Risk Assessment of Air Sampling and Modeling Data for the Milford Hills Area in Salisbury, North Carolina Prepared by Occupational and Environmental Epidemiology Branch July 19, 2002

Executive Summary

The Occupational and Environmental Epidemiology Branch assessed the risk from exposure to the modeled and measured chemical concentrations reported by the NC Division of Air Quality for the Milford Hills area in Salisbury from May 14 through September 7, 2001 (Division of Air Quality Toxics Protection Branch Air Toxics Analytical Support Team (ATAST) ATAST Investigation Numbers 01007 and 01008 Draft Study Report Salisbury Air Quality Monitoring Study April 30, 2002; Tables prepared by Bryan Lange with the North Carolina Division of Air Quality per June 13, 2002 email). The data consists of volatile organic chemical and hydrogen sulfide monitoring and dispersion modeling results as well as modeling results for criteria air pollutants. A complete list of the measured and modeled chemical concentrations as well as recommended health-based concentrations can be found in Tables 1, 2, and 3. A map showing the modeled and monitored locations can be found in Figure 1 (including Resident 1, Resident 2, Cul-de-sac, Access Road, and Inside ExxonMobil). This risk assessment considers exposures to modeled and measured ambient air chemical concentrations from May 14 through September 7, 2001 only.

The following risk assessment reports that prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of bronchial constriction for asthmatics and nasal mucosa inflammation from exposure to hydrogen sulfide concentrations for the Cul-de-sac and Access Road residential areas. Following installation of the carbon filters in 2002, the 1-hour and annual average hydrogen sulfide concentrations are estimated to be less than the recommended concentrations and are expected to pose no increased risk.

Chemical Concentrations From Surrounding Sources

Volatile Organic Chemicals (VOCs)

The modeling data included estimates of the maximum chemical concentrations from four surrounding sources over a 365 day period. The four surrounding businesses included a Southern States remediation site, Associated Asphalt (a liquid asphalt distribution terminal), APAC-Carolina, Inc. (a hot mix asphalt plant), and an ExxonMobil remediation site. The maximum modeled volatile organic chemical concentrations and corresponding location relative to these four businesses are provided in Tables 1 and 3. The Southern States remediation site was the principal emitter of VOCs. In March 2002 (after the study), Southern States voluntarily decided to discontinue operation of the air sparging/soil-vapor extraction system. According to the NC Division of Air Quality, discontinuing the air sparging soil-vapor extraction system at Southern States would reduce the volatile organic chemical (e.g., benzene) releases in the area.

Hydrogen Sulfide

The maximum modeled hydrogen sulfide concentrations occur just outside the Associated Asphalt, Inc. property lines. The major source of hydrogen sulfide emissions is from the storage tank filling operations. The Division of Air Quality directed Associated Asphalt to reinstall activated carbon filters on the storage tank vents which is expected to reduce facility-wide hydrogen sulfide emissions by approximately 85%. These carbon filters were installed after the study on April 3, 2002. Assuming an 85% reduction in maximum modeled concentrations from selected sources, the maximum hydrogen sulfide concentrations are estimated for residential areas as shown in Table 2. The tables include predicted levels with and without carbon filters. A direct relationship is assumed between 85% reduction in emissions and 85% reduction in nearby ambient air levels.

Chemicals of Most Concern

Of all the chemicals measured and modeled, benzene and hydrogen sulfide are the chemicals of most concern for the following reasons:

Benzene

- The 24-hour average benzene concentration measured at the Cul-de-sac residential area of 0.6 ug/m3 is above the EPA one in a million cancer risk level of 0.25 ug/m^3 .

Hydrogen Sulfide

- The maximum 1-hour hydrogen sulfide concentrations measured and modeled for the Access Road of 65 and 171 ug/m^3 , respectively, are above the recommended 1-hour concentration of 56 ug/m^3 (based on bronchial constriction in asthmatic adults).

- The maximum 1-hour hydrogen sulfide concentration modeled for the cul-de-sac of 95 ug/m^3 is above the recommended 1-hour concentration of 56 ug/m^3 (measured max only 34 ug/m^3). The modeled concentrations are higher than the measured concentrations. The modeled concentrations are estimates of the concentrations that may be present under certain operating and meteorological conditions.

- The annual average hydrogen sulfide concentrations modeled and measured for the Access Road of 7.3 and 2.3 ug/m^3 and Cul-de-sac of 1.6 and 1.5 ug/m^3 are above the EPA recommended concentration for long-term exposure of 1 ug/m^3 (based on inflammation of nasal mucosa in mice) but below level recommended for long-term exposure by the North Carolina Department of Environment and Natural Resources Secretary's Scientific Advisory Board on Toxic Air Pollutants of 32 ug/m^3 (based on eye pain and visual disturbances in humans).

The remaining chemical concentrations measured and modeled are approximately equal to or below the recommended health-based concentrations with the exception of 1,2-dichloroethane, 1,2-dichloropropane, ethyl chloride, and methyl chloride. Only one single

measure was found for 1,2-dichloroethane and 1,2-dichloropropane, so exposure is likely to be infrequent. For ethyl chloride and methyl chloride, the maximum concentration instead of the average concentration exceeded the one in a million cancer risk level. The average concentration better represents the exposure concentration over a long-term period. Therefore, exposure to these four chemicals is not expected to present an increased risk.

Risks to Individuals Living near Resident 1, Resident 2, Access Road, and Cul-de-sac Locations from Exposure to Measured and Modeled Benzene and Hydrogen Sulfide Concentrations (See Figure 1 for map showing residential locations surrounding the nearby sources)

The risks from short-term and long-term exposure to measured and modeled benzene and hydrogen sulfide concentrations were assessed by comparing measured and modeled concentrations within the residential areas to recommended health-based concentrations.

Benzene – Risk from Short-term Exposure

The risk from short-term exposure to the benzene concentrations reported is assessed by comparing the maximum 24-hour measured benzene concentrations from all sources for the Access Road and Cul-de-sac residential areas and the maximum 24-hour modeled concentrations from selected sources for Resident 1, Resident 2, Access Road, and Cul-de-sac residential areas to the Agency for Toxic Substance and Disease Registry (ATSDR) recommended level for short-term exposure. The maximum 24-hour measured benzene concentration from all surrounding sources for the Cul-de-sac and Access Road is approximately 1 ug/m^3, and the maximum 24-hour modeled benzene concentration from selected sources for the residential areas ranged from 0.014 (Access Road) to 0.10 ug/m^3 (Resident 1). These modeled and measured concentrations are well below the ATSDR recommended level for short-term exposure (1-14 days) of 160 ug/m^3 (based on immunological effects). There is no increased risk of immunological effects from short-term exposure to the 2001 modeled or measured benzene concentrations for Resident 1, Resident 2, Access Road, and Cul-de-sac.

Benzene – Risk from Long-term Exposure

The risk from long-term exposure to the benzene concentrations reported is assessed by comparing the 24-hour average benzene concentrations measured from all sources for the Access Road and Cul-de-Sac, and the annual average modeled concentrations from selected sources for Resident 1, Resident 2, Access Road, and Cul-de-sac residential areas to the recommended levels for long-term exposure provided by ATSDR and EPA Region 9 as well as NC AALs. The 24-hour average concentration measured from all sources for the cul-de-sac residential area was 0.6 ug/m^3. Only one single measure of benzene was found at the Access Road, so exposure is likely to be infrequent at the Access Road. The annual average modeled concentrations from selected sources for the residential areas ranged from 0.003 ug/m^3 (Access Road and Resident 2) to 0.008 ug/m^3 (Resident 1). These concentrations are well below the EPA recommended noncancer level for long-term exposure of 6.2 ug/m^3. According to US EPA, benzene concentrations at 0.13 to 0.45 ug/m^3 are associated with a one in a

million excess cancer risk. The middle of this range or 0.25 ug/m^3 (a one in a million cancer risk level) is used to assess the cancer risk. The excess cancer risks associated with long-term exposure to 0.003 to 0.6 ug/m^3 ranges from less than 1 out of a billion to two out of a million, which is a very low cancer risk. With the removal of air sparging at Southern States, benzene concentrations are expected to be lower in residential areas, which should further reduce the cancer risk. There is a very low cancer risk from long-term exposure to the 2001 modeled or measured benzene concentrations for Resident 1, Resident 2, Access Road, and Cul-de-sac.

Hydrogen Sulfide – Risk from Short-term Exposure

The risk from short-term exposure to the hydrogen sulfide concentrations reported is assessed by comparing the maximum 1-hour and 24-hour measured hydrogen sulfide concentrations from all sources for the Access Road and Cul-de-sac and the maximum 1-hour modeled concentrations from selected sources for Resident 1, Resident 2, Access Road, and Cul-de-sac residential areas to the ATSDR recommended level of 98 ug/m^3 for short-term exposure, ATSDR recommended level of 42 ug/m^3 for intermediate exposure, and proposed NC AAL of 56 ug/m^3 for short-term exposure.

Cul-de-sac

The maximum 1-hour measured hydrogen sulfide concentration from all surrounding sources for the cul-de-sac of 34 ug/m^3 is below the ATSDR recommended level of 98 ug/m^3 (based on bronchial constriction in asthmatic adults) and proposed NC AAL of 56 ug/m^3 (based on bronchial constriction in asthmatic adults with additional safety factors). However, the maximum 1-hour modeled hydrogen sulfide concentration from selected sources for the cul-de-sac residential area (without carbon filters at Associated Asphalt) is 95 ug/m^3 which is just below the ATSDR recommended level of 98 ug/m^3, above the proposed NC AAL of 56 ug/m^3, and below the level associated with bronchial constriction in asthmatic adults at 2,787 ug/m^3. The maximum 24-hour concentration measured from all surrounding sources for the Cul-de-sac (without carbon filters at Associated Asphalt) is 24 ug/m^3 which is below level recommended by ATSDR for intermediate exposure (15- 364 days) of 42 ug/m^3 (based on respiratory effects) and proposed NC 24-hour AAL of 32 ug/m^3 (based on eye pain and visual disturbances in humans). Prior to the installation of carbon filters at Associated Asphalt (completed April 3, 2002), there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled hydrogen sulfide concentrations (not measured) and no increased risk of eye pain and visual disturbances for the Cul-de-sac. Assuming an 85% reduction in the maximum modeled concentrations with the addition of carbon filters at Associated Asphalt, the maximum 1-hour hydrogen sulfide concentrations are estimated to be 14 ug/m^3 which is below the recommended level of 56 ug/m^3. Following the installation of carbon filters at Associated Asphalt in 2002, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated maximum 1-hour hydrogen sulfide concentrations for the cul-de-sac area.

Access Road

The maximum 1-hour measured hydrogen sulfide concentration from all surrounding sources for the Access road of 65 ug/m^3 is below the ATSDR recommended level of 98 ug/m^3 (based on bronchial constriction in asthmatic adults) and just above the proposed NC AAL of 56 ug/m^3 (based on bronchial constriction in asthmatic adults with additional safety factors). The maximum 1-hour modeled hydrogen sulfide concentration from selected sources for the access road residential area (without carbon filters at Associated Asphalt) is 171 ug/m^3 which is above the ATSDR recommended level of 98 ug/m^3 and the proposed NC AAL of 56 ug/m^3. The maximum 1-hour measured and modeled 1-hour hydrogen sulfide concentrations for the Access road are above the recommended level for asthmatics but well below level associated with bronchial constriction in asthmatic adults at 2,787 ug/m^3. The maximum 24-hour concentration measured from all surrounding sources for the Access Road (without carbon filters at Associated Asphalt) is 12 ug/m^3 which is below the level recommended by ATSDR for intermediate exposure (15- 364 days) of 42 ug/m^3 (based on respiratory effects) and proposed NC 24-hour AAL of 32 ug/m^3 (based on eye pain and visual disturbances in humans). Prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled and measured hydrogen sulfide concentrations and no increased risk of eye pain and visual disturbances for the Access Road. Assuming an 85% reduction in the maximum modeled concentrations with the addition of carbon filters at Associated Asphalt, the maximum 1-hour hydrogen sulfide concentrations are estimated to be 26 ug/m^3 at the Access Road which is below the recommended level of 56 ug/m^3. Following the installation of carbon filters at Associated Asphalt in 2002, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated maximum 1-hour hydrogen sulfide concentrations for the Access Road.

Resident 1 and 2

The maximum 1-hour concentrations modeled for Resident 1 and 2 of 18 and 44 ug/m^3 are below the ATSDR recommended level of 98 ug/m^3 (based on bronchial constriction in asthmatic adults) and the proposed NC AAL of 56 ug/m^3 (based on bronchial constriction in asthmatic adults which included more safety factors). There is no increased risk of bronchial constriction for asthmatics following short-term exposure to the maximum 1-hour 2001 modeled hydrogen sulfide concentrations for Resident 1 and 2.

Hydrogen Sulfide – Risk from Long-term Exposure

The risk from long-term exposure to the hydrogen sulfide concentrations reported is assessed by comparing the annual average measured concentrations from all sources for the Access Road and Cul-de-sac, and the annual average modeled concentrations from selected sources for Resident 1, Resident 2, Access Road, and Cul-de-sac residential areas to the recommended levels for intermediate exposure provided by ATSDR and long-term exposure by EPA Region 9 and NC AALs.

Cul-de-sac

Prior to the installation of carbon filters in 2002 at Associated Asphalt, the annual average modeled concentration for the Cul-de-sac of 1.6 ug/m^3 and annual average measured concentration of 1.5 ug/m^3 are below the recommended ATSDR level for intermediate exposure (15-364 day exposure) of 42 ug/m^3 (based on respiratory effects), slightly above EPA recommended level for long-term exposure 1 ug/m^3 (based on inflammation of nasal mucosa in mice), and below proposed NC 24-hour AAL of 32 ug/m^3 (based on eye pain and visual disturbances in humans). Therefore, prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average measured and modeled hydrogen sulfide concentrations for the Cul-de-sac. With the installation of carbon filters at Associated Asphalt in 2002, the annual average modeled hydrogen sulfide concentration for the Cul-de-sac is estimated to be 0.25 ug/m^3 which is less than recommended levels so no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at the Cul-de-sac following installation of carbon filters.

Access Road

Prior to the installation of carbon filters in 2002 at Associated Asphalt, the annual average modeled concentration for the access road of 7.3 ug/m^3 and annual average measured concentration of 2.3 ug/m^3 are below the recommended ATSDR level for intermediate exposure (15-364 day exposure) of 42 ug/m^3 (based on respiratory effects), above EPA recommended level for long-term exposure 1 ug/m^3 (based on inflammation of nasal mucosa in mice), and below proposed NC 24-hour AAL of 32 ug/m^3 (based on eye pain and visual disturbances in humans). Therefore, prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average measured and modeled hydrogen sulfide concentrations for the Access road. With the installation of carbon filters at Associated Asphalt in 2002, the annual average modeled hydrogen sulfide concentration for the Access road is estimated to be approximately 1 ug/m^3 which is equal to or less than recommended levels so there is no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at the Access road following installation of carbon filters.

Resident 1 and 2

Prior to the installation of carbon filters in 2002 at Associated Asphalt, the maximum annual average modeled concentrations for Resident 1 of 0.14 ug/m^3 and Resident 2 of 0.63 ug/m^3 are below the recommended ATSDR level for intermediate exposure (15-364 day exposure) of 42 ug/m^3 (based on respiratory effects), below EPA recommended level for long-term exposure 1 ug/m^3 (based on inflammation of nasal mucosa in mice), and below proposed NC 24-hour AAL of 32 ug/m^3 (based on eye pain and visual disturbances in humans). Therefore, prior to the installation of carbon filters at Associated Asphalt in 2002, there was no increased risk of nasal mucosa inflammation, respiratory effects, eye pain and visual

disturbances from long-term exposure to the 2001 annual average modeled hydrogen sulfide concentrations for Resident 1 and 2.

Summary of Risk to Residents Based on 2001 Modeled and Measured Air Data

- There is no increased risk of immunological effects from short-term exposure to the 2001 modeled or measured benzene concentrations for Resident 1, Resident 2, Access Road, and Cul-de-sac.

- There is a very low cancer risk (1 out of a billion to two out of a million) from long-term exposure to the 2001 modeled or measured benzene concentrations for Resident 1, Resident 2, Access Road, and Cul-de-sac.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled hydrogen sulfide concentrations (not measured) and no increased risk of eye pain and visual disturbances for the Cul-de-sac. Following the installation of carbon filters at Associated Asphalt in 2002, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated maximum 1-hour hydrogen sulfide concentrations for the Cul-de-sac.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled and measured hydrogen sulfide concentrations and no increased risk of eye pain and visual disturbances for the Access Road. Following the installation of carbon filters at Associated Asphalt in 2002, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated maximum 1-hour hydrogen sulfide concentrations for the Access Road.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was no increased risk of bronchial constriction for asthmatics following short-term exposure to the 2001 modeled hydrogen sulfide concentrations for Resident 1 and 2.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average measured and modeled hydrogen sulfide concentrations for the Access road. With the installation of carbon filters at Associated Asphalt in 2002, the annual average hydrogen sulfide concentration for the access road is estimated to be 1 ug/m^3 which is equal to or less than recommended levels so no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at the Access road following installation of the carbon filters at Associated Asphalt in 2002.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average measured and modeled hydrogen sulfide concentrations for the Cul-de-sac. With the installation of carbon filters at Associated Asphalt in 2002, the annual average modeled hydrogen sulfide concentration for the Cul-de-sac is estimated to be 0.25 ug/m^3 which is less than recommended levels so no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at the Cul-de-sac following installation of carbon filters at Associated Asphalt in 2002.

- Prior to the installation of carbon filters at Associated Asphalt in 2002, there was no increased risk of nasal mucosa inflammation, respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average modeled hydrogen sulfide concentrations for Resident 1 and 2.

- The remaining chemical concentrations measured and modeled are approximately equal to or below the recommended health-based concentrations with the exception of 1,2-dichloroethane, 1,2-dichloropropane, ethyl chloride, and methyl chloride. Only one single measure was found for 1,2-dichloroethane and 1,2-dichloropropane, so exposure is likely to be infrequent. For ethyl chloride and methyl chloride, the maximum concentration instead of the average concentration exceeded the one in a million cancer risk level. The average concentration better represents the exposure concentration over a long-term period. Exposure to these four chemicals at the concentrations reported is not expected to present an increased risk.

- In summary, prior to the installation of carbon filters at Associated Asphalt in 2002, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to hydrogen sulfide and nasal mucosa inflammation from long-term exposure to hydrogen sulfide for the Cul-de-sac and Access Road residential areas. Following installation of carbon filters at Associated Asphalt in 2002, the levels are expected to be less than the recommended levels and pose no increased risk.

Table 1. Modeled and Measured Benzene Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Av. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road, Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Benzene	24-hour	16 (Resident 1 is 1,140 ft Northeast from Southern States)	Cul-de-sac 0.033 ug/m^3 (2,050 ft from max) Resident 1 0.10 ug/m^3 (1,140 ft from max) Resident 2 0.027 ug/m^3 (2,540 ft from max) Access Road 0.014 ug/m^3 (1,920 ft from max)	 Access Rd Single Measure = 1.19 Cul-de-sac Avg = 0.6 Max = 1.15 Inside ExxonMobil Single Measure = 1.0	160 (1-14 days) 0.1 (365 days and longer, one out of a million cancer risk)	0.25 (annual, one out of a million cancer risk) 6.2 (annual, noncancer)	0.12 (annual, one out of a million cancer risk))	Modeled and measured concentrations well below ATSDR recommended level for short-term exposure (1-14 days) of 160 ug/m^3 (based on immunological effects). No increased risk of immunological effects from short-term exposure to the 2001 modeled or measured benzene concentrations for Resident 1, Resident 2, Access Road, and Cul-de-sac. See calculated excess cancer risk from exposure to the 24-hour average concentrations below.
	Annual	1 (Resident 1 is 1,140 ft Northeast from Southern States)	Cul-de-sac 0.0047 ug/m^3 (2,050 ft from max) Resident 1 0.0079 ug/m^3 (1,140 ft from max) Resident 2 0.003 ug/m^3 (2,540 ft from max) Access Road 0.003 ug/m^3 (1,920 ft from max)	Not Available	0.1 (365 days and longer, one out of a million cancer risk)	0.25 (annual, one out of a million cancer risk) 6.2 (annual, noncancer)	0.12 (annual)	Excess cancer risks associated with long-term exposure to 0.003 (annual) average to 0.6 ug/m^3 (24-hour average) ranges from less than 1 out of a billion to two out of a million which is a very low cancer risk. With the removal of air sparging at Southern States, benzene concentrations expected to be lower in residential areas which should reduce cancer risk.

Table 2. Modeled and Measured Hydrogen Sulfide Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. Estimated Hydrogen Sulfide Concs. in Residential Areas w/ Carbon Filters at Associated Asphalt (Assuming 85% Reduction in maximum modeled concs.)	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Hydrogen sulfide	**1-hour**	**404 (330 ft Northwest of Associated Asphalt)**	**Cul-de-sac 95 ug/m^3 (620 ft from max)** **Resident 1 18 ug/m^3 (1,580 ft from max)** **Resident 2 44 ug/m^3 (754 ft from max)** **Access Road 171 ug/m^3 (98 ft from max)**	**Cul-de-sac 14 ug/m^3 (620 ft from max)** **Resident 1 2.7 ug/m^3 (1,580 ft from max)** **Resident 2 6.6 ug/m^3 (754 ft from max)** **Access Road 26 ug/m^3 (98 ft from max)**	**Access Rd Avg = 2.3 Max = 65** **Cul-de-sac Avg = 1.5 Max = 34** **Inside ExxonMobil Avg = 1.4 Max = 3.5**	**98 (1-14 days) (based on bronchial constriction in asthmatic adults at 2,787 ug/m^3 for 30 minutes)**	**Not Available**	**2,100 (1-hour) (current) 56 (1-hour) (proposed (based on same data used by ATSDR where bronchial constriction in asthmatic adults at 2,787 ug/m^3 for 30 minutes but NC used more uncertainty factors)**	Prior to the installation of carbon filters at Associated Asphalt in 2001, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled hydrogen sulfide concentrations (not measured) and no increased risk of eye pain and visual disturbances for the Cul-de-sac. Following the installation of carbon filters at Associated Asphalt, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated hydrogen sulfide concentrations for the cul-de-sac. **Prior to the installation of carbon filters at Associated Asphalt in 2001, there was an increased risk of bronchial constriction for asthmatics from short-term exposure to 2001 modeled and measured hydrogen sulfide concentrations and no increased risk of eye pain and visual disturbances for the Access Road. Following the installation of carbon filters at Associated Asphalt, no increased risk of bronchial constriction for asthmatics is expected following short-term exposure to the estimated hydrogen sulfide concentrations for the Access Road.** Prior to the installation of carbon filters at Associated Asphalt in 2001, there was no increased risk of bronchial constriction for asthmatics following short-term exposure to the 2001 modeled hydrogen sulfide concentrations for Resident 1 and 2.

Table 2. Modeled and Measured Hydrogen Sulfide Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. Estimated Hydrogen Sulfide Concs. in Residential Areas w/ Carbon Filters at Associated Asphalt (Assuming 85% Reduction in maximum modeled concs.)	Max. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Hydrogen Sulfide	24-hour	Not Available	Not Available	Not Available	Access Road Max =12 Cul-de-sac Max = 24 Inside ExxonMobile Max 1.7	42 (15 – 364 days) based on respiratory effects	Not Available	32 (24-hour) Eye pain and visual disturbances in rayon workers exposed to avg. 13,700 ug/m^3 40 hours a week with 420 safety factor	The maximum 24-hour concentrations measured for the Access Road and Cul-de-sac are below recommended levels so no increased risk of respiratory effects, eye pain or visual disturbances from short-term exposure to the maximum 24-hour measured concentrations for the Access Road or Cul-de-sac.

Table 2. Modeled and Measured Hydrogen Sulfide Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. Estimated Hydrogen Sulfide Concs. in Residential Areas w/ Carbon Filters at Associated Asphalt (Assuming 85% Reduction in maximum modeled concs.)	Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Hydrogen Sulfide	Annual	12 (300 ft Northwest from Associated Asphalt)	Cul-de-sac 1.6 ug/m^3 (470 ft from max) Resident 1 0.14 ug/m^3 (1,470 ft from max) Resident 2 0.63 ug/m^3 (850 ft from max) Access Road 7.3 ug/m^3 (170 ft from max)	Cul-de-sac 0.25 ug/m^3 (470 ft from max) Resident 1 0.02 ug/m^3 (1,470 ft from max) Resident 2 0.09 ug/m^3 (850 ft from max) Access Road 1.1 ug/m^3 (170 ft from max) (All values assume 85% reduction from all H2S sources)	Access Road Avg = 2.3 Cul-de-sac Avg. 1.5 Inside ExxonMobile Avg = 1.4 (Study duraction 117 days which is less than 1/3 of a year)	42 (15 – 364 days) based on respiratory effects	1 (annual) based on inflammation of nasal mucosa in mice at 110,000 ug/m^3 and equivalent human concentration is estimated to be 2,600 ug/m^3	32 (24-hour) Eye pain and visual disturbances in rayon workers exposed to avg. 13,700 ug/m^3 40 hours a week with 420 safety factor	Prior to installation of carbon filters at Associated Asphalt, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to 2001 annual average measured and modeled hydrogen sulfide concentrations for the Access road. With the installation of carbon filters, maximum annual average hydrogen sulfide concentration for access road is approximately 1 ug/m^3 which is equal to or less than recommended levels so no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at Access Road. Prior to the installation of carbon filters at Associated Asphalt, there was an increased risk of nasal mucosa inflammation and no increased risk of respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average measured and modeled hydrogen sulfide concentrations for Cul-de-sac. With the installation of carbon filters, annual average modeled hydrogen sulfide concentration for Cul-de-sac is estimated to be 0.24 ug/m^3 which is less than recommended levels so no increased risk of nasal mucosa inflammation, respiratory effects, eye irritation or visual disturbances is expected at the Cul-de-sac. Prior to the installation of carbon filters at Associated Asphalt, there was no increased risk of nasal mucosa inflammation, respiratory effects, eye pain and visual disturbances from long-term exposure to the 2001 annual average modeled hydrogen sulfide concentrations for Resident 1 and 2.

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Benzo(a)pyrene	annual	0.00002 (680 ft Northwest of APAC)	Cul-de-sac Below Quantitation Limit (920 ft from max) Resident 1 Below Quantitation Limit (2,110 ft from max) Resident 2 0.00001 ug/m^3 (220 ft from max) Access Road Below Quantitation Limit (480 ft from max)	Not Available	Not Available	Not Available	0.03(annual)	Below recommended levels so No Increased Risk
Carbon disulfide	24-hour	0.38 (330 ft Northwest of Associated)	Cul-de-sac 0.078 ug/m^3 (620 ft from max) Resident 1 0.016 ug/m^3 (1,580 ft from max) Resident 2 0.055 ug/m^3 (750 ft from max) Access Road 0.32 ug/m^3 (100 ft from max)	Not Available	930 (365 days and longer)	730 (annual)	186 (24-hour)	Below recommended levels so No Increased Risk
Formaldehyde	1-hour	26.3 (470 ft North of Associated)	Cul-de-sac 6.01 ug/m^3 (1,300 ft from max) Resident 1 1.41 ug/m^3 (2,170 ft from max) Resident 2 9.20 ug/m^3 (660 ft from max) Access Road 6.27 ug/m^3 (740 ft from max)	Not Available	49 (1- 14 days)	Not Available	150 (1-hour)	Below recommended levels so No Increased Risk

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Methylene Chloride	24-hour	0.00074 (330 ft Northwest of Associated)	Cul-de-sac 0.00016 ug/m^3 (620 ft from max) Resident 1 0.00003 ug/m^3 (1,580 ft from max) Resident 2 0.00013 ug/m^3 (750 ft from max) Access Road 0.00061 ug/m^3 (100 ft from max)	Cul-de-sac Below analytical quantitation limits (BQL) Access Road Not Availabe Inside ExxonMobil Below analytical quantitation limits (BQL)	2,000 (1-14 days) 1,000 (365 days and longer)	4.1 (annual, one out of a million cancer risk) 3,100 (annual, noncancer)	24 (annual)	Below recommended levels so No Increased Risk
	annual	0.00015 (300 ft Northwest of Associated)	Cul-de-sac 0.00003 ug/m^3 (470 ft from max) Resident 1 Below analytical quantitation limits (BQL) (850 ft from max) Resident 2 0.00001 ug/m^3 (1,470 ft from max) Access Road 0.00007 ug/m^3 (170 ft from max)	Not Available	1,000 (365 days and longer)	4.1 (annual, one out of a million cancer risk) 3,100 (annual, noncancer)	24 (annual)	Below recommended levels so No Increased Risk
N-Hexane	24-hour	3.88 (650 ft Northwest of APAC)	Cul-de-sac 0.64 ug/m^3 (1,200 ft from max) Resident 1 0.11 ug/m^3 (2,210 ft from max) Resident 2 0.44 ug/m^3 (450 ft from max) Access Road 2.1 ug/m^3 (660 ft from max)	Not Available	2,000 (365 days and longer)	210 (annual)	1,100 (24-hour)	Below recommended levels so No Increased Risk

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level[4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Phenols	1-hour	0.793 (530 ft Northwest of APAC)	Cul-de-sac 0.132 ug/m^3 (1,170 ft from max) Resident 1 0.013 ug/m^3 (2,170 ft from max) Resident 2 0.322 ug/m^3 (440 ft from max) Access Road 0.138 ug/m^3 (620 ft from max)	Not Available	Not Available	Not Available	950 (1-hour)	Below recommended levels so No Increased Risk
Styrene	1-hour	0.14 (330 ft Northwest of Associated)	Cul-de-sac 0.017 ug/m^3 (620 ft from max) Resident 1 0.007 ug/m^3 (1,580 ft from max) Resident 2 0.030 ug/m^3 (750 ft from max) Access Road 0.049 ug/m^3 (100 ft from max)	Not Available	Not Available	Not Available	10,600 (1-hour)	Below recommended levels so No Increased Risk
	24-hour	0.015 (330 ft Northwest of Associated)	Cul-de-sac 0.0034 ug/m^3 (620 ft from max) Resident 1 0.0006 ug/m^3 (1,580 ft from max) Resident 2 0.0032 ug/m^3 (750 ft from max) Access Road 0.0121 ug/m^3 (100 ft from max)	Access Road Below analytical quantitation limits (BQL) Cul-de-sac Below analytical quantitation limits (BQL) Inside ExxonMobil Single measure = 1.1	250 (365 days and longer)	1,100 (annual)	Not Available	Below recommended levels so No increased risk

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemical	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road , Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level[4,5] (ug/m^3)	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Toluene	1-hour	1,707 (210 ft East of Southern States)	Cul-de-sac 0.63 ug/m^3 (2,050 ft from max) Resident 1 7.3 ug/m^3 (1,140 ft from max) Resident 2 0.72 ug/m^3 (2,540 ft from max) Access Road 0.90 ug/m^3 (1,920 ft from max)	Not Available	3,700 (1-14 days)	Not Available	56,000(1-hour)	Below recommended levels so No Increased Risk
	24-hour	120 (210 ft East of Southern States)	Cul-de-sac 0.15 ug/m^3 (2,050 ft from max) Resident 1 0.77 ug/m^3 (1,140 ft from max) Resident 2 0.12 ug/m^3 (2,540 ft from max) Access Road 0.18 ug/m^3 (1,920 ft from max)	Access Rd Avg = 1.49 Max = 3.01 Cul-de-sac Avg = 1.69 Max = 3.0 Inside ExxonMobil Avg = 1.54 Max = 3.68	300 (365 days and longer)	400 (annual)	4,700 (24-hour)	Below recommended levels so No Increased Risk
Trichlorofluoromethane	1-hour	0.001 (830 ft Northwest of APAC)	Cul-de-sac 0.00015 ug/m^3 (890 ft from max) Resident 1 0.00002 ug/m^3 (2,160 ft from max) Resident 2 0.00037 ug/m^3 (189 ft from max) Access Road 0.00017 ug/m^3 (541 ft from max)	Not Available due to Contamination problem at the DAQ lab facility caused by a refrigerant leak	Not Available	Not Available	560,000 (1-hour)	Below recommended levels so No Increased Risk

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemicals	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road, Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level[4,5] (ug/m^3)	National Ambient Air Quality Standards[8]	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Xylenes	1-hour	3,959 (210 ft East of Southern States)	Cul-de-sac 1.7 ug/m^3 (2,050 ft from max) Resident 1 16.9 ug/m^3 (1,140 ft from max) Resident 2 1.8 ug/m^3 (2,540 ft from max) Access Road 2.7 ug/m^3 (1,920 ft from max)	Not Available	4,340 (1-14 days)	Not Available	65,000 (1-hour)	Not Available	Below recommended levels so No Increased Risk
	24-hour	279 (210 ft East of Southern States)	Cul-de-sac 0.40 ug/m^3 (2,050 ft from max) Resident 1 1.80 ug/m^3 (1,140 ft from max) Resident 2 0.31 ug/m^3 (2,540 ft from max) Access Road 0.68 ug/m^3 (1,920 ft from max)	Access Rd Below analytical quantitation limits (BQL Cul-de-sac Single measure m,-xylene 2.3 Inside ExxonMobil Single measure m,p-Xylene=1.2	434 (365 days and longer)	730 (annual)	2,700 (24-hour)	Not Available	Below recommended levels so No Increased Risk
Carbon Monoxide	1-hour	1,441	Not Available	Not Available	Not Available	Not Available	40,000	Not Available	Below recommended levels so No Increased Risk
	8-hour	241	Not Available	Not Available	Not Available	Not Available	10,000	Not Available	Below recommended levels so No Increased Risk
Nitrogen Dioxide	annual	15.7	Not Available	Not Available	Not Available	Not Available	100	Not Available	Below recommended levels so No Increased Risk
PM10	24-hour	7.9	Not Available	Not Available	Not Available	Not Available	150	Not Available	Below recommended levels so No Increased Risk
	annual	1.3	Not Available	Not Available	Not Available	Not Available	50	Not Available	Below recommended levels so No Increased Risk

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemicals	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level [4,5] (ug/m^3)	National Ambient Air Quality Standards[8]	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Sulfur Dioxide	3-hour	3.0	Not Available	Not Available	Not Available	Not Available	1,300	Not Available	Below recommended levels so No Increased Risk
	24-hour	0.99	Not Available	Not Available	Not Available	Not Available	365	Not Available	Below recommended levels so No Increased Risk
	annual	0.09	Not Available	Not Available	Not Available	Not Available	80	Not Available	Below recommended levels so No Increased Risk
1,2-dichloroethane	24-hour	Not Available	Not Available	Access Rd Single measure = 1.11 Cul-de-sac Below analytical quantitation limits (BQL Inside ExxonMobil BQL	Not Available	0.074 (annual, one out of a million cancer risk) 5.1 (noncancer)	Not Available	Not Available	Only one single measure was found which was at the Access Road which indicates that daily long-term exposure is unlikely. The one single measure does exceed the one in a million cancer risk but long-term exposure is not expected. Therefore, there is no increased risk.
1,2-dichloropropane	24-hour	Not Available	Not Available	Access Rd BQL Cul-de-sac Single measure 1.90 Inside ExxonMobil BQL	Not Available	0.099 (annual, one out of a million cancer risk) 4.2 (annual, noncancer)	Not Available	Not Available	Only one single measure was found which was at the Cul-de-sac which indicates that daily long-term exposure is unlikely. The one single measure does exceed the one in a million cancer risk but long-term exposure is not expected. Therefore, there is no increased risk.

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemicals	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road, Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level[45,] (ug/m^3)	National Ambient Air Quality Standards[8]	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
Ethyl chloride	24-hour	Not Available	Not Available	Access Rd Avg = 0.44 Max = 0.86 Cul-de-sac Avg. = 0.71 Max = 4.65 Inside ExxonMobil Avg = 0.44 Max = 0.85	Not Available	2.3 (annual, one out of a million cancer risk) 10,000 (annual, noncancer)	Not Available	Not Available	A maximum 24-hour level did exceed the one out of a million cancer risk level at the Cul-de-sac but the average level reported was below the one in a million cancer risk level and recommended noncancer level. The 24-hour average level better represents the exposure concentrations that may be present over a long-term period. Therefore, there is no increased risk.
Ethylbenzene	24-hour	Not Available	Not Available	Access Rd BQL Cul-de-sac Single Measure 1.88 Inside ExxonMobil BQL	4,340 (15 to 364 days)	1,100 (annual, noncancer)	Not Available	Not Available	Below recommended levels so No Increased Risk
Methyl Chloride	24-hour	Not Available	Not Available	Access Rd Avg = 0.92 Max = 1.55 Cul-de-sac Avg = 0.84 Max = 1.59 Inside ExxonMobil Avg = 1.4 Max = 2.26	1,033 (1-14 days) 103 (365 days and longer)	1.1 (annual, one out of a million cancer risk) 90 (annual, noncancer)	Not Available	Not Available	A maximum 24-hour level did exceed the one out of a million cancer risk level at the Access Road and Cul-de-sac but the average levels reported were below the one in a million cancer risk level and recommended noncancer level. The 24-hour average level better represents the exposure concentrations that may be present over a long-term period. Therefore, there is no increased risk.

Table 3. Other Modeled and Measured Chemical Concentrations Milford Hills Area in Salisbury, NC

Chemicals	Avg. Period	Max. Modeled Concs. Near Property Lines[1] (ug/m^3) (Distance to Closest Residential Area)	Max. Modeled Concs in Residential Areas	Max. and Avg. Measured Chemical Concs. Just Outside Associated Asphalt Property lines at Access Road, Cul-de-sac, and within ExxonMobil Property lines	ATSDR Rec. Level [2,3] (ug/m^3)	EPA Region 9 Rec. Level[4,5] (ug/m^3)	National Ambient Air Quality Standards[8]	NC AALs [6,7] (ug/m^3)	Risks to Residents From Exposure to Concs. Measured and Modeled in Residential Areas
1,2,4-Trimethylbenzene	24-hour	Not Available	Not Available	Access Road Avg = 0.96 Max = 2.37 Cul-de-sa Avg = 1.40 Max = 3.11 Inside ExxonMobil Avg = 1.22 Max = 2.88	Not Available	6.2 (annual)	Not Available	Not Available	Below recommended levels so No Increased Risk
1,3,5-Trimethylbenzene	24-hour	Not Available	Not Available	Access Road Below analytical quantitation limits (BQL) Cul-de-sac Single Measure 3.37 Inside ExxonMobil Single Measure 3.09	Not Available	6.2 (annual)	Not Available	Not Available	Below recommended levels so No Increased Risk

References for Tables 1, 2, and 3

[1] Division of Air Quality Toxics Protection Branch Air toxics Analytical Support Team (ATAST) ATAST Investigation Numbers 01007 and 01008 Draft Study Report Salisbury Air Quality Monitoring Study April 30, 2002.

[2]Agency for Toxic Substances and Disease Registry 2002 (http://www.atsdr.cdc.gov/mrls.html). Minimal risk Levels (MRLs) for Hazardous Substances. MRLs are established for acute (1-14 days), intermediate (15-364 days), and chronic 9365 days and longer) exposure durations for noncancer health outcomes. MRLs are considered to be safe levels of exposure. They are developed using conservative exposure assumptions and uncertainty factors and are generally muchlower than exposure concentrations noted to cause harmful health effects. If the air contaminant levels are below the MRL then the exposure is unlikely to be a public health concern. Due to conservative assumptions it should not be concluded that a concentration greater than the comparison value will necessarily lead to harmful health effects in healthy populations.

[3]Agency for Toxic Substances and Disease Registry Health Consultation, Grand Bois Community Bourg, Terrebonne Parish, Louisiana, August 14, 2001.

[4]US EPA Region 9 Preliminary Remediation goals (http://www.epa.gov/region09/waste/sfund/prg/) . Preliminary Remediation Goals (PRGs) are tools for evaluating and cleaning up contaminated sites. They are risk-based concentrations derived from standardized equations, combining exposure information assumptions and EPA toxicity data.

[5]US EPA Integrated Risk Information System Database 2002 (on-line), www.epa.gov/iris.

[6]North Carolina Acceptable Ambient Air Levels (AALs) NCAC 2D.1100. AALs are determined by a scientific body of experts known as the Scientific Advisory Board (SAB). The AALs are safe exposure concentrations for toxic air pollutants that allow an ample margin of safety for potentially exposed people.

[7] Summary of the toxicity assessment of hydrogen sulfide conducted by the Secretary's Scientific Advisory Board on Toxic Air Pollutants 10/2/01.

[8]National Ambient Air Quality Standards are established by EPA to protect public health and public welfare within an adequate margin of safety

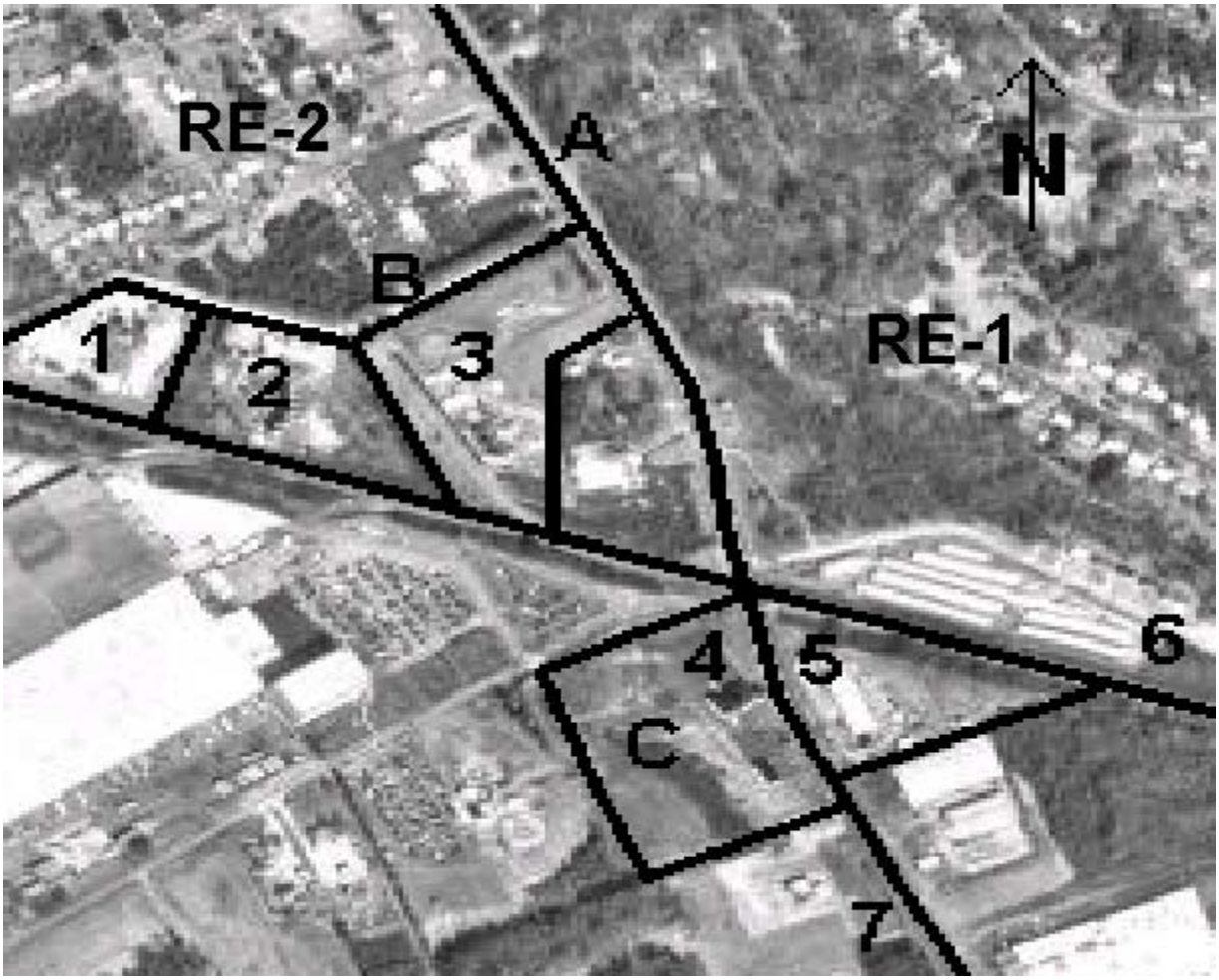

Figure 1. Salisbury Study Area. Aerial view of the Salisbury monitoring study area showing the monitoring stations (A [Cul-de-sac], B [Access Road], C[Remediation site]), industrial facilities (1 [concrete plant], 2 & 3 [asphalt facilities], 4 & 5 [remediation sites]), landmarks (6 [Southern Railway], 7 [Jake Alexander Boulevard]), and two representative residents (RE-1, RE-2).