ORION
Environmental Solutions, LLC

August 16, 2019

Ms. Rosanne DiPizio
AL Asphalt
100 Stradtman Street
Cheektowaga, New York 14206

Re: Odor Analysis
AL Asphalt Corporation
Hamburg, NY

Dear Rosanne,

Orion Environmental Solutions, LLC (Orion) has prepared the following information regarding the off-site odor analysis for the proposed hot-mix asphalt (HMA) plant to be located at the Great Lakes Concrete Products property at 5690 Camp Road in Hamburg, New York.

## FACILITY DESCRIPTION

The AL Asphalt Facility (Facility or plant) is planned to provide up to 135,000 tons per year of hot mix asphaltic cement (asphalt) for use in roads, parking lots, and highways throughout the greater Hamburg/Western New York area. The process will include storage of different size aggregates (already occurring at the Facility), storage of asphalt oil in an above ground storage tank heated by combustion of diesel fuel, a rotary drum dryer heated by combustion of natural gas, and silos for storage of the hot mix asphalt product.

Due to winter weather conditions preventing placement or use of asphalt, the Facility will typically only operate between May and November of any given year. Hours of operations will vary depending on product demand and weather conditions but will generally be limited to 2,500 hours per year.

The Facility location is proposed to be on an approximately 26-acre parcel of land in the Village and Town of Hamburg at the existing Great Lakes Concrete Facility, however, the physical HMA Facility will only occupy less than 1-acre of this parcel. Figure 1 provides the Facility location relative to the property boundary.

## PROCESS ODORS

Odors associated with HMA plants primarily are associated with the oils utilized to mix with aggregate in formulation of the HMA. The most notable odorous compound found in the oils is naphthalene, a simple polycyclic aromatic hydrocarbon (PAH). Naphthalene has a strong odor that is often detectable at concentrations as low as 0.08 parts per

million (ppm) or 0.44 milligrams per cubic meter (mg/m$^3$) per the Agency for Toxic Substances and Disease Registry (ATSDR).

Based on studies of the HMA process, odorous emissions at the HMA plant are typically associated with two activities: daily filling of the on-site asphalt oil storage tank and loading of HMA into trucks or silo.

- **Asphalt Oil Tank Filling**
  Tank filling operations involve pumping the asphalt oil from a tanker truck into the heated oil storage tank. The tank vent will have the highest concentration of odorous compounds, but because the tank fill rate is low, the overall exhaust volume from the tank is low (based on displacement of fluids) and is not at a steady or continuous rate (only filled one or two times per day, for short periods). Due to these operational conditions it is difficult to estimate continuous emissions from the tank, and associated odors generated from the tank should be negligible.

- **Product Load-Out/Silo Filling**
  The activity of loading HMA into trucks or silo produces the second highest concentration of oil odorous compounds associated with the Facility. At the point of loading, the HMA is hot and oil has just been mixed with the aggregate, and the action of transferring from conveyor into truck (or silo) tends to "aerate" the HMA, exposing much surface area to the air which can liberate the odorous volatile compounds.

Because air emissions from the Facility are based on hourly production rates, utilizing these production rates provides an estimate of the emissions of odorous compounds from the loading operation. Additionally, because the silo is the tallest structure in the HMA plant, and the action of transferring HMA by conveyor, the contribution to the potential for any off-site impact of odorous compounds from the silo will be much greater than those associated with the asphalt oil storage tank.

## ODOROUS EMISSION ESTIMATES

In the calculation of air emissions from contributing sources at the proposed Facility, emission estimates for the load-out and silo filling operations were used**.** Emissions were based on guidance and emission factors from USEPA AP-42 Section 11.1, including the factor for emissions of total organic compounds (TOCs) at 0.0163 pounds of TOC per ton of HMA produced**.** In this calculation, TOCs include individual compounds typically associated with HMA production, however, for the purposes of an odor analysis and as a conservative estimate, an assumed concentration of 100% naphthalene was used for TOCs**.** Based on the hourly production rate of 300 tons per hour, we have an assumed naphthalene emission rate of 4.9 pounds per hour**.** Because of the above reasoning and assumptions, this value greatly exaggerates the potential naphthalene emission rate and provides a very conservative approach to the analysis of potential off-site odor impacts associated with the HMA plant.

Similarly, this analysis assumes that all of the emissions from load-out processes emanate from the top of the silo, at the hourly production rate of 300 tons per hour, which calculates to a volumetric air flow rate of approximately 225 cubic feet per minute, or an exit velocity of 8.5 feet per second. Actual air emissions associated with load-out operations will be more fugitive in nature, occurring at much lower transfer points in the load-out process. Assuming that all odors are emitted from the highest point and at a constant rate, a conservative approach for the analysis of potential off-site odor impact is assured.

## ODOR EMISSIONS MODELING

Utilizing the naphthalene emission data as described, Orion performed a screening model to determine the impact of odors at the property boundary, nearest off-site receptor, and nearest off-site residence. The property boundary is approximately 400-feet away from the HMA Facility. The nearest off-site receptor is the Carubba Collision Facility, located at 5788 Camp Road and approximately 575-feet from the proposed HMA Facility. The nearest off-site residential receptor is located on Franklin Road, approximately 1000-feet from the proposed HMA Facility. Each selected location is west/southwest from the proposed HMA Facility, which also corresponds to the predominant wind direction in Hamburg.

Site specific data including the site location, exhaust flow rate, exhaust height, etc., along with the assumed emission rate for naphthalene were entered into the NYSDEC AERSCREEN computer program. The AERSCREEN model utilizes local meteorological data and local terrain information to calculate dispersion of contaminants in the air and determines the maximum concentration at given distances from a source, which accounts for a "worst case" condition. The model assumes that processes run continuously throughout a given year, although realistically, HMA production only occurs during the warmer months, typically May through November. This odor evaluation is not intended as a comparison to health-risk based values, most notably because of the artificially exaggerated emission rate utilized to estimate "worst-case" odors from the Facility, but rather, a comparison to the NYSDEC DAR-1 short term guideline concentration (SGC) value in order to identify a NYSDEC-allowable concentration of naphthalene in the air.

The following table is a brief summary of the model results.

| | ***AERSCREEN Results*** | | | | | ***ATSDR Odor Threshold ($ug/m^3$)*** | ***DAR-1 SGC ($ug/m^3$)*** |
|---|---|---|---|---|---|---|---|
| ***Contaminant & Distance*** | ***1-hr ($ug/m^3$)*** | ***3-hr ($ug/m^3$)*** | ***8-hr ($ug/m^3$)*** | ***24-hr ($ug/m^3$)*** | ***Annual ($ug/m^3$)*** | | |
| Naphthalene – 400' distance | 331 | 331 | 289 | 199 | 33 | 440 | 7,900 |
| Naphthalene – 575' distance | 256 | 256 | 231 | 154 | 26 | | |
| Naphthalene – 1000' distance | 171 | 171 | 154 | 103 | 17 | | |

## CONCLUSION

Based upon the AERSCREEN model results, the maximum off-site concentration of naphthalene at the property boundary is 331 micrograms per cubic meter (ug/$m^3$), 256 ug/$m^3$ at the nearest commercial receptor, and 171 ug/$m^3$ at the nearest residential receptor. As noted previously, based on information provided by the ATSDR, naphthalene odors are typically not detectable until a concentration of approximately 440 ug/$m^3$ in the air is achieved. Therefore, odors from the HMA Facility should not be detectable outside the AL Asphalt property boundary, or at the nearest receptors.

If you have any questions, need additional information, please feel free to contact me at (716) 870-1040.

Sincerely,
Orion Environmental Solutions, LLC

William F. Doebler IV
Managing Director

File: 0027-001-001

# FIGURE 1

## SITE AND PROPERTY BOUNDARIES

C:\Users\CADD Station\Orion Environmental Solutions, LLC\Orion Network Files - Documents\00 - Projects\AL Asphalt (Hamburg)\CAD\alasphaltbasemap.dwg

DATE: AUGUST 2019
DRAFTED BY: BCH

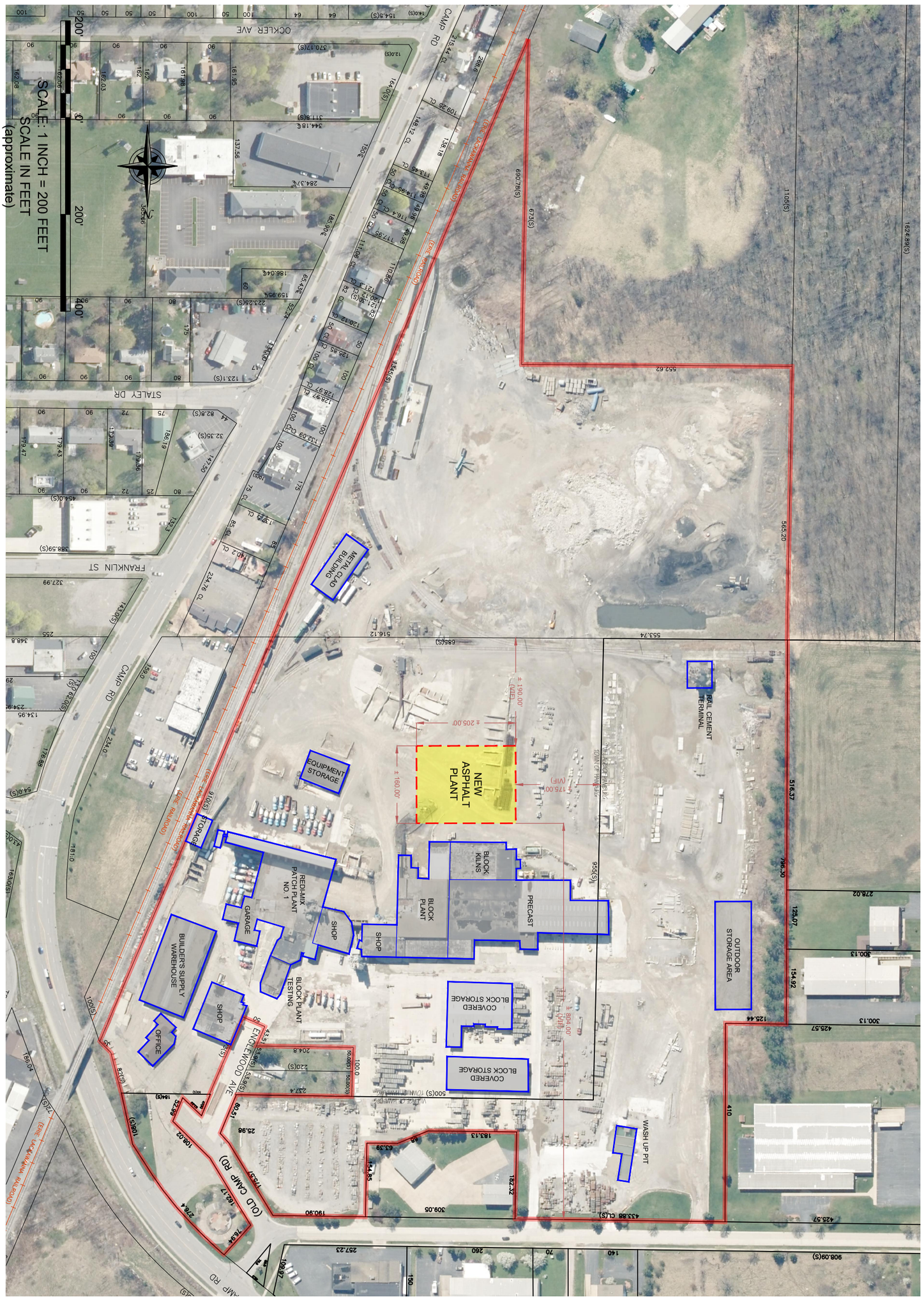


FIGURE 1

# SITE PLAN

STATE FACILITY PERMIT APPLICATION

HAMBURG FACILITY
HAMBURG, NEW YORK

PREPARED FOR
AL ASPHALT CORPORATION

ORION
Environmental Solutions, LLC
4535 Southwestern Boulevard, Suite 210, Hamburg, NY 14075

JOB NO.: 0027-001-001

# ATTACHMENT 1

## MODELING DATA



ORION

AERSCREEN 16216 / AERMOD 18081 08/06/19
09:38:28

TITLE: Hamburg Naphthalene 400'

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**********  STACK PARAMETERS  **********

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| | | | |
|---|---|---|---|
| SOURCE EMISSION RATE: | 0.2114 g/s | 1.678 lb/hr |
| STACK HEIGHT: | 13.41 meters | 44.00 feet |
| STACK INNER DIAMETER: | 0.254 meters | 10.00 inches |
| PLUME EXIT TEMPERATURE: | Ambient | |
| PLUME EXIT VELOCITY: | 2.096 m/s | 6.88 ft/s |
| STACK AIR FLOW RATE: | 225 ACFM | |
| RURAL OR URBAN: | RURAL | |
| INITIAL PROBE DISTANCE = | 5000. meters | 16404. feet |

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**********  BUILDING DOWNWASH PARAMETERS  **********

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NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS

**********  PROBE ANALYSIS  **********

25 meter receptor spacing: 122. meters - 5000. meters

| Zo SECTOR | ROUGHNESS LENGTH | 1-HR CONC (ug/m3) | DIST (m) | TEMPORAL PERIOD |
|---|---|---|---|---|
| 1* | 0.001 | 331.3 | 121.9 | WIN |

* = worst case flow sector

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**********  MAKEMET METEOROLOGY PARAMETERS  **********

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MIN/MAX TEMPERATURE: 249.8 / 310.9 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT:  10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE:  Average Moisture
DOMINANT SEASON:  Winter

ALBEDO:  0.60
BOWEN RATIO:  1.50
ROUGHNESS LENGTH:  0.001 (meters)

SURFACE FRICTION VELOCITY (U*) ADJUSTED

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 04 | 4 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 6.07 | 0.033 | 0.100 | 0.020 | 11. | 14. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 249.8 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash):  0.6 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:  13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash):  2.9 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):  16.3 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 04 | 4 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 6.07 | 0.033 | 0.100 | 0.020 | 11. | 14. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 249.8 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash): 0.6 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash): 2.9 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash): 16.3 meters

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********** AERSCREEN AUTOMATED DISTANCES **********

OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

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| DIST (m) | MAXIMUM 1-HR CONC (ug/m3) | DIST (m) | MAXIMUM 1-HR CONC (ug/m3) |
|---|---|---|---|
| 121.92 | 331.3 | 2575.00 | 35.43 |
| 125.00 | 325.9 | 2600.00 | 35.17 |
| 150.00 | 286.9 | 2625.00 | 34.91 |
| 175.00 | 256.4 | 2650.00 | 34.66 |
| 200.00 | 232.6 | 2675.00 | 34.41 |
| 225.00 | 213.4 | 2700.00 | 34.16 |
| 250.00 | 197.6 | 2725.00 | 33.92 |
| 275.00 | 184.3 | 2750.00 | 33.68 |
| 300.00 | 173.0 | 2775.00 | 33.45 |
| 325.00 | 163.2 | 2800.00 | 33.22 |
| 350.00 | 154.7 | 2825.00 | 32.99 |
| 375.00 | 147.1 | 2850.00 | 32.76 |
| 400.00 | 140.3 | 2875.00 | 32.54 |
| 425.00 | 134.3 | 2900.00 | 32.32 |
| 450.00 | 128.8 | 2925.00 | 32.11 |
| 475.00 | 123.8 | 2950.00 | 31.90 |
| 500.00 | 119.3 | 2975.00 | 31.69 |
| 525.00 | 115.1 | 3000.00 | 31.48 |
| 550.00 | 111.3 | 3025.00 | 31.28 |
| 575.00 | 107.8 | 3050.00 | 31.08 |
| 600.00 | 104.5 | 3075.00 | 30.88 |
| 625.00 | 101.4 | 3100.00 | 30.69 |
| 650.00 | 98.56 | 3125.00 | 30.50 |
| 675.00 | 95.88 | 3150.00 | 30.31 |
| 700.00 | 93.37 | 3175.00 | 30.12 |
| 725.00 | 91.01 | 3200.00 | 29.94 |
| 750.00 | 88.78 | 3225.00 | 29.76 |
| 775.00 | 86.68 | 3250.00 | 29.58 |
| 800.00 | 84.69 | 3275.00 | 29.40 |
| 825.00 | 82.81 | 3300.00 | 29.22 |
| 850.00 | 81.02 | 3325.00 | 29.05 |
| 875.00 | 79.32 | 3350.00 | 28.88 |

| | | | |
|---|---|---|---|
| 900.00 | 77.70 | 3375.00 | 28.71 |
| 925.00 | 76.15 | 3400.00 | 28.55 |
| 950.00 | 74.68 | 3425.00 | 28.38 |
| 975.00 | 73.27 | 3450.00 | 28.22 |
| 1000.00 | 71.92 | 3475.00 | 28.06 |
| 1025.00 | 70.62 | 3500.00 | 27.90 |
| 1050.00 | 69.38 | 3525.00 | 27.74 |
| 1075.00 | 68.19 | 3550.00 | 27.59 |
| 1100.00 | 67.05 | 3575.00 | 27.44 |
| 1125.00 | 65.94 | 3600.00 | 27.29 |
| 1150.00 | 64.88 | 3625.00 | 27.14 |
| 1175.00 | 63.86 | 3650.00 | 26.99 |
| 1200.00 | 62.88 | 3675.00 | 26.84 |
| 1225.00 | 61.93 | 3700.00 | 26.70 |
| 1250.00 | 61.01 | 3725.00 | 26.56 |
| 1275.00 | 60.12 | 3750.00 | 26.42 |
| 1300.00 | 59.26 | 3775.00 | 26.28 |
| 1325.00 | 58.43 | 3800.00 | 26.14 |
| 1350.00 | 57.63 | 3825.00 | 26.00 |
| 1375.00 | 56.85 | 3850.00 | 25.87 |
| 1400.00 | 56.10 | 3875.00 | 25.74 |
| 1425.00 | 55.36 | 3900.00 | 25.60 |
| 1450.00 | 54.65 | 3925.00 | 25.47 |
| 1475.00 | 53.96 | 3950.00 | 25.34 |
| 1500.00 | 53.29 | 3975.00 | 25.22 |
| 1525.00 | 52.64 | 4000.00 | 25.09 |
| 1550.00 | 52.00 | 4025.00 | 24.97 |
| 1575.00 | 51.39 | 4050.00 | 24.84 |
| 1600.00 | 50.79 | 4075.00 | 24.72 |
| 1625.00 | 50.20 | 4100.00 | 24.60 |
| 1650.00 | 49.63 | 4125.00 | 24.48 |
| 1675.00 | 49.08 | 4150.00 | 24.36 |
| 1700.00 | 48.53 | 4175.00 | 24.24 |
| 1725.00 | 48.01 | 4200.00 | 24.13 |
| 1750.00 | 47.49 | 4225.00 | 24.01 |
| 1775.00 | 46.99 | 4250.00 | 23.90 |
| 1800.00 | 46.50 | 4275.00 | 23.78 |
| 1825.00 | 46.02 | 4300.00 | 23.67 |
| 1850.00 | 45.55 | 4325.00 | 23.56 |
| 1875.00 | 45.09 | 4350.00 | 23.45 |
| 1900.00 | 44.65 | 4375.00 | 23.34 |
| 1925.00 | 44.21 | 4400.00 | 23.24 |
| 1950.00 | 43.78 | 4425.00 | 23.13 |
| 1975.00 | 43.36 | 4450.00 | 23.02 |
| 2000.00 | 42.95 | 4475.00 | 22.92 |
| 2025.00 | 42.55 | 4500.00 | 22.82 |
| 2050.00 | 42.16 | 4525.00 | 22.71 |
| 2075.00 | 41.77 | 4550.00 | 22.61 |
| 2100.00 | 41.39 | 4575.00 | 22.51 |
| 2125.00 | 41.02 | 4600.00 | 22.41 |

| | | | |
|---|---|---|---|
| 2150.00 | 40.66 | 4625.00 | 22.31 |
| 2175.00 | 40.31 | 4650.00 | 22.21 |
| 2200.00 | 39.96 | 4675.00 | 22.12 |
| 2225.00 | 39.62 | 4700.00 | 22.02 |
| 2250.00 | 39.28 | 4725.00 | 21.92 |
| 2275.00 | 38.95 | 4750.00 | 21.83 |
| 2300.00 | 38.63 | 4775.00 | 21.74 |
| 2325.00 | 38.31 | 4800.00 | 21.64 |
| 2350.00 | 38.00 | 4825.00 | 21.55 |
| 2375.00 | 37.69 | 4850.00 | 21.46 |
| 2400.00 | 37.39 | 4875.00 | 21.37 |
| 2425.00 | 37.10 | 4900.00 | 21.28 |
| 2450.00 | 36.81 | 4925.00 | 21.19 |
| 2475.00 | 36.52 | 4950.00 | 21.10 |
| 2500.00 | 36.24 | 4975.00 | 21.02 |
| 2525.00 | 35.97 | 5000.00 | 20.93 |
| 2550.00 | 35.70 | | |

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********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

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| CALCULATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| FLAT TERRAIN | 331.3 | 331.3 | 298.2 | 198.8 | 33.13 |

DISTANCE FROM SOURCE 121.92 meters

| | | | | | |
|---|---|---|---|---|---|
| IMPACT AT THE AMBIENT BOUNDARY | 331.3 | 331.3 | 298.2 | 198.8 | 33.13 |

DISTANCE FROM SOURCE 121.92 meters

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********** AERSCREEN FUMIGATION SUMMARY **********

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| FUMIGATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| INVERSION BREAK-UP | 259.9 | 259.9 | 233.9 | 155.9 | 25.99 |

DISTANCE FROM SOURCE 100.00 meters

AERSCREEN 16216 / AERMOD 18081 08/06/19
11:40:05

TITLE: Hamburg Naphthalene 575'

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**********  STACK PARAMETERS  **********

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| | | | |
|---|---|---|---|
| SOURCE EMISSION RATE: | 0.2114 g/s | 1.678 lb/hr |
| STACK HEIGHT: | 13.41 meters | 44.00 feet |
| STACK INNER DIAMETER: | 0.254 meters | 10.00 inches |
| PLUME EXIT TEMPERATURE: | Ambient | |
| PLUME EXIT VELOCITY: | 2.096 m/s | 6.88 ft/s |
| STACK AIR FLOW RATE: | 225 ACFM | |
| RURAL OR URBAN: | RURAL | |
| INITIAL PROBE DISTANCE = | 5000. meters | 16404. feet |

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**********  BUILDING DOWNWASH PARAMETERS  **********

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NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS

**********  PROBE ANALYSIS  **********

25 meter receptor spacing: 175. meters - 5000. meters

| Zo SECTOR | ROUGHNESS LENGTH | 1-HR CONC (ug/m3) | DIST (m) | TEMPORAL PERIOD |
|---|---|---|---|---|
| 1* | 0.001 | 256.2 | 175.3 | WIN |

* = worst case flow sector

---

**********  MAKEMET METEOROLOGY PARAMETERS  **********

---

MIN/MAX TEMPERATURE: 249.8 / 310.9 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT:  10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE:  Average Moisture
DOMINANT SEASON:  Winter

ALBEDO:  0.60
BOWEN RATIO:  1.50
ROUGHNESS LENGTH:  0.001 (meters)

SURFACE FRICTION VELOCITY (U*) ADJUSTED

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 01 | 1 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.92 | 0.031 | 0.100 | 0.020 | 14. | 12. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 249.8 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash):  0.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:  13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash):  3.1 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):  16.5 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 01 | 1 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.92 | 0.031 | 0.100 | 0.020 | 14. | 12. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 249.8 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash): 0.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash): 3.1 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash): 16.5 meters

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********** AERSCREEN AUTOMATED DISTANCES **********

OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

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| DIST (m) | MAXIMUM 1-HR CONC (ug/m3) | DIST (m) | MAXIMUM 1-HR CONC (ug/m3) |
|---|---|---|---|
| 175.26 | 256.2 | 2600.00 | 35.17 |
| 200.00 | 232.6 | 2625.00 | 34.91 |
| 225.00 | 213.4 | 2650.00 | 34.66 |
| 250.00 | 197.6 | 2675.00 | 34.41 |
| 275.00 | 184.3 | 2700.00 | 34.16 |
| 300.00 | 173.0 | 2725.00 | 33.92 |
| 325.00 | 163.2 | 2750.00 | 33.68 |
| 350.00 | 154.7 | 2775.00 | 33.45 |
| 375.00 | 147.1 | 2800.00 | 33.22 |
| 400.00 | 140.3 | 2825.00 | 32.99 |
| 425.00 | 134.3 | 2850.00 | 32.76 |
| 450.00 | 128.8 | 2875.00 | 32.54 |
| 475.00 | 123.8 | 2900.00 | 32.32 |
| 500.00 | 119.3 | 2925.00 | 32.11 |
| 525.00 | 115.1 | 2950.00 | 31.90 |
| 550.00 | 111.3 | 2975.00 | 31.69 |
| 575.00 | 107.8 | 3000.00 | 31.48 |
| 600.00 | 104.5 | 3025.00 | 31.28 |
| 625.00 | 101.4 | 3050.00 | 31.08 |
| 650.00 | 98.56 | 3075.00 | 30.88 |
| 675.00 | 95.88 | 3100.00 | 30.69 |
| 700.00 | 93.37 | 3125.00 | 30.50 |
| 725.00 | 91.01 | 3150.00 | 30.31 |
| 750.00 | 88.78 | 3175.00 | 30.12 |
| 775.00 | 86.68 | 3200.00 | 29.94 |
| 800.00 | 84.69 | 3225.00 | 29.76 |
| 825.00 | 82.81 | 3250.00 | 29.58 |
| 850.00 | 81.02 | 3275.00 | 29.40 |
| 875.00 | 79.32 | 3300.00 | 29.22 |
| 900.00 | 77.70 | 3325.00 | 29.05 |
| 925.00 | 76.15 | 3350.00 | 28.88 |
| 950.00 | 74.68 | 3375.00 | 28.71 |

| | | | |
|---|---|---|---|
| 975.00 | 73.27 | 3400.00 | 28.55 |
| 1000.00 | 71.92 | 3425.00 | 28.38 |
| 1025.00 | 70.62 | 3450.00 | 28.22 |
| 1050.00 | 69.38 | 3475.00 | 28.06 |
| 1075.00 | 68.19 | 3500.00 | 27.90 |
| 1100.00 | 67.05 | 3525.00 | 27.74 |
| 1125.00 | 65.94 | 3550.00 | 27.59 |
| 1150.00 | 64.88 | 3575.00 | 27.44 |
| 1175.00 | 63.86 | 3600.00 | 27.29 |
| 1200.00 | 62.88 | 3625.00 | 27.14 |
| 1225.00 | 61.93 | 3650.00 | 26.99 |
| 1250.00 | 61.01 | 3675.00 | 26.84 |
| 1275.00 | 60.12 | 3700.00 | 26.70 |
| 1300.00 | 59.26 | 3725.00 | 26.56 |
| 1325.00 | 58.43 | 3750.00 | 26.42 |
| 1350.00 | 57.63 | 3775.00 | 26.28 |
| 1375.00 | 56.85 | 3800.00 | 26.14 |
| 1400.00 | 56.10 | 3825.00 | 26.00 |
| 1425.00 | 55.36 | 3850.00 | 25.87 |
| 1450.00 | 54.65 | 3875.00 | 25.74 |
| 1475.00 | 53.96 | 3900.00 | 25.60 |
| 1500.00 | 53.29 | 3925.00 | 25.47 |
| 1525.00 | 52.64 | 3950.00 | 25.34 |
| 1550.00 | 52.00 | 3975.00 | 25.22 |
| 1575.00 | 51.39 | 4000.00 | 25.09 |
| 1600.00 | 50.79 | 4025.00 | 24.97 |
| 1625.00 | 50.20 | 4050.00 | 24.84 |
| 1650.00 | 49.63 | 4075.00 | 24.72 |
| 1675.00 | 49.08 | 4100.00 | 24.60 |
| 1700.00 | 48.53 | 4125.00 | 24.48 |
| 1725.00 | 48.01 | 4150.00 | 24.36 |
| 1750.00 | 47.49 | 4175.00 | 24.24 |
| 1775.00 | 46.99 | 4200.00 | 24.13 |
| 1800.00 | 46.50 | 4225.00 | 24.01 |
| 1825.00 | 46.02 | 4250.00 | 23.90 |
| 1850.00 | 45.55 | 4275.00 | 23.78 |
| 1875.00 | 45.09 | 4300.00 | 23.67 |
| 1900.00 | 44.65 | 4325.00 | 23.56 |
| 1925.00 | 44.21 | 4350.00 | 23.45 |
| 1950.00 | 43.78 | 4375.00 | 23.34 |
| 1975.00 | 43.36 | 4400.00 | 23.24 |
| 2000.00 | 42.95 | 4425.00 | 23.13 |
| 2025.00 | 42.55 | 4450.00 | 23.02 |
| 2050.00 | 42.16 | 4475.00 | 22.92 |
| 2075.00 | 41.77 | 4500.00 | 22.82 |
| 2100.00 | 41.39 | 4525.00 | 22.71 |
| 2125.00 | 41.02 | 4550.00 | 22.61 |
| 2150.00 | 40.66 | 4575.00 | 22.51 |
| 2175.00 | 40.31 | 4600.00 | 22.41 |
| 2200.00 | 39.96 | 4625.00 | 22.31 |

| | | | |
|---|---|---|---|
| 2225.00 | 39.62 | 4650.00 | 22.21 |
| 2250.00 | 39.28 | 4675.00 | 22.12 |
| 2275.00 | 38.95 | 4700.00 | 22.02 |
| 2300.00 | 38.63 | 4725.00 | 21.92 |
| 2325.00 | 38.31 | 4750.00 | 21.83 |
| 2350.00 | 38.00 | 4775.00 | 21.74 |
| 2375.00 | 37.69 | 4800.00 | 21.64 |
| 2400.00 | 37.39 | 4825.00 | 21.55 |
| 2425.00 | 37.10 | 4850.00 | 21.46 |
| 2450.00 | 36.81 | 4875.00 | 21.37 |
| 2475.00 | 36.52 | 4900.00 | 21.28 |
| 2500.00 | 36.24 | 4925.00 | 21.19 |
| 2525.00 | 35.97 | 4950.00 | 21.10 |
| 2550.00 | 35.70 | 4975.00 | 21.02 |
| 2575.00 | 35.43 | 5000.00 | 20.93 |

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********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

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| CALCULATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| FLAT TERRAIN | 256.2 | 256.2 | 230.5 | 153.7 | 25.62 |

DISTANCE FROM SOURCE 175.26 meters

| | | | | | |
|---|---|---|---|---|---|
| IMPACT AT THE AMBIENT BOUNDARY | 256.2 | 256.2 | 230.5 | 153.7 | 25.62 |

DISTANCE FROM SOURCE 175.26 meters

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********** AERSCREEN FUMIGATION SUMMARY **********

---

| FUMIGATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| INVERSION BREAK-UP | 259.9 | 259.9 | 233.9 | 155.9 | 25.99 |

DISTANCE FROM SOURCE 100.00 meters

AERSCREEN 16216 / AERMOD 18081 08/06/19
11:46:18

TITLE: Hamburg Napthalene 1000'

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**********  STACK PARAMETERS  **********

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| | | |
|---|---|---|
| SOURCE EMISSION RATE: | 0.2114 g/s | 1.678 lb/hr |
| STACK HEIGHT: | 13.41 meters | 44.00 feet |
| STACK INNER DIAMETER: | 0.254 meters | 10.00 inches |
| PLUME EXIT TEMPERATURE: | Ambient | |
| PLUME EXIT VELOCITY: | 2.096 m/s | 6.88 ft/s |
| STACK AIR FLOW RATE: | 225 ACFM | |
| RURAL OR URBAN: | RURAL | |
| INITIAL PROBE DISTANCE = | 5000. meters | 16404. feet |

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**********  BUILDING DOWNWASH PARAMETERS  **********

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NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS

**********  PROBE ANALYSIS  **********

25 meter receptor spacing: 305. meters - 5000. meters

| Zo SECTOR | ROUGHNESS LENGTH | 1-HR CONC (ug/m3) | DIST (m) | TEMPORAL PERIOD |
|---|---|---|---|---|
| 1* | 0.001 | 171.0 | 304.8 | WIN |

* = worst case flow sector

---

**********  MAKEMET METEOROLOGY PARAMETERS  **********

---

MIN/MAX TEMPERATURE: 249.8 / 310.9 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT:  10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
DOMINANT CLIMATE TYPE:  Average Moisture
DOMINANT SEASON:  Winter

ALBEDO:  0.60
BOWEN RATIO:  1.50
ROUGHNESS LENGTH:  0.001 (meters)

SURFACE FRICTION VELOCITY (U*) ADJUSTED

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 02 | 2 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.60 | 0.030 | 0.100 | 0.020 | 14. | 12. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 280.4 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash):  0.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:  13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash):  3.2 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):  16.6 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

| YR | MO | DY | JDY | HR |
|---|---|---|---|---|
| 10 | 01 | 02 | 2 | 12 |

| H0 | U* | W* | DT/DZ | ZICNV | ZIMCH | M-O LEN | Z0 | BOWEN | ALBEDO | REF WS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.60 | 0.030 | 0.100 | 0.020 | 14. | 12. | -1.0 | 0.001 | 1.50 | 0.60 | 0.50 |

| HT | REF TA | HT |
|---|---|---|
| 10.0 | 280.4 | 2.0 |

WIND SPEED AT STACK HEIGHT (non-downwash): 0.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 13.4 meters
ESTIMATED FINAL PLUME RISE (non-downwash): 3.2 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash): 16.6 meters

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********** AERSCREEN AUTOMATED DISTANCES **********

OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

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| DIST (m) | MAXIMUM 1-HR CONC (ug/m3) | DIST (m) | MAXIMUM 1-HR CONC (ug/m3) |
|---|---|---|---|
| 304.80 | 171.0 | 2675.00 | 34.41 |
| 325.00 | 163.2 | 2700.00 | 34.16 |
| 350.00 | 154.7 | 2725.00 | 33.92 |
| 375.00 | 147.1 | 2750.00 | 33.68 |
| 400.00 | 140.3 | 2775.00 | 33.45 |
| 425.00 | 134.3 | 2800.00 | 33.22 |
| 450.00 | 128.8 | 2825.00 | 32.99 |
| 475.00 | 123.8 | 2850.00 | 32.76 |
| 500.00 | 119.3 | 2875.00 | 32.54 |
| 525.00 | 115.1 | 2900.00 | 32.32 |
| 550.00 | 111.3 | 2925.00 | 32.11 |
| 575.00 | 107.8 | 2950.00 | 31.90 |
| 600.00 | 104.5 | 2975.00 | 31.69 |
| 625.00 | 101.4 | 3000.00 | 31.48 |
| 650.00 | 98.56 | 3025.00 | 31.28 |
| 675.00 | 95.88 | 3050.00 | 31.08 |
| 700.00 | 93.37 | 3075.00 | 30.88 |
| 725.00 | 91.01 | 3100.00 | 30.69 |
| 750.00 | 88.78 | 3125.00 | 30.50 |
| 775.00 | 86.68 | 3150.00 | 30.31 |
| 800.00 | 84.69 | 3175.00 | 30.12 |
| 825.00 | 82.81 | 3200.00 | 29.94 |
| 850.00 | 81.02 | 3225.00 | 29.76 |
| 875.00 | 79.32 | 3250.00 | 29.58 |
| 900.00 | 77.70 | 3275.00 | 29.40 |
| 925.00 | 76.15 | 3300.00 | 29.22 |
| 950.00 | 74.68 | 3325.00 | 29.05 |
| 975.00 | 73.27 | 3350.00 | 28.88 |
| 1000.00 | 71.92 | 3375.00 | 28.71 |
| 1025.00 | 70.62 | 3400.00 | 28.55 |
| 1050.00 | 69.38 | 3425.00 | 28.38 |
| 1075.00 | 68.19 | 3450.00 | 28.22 |

| | | | |
|---|---|---|---|
| 1100.00 | 67.05 | 3475.00 | 28.06 |
| 1125.00 | 65.94 | 3500.00 | 27.90 |
| 1150.00 | 64.88 | 3525.00 | 27.74 |
| 1175.00 | 63.86 | 3550.00 | 27.59 |
| 1200.00 | 62.88 | 3575.00 | 27.44 |
| 1225.00 | 61.93 | 3600.00 | 27.29 |
| 1250.00 | 61.01 | 3625.00 | 27.14 |
| 1275.00 | 60.12 | 3650.00 | 26.99 |
| 1300.00 | 59.26 | 3675.00 | 26.84 |
| 1325.00 | 58.43 | 3700.00 | 26.70 |
| 1350.00 | 57.63 | 3725.00 | 26.56 |
| 1375.00 | 56.85 | 3750.00 | 26.42 |
| 1400.00 | 56.10 | 3775.00 | 26.28 |
| 1425.00 | 55.36 | 3800.00 | 26.14 |
| 1450.00 | 54.65 | 3825.00 | 26.00 |
| 1475.00 | 53.96 | 3850.00 | 25.87 |
| 1500.00 | 53.29 | 3875.00 | 25.74 |
| 1525.00 | 52.64 | 3900.00 | 25.60 |
| 1550.00 | 52.00 | 3925.00 | 25.47 |
| 1575.00 | 51.39 | 3950.00 | 25.34 |
| 1600.00 | 50.79 | 3975.00 | 25.22 |
| 1625.00 | 50.20 | 4000.00 | 25.09 |
| 1650.00 | 49.63 | 4025.00 | 24.97 |
| 1675.00 | 49.08 | 4050.00 | 24.84 |
| 1700.00 | 48.53 | 4075.00 | 24.72 |
| 1725.00 | 48.01 | 4100.00 | 24.60 |
| 1750.00 | 47.49 | 4125.00 | 24.48 |
| 1775.00 | 46.99 | 4150.00 | 24.36 |
| 1800.00 | 46.50 | 4175.00 | 24.24 |
| 1825.00 | 46.02 | 4200.00 | 24.13 |
| 1850.00 | 45.55 | 4225.00 | 24.01 |
| 1875.00 | 45.09 | 4250.00 | 23.90 |
| 1900.00 | 44.65 | 4275.00 | 23.78 |
| 1925.00 | 44.21 | 4300.00 | 23.67 |
| 1950.00 | 43.78 | 4325.00 | 23.56 |
| 1975.00 | 43.36 | 4350.00 | 23.45 |
| 2000.00 | 42.95 | 4375.00 | 23.34 |
| 2025.00 | 42.55 | 4400.00 | 23.24 |
| 2050.00 | 42.16 | 4425.00 | 23.13 |
| 2075.00 | 41.77 | 4450.00 | 23.02 |
| 2100.00 | 41.39 | 4475.00 | 22.92 |
| 2125.00 | 41.02 | 4500.00 | 22.82 |
| 2150.00 | 40.66 | 4525.00 | 22.71 |
| 2175.00 | 40.31 | 4550.00 | 22.61 |
| 2200.00 | 39.96 | 4575.00 | 22.51 |
| 2225.00 | 39.62 | 4600.00 | 22.41 |
| 2250.00 | 39.28 | 4625.00 | 22.31 |
| 2275.00 | 38.95 | 4650.00 | 22.21 |
| 2300.00 | 38.63 | 4675.00 | 22.12 |
| 2325.00 | 38.31 | 4700.00 | 22.02 |

| | | | |
|---|---|---|---|
| 2350.00 | 38.00 | 4725.00 | 21.92 |
| 2375.00 | 37.69 | 4750.00 | 21.83 |
| 2400.00 | 37.39 | 4775.00 | 21.74 |
| 2425.00 | 37.10 | 4800.00 | 21.64 |
| 2450.00 | 36.81 | 4825.00 | 21.55 |
| 2475.00 | 36.52 | 4850.00 | 21.46 |
| 2500.00 | 36.24 | 4875.00 | 21.37 |
| 2525.00 | 35.97 | 4900.00 | 21.28 |
| 2550.00 | 35.70 | 4925.00 | 21.19 |
| 2575.00 | 35.43 | 4950.00 | 21.10 |
| 2600.00 | 35.17 | 4975.00 | 21.02 |
| 2625.00 | 34.91 | 5000.00 | 20.93 |
| 2650.00 | 34.66 | | |

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********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

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| CALCULATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| FLAT TERRAIN | 171.0 | 171.0 | 153.9 | 102.6 | 17.10 |

DISTANCE FROM SOURCE 304.80 meters

| | | | | | |
|---|---|---|---|---|---|
| IMPACT AT THE AMBIENT BOUNDARY | 171.0 | 171.0 | 153.9 | 102.6 | 17.10 |

DISTANCE FROM SOURCE 304.80 meters

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********** AERSCREEN FUMIGATION SUMMARY **********

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| FUMIGATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| INVERSION BREAK-UP | 259.9 | 259.9 | 233.9 | 155.9 | 25.99 |

DISTANCE FROM SOURCE 100.00 meters