of the potential exposure to the white-tailed deer was excluded for this site because of the limited size of the site. Possible exposure pathways for the shrew include: sediment ingestion and invertebrate ingestion.

Estimated daily doses for the shrew will be estimated based on invertebrate and sediment ingestion rates, sediment concentrations, and estimated concentrations in invertebrates (earthworms). The home range for the shrew extends beyond the area of the grit blasting disposal area. In addition, the area of concern is not suitable habitat for the shrew. It will be assumed that the shrew will obtain 5 to 15% of its estimated daily dose from the area around the ditch and the grit disposal area.

Site 22 - Ordnance Maintenance/Paint Chip Disposal Area

Site 22 consists of approximately 50 square feet of stressed or blackened vegetation which is located directly behind and adjacent to Building D-2. Two drainage ditches run through the areas of discolored and stained soil. Soil and sediment samples were collected at this site. Because of the limited potential exposure for the white-tailed deer, this target species was not included for evaluation on this site. The potential exposure pathways for the shrew may include: sediment ingestion, soil ingestion, and invertebrate ingestion.

Estimated daily doses for the shrew will be estimated based on invertebrate, soil, and sediment ingestion rates, soil and sediment concentrations, and estimated chemical concentrations in invertebrates (earthworms). The home range for the shrew extends beyond the area of the discolored or stained soil area. In addition, the area of concern is not suitable habitat for the shrew. It will be assumed that the shrew will obtain 5 to 15% of its estimated daily dose from the area around the discolored and stained soil area and along the two drainage ditches.

Site 26 - Ordnance Disposal/Explosive "D" Washout Area

Site 26 consists of approximately 400 square feet. An open tile ditch leads from the Building GB-1 to a sandy depression with little or no vegetation. Low grasses surround the depression area which is bordered by pines. Groundwater, sediment, and soil samples were collected at the site. Only nitrates and nitrites were analyzed for in the soil samples. Nitrates and nitrites were present in the soils at concentrations below suspected toxic levels

and therefore were not considered to be a chemical of concern for site 26. Soil was not considered as a potential source of exposure and therefore was not included for site 26. All sediment samples were taken in the depression area and therefore potential exposure of the white-tailed deer to this area was considered to be negligible. Potential exposure pathways for the shrew may include: sediment ingestion and invertebrate ingestion.

Estimated daily doses for the shrew will be estimated based on invertebrate and sediment ingestion rates, sediment concentrations, and estimated chemical concentrations in invertebrates (earthworms). The home range for the shrew extends beyond the area of the depression area. In addition, the area of concern where the sediment samples were taken is not considered to be suitable habitat for the shrew. It will be assumed that the shrew will obtain 1 to 5% of its estimated daily dose from the depression area.