The toxicological evaluation for the open field adjacent to the Central Chemical property is attached. The contaminants DDE, DDE, DDT, and aldrin exceeded the residential or industrial screening levels. A quantitative risk assessment for a residential child, a residential adult, and an adult worker was performed for these compounds.

The cumulative estimated noncarcinogenic risk for a residential child, as well as DDT alone, slightly exceeded the U.S. Environmental Protection Agency's (EPA) hazard index (HI) of 1. The DDT concentration was the driving factor in exceeding the HI. As mentioned in the summary, the HI would be increased slightly if the concentrations of DDE and DDD were included in the estimated noncarcinogenic risk calculations. However, since there were no RfDs for these compounds, they could not be included. The noncarcinogenic risk for the other two populations was below the acceptable U.S. EPA's HI of 1. The estimated carcinogenic risk for all populations fell within the U.S. EPA's acceptable range of $10^{-4}$ to $10^{-6}$.

Please contact Chuck Nace or me with any questions (x3906).

/DLM
Enclosure

cc: Chuck Nace
Central Chemical
Toxicological Evaluation

1.0 Introduction
Central Chemical is located in Hagerstown, MD in Washington County. A residential area, Brighton Manor, is separated from the Central Chemical site by an open field. A local builder has secured the permits to develop the open field. Soil samples were collected from the open field in February 1997 to confirm that pesticide-contaminated soils were below the Removal Action Levels (RALs). Additional samples were collected, in the presence of Maryland Department of the Environment (MDE) representatives, for confirmation of the previous results.

2.0 Methodology
Contaminants that were detected in the soil samples were initially screened using United States Environmental Protection Agency (U.S. EPA) Region III risk based concentrations (RBCs) (2). The RBCs are derived from toxicity constants and “standard” exposure scenarios to correspond to fixed levels of risk (i.e., a hazard quotient of one, or lifetime cancer risk of 10^-6). Since the RBCs for the detected contaminants are all based on their carcinogenicity, no adjustment to the RBCs were necessary to account for additive non-cancer effects.

Future land use of the area adjacent to the Central Chemical site includes residential development. Based on this information, residential ingestion of soil was evaluated in the quantitative human health assessment. A quantitative risk assessment was performed for the following three potentially exposed populations (3,4,5).

Resident Child aged 1-6 years (16 kg)
1) ingesting 200 mg/kg of soil per day, 350 days per year, for 6 years.

Resident Adult (70 kg)
1) ingesting 100 mg of soil per day, 350 days a year, for 30 years.

Adult Worker (70 kg)
1) ingesting 50 mg of soil per day, 250 days per year, for 25 years.

3.0 Support Data for Central Chemical Site (Residential and Industrial)

3.1 Surface Soil
Fifteen surface soil samples were collected in the open field adjacent to the Central Chemical site. The compounds 1,1-dichloro-2,2'-bis(p-chlorophenyl)ethylene (DDE), 1,1-dichloro-2,2'-bis(p-chlorophenyl)ethane (DDD), 1,1''-(2,2',2'-trichloroethylidene)bis[4-chlorobenzene] (DDT), and aldrin were detected in concentrations that exceeded the U.S. EPA Region III RBCs for residential soil ingestion. These compounds were included in the quantitative risk assessment. In addition, DDE, DDD, and DDT were detected in concentrations that exceeded the U.S. EPA Region III RBCs for industrial soil ingestion.

Beta-Hexachlorocyclohexane (HCH) and dieldrin were also detected but the concentrations were below the U.S. EPA Region III RBCs for residential and industrial soil ingestion.
3.11 Organics

DDE
DDE was detected at a maximum concentration of 17 ppm which exceeded the residential soil RBC of 1.9 mg/kg and was equal to the industrial soil RBC of 17 mg/kg. Both of these screening levels were based on carcinogenic effects.

There is currently no reference dose (RfD) for DDE. Therefore, a quantitative risk calculation could not be calculated.

DDE is classified as a probable human carcinogen by the U.S. EPA (6). Lifetime Average Daily Dose (LADD) estimates for DDE in site soil were calculated for the three populations (Table 2). Applying the U.S. EPA's oral cancer potency of 3.40E-01 to the LADDs results in site soil lifetime excess cancer risk (CR) values of 6E-06, 3E-06, and 6E-18 for the resident child, resident adult, and adult worker, respectively. All of these values are within or below EPA's acceptable risk range of 1E-04 to 1E-06.

DDD
DDD was detected at a maximum concentration of 24 ppm which exceeded the residential soil RBC of 2.7 mg/kg and was equal to the industrial soil RBC of 24 mg/kg. Both of these screening levels were based on carcinogenic effects.

There is currently no RfD for DDE. Therefore, a quantitative risk calculation could not be calculated.

DDD is classified as a probable human carcinogen by the U.S. EPA (6). LADD estimates for DDE in site soil were calculated for the three populations (Table 2). Applying U.S. EPA's oral cancer potency of 2.40E-01 to the LADDs results in site soil lifetime excess CR values of 6E-06, 3E-06, and 8E-18 for the resident child, resident adult, and adult worker, respectively. All of these values are within or below EPA's acceptable risk range of 1E-04 to 1E-06.

DDT
DDT was detected at a maximum concentration of 45 ppm which exceeded the residential soil RBC of 1.9 mg/kg and the industrial soil RBC of 17 mg/kg based on carcinogenic effects.

The U.S. EPA RfD for DDT is 5.0E-04 mg/kg/day (6). Average Daily Dose (ADD) estimates were calculated for three population groups (Table 1). Applying the RfD to the ADDs results in site soil Hazard Quotients (HQs) of 1.1E+00, 1.2E-01, and 9.8E-04 for the resident child, resident adult, and adult worker, respectively. The HQ for the resident child is greater than the U.S. EPA acceptable value of 1. The HQs for the other two populations fall below the U.S. EPA acceptable value of 1.

DDT is classified as a probable human carcinogen by the U.S. EPA (6). LADD estimates for DDE in site soil were calculated for the three populations (Table 2). Applying the U.S. EPA's oral cancer potency of 3.40E-01 to the LADDs results in site soil lifetime excess CR values of 2E-05, 9E-05, and 4E-17 for the resident child, resident adult, and adult worker, respectively. All of these values are within or below EPA's acceptable risk range of 1E-04 to 1E-06.
Aldrin
Aldrin was detected at a maximum concentration of 0.28 ppm which exceeded the residential soil RBC of 0.038 mg/kg based on carcinogenic effects. Aldrin concentrations did not exceed the industrial soil RBC of 0.34 mg/kg.

The U.S. EPA RfD for aldrin is 3.0E-05 mg/kg/day (6). ADD estimates were calculated for two residential population groups (Table 1). Applying the RfD to the ADDs results in site soil HQs of 1.1E-01 and 1.3E-02 for the resident child and resident adult, respectively. The HQs for the two populations fall below the U.S. EPA acceptable value of 1.

Aldrin is classified as a probable human carcinogen by the U.S. EPA (6). LADD estimates for aldrin in site soil were calculated for the two residential populations (Table 2). Applying the U.S. EPA’s oral cancer potency of 1.70E+01 to the LADDs results in site soil lifetime excess CR values of 5E-06 and 3E-06 for the resident child and resident adult, respectively. Both of these values are within the U.S. EPA’s acceptable risk range of 1E-04 to 1E-06.

4.0 Conclusion
Noncarcinogenic risks from ingestion of soil were evaluated for the potentially exposed residential child, residential adult, and adult worker. The U.S. EPA recognizes as acceptable HI values less than or equal to 1. The cumulative estimated non-carcinogenic risk for a residential child, as well as for DDT alone, exceeded the HI of 1. The estimated noncarcinogenic risks for the other populations fell below the acceptable risk range recognized by the U.S. EPA. Since there were no RfDs for DDE or DDD the quantitative risk from these compounds was not incorporated into the HI. While these compounds would add to the overall HI, it is not expected to increase the HI substantially for any of the populations. The noncarcinogenic risk calculations are shown in Table 1.

Carcinogenic risks from ingestion of soil were evaluated for the potentially exposed residential child, residential adult, and adult worker. The U.S. EPA recognizes as acceptable excess lifetime cancer risk below 10^-4 to 10^-6. The estimated carcinogenic risks for the three populations, both individually and cumulative, fell within or below the acceptable risk range recognized by the U.S. EPA. For populations that did not exceed the acceptable risk range, it can be expected that the actual risks will be within the acceptable range. The carcinogenic risk calculations are shown in Table 2.

References
2) U.S. Environmental Protection Agency, Region III: Risk-Based Concentration Table, April 18, 1996.
### Table 1. Quantitative Risk Assessment - Noncarcinogenic
Residential Use/Commerical and Industrial Development - Soil Ingestion

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<th>Soil [ ] Max (mg/kg)</th>
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<th>ADD Adult HQ Resident</th>
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**SUM→** 1.2E+00  SUM→ 1.3E-01  SUM→ 9.8E-04

### Table 2. Quantitative Risk Assessment - Carcinogenic
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**SUM→** 3E-05  SUM→ 2E-05  SUM→ 6E-17

N/A = did not exceed RBC screening level
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Results reported in parts per million (ppm).

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* EPA inside fence*

\[
\text{DDD} = \frac{0.05}{0.05} \times 17 = 1.7 \\
\text{DDT} = \frac{0.02}{0.05} = 2.4 \\
\text{HCH} = \frac{0.03}{0.05} = 0.6 \\
\text{ppm (max 3)}
\]