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OFFICE OF AIR QUALITY PLANNING AND STANDARDS
EMISSION STANDARDS DIVISION
RESEARCH TRIANGLE PARK, NC 27711

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SUBJECT: Residual Risk Assessment for the Magnetic Tape Manufacturing Source Category

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MEMORANDUM

Introduction

Section 112(f)(2)(A) of the Clean Air Act directs EPA to assess the risk remaining (residual risk) after the implementation of MACT standards under section 112(d) of the Act. Under these requirements, EPA will promulgate additional emission standards for a source category if existing MACT standards do not provide an "ample margin of safety" for human health or are not sufficient to prevent adverse environmental impacts. The residual risk assessment is performed by EPA as part of the residual risk rule development process, which is generally completed within eight years of the promulgation of MACT standards.

The purpose of this memorandum is to describe the methodology and results of the residual risk assessment performed for the magnetic tape manufacturing source category. The results of this analysis will assist EPA in determining whether a residual risk rule for this source category is appropriate.

Methods

Scope

The residual risk assessment for the magnetic tape manufacturing source category focused on human health, evaluating the potential of emissions to cause cancer and noncancer risks associated with a lifetime of continuous exposure. The assessment of health risks via the inhalation pathway was the focus of this analysis. A screening assessment of the potential for public health impacts associated with short-term emissions was also performed using a hypothetical one-hour exposure scenario.

Some persistent and bioaccumulative (PB) hazardous air pollutant(s) (HAP) may pose human health risks via exposure pathways other than inhalation. These HAP can also pose ecological risks by entering the wildlife food chain.[1] EPA has developed a list of persistent, bioaccumulative, and toxic HAP based on information from the Pollution Prevention Program, the Great Waters program, and the Toxics Release Inventory and additional analysis conducted by OAQPS. Refer to Volume I, Section 4.2.5, of the Air Toxics Risk Assessment Reference Library (available at: http://www.epa.gov/ttn/fera/risk_atoxic.html) for more information on the list of PB HAP.

Based on the emissions data obtained for this source category, lead is the only PB HAP emitted by magnetic tape sources. Therefore, lead was investigated for potential human health impacts via non-inhalation pathways (e.g., ingestion). Because EPA is also required to consider adverse impacts to the environment (i.e., ecological risks) as a part of a residual risk assessment, lead was also investigated for potential ecological risks. For HAP other than lead, we believe the human health non-inhalation and ecological risks to be minimal for this source category, and we conclude that a quantitative risk characterization for human multipathway and ecological exposures from these HAP is unnecessary for this source category.

Source Category Characterization

EPA found that as of December 2003, only six magnetic tape manufacturing facilities remained in operation in the United States. The six facilities identified as having magnetic tape manufacturing operations are as follows: Quantegy Inc. (Opelika, AL); JVC Magnetics America Co. (Tuscaloosa, AL); Sony Magnetic Products Inc. of America (Dothan, AL); 3M Magnetic Tape Manufacturing Division (Hutchinson, MN); Eastman Kodak Co. (Rochester, NY); and Imation Enterprises Corp. (Weatherford, OK). The analysis included emissions associated with the coating operations at each of these facilities.

[1] In assessing ecological risks, we contend that human toxicity values for the inhalation pathway are protective of the inhalation exposure pathway for terrestrial mammals. Because the maximum cancer and non-cancer hazards to humans from inhalation exposure are relatively low, we expect there to be no significant and widespread adverse effects to terrestrial mammals from inhalation exposure to HAP emitted from magnetic tape manufacturing sources.

Emissions Data

The primary sources of emissions data were the 1999 National Emissions Inventory (NEI) Final Version 3, the 2000 Toxics Release Inventory (TRI), and industry sources. The NEI provided data for each of the six facilities on the list of sources subject to the Magnetic Tape Manufacturing NESHAP; however, there were deficiencies in the inventory that were addressed for this assessment. For missing key parameters (e.g., stack height, stack diameter, stack gas temperature, velocity), EPA obtained actual parameter data from most of the facilities involved, including data on stack parameters (for stack emission points) and building volume (for fugitive emission points). For any missing parameters that remained, reasonable default values were used (discussed below).

Also, in most cases, the HAP emissions data in the NEI did not reflect recent emission reductions achieved in the industry. Consequently, EPA supplemented the NEI with emissions data obtained from the more recent 2000 TRI and by contacting the facilities involved directly. Stakeholders provided updated information on the facilities' HAP emissions and on the percentage of HAP emissions that could be attributed to magnetic tape manufacturing operations.

At three of the six facilities (i.e., Quantegy, JVC Magnetics America, and Sony Magnetic Products), it was possible to attribute all of the facilities' TRI emissions to their magnetic tape manufacturing operations because they manufacture only magnetic tape. At the remaining three facilities (i.e., Eastman Kodak, Imation Enterprises, and 3M Magnetic Tape), only a fraction of these facilities' emissions are attributed to their magnetic tape manufacturing operations because they manufacture more than just magnetic tape. For Eastman Kodak, EPA was able to obtain emissions data from the facility that were specific to the facility's magnetic tape manufacturing operation. For Imation Enterprises, the SIC codes provided in the NEI made it possible to segregate the NEI emissions attributable to the magnetic tape manufacturing operation at the facility from the NEI emissions attributable to sources that are part of another source category at the facility. For 3M Magnetic Tape, EPA obtained information from the facility indicating that up to 30 percent of the facility's TRI emissions could be attributed to the magnetic tape manufacturing operation. However, it was not possible to determine exactly which pollutants from the TRI were emitted from the facility's magnetic tape manufacturing operation and which were emitted from sources that are part of other source categories at the facility. Therefore, it was assumed that 30 percent of all emitted HAP may be associated with magnetic tape manufacturing activities at 3M Magnetic Tape.

Appendix A is a summary table compiled in November 2003 that presents emissions data and facility parameters for those facilities that comprise the magnetic tape manufacturing source category. Before initiating the modeling exercises, the spreadsheet was modified to include default parameters where data were missing. In addition, the facility coordinates were verified and corrected as necessary. The revised version of the spreadsheet is provided in Appendix B. Also, facility-specific contact reports and other documentation to support the emissions data and facility parameters used for modeling potential exposures and associated risks are provided in the Magnetic Tape Manufacturing Operations Docket No. A-91-31 and E-Docket OAR-2003-0161.

Selection of HAP and Dose-Response Information

Table 1 provides the comprehensive list of HAP emitted at any one of the six facilities with their respective cancer and chronic non-cancer dose-response values. The dose-response values we used for assessment of risks from chronic exposures are the same as those made available by EPA's air toxics program at http://www.epa.gov/ttn/atw/toxsource/summary.html.

Table 2 presents a summary of acute non-cancer dose-response assessment values. These values are from a variety of sources, and with the exceptions noted below were derived for one-hour exposure periods.

- National Advisory Committee's Acute Exposure Guideline Level (AEGL), defined for three levels of severity;
- American Industrial Hygiene Association's Emergency Response Planning Guidelines (ERPG), defined for three levels of severity;
- National Institute for Occupational Safety and Health's Immediately Dangerous to Life or Health Concentration (IDLH) divided by a factor of 10;
- California EPA's acute Reference Exposure Level (REL), for some chemicals derived for exposure periods as long as 8 hours; and
- The Agency for Toxic Substances and Disease Registry's Acute Minimal Risk Level (MRL), derived for exposure periods of 1 to 14 days duration.

Because EPA has not defined a prioritization scheme for the use of these acute dose-response values in the assessment of air toxics (due largely to the differing contexts of their development), we have compared the predicted short-term exposure concentrations to all of these values, as available, for the HAP of interest. Based on this quantitative comparison, we then took into consideration details regarding the available dose-response values in evaluating the potential for concern. Further information on the acute reference values presented in Table 2 is presented on EPA's air toxics website cited above.

Toxicity profiles for the HAP of primary concern were obtained from EPA's air toxics website at http://www.epa.gov/ttn/atw/hapindex.html and are provided in Appendix C. These HAP include: methyl ethyl ketone and toluene (which comprise 97 percent of all air emissions in this source category); cobalt (detected at three of the six facilities in this source category); and lead (the only PB-HAP identified for this source category).

Table 1
Unit Risk Estimates[a] and Reference Concentrations[b] Used in This Assessment

HAP	WOE for Cancer	URE (1/[µg/m^3])	RfC or similar value (mg/m^3)	Sources of Toxicity Values
Acrylonitrile	B1	0.00007	0.002	IRIS
Antimony	–	–	0.0002[c]	IRIS
Cobalt compounds [d]	–	–	0.0001	ATSDR
Ethyl benzene	D	–	1	IRIS
Ethylene glycol	–	–	0.4	CAL
Hydrogen chloride	–	–	0.02	IRIS
n-Hexane	–	–	0.2	IRIS
Lead compounds [e]	B2	–	0.0015	OAQPS
Methanol	–	–	4	CAL
Methyl ethyl ketone	–	–	5	IRIS
Methyl isobutyl ketone	–	–	3	IRIS
Toluene	D	–	0.4	IRIS
Xylenes (mixed isomers)	–	–	0.1	IRIS

Notes:
Source: EPA's air toxics website at http://www.epa.gov/ttn/atw/toxsource/summary.html. Accessed May 2004.
A dash (–) indicates either no available weight-of-evidence conclusion on potential human carcinogenicity, or there was no adequate quantitative potency estimate for a particular HAP; thus, the HAP was not considered in the quantitative risk analysis for carcinogenic effects.
[a] Unit risk estimate (URE): The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/m^3 in air. The interpretation of unit risk would be as follows: if URE = 1.5 x 10^{-6} µg/m^3, up to 1.5 additional people are expected to develop cancer in their lifetime per 1,000,000 people exposed continuously for a lifetime to 1 µg of the chemical per 1 m^3 of air. "Upper-bound" in this context is defined as a plausible upper limit to the true probability. An appropriate interpretation of upper-bound unit risk estimates is that the true value is probably less, and probably not greater.
[b] Reference Concentration (RfC): An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.
[c] The RfC for antimony trioxide was used as the non-cancer dose-response value for antimony (no other RfCs were available for antimony or its compounds).
[d] The RfC applies to emissions reported as cobalt compounds (as cobalt) and cobalt.
[e] Lead was detected in one facility, at very low concentrations. Although lead has been classified as a probable human carcinogen, a quantitative estimate of carcinogenic risk from inhalation exposure is not currently available. Therefore, the inhalation concentration used to evaluate chronic inhalation impacts is the National Ambient Air Quality Standard for lead.
WOE = weight-of-evidence
A Human carcinogen
B Probable human carcinogen:

B1 indicates limited human evidence
B2 indicates sufficient evidence in animals and inadequate or no evidence in humans
C Possible human carcinogen
D Not classifiable as to human carcinogenicity
E Evidence of noncarcinogenicity for humans
IRIS = EPA's Integrated Risk Information System
ATSDR = Agency for Toxic Substances and Disease Registry
CAL = California Environmental Protection Agency
OAQPS = EPA's Office of Air Quality Planning and Standards

Table 2
Acute Non-cancer Dose-Response Values Used in This Assessment

HAP	Acute Dose-Response Values (mg/m^3)								
	AEGL-1	AEGL-2	AEGL-3	ERPG-1	ERPG-2	ERPG-3	IDLH/10	MRL	REL
Acrylonitrile	–	–	–	22	77	170	19	0.22	–
Antimony	–	–	–	–	–	–	5	–	–
Cobalt compounds [a]	–	–	–	–	–	–	2	–	–
Ethyl benzene	–	–	–	–	–	–	350	–	–
Ethylene glycol	–	–	–	–	–	–	–	1.3	–
Hydrogen chloride	2.7 [i]	33 [i]	150 [i]	4.5	30	220	7.5	–	2.1
n-Hexane	–	12,000 [p]	–	–	–	–	390	–	–
Lead compounds	–	–	–	–	–	–	10	–	–
Methanol	690 [i]	2,700 [i]	10,000 [i]	260	1,300	6,500	790	–	28
Methyl ethyl ketone	290 [p]	5,000 [p]	12,000 [p]	–	–	–	–	–	13
Methyl isobutyl ketone	–	–	–	–	–	–	–	–	–
Toluene	750 [i]	1,900 [i]	11,000 [i]	190	1,100	3,800	190	3.8	37
Xylenes (mixed isomers)	560	1,700 [p]	4,800 [p]	–	–	–	390	4.3	22

Notes:
A dash (–) indicates that no acute dose-response value of that type was defined for that HAP. No acute dose-response values were identified for methyl isobutyl ketone; therefore, this HAP was not included in the acute exposure and risk assessment.
[a] Dose-response value applies to emissions reported as cobalt compounds (as cobalt) and cobalt.
"i" indicates an interim value (have received public review).
"p" indicates a proposed value (have not completed public review).

Dispersion Modeling for Chronic Exposures

The EPA Human Exposure Model (HEM-Screen, 2003 Version) was utilized for the assessment of chronic exposures. Information about HEM-Screen is available from EPA at http://www.epa.gov/ttn/fera/.

HEM-Screen contains an atmospheric dispersion model with meteorological data and year 2000 population data at the census block level from the U.S. Bureau of Census. HEM-Screen's dispersion model is a Gaussian model based on the Industrial Source Complex Long Term model (ISCLT2) that has been simplified to improve computational efficiency. Necessary source-related inputs include emission rate, release point location coordinates, height of the release, exit velocity, stack diameter, and temperature; other parameters and settings (e.g., urban or rural setting, downwash-related parameters) must also be specified for each modeled source. HEM-Screen includes model-ready meteorological data for 348 stations across the U.S. The model selects the meteorological data for the station closest to the facility and uses this to estimate long-term ambient concentrations of pollutant air emissions at individual census block centroid locations surrounding each facility within a given radius. HEM-Screen then looks up the number of people listed for each census block, providing the user a measure of population exposure.

For this assessment, we used HEM-Screen to estimate the average annual ambient concentration at census block centroid locations for each facility. This concentration was then used as a surrogate for exposure to estimate the maximum lifetime individual cancer risk and chronic non-cancer hazard index for that facility. Emissions data were toxicity-weighted prior to running HEM-Screen to facilitate running multiple facilities in a single model run, thereby reducing the total number of runs and output data processing required. For assessment of risks from chronic exposures, we will assume a constant emission rate (i.e., the total annual emissions reported in NEI were evenly distributed over the course of a year). This approach was judged to be reasonable for the assessment of health risks from long-term exposure to emitted HAP, because risks from chronic exposures were calculated based on the long-term average concentration (even though emissions from some sources can vary temporally) (USEPA, 1992a).

HEM-Screen input data and output files are presented in Appendix D to this assessment.

Dispersion Modeling for Acute Exposures

For the assessment of acute exposures we used EPA's SCREEN3 air dispersion model. SCREEN3 is a screening-level, Gaussian dispersion model that can be used to predict "worst-case" one-hour concentrations for a source of air toxics. The model contains a set of wind speed and atmospheric stability values that are used in combination with facility-specific release parameters to predict the maximum ambient concentration along the centerline of a plume in the downwind direction (USEPA, 1995). SCREEN3 calculates ambient concentrations assuming worst-case meteorological conditions, no deposition or atmospheric reactions, and flat terrain. Unlike the HEM-Screen model, SCREEN3 does not incorporate population data, facility coordinates, or actual facility boundaries. Facility-wide impacts can be determined by summing the individual contributions from each source (i.e., by assuming all sources are co-located). By using SCREEN3 in combination with these health-protective assumptions, a relatively large

degree of conservatism is incorporated in the modeling procedure to provide reasonable assurance that maximum concentrations will not be underestimated (USEPA, 1992b).

For the purpose of this assessment, we considered it reasonable to assume an individual could spend an hour at the nearest off-site downwind location with the highest concentration. Site-specific data on the minimum distance to fenceline were not available for the facilities included in this assessment; therefore, a distance of 100 meters was used for this assessment. For the acute exposure assessment, all release points at a facility were assumed to be co-located in one point. In addition, annual average emissions were adjusted by the operating hours for each facility to obtain a reasonable maximum short-term emission rate.

SCREEN3 modeling summary tables are provided in Appendix E to this assessment. SCREEN3 input and output files will be included as part of the Magnetic Tape Manufacturing Operations Docket No. A-91-31 and E-Docket OAR-2003-0161.

Human Health Multipathway and Ecological Assessment

Potential multipathway exposures (i.e., human health multipathway and ecological exposures) were considered for emissions of lead. Lead was the only PB HAP reported as emitted by any of the six magnetic tape manufacturing sources. Specifically, lead compounds from magnetic tape manufacturing sources were reported for one facility, 3M Magnetic Tape, at 0.004 tons/year. Using HEM-Screen, the annual average air concentration of lead associated with 3M Magnetic Tape was estimated.

The Industrial Source Complex - Short-Term (ISCST3) model was used to model the deposition of lead into soil as a result of emissions from the 3M facility. Further calculations were performed to estimate long-term soil lead concentration levels (i.e., the lead concentrations due to deposition over a 30-year time period) associated with these emissions, using the annual average deposition rate. The census block centroid with the highest predicted long-term soil lead level was identified, and this maximum lead concentration was used to estimate the potential concentration of lead in the blood of a hypothetical child or population of children (6 months to 7 years of age) potentially exposed to the total predicted soil lead level via ingestion.

Specifically, the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) was used to predict blood lead concentrations (PbBs) for children exposed to predicted concentrations of lead in soil as a result of emissions from 3M. The EPA and the Centers for Disease Control and Prevention have determined that childhood PbB concentrations at or above 10 micrograms of Pb per deciliter of blood (μg Pb/dL) present risks to children's health. The maximum predicted PbB was compared to this risk limit. Calculated lead soil concentrations were also evaluated considering the Region IV recommended ecological screening value for lead. Details of this evaluation are provided in Appendix F.

Results and Discussion

Summary of Chronic Risk Assessment Results

For each facility, the census blocks with the highest estimated maximum lifetime individual cancer risk and chronic hazard index (HI) estimates are summarized in Table 3. Only census blocks where people reside are included. Of the six sources, only one (Imation Enterprises) was modeled for potential cancer risks; the other five sources did not report emissions of HAP for which UREs were defined. The highest estimated individual lifetime cancer risk associated with Imation Enterprises was $1x10^{-8}$.

Chronic HIs presented in Table 3 represent the cumulative HI for an individual at the most-exposed census block centroid, combined across all chemicals and release points at a given facility. Estimated chronic HIs for the six modeled facilities ranged from 0.0002 (Imation) to 0.2 (Sony). For Sony, the primary non-cancer risk driver was cobalt (responsible for over 99% of the estimated risk). All facilities showed maximum offsite HI values equal to or below 0.2.

Table 3
Summary of Estimated Cancer and Chronic Hazard Values for the Magnetic Tape Manufacturing Source Category

Facility	Estimated Maxmimum Lifetime Individual Cancer Risk	Estimated Population at Cancer Risk > 1 in a Million	Chronic Non-Cancer HI	Estimated Population at HI = 0.2
Quantegy	NA	NA	0.008	0
JVC Magnetics America	NA	NA	0.02	0
3M Magnetic Tape	NA	NA	0.01	0
Eastman Kodak Co.	NA	NA	0.0002	0
Imation Enterprises	1×10^{-8}	0	0.0002	0
Sony Magnetic Products	NA	NA	0.2	264

Note:
NA = not applicable

Summary of Acute Risk Assessment Results

The maximum one-hour ambient concentrations estimated by SCREEN3 were compared to acute non-cancer dose-response values for each of the HAP assessed at each of the six facilities included in this assessment (recall that no acute dose-response values for methyl isobutyl ketone were available for comparison). For each of the 12 chemicals assessed, we generated a chart plotting maximum exposure concentrations (for that chemical) versus available acute dose-response concentration values (see Appendix G). If there is no exposure concentration plotted for a HAP at a particular facility, then that facility did not emit that HAP. In instances where

multiple acute dose-response concentration values were available for a single chemical, all of the available values are included on the charts. Note that concentration (on the y-axis) is plotted on a logarithmic scale to accommodate the wide ranges of exposure concentrations and acute reference values.

As shown in Appendix G, Exhibits G-1 through G-12, the maximum estimated one-hour HAP exposure concentrations were below all available acute dose-response reference levels, with one exception. The maximum one-hour toluene exposure concentration for one facility (4.0 mg/m^3; JVC Magnetics America) was slightly above the ATSDR MRL for toluene of 3.8 mg/m^3. However, ATSDR MRLs for acute exposures are derived assuming 1-14 day exposure durations and may not be appropriate for comparison to maximum one-hour HAP concentrations. A toluene MRL derived specifically for a one-hour exposure period would likely be higher than the MRL associated with a 1-14 day exposure duration and above the maximum one-hour toluene exposure concentration of 4.0 mg/m^3. No other acute dose-response values for toluene were exceeded at any facility. Therefore, significant acute effects associated with HAP at the six facilities within the magnetic tape manufacturing source category are not expected.

Summary of Human Health Multipathway and Ecological Assessment Results

Soil lead concentrations associated with lead emissions at the 3M facility were calculated from total deposition rate at census block centroid receptor locations. The maximum soil concentration of lead due to deposition over a 30-year time period at a census block centroid was estimated as 4.6 mg/g. The blood lead levels for children 7 years old and younger were calculated using an assumed soil lead concentration of 204.6 mg/g, which represents the IEUBK default of 200 mg/g plus the maximum calculated soil concentration of lead associated with 3M of 4.6 mg/g. All of the blood lead levels (ranging from 2.5 - 4.2 μg/dL for the various age groups evaluated) were below 10.0 mg/dL, the value which represents a level of concern for children as specified by EPA and the Centers for Disease Control and Prevention.

EPA Region IV publishes Ecological Risk Assessment Bulletins that provide soil, sediment, and surface water screening values for risk assessment purposes. Region IV recommends an ecological screening value for lead in soil of 50 mg/g (USEPA, 2001). Predicted soil lead concentrations associated with the 3M facility are low (with a maximum of 4.6 mg/g) compared to this screening value and would not be expected to cause unacceptable risks to ecological receptors.

The ATSDR reports that natural lead content of soil ranges from <10 to 30 mg/g soil. Soil effected by anthropogenic sources of lead typically has much higher concentrations. The ATSDR presents a soil concentration of 60,000 mg/g of lead outside a smelter facility, and concentrations >10,000 mg/g outside houses with exterior lead-based paints (ATSDR, 1999). These levels estimated or monitored in the environment provide further support to indicate that the emissions of lead associated with 3M Magnetic Tape would not be expected to pose a significant human health multipathway or ecological risk.

Qualitative Uncertainty Analysis

This section summarizes some of the primary uncertainties associated with various components of this analysis, including the modeling data from NEI and TRI, the dispersion models as applied in this assessment, population data, and toxicity information.

Emissions Inventory Uncertainties

The major uncertainties associated with modeling data from NEI and TRI are discussed below.

- The HAP emissions inventory and facility data included in NEI and TRI are of variable derivation; EPA receives data collected by different sources utilizing different methods. There will be variability in the quality and accuracy of these data.

- Some emission factors may be missing or of poor quality, resulting in unrepresentative emission estimates.

- There may be completeness issues and instances of unreported data. Not all states have submitted data to EPA for inclusion in NEI/TRI and not all sources are accounted for in these inventories (e.g., in some states, very small sources have been reported, while in others only the largest sources in certain types of industry are included).

Overall, however, we believe that the 1999 NEI and 2000 TRI represent EPA's best available sources of comprehensive information for the modeling performed in this risk assessment (including facility locations, pollutant-specific emission rates, and emission release point parameters). Development of NEI has involved extensive review by Federal, state, tribal, and local air toxics agencies as well as various industry groups. EPA continues to refine these emissions inventories as tools for analysis of air emissions.

Parameter Uncertainties

As discussed previously, one primary source of emissions and site-specific modeling data used for this residual risk analysis was the Final 1999 NEI Version 3. Deficiencies in NEI (i.e., missing or default parameters, out-of-date emissions information) were addressed by supplementing NEI data with emissions data and facility parameters from the 2000 TRI and information obtained directly from the six facilities. Actual parameter data from the facilities were used where available; however, there were missing facility parameters (e.g., building dimensions, release height for fugitive emissions, stack exit temperature) remaining that required the use of defaults. Use of defaults introduces uncertainties into modeling and calculating risks; default values may not best represent conditions at a facility. However, in the absence of site-specific data, every effort was made to provide reasonable default values (i.e., values that would not result in a gross over- or underestimate of risks), as documented in Appendix B, Table B-1.

Modeling Uncertainties

There are aspects of the application of HEM-Screen and SCREEN3 that can introduce uncertainty to the final results. These models require the use of assumptions that may be

associated with model algorithms, meteorology, geography, deposition, chemical fate and transport, terrain and building downwash effects, and other components of the model, and there are uncertainties inherent in those assumptions.

For HEM-Screen, meteorologic data are pulled from the built-in set of data in HEM-Screen for the weather station nearest the emission point. These data may not be representative of the weather patterns in the area around the source if the weather station is too far away or if there are deviations in the weather pattern estimates from the site-specific patterns. For HEM-Screen and SCREEN3, fate and transport characteristics were assumed to be the same for all HAP (e.g., no chemical transformation to more or less toxic substances was modeled; all chemicals were assumed to disperse in the same way). For both models, all HAP are modeled as gases (e.g., no accounting for deposition of pollutants that are fibrous or consist of particulate matter). Thus, for these pollutants (e.g., metals) the ambient concentration tends to be overestimated. In addition, the modeling terrain was assumed to be flat, which could misrepresent concentrations for releases in complex terrains.

Although there are uncertainties inherent in these models, none would be expected to systematically over- or under-predict results.

Population and Exposure Uncertainties

The census data used in HEM-Screen are at the census block level, which is the smallest defined population unit available. For assessment of population exposures using HEM-Screen, all people within a block are assumed to reside at the centroid of the block (i.e., the area-weighted geographical center of the block). Locations of actual residences were not included in the population data. Uncertainties could arise as some people may actually live closer to or farther from the emission source than depicted within the model. The census block centroid location was used as a surrogate for actual receptor locations. On balance, however, this approach was considered to be appropriate and would not grossly over- or underestimate risks.

For the assessment of chronic risks, it was conservatively assumed that individuals may be exposed to potential air toxics 24 hours/day, 7 days/week over a lifetime (70 years). These assumptions were used in order to capture the upper-bound of the estimated risk and provide the most health-protective results. Using these conservative, health-protective exposure assumptions, however, likely results in an overestimate of risks.

Toxicological Uncertainties

Toxicity values used in this assessment were based on values compiled by EPA for air risk assessment in October 2003. These values are continuously under review and may be subject to change as new health studies become available.

As noted earlier, lead has been classified as a probable human carcinogen; however, a quantitative estimate of carcinogenic risk from inhalation exposure is not currently available. The IRIS assessment for lead concluded that data are not sufficient to quantify cancer risks (due to uncertainties in the exposure estimate and insufficient knowledge of lead pharmacokinetics).

Thus, potential carcinogenic effects associated with the inhalation of lead at 3M Magnetic Tape were not evaluated in this assessment.

Risk Characterization Uncertainties

The EPA air toxics risk assessment reference library (available at http://www.epa.gov/ttn/fera/risk_atoxic.html) describes the calculation of the aggregate non-cancer hazard for multiple substances in terms of the Target Organ Specific Hazard Index (TOSHI). The TOSHI represents the sum of HQs for individual air toxics that affect the same organ or organ system. However, for the calculation of the non-cancer HIs in this assessment, chronic non-cancer hazard quotients (HQs) were summed across *all* chemicals at each facility. Using this alternative approach likely results in an overestimate of risks, but ensures that the risk results are not underestimated.

Source Category Conclusions

Results of this residual risk assessment may be summarized as follows:

- One of the six facilities within the magnetic tape manufacturing source category was quantitatively assessed for potential cancer risks. The estimated maximum lifetime individual cancer risk associated with this facility (due to acrylonitrile) was $1x10^{-8}$, which is well below $1x10^{-6}$.

- All maximum chronic multiple HAP cumulative HIs for the six modeled facilities (using HEM-Screen) were equal to or below 0.2. For Sony, the facility with the highest HI, the primary non-cancer risk driver was cobalt, responsible for 99% of the estimated risk.

- One PB HAP, lead, was reported as emitted by one of the six facilities within the source category. The maximum annual average air concentration of lead associated with this facility was estimated at 3.2×10^{-4} μg/m^3. Concentrations of lead in soil resulting from the facility's reported emissions depositing into soil over a 30-year time period were estimated to be low (with a maximum of 4.6 mg/g), and were shown not to contribute significantly to predicted blood lead levels in children potentially exposed to this soil. In addition, the predicted soil lead concentrations associated with the facility were low compared to the Region IV ecological soil screening value of 50 mg/g. Thus, no significant human health multipathway or ecological risks would be expected.

- With one exception, all maximum one-hour exposure concentrations were below available acute dose-response values. The predicted maximum one-hour concentration of toluene at one facility slightly exceeded the ATSDR MRL. However, since ATSDR MRLs for acute exposures are derived assuming 1-14 day exposure durations, they may not be appropriate for comparison to maximum one-hour HAP concentrations. The maximum one-hour concentration of toluene would be expected to be below a toluene MRL derived specifically for a one-hour exposure period. No other acute dose-response values for toluene were exceeded at any facility.

Given these results, the potential for unacceptable chronic or acute human health effects and ecological effects appears to be low for this source category.

This analysis is not exhaustive and is not intended to be. We have used (1) the best emissions data currently available to us, (2) reasonable dispersion models, and (3) exposure locations where receptor populations currently reside. However, we applied several health protective assumptions. On balance, using our scientific judgment and risk assessment experience, we believe the results are protective, meaning the predicted risk estimates are likely higher than would be expected to actually occur in the exposed population.

List of Appendices

Documentation utilized in this risk assessment is included in the following attachments:

Appendix A Summary of Emissions Data and Facility Parameters for Facilities in the Magnetic Tape Manufacturing Source Category (provided by Research Triangle Institute, 11/25/03)

Appendix B Summary of All Emissions Data and Facility Parameters Used for Modeling

Appendix C Toxicity Profiles for Selected HAP

Appendix D Summary of HEM-Screen Input Data and HEM-Screen Output Files

Appendix E SCREEN3 Modeling Summary Tables

Appendix F Lead Deposition and Soil Concentration Modeling at the 3M Facility

Appendix G Results of the Acute Risk Assessment

References

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Contents

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APPENDIX A

Summary of Emissions Data and Facility Parameters for Facilities in the Magnetic Tape Manufacturing Source Category (Research Triangle Institute, 11/25/03)

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Address	City	State	Zip	County	Latitude	Longitude	SIC code	NAICS code	Mag tape products
Quantegy Inc.	2230 Marvyn Parkway	Opelika	AL	36801	Lee	32-37-20	85-22-09	3695	334613	Audio, video, and datatape
Quantegy Inc.	2230 Marvyn Parkway	Opelika	AL	36801	Lee	32-37-20	85-22-09	3695	334613	Audio, video, and datatape
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Total Quantegy										
JVC Magnetics America Co.	1 JVC Road	Tuscaloosa	AL	35405	Tuscaloosa	33-10-29	87-27-30	3695	334613	Audio and videotape
JVC Magnetics America Co.	1 JVC Road	Tuscaloosa	AL	35405	Tuscaloosa	33-10-29	87-27-30	3695	334613	Audio and videotape
JVC Magnetics America Co.	1 JVC Road	Tuscaloosa	AL	35405	Tuscaloosa	33-10-29	87-27-30	3695	334613	Audio and videotape
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JVC Magnetics America Co.	1 JVC Road	Tuscaloosa	AL	35405	Tuscaloosa	33-10-29	87-27-30	3695	334613	Audio and videotape
JVC Magnetics America Co.	1 JVC Road	Tuscaloosa	AL	35405	Tuscaloosa	33-10-29	87-27-30	3695	334613	Audio and videotape
Total JVC										
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
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3M Magnetic Tape Manufacturi	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222	Audio and videotape
Total 3M										
Eastman Kodak Co. - Kodak Pa	1669 Lake Avenue	Rochester	NY	14652	Monroe	43-12-10	77-37-45	3861	325992	Advantix film
Eastman Kodak Co. - Kodak Pa	1669 Lake Avenue	Rochester	NY	14652	Monroe	43-12-10	77-37-45	3861	325992	Advantix film

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Facility name	Address	City	State	Zip	County	Latitude	Longitude	SIC code	NAICS code	Mag tape products
Eastman Kodak Co. - Kodak Pa	1669 Lake Avenue	Rochester	NY	14652	Monroe	43-12-10	77-37-45	3861	325992	Advantix film
Eastman Kodak Co. - Kodak Pa	1669 Lake Avenue	Rochester	NY	14652	Monroe	43-12-10	77-37-45	3861	325992	Advantix film
Eastman Kodak Co. - Kodak Pa	1669 Lake Avenue	Rochester	NY	14652	Monroe	43-12-10	77-37-45	3861	325992	Advantix film
Total Eastman Kodak										
Imation Enterprises Corp.	2700 East Frontage Roa	Weatherford	OK	73096	Custer	35-31-15	98-41-01	3695	334613	Diskettes, datatape
Imation Enterprises Corp.	2700 East Frontage Roa	Weatherford	OK	73096	Custer	35-31-15	98-41-01	3695	334613	Diskettes, datatape
Imation Enterprises Corp.	2700 East Frontage Roa	Weatherford	OK	73096	Custer	35-31-15	98-41-01	3695	334613	Diskettes, datatape
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Imation Enterprises Corp.	2700 East Frontage Roa	Weatherford	OK	73096	Custer	35-31-15	98-41-01	3695	334613	Diskettes, datatape
Total Imation										
Sony Magnetics Products Inc. o	4275 W. Main Street	Dothan	AL	36305	Houston	31-13-00	85-27-30	3695	334613	Audio, video, and datatape
Sony Magnetics Products Inc. o	4275 W. Main Street	Dothan	AL	36305	Houston	31-13-00	85-27-30	3695	334613	Audio, video, and datatape
Sony Magnetics Products Inc. o	4275 W. Main Street	Dothan	AL	36305	Houston	31-13-00	85-27-30	3695	334613	Audio, video, and datatape
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Total Sony										

Table A-1
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Facility name	Equipment	Emission type	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/s	Stack height, ft	Stack velocity, ft/s
Quantegy Inc.	Stack 1 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 1 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Stack 2 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 2 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Stack 3 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 3 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Stack 4 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 4 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Stack 5 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 5 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Stack 6 - storage tanks, mix tanks, coating lines,	Stack	Toluene	0.8	1,647	2.7	1479	17	4.3
Quantegy Inc.	Stack 6 - storage tanks, mix tanks, coating lines,	Stack	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3
Quantegy Inc.	Emission unit 014	Stack	Methyl ethyl ketone	1.0	2,000	1.5	42	25	0.4
Quantegy Inc.	Emission unit 104121	Stack	Cobalt	0.0025	5.0	2.9	263	52	0.7
Quantegy Inc.	Plant 1 - coating lines	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 1 - coating lines	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 1 - ovens	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 1 - ovens	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 1 - mix prep area	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 1 - mix prep area	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 1 - mix prep area	Fugitive	Cobalt	0.0008	1.7				
Quantegy Inc.	Plant 2 - coating line 1	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 2 - coating line 1	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 2 - coating line 2	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 2 - coating line 2	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 2 - ovens	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 2 - ovens	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 2 - mix prep area	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	Plant 2 - mix prep area	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	Plant 2 - mix prep area	Fugitive	Cobalt	0.0008	1.7				
Quantegy Inc.	R&D bldg - coating line 1	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	R&D bldg - coating line 1	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	R&D bldg - coating line 2	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	R&D bldg - coating line 2	Fugitive	Methyl ethyl ketone	1.8	3,559				

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Equipment	Emission type	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/s	Stack height, ft	Stack velocity, ft/s
Quantegy Inc.	R&D bldg - oven 1	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	R&D bldg - oven 1	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	R&D bldg - oven 2	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	R&D bldg - oven 2	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	R&D bldg - mix prep area	Fugitive	Toluene	1.2	2,384				
Quantegy Inc.	R&D bldg - mix prep area	Fugitive	Methyl ethyl ketone	1.8	3,559				
Quantegy Inc.	R&D bldg - mix prep area	Fugitive	Cobalt	0.0008	1.7				
Total Quantegy				49	97,971				
JVC Magnetics America Co.	Area 1 - mixing room	Fugitive	Toluene	27	54,880				
JVC Magnetics America Co.	Area 1 - mixing room	Fugitive	Methyl ethyl ketone	42	83,729				
JVC Magnetics America Co.	Area 2 - coating and rewind room	Fugitive	Toluene	24	47,196				
JVC Magnetics America Co.	Area 2 - coating and rewind room	Fugitive	Methyl ethyl ketone	36	72,007				
JVC Magnetics America Co.	Area 3 - coating cleanroom	Fugitive	Toluene	2.7	5,488				
JVC Magnetics America Co.	Area 3 - coating cleanroom	Fugitive	Methyl ethyl ketone	4.2	8,373				
JVC Magnetics America Co.	Area 4 - K-room	Fugitive	Toluene	1.1	2,195				
JVC Magnetics America Co.	Area 4 - K-room	Fugitive	Methyl ethyl ketone	1.7	3,349				
Total JVC				139	277,217				
3M Magnetic Tape Manufacturir		Stack	Ethyl benzene	0.05	90				
3M Magnetic Tape Manufacturir		Stack	Ethylene glycol	0.007	14				
3M Magnetic Tape Manufacturir		Stack	n-Hexane	2.6	5,100				
3M Magnetic Tape Manufacturir		Fugitive	n-Hexane	0.05	90				
3M Magnetic Tape Manufacturir		Stack	Methanol	12	23,400				
3M Magnetic Tape Manufacturir		Stack	MEK	24	48,000				
3M Magnetic Tape Manufacturir		Fugitive	MEK	15	29,400				
3M Magnetic Tape Manufacturir		Stack	MIBK	0.2	300				
3M Magnetic Tape Manufacturir		Stack	Toluene	21	42,000				
3M Magnetic Tape Manufacturir		Fugitive	Toluene	5.1	10,200				
3M Magnetic Tape Manufacturir		Stack	Xylenes	0.2	300				
3M Magnetic Tape Manufacturir		Fugitive	Xylenes	0.02	39				
3M Magnetic Tape Manufacturir		Stack	Antimony	0.003	6.3				
3M Magnetic Tape Manufacturir		Stack	Lead compounds	0.004	7.2				
Total 3M				79	158,946				
Eastman Kodak Co. - Kodak Pa	Source A - coater	Stack	Methyl ethyl ketone	1.217112922	2,434	12	169,697	100	25
Eastman Kodak Co. - Kodak Pa	Source A - coater	Stack	Toluene	3.032887078	6,066	12	169,697	100	25

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Equipment	Emission type	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/s	Stack height, ft	Stack velocity, ft/s
Eastman Kodak Co. - Kodak Pa	Source B - mix prep area	Stack	Hydrogen chloride	0.035	70	0.5	30	73	2.5
Eastman Kodak Co. - Kodak Pa	Source B - mix prep area	Stack	Cobalt	0.0000005	0.001	0.5	30	73	2.5
Eastman Kodak Co. - Kodak Pa	Source C - mix prep area	Stack	Cobalt	0.000001	0.002	1.25	3,700	74	50
Total Eastman Kodak				4.3	8,570				
Imation Enterprises Corp.	Emission unit 1 - miscellaneous	Stack	Methyl ethyl ketone	0.005	10	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 1 - miscellaneous	Stack	Acrylonitrile	0.004	8	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4A - coater, curing ovens, mix/pum	Stack	Toluene	0.2	390	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4A - coater, curing ovens, mix/pum	Stack	Methanol	0.01	20	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4A - coater, curing ovens, mix/pum	Stack	Methyl ethyl ketone	2.7	5,420	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4B - coater, curing ovens, mix/pum	Stack	Toluene	0.2	390	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4B - coater, curing ovens, mix/pum	Stack	Methanol	0.01	20	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 4B - coater, curing ovens, mix/pum	Stack	Methyl ethyl ketone	2.7	5,420	3.5	30,000	30	52
Imation Enterprises Corp.	Emission unit 3 - mixing	Fugitive	Methyl ethyl ketone	0.004	8				
Total Imation				5.8	11,686				
Sony Magnetics Products Inc. o	Advanced metal evaporation process: ME plant								
Sony Magnetics Products Inc. o	Control equipment	Fugitive	Cobalt	0.07	145				
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Cobalt	0.2	435				
Sony Magnetics Products Inc. o	Conventional process: P-1 plant								
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Cobalt compounds	0.002	3.0	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Methyl ethyl ketone	19	37,530	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Toluene	4.5	9,090	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Coating line	Fugitive	Methyl ethyl ketone	28	56,295	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Coating line	Fugitive	Toluene	6.8	13,635	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Oven	Fugitive	Methyl ethyl ketone	33	65,678	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Oven	Fugitive	Toluene	8.0	15,908	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Control equipment	Stack/fugitive	Methyl ethyl ketone	5.9	11,823	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Control equipment	Stack/fugitive	Toluene	1.4	2,873	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Cobalt compounds	0.0004	0.75	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Methyl ethyl ketone	9.4	18,765	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Toluene	2.3	4,545	4x4	2,167	50	135
Sony Magnetics Products Inc. o	Conventional process: P-2 plant								
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Cobalt compounds	0.002	3.0	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Methyl ethyl ketone	19	37,530	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Mixing room	Fugitive	Toluene	4.5	9,090	4x4	2,500	50	156

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Equipment	Emission type	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/s	Stack height, ft	Stack velocity, ft/s
Sony Magnetics Products Inc. o	Coating line	Fugitive	Methyl ethyl ketone	28	56,295	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Coating line	Fugitive	Toluene	6.8	13,635	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Oven	Fugitive	Methyl ethyl ketone	32.8	65,678	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Oven	Fugitive	Toluene	8.0	15,908	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Control equipment	Stack/fugitive	Methyl ethyl ketone	5.9	11,823	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Control equipment	Stack/fugitive	Toluene	1.4	2,873	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Cobalt compounds	0.0004	0.75	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Methyl ethyl ketone	9.4	18,765	4x4	2,500	50	156
Sony Magnetics Products Inc. o	Misc. fugitives	Fugitive	Toluene	2.3	4,545	4x4	2,500	50	156
Total Sony				236	472,868				

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Stack temperature, deg F	Building volume, ft3	Operating hr/yr	Notes
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	100		6,257	Estimated emissions assuming equal fraction of emissions through each adsorber.
Quantegy Inc.	120		6,257	Data from 1999 NEI; used operating hours from facility.
Quantegy Inc.	217		6,257	Data from 1999 NEI; used operating hours from facility.
Quantegy Inc.		4,312	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		4,312	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		33,750	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		33,750	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		171,110	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		171,110	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		171,110	8,760	Estimated emissions assuming equal fraction of emissions through each mix prep area.
Quantegy Inc.		878	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		878	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		1,440	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		1,440	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		165,835	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		165,835	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		415,538	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		415,538	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		415,538	8,760	Estimated emissions assuming equal fraction of emissions through each mix prep area.
Quantegy Inc.		619	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		619	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		2,475	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		2,475	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Stack temperature, deg F	Building volume, ft3	Operating hr/yr	Notes
Quantegy Inc.		14,850	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		14,850	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		7,475	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		7,475	6,257	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		53,035	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		53,035	8,760	Estimated emissions assuming equal fraction of emissions through each emission point.
Quantegy Inc.		53,035	8,760	Estimated emissions assuming equal fraction of emissions through each mix prep area.
Total Quantegy				
JVC Magnetics America Co.		290,133	8,760	Estimated to emit 50% of fugitive toluene emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		290,133	8,760	Estimated to emit 50% of fugitive MEK emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		283,729	8,760	Estimated to emit 43% of fugitive toluene emissions;assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		283,729	8,760	Estimated to emit 43% of fugitive MEK emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		253,760	8,760	Estimated to emit 5% of fugitive toluene emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		253,760	8,760	Estimated to emit 5% of fugitive MEK emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		54,080	8,760	Estimated to emit 2% of fugitive toluene emissions; assume 24 hr/d, 7 d/wk.
JVC Magnetics America Co.		54,080	8,760	Estimated to emit 2% of fugitive MEK emissions; assume 24 hr/d, 7 d/wk.
Total JVC				
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
3M Magnetic Tape Manufacturi			8,760	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d, 7 d/wk.
Total 3M				
Eastman Kodak Co. - Kodak Pa	100		3,000	Estimated emissions by applying ratio of MEK and toluene emissions from 2000 TRI to total organi
Eastman Kodak Co. - Kodak Pa	100		3,000	Estimated emissions by applying ratio of MEK and toluene emissions from 2000 TRI to total organi

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Stack temperature, deg F	Building volume, ft3	Operating hr/yr	Notes
Eastman Kodak Co. - Kodak Pa	ambient		630	Estimated emissions by applying ratio of MEK and toluene emissions from 2000 TRI to total organi
Eastman Kodak Co. - Kodak Pa	ambient		630	Estimated emissions by applying ratio of MEK and toluene emissions from 2000 TRI to total organi
Eastman Kodak Co. - Kodak Pa	ambient		630	Estimated emissions by applying ratio of MEK and toluene emissions from 2000 TRI to total organi
Total Eastman Kodak				
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI; assumed same stack parameters as process units 4A & B.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI; assumed same stack parameters as process units 4A & B.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.	400		6,240	Data from 1999 NEI.
Imation Enterprises Corp.			6,240	Data from 1999 NEI; default stack parameters in NEI not useful for fugitives modeling.
Total Imation				
Sony Magnetics Products Inc. o				
Sony Magnetics Products Inc. o		75,000	8,736	Estimated to emit 25% of cobalt emissions (total cobalt emissions = 0.29 tpy for 2000)
Sony Magnetics Products Inc. o		75,000	8,736	Estimated to emit 75% of cobalt emissions (total cobalt emissions = 0.29 tpy for 2000)
Sony Magnetics Products Inc. o				
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 40% of cobalt compound emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 15% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 15% of toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 17.5% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 17.5% of toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 2.5% of MEK emissions; added 50% of stack MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 2.5% of toluene emissions; added 50% of stack toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of cobalt compound emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 5% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 5% of toluene emissions
Sony Magnetics Products Inc. o				
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 40% of cobalt compound emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of toluene emissions

Table A-1
Emissions Data and Facility Parameters (Provided by RTI, 11/25/03)

Facility name	Stack temperature, deg F	Building volume, ft3	Operating hr/yr	Notes
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 15% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 15% of toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 17.5% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 17.5% of toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 2.5% of MEK emissions; added 50% of stack MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 2.5% of toluene emissions; added 50% of stack toluene emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 10% of cobalt compound emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 5% of MEK emissions
Sony Magnetics Products Inc. o		600,000	8,736	Estimated to emit 5% of toluene emissions
Total Sony				

APPENDIX B

Summary of All Emissions Data and Facility Parameters Used for Modeling

Appendix B
Attachment 1. Facility Coordinate Verification

The original facility coordinates identified by RTI (Appendix A, Table A-1) were verified using aerial photography, the facility address, and GIS-analysis. Each set of coordinates from RTI was located on geo-referenced aerial photos from the U.S. Geological Survey (USGS, 2004). Coordinates for each facility were also obtained from the Enforcement & Compliance History Online database (ECHO; EPA, 2004). If the RTI and ECHO coordinates were the same and were located on top of an industrial facility in the aerial photo, it was assumed that the original RTI-identified coordinates for a facility were correct. In cases where either the ECHO and RTI coordinates were not the same, or the coordinates were the same but did not appear to be associated with an industrial facility in the aerial photo, the facility's street address was then used to obtain a third set of latitude and longitude coordinates. The coordinates associated with the street address were then plotted on top of an aerial photo, along with the RTI and ECHO coordinates. From this information, the most likely facility location was identified.

For three facilities, the RTI coordinates did not appear to represent the facility locations. These facilities (Imation in Weatherford, OK; Quantegy, Inc. in Opelika, AL; and Sony in Dothan, AL) are shown in Figures B-1 through B-3. Each figure displays the USGS aerial photo, the original RTI-provided facility location, and the "corrected" facility location based on the analysis described above. The distance between the two sets of coordinates was calculated for each facility and is displayed for each figure.

References

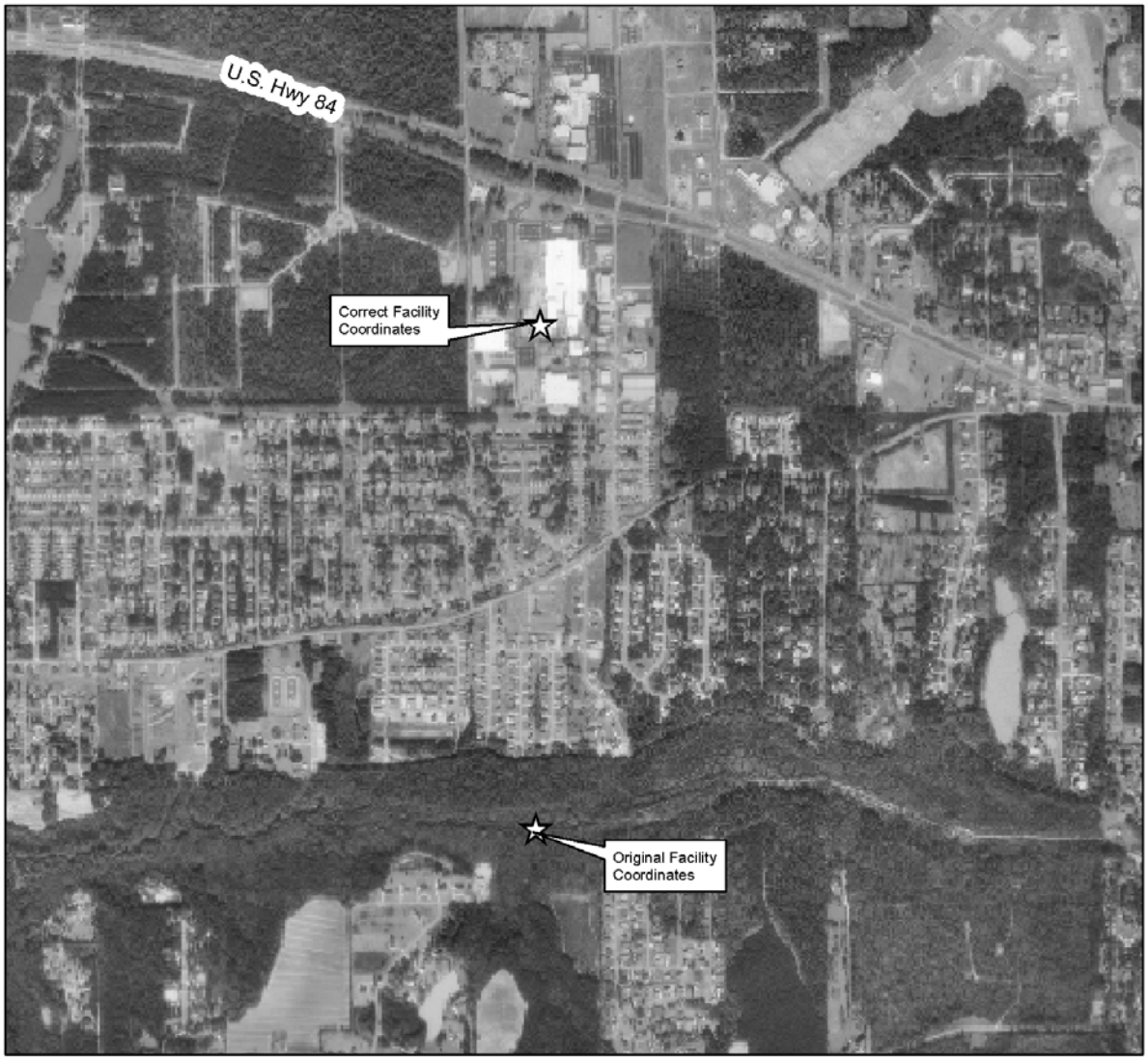
U.S. EPA. 2004. Enforcement & Compliance History Online. Available at: http://www.epa.gov/echo/.

USGS. 2004. Aerial DOQ photography.

Figure B-1
Imation Facility Location

Figure B-2
Quantegy Facility Location

Figure B-3
Sony Facility Location



Sony - Dothan, AL
Distance between points is 1,640 meters

Table B-1
Emissions Data and Facility Parameters Used for Modeling

Facility name	Latitude *	Longitude *	Emission type	Emission Release Point ID	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/min	Stack height, ft	Stack velocity, ft/s	Stack temperature, deg F	Building volume, ft3	Building Area, ft2	Operating hr/yr	Notes (ICF)
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack1	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack1	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack2	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack2	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack3	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack3	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack4	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack4	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack5	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack5	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack6	Toluene	0.8	1,647	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack6	Methyl ethyl ketone	1.2	2,461	2.7	1479	17	4.3	100			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack7	Methyl ethyl ketone	1.0	2,000	1.5	42	25	0.4	120			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Stack	Stack8	Cobalt	0.0025	5.0	2.9	263	52	0.7	217			6,257	a
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-1	Toluene	1.2	2,384			7.5		67.7	4,312	287	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-1	Methyl ethyl ketone	1.8	3,559			7.5		67.7	4,312	287	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-2	Toluene	1.2	2,384			7.5		67.7	33,750	2,250	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-2	Methyl ethyl ketone	1.8	3,559			7.5		67.7	33,750	2,250	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-3	Toluene	1.2	2,384			7.5		67.7	171,110	11,407	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-3	Methyl ethyl ketone	1.8	3,559			7.5		67.7	171,110	11,407	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug1-3	Cobalt	0.0008	1.7			7.5		67.7	171,110	11,407	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-1	Toluene	1.2	2,384			7.5		67.7	878	59	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-1	Methyl ethyl ketone	1.8	3,559			7.5		67.7	878	59	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-2	Toluene	1.2	2,384			7.5		67.7	1,440	96	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-2	Methyl ethyl ketone	1.8	3,559			7.5		67.7	1,440	96	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-3	Toluene	1.2	2,384			7.5		67.7	165,835	11,056	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-3	Methyl ethyl ketone	1.8	3,559			7.5		67.7	165,835	11,056	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-4	Toluene	1.2	2,384			7.5		67.7	415,538	27,703	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-4	Methyl ethyl ketone	1.8	3,559			7.5		67.7	415,538	27,703	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug2-4	Cobalt	0.0008	1.7			7.5		67.7	415,538	27,703	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-1	Toluene	1.2	2,384			7.5		67.7	619	41	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-1	Methyl ethyl ketone	1.8	3,559			7.5		67.7	619	41	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-2	Toluene	1.2	2,384			7.5		67.7	2,475	165	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-2	Methyl ethyl ketone	1.8	3,559			7.5		67.7	2,475	165	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-3	Toluene	1.2	2,384			7.5		67.7	14,850	990	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-3	Methyl ethyl ketone	1.8	3,559			7.5		67.7	14,850	990	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-4	Toluene	1.2	2,384			7.5		67.7	7,475	498	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-4	Methyl ethyl ketone	1.8	3,559			7.5		67.7	7,475	498	6,257	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-5	Toluene	1.2	2,384			7.5		67.7	53,035	3,536	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-5	Methyl ethyl ketone	1.8	3,559			7.5		67.7	53,035	3,536	8,760	b, c
Quantegy Inc.	32-37-28	85-22-24	Fugitive	Fug3-5	Cobalt	0.0008	1.7			7.5		67.7	53,035	3,536	8,760	b, c
Total Quantegy				20		49	97,971									
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug1	Toluene	27	54,880			7.5		67.7	290,133	19,342	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug1	Methyl ethyl ketone	42	83,729			7.5		67.7	290,133	19,342	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug2	Toluene	24	47,196			7.5		67.7	283,729	18,915	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug2	Methyl ethyl ketone	36	72,007			7.5		67.7	283,729	18,915	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug3	Toluene	2.7	5,488			7.5		67.7	253,760	16,917	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug3	Methyl ethyl ketone	4.2	8,373			7.5		67.7	253,760	16,917	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug4	Toluene	1.1	2,195			7.5		67.7	54,080	3,605	8,760	b, c
JVC Magnetics America Co.	33-10-29	87-27-30	Fugitive	Fug4	Methyl ethyl ketone	1.7	3,349			7.5		67.7	54,080	3,605	8,760	b, c

Table B-1
Emissions Data and Facility Parameters Used for Modeling

Facility name	Latitude *	Longitude *	Emission type	Emission Release Point ID	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/min	Stack height, ft	Stack velocity, ft/s	Stack temperature, deg F	Building volume, ft3	Building Area, ft2	Operating hr/yr	Notes (ICF)
Total JVC				4		139	277,217									
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Fugitive	Fug1	n-Hexane	0.05	90	0.003		10	0.0003	72		1076.4	8,760	d, e
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Fugitive	Fug1	MEK	15	29,400	0.003		10	0.0003	72		1076.4	8,760	d, e
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Fugitive	Fug1	Toluene	5.1	10,200	0.003		10	0.0003	72		1076.4	8,760	d, e
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Fugitive	Fug1	Xylenes	0.02	39	0.003		10	0.0003	72		1076.4	8,760	d, e
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Ethyl benzene	0.05	90	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Ethylene glycol	0.007	14	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	n-Hexane	2.6	5,100	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Methanol	12	23,400	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	MEK	24	48,000	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	MIBK	0.2	300	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Toluene	21	42,000	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Xylenes	0.2	300	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack1	Antimony	0.003	6.3	3		44	31	217			8,760	a, d
3M Magnetic Tape Manufactur	44-52-49	94-21-32	Stack	Stack2	Lead compounds	0.004	7.2	2.20000005		51.7	23.3	331.3999939			8,760	a, d
Total 3M				3		79	158,946									
Eastman Kodak Co. - Kodak P	43-12-10	77-37-45	Stack	Stack1	Methyl ethyl ketone	1.21711292	2,434	12	169,697	100	25	100			3,000	a
Eastman Kodak Co. - Kodak P	43-12-10	77-37-45	Stack	Stack1	Toluene	3.03288708	6,066	12	169,697	100	25	100			3,000	a
Eastman Kodak Co. - Kodak P	43-12-10	77-37-45	Stack	Stack2	Hydrogen chloride	0.035	70	0.5	30	73	2.5	67.7			630	a, c
Eastman Kodak Co. - Kodak P	43-12-10	77-37-45	Stack	Stack2	Cobalt	0.0000005	0.001	0.5	30	73	2.5	67.7			630	a, c
Eastman Kodak Co. - Kodak P	43-12-10	77-37-45	Stack	Stack3	Cobalt	0.000001	0.002	1.25	3,700	74	50	67.7			630	a, c
Total Eastman Kodak				3		4.3	8,570									
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack1	Methyl ethyl ketone	0.005	10	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack1	Acrylonitrile	0.004	8	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack2	Toluene	0.2	390	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack2	Methanol	0.01	20	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack2	Methyl ethyl ketone	2.7	5,420	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack3	Toluene	0.2	390	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack3	Methanol	0.01	20	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Stack	Stack3	Methyl ethyl ketone	2.7	5,420	3.5	30,000	30	52	400			6,257	a, g
Imation Enterprises Corp.	35-32-3	98-40-25	Fugitive	Fug1	Methyl ethyl ketone	0.004	8			7.5		67.7		1076.4	6,257	b, c, e, g
Total Imation				4		5.8	11,686									
Sony Magnetics Products Inc. (	31-13-56	85-27-28														
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug1	Cobalt	0.07	145			7.5		67.7	75,000	5,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug1	Cobalt	0.2	435			7.5		67.7	75,000	5,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28														
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-1	Cobalt compounds	0.002	3.0	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-1	Methyl ethyl ketone	19	37,530	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-1	Toluene	4.5	9,090	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-2	Methyl ethyl ketone	28	56,295	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-2	Toluene	6.8	13,635	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-3	Methyl ethyl ketone	33	65,678	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-3	Toluene	8.0	15,908	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Stack/fugitive	Stack1	Methyl ethyl ketone	5.9	11,823	5.65685425	2,167	50	135	67.7	600,000		8,760	a, c, f, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Stack/fugitive	Stack1	Toluene	1.4	2,873	5.65685425	2,167	50	135	67.7	600,000		8,760	a, c, f, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-4	Cobalt compounds	0.0004	0.75	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-4	Methyl ethyl ketone	9.4	18,765	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug2-4	Toluene	2.3	4,545	4x4	2,167	7.5	135	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28														

Table B-1
Emissions Data and Facility Parameters Used for Modeling

Facility name	Latitude *	Longitude *	Emission type	Emission Release Point ID	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/min	Stack height, ft	Stack velocity, ft/s	Stack temperature, deg F	Building volume, ft3	Building Area, ft2	Operating hr/yr	Notes (ICF)
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-1	Cobalt compounds	0.002	3.0	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-1	Methyl ethyl ketone	19	37,530	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-1	Toluene	4.5	9,090	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-2	Methyl ethyl ketone	28	56,295	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-2	Toluene	6.8	13,635	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-3	Methyl ethyl ketone	32.8	65,678	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-3	Toluene	8.0	15,908	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Stack/fugitive	Stack2	Methyl ethyl ketone	5.9	11,823	5.65685425	2,500	50	156	67.7	600,000		8,760	a, c, f, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Stack/fugitive	Stack2	Toluene	1.4	2,873	5.65685425	2,500	50	156	67.7	600,000		8,760	a, c, f, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-4	Cobalt compounds	0.0004	0.75	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-4	Methyl ethyl ketone	9.4	18,765	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Sony Magnetics Products Inc. (	31-13-56	85-27-28	Fugitive	Fug3-4	Toluene	2.3	4,545	4x4	2,500	7.5	156	67.7	600,000	40,000	8,760	b, c, g
Total Sony				11		236	472,868									

General Assumptions/Notes
Each emission release point will be modeled separately.
For HEM, all stacks are assumed to be vertical, and all fugitives are assumed to be non-vertical.
Every facility is assumed to be urban, as per EPA request.

Specific Notes
* The original facility coordinates (as provided in Appendix A, Table A-1) were verified and corrected as appropriate. Figures B-1 through B-3 show the facilities for which coordinates were corrected.
[a]Nearest building is estimated at 100 meters^2 (1076.4 ft^2) for modeling building downwash for all point sources.
[b]Assumed building height of 15 feet for all buildings (except 3M, assumed 20 ft based on fugitive stack height of 10 ft). Building area is volume/15; release height is half the building height (15/2 = 7.5 feet).
[c]Assumed release temperature of 67.7 degrees Fahrenheit (293 K
[d]3M stack parameters are from NEI. Used emission release point ID (ERPID) 1 for Fug1, 2 for Stack1, and EU004 for Stack2. Crosswalk based on chemicals emitted at each ERP.
[e]Building area is assumed to be 100 m^2 (1076.4 ft^2).
[f]Diameter given as "4x4." Changed to be sqrt(32)
[g]RTI calculation based on 52 wks/year was changed to 365 days/year for consistency.

APPENDIX C

Toxicity Profiles for Selected HAP

Rules & Implementation
National-Scale Air Toxics Assessment
Urban, Great Waters, Regional Programs
Education & Outreach
About Air Toxics
Pollutants & Sources
State, Local, Tribal Resources
Publications
Contacts
Technical Resources
ATW Home
TTN Home

Cobalt Compounds

Hazard Summary

Cobalt is a natural element found throughout the environment. Acute (short-term) exposure to high levels of cobalt by inhalation in humans and animals results in respiratory effects, such as a significant decrease in ventilatory function, congestion, edema, and hemorrhage of the lung. Respiratory effects are also the major effects noted from chronic (long-term) exposure to cobalt by inhalation, with respiratory irritation, wheezing, asthma, pneumonia, and fibrosis noted. Cardiac effects, congestion of the liver, kidneys, and conjunctiva, and immunological effects have also been noted in chronically-exposed humans. Cobalt is an essential element in humans, as a constituent of vitamin B_{12}. Human studies are inconclusive regarding inhalation exposure to cobalt and cancer, and the one available oral study did not report a correlation between cobalt in the drinking water and cancer deaths. EPA has not classified cobalt for carcinogenicity.

Please Note: The main sources of information for this fact sheet are the Agency for Toxic Substances and Disease Registry's (ATSDR's) *Toxicological Profile for Cobalt* and California Environmental Protection Agency's *Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels*.

Uses

- Cobalt is used to make superalloys (alloys that maintain their strength at high temperatures approaching their melting points) and in pigment manufacture. (1,5)

Sources and Potential Exposure

- Cobalt is a natural element found throughout the environment; the general population may be exposed to cobalt in the air, drinking water, and food. (1,5)
- The average concentration of cobalt in ambient air in the United States is approximately 0.0004 micrograms per cubic meter (µg/m^3). However, higher levels have been detected; in one industrial area, levels of 0.61 µg/m^3 were measured. (1)
- A study found average cobalt levels in drinking water of 2 micrograms per liter (µg/L), but values up to 107 µg/L have been reported. (1)
- The average daily intake of cobalt from food is estimated to be 5 to 40 µg/d. (1)

- Occupational exposure to cobalt may occur, particularly in workers in the hard metal industry. (1)

Assessing Personal Exposure

- Cobalt can be measured in the urine and the blood, for periods up to a few days after the exposure. (1)

Health Hazard Information

Acute Effects:

- Acute exposure to high levels of cobalt by inhalation in humans and animals results in respiratory effects, such as a significant decrease in ventilatory function, congestion, edema, and hemmorhage of the lung. (1)
- Acute animal tests in rats have shown cobalt to have extreme toxicity from inhalation exposure, and moderate to high toxicity from oral exposure. (1,2)

Chronic Effects (Noncancer):

- Cobalt is an essential element in humans and animals as a constituent of vitamin B_{12}. Cobalt has also been used as a treatment for anemia, because it stimulates red blood cell production. (1)
- Chronic exposure to cobalt by inhalation in humans results in effects on the respiratory system, such as respiratory irritation, wheezing, asthma, decreased lung function, pneumonia, and fibrosis. (1,5)
- Other effects noted in humans from inhalation exposure to cobalt include cardiac effects, such as functional effects on the ventricles and enlargement of the heart, congestion of the liver, kidneys, and conjunctiva, and immunological effects that include cobalt sensitization, which can precipitate an asthmatic attack in sensitized individuals. (1,3)
- Cardiovascular effects (cardiomyopathy) were observed in people who consumed large amounts of beer over several years time containing cobalt sulfate as a foam stabilizer. The effects were characterized by cardiogenic shock, sinus tachycardia, left ventricular failure, and enlarged hearts. The beer drinkers ingested cobalt at an average concentration of 0.04 milligrams per kilogram per day (mg/kg/d) to 0.14 mg/kg/d. (1,3)
- Gastrointestinal effects (nausea, vomiting, and diarrhea), effects on the blood, liver injury, and allergic dermatitis have also been reported in humans from oral exposure to cobalt. (1)
- Animal studies have reported respiratory, cardiovascular, and central nervous system (CNS) effects, decreased body weight, necrosis of the thymus, and effects on the blood, liver, and kidneys from inhalation exposure to cobalt. (1,3)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for cobalt.
- The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level of 0.000005 milligrams per cubic meter (mg/m^3) for cobalt based on respiratory effects in rats and mice. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. It is not a direct estimator of risk, but rather a reference point to gauge the potential effects. At

lifetime exposures increasingly greater than the reference exposure level, the potential for adverse health effects increases. (5)

- ATSDR has established an intermediate inhalation minimal risk level (MRL) of 0.00003 mg/m^3 based on respiratory effects in rats. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. (1)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of cobalt in humans via inhalation exposure. In one oral study, no developmental effects on human fetuses were observed following treatment of pregnant women with cobalt chloride. (1)
- Animal studies, via inhalation exposure, have reported testicular atrophy, a decrease in sperm motility, and a significant increase in the length of the estrus cycle, while oral studies have reported stunted growth and decreased survival of newborn pups. These effects on the offspring occurred at levels that also caused maternal toxicity. (1,5)

Cancer Risk:

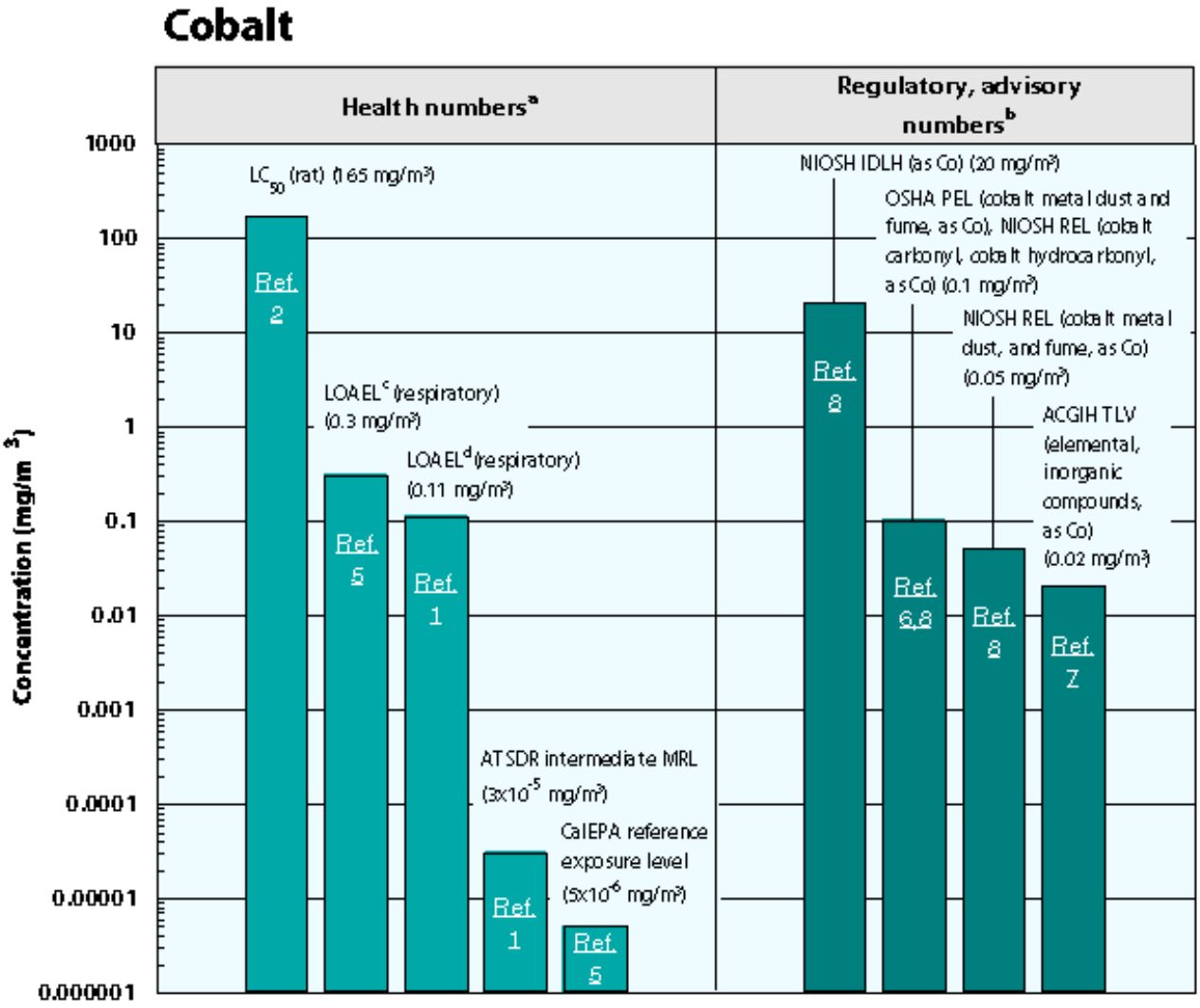
- Limited data are available on the carcinogenic effects of cobalt. In one study on workers that refined and processed cobalt and sodium, an increase in deaths due to lung cancer was found for workers exposed only to cobalt. However, when this study was controlled for date of birth, age at death, and smoking habits, the difference in deaths due to lung cancer was found to not be statistically significant. In another study assessing the correlation between cancer deaths and trace metals in water supplies in the United States, no correlation was found between cancer mortality and the level of cobalt in the water. (1)
- In a study by the National Toxicology Program (NTP), cobalt sulfate heptahydrate exposure via inhalation resulted in increased incidences of alveolar/bronchiolar tumors in rats and mice. (9)
- In an animal study, inhalation of cobalt over a lifetime did not increase the incidence of tumors in hamsters. (1,4)
- Cobalt, via direct injection under the muscles or skin, has been reported to cause tumors at the injection site in animals. (1,4)
- EPA has not classified cobalt for carcinogenicity.

Physical Properties

- Cobalt usually occurs in the environment in association with other metals such as copper, nickel, manganese, and arsenic. (1)
- Pure cobalt is a steel-gray, shiny, hard metal that is insoluble in water. (1)
- The chemical symbol for cobalt is Co, and the atomic weight is 58.93 g/mol. (1,5)

Conversion Factors:
To convert concentrations in air (at 25°C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For cobalt: 1 ppm = 2.4 mg/m^3.

Health Data from Inhalation Exposure



ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
LOAEL--Lowest-observed-adverse-effect level.
NIOSH IDLH--National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.
NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.
OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.
[a] Health numbers are toxicological numbers from animal testing or risk assessment values

developed by EPA.

[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

[c] The LOAEL is from the critical study used as the basis for the CalEPA reference exposure level.

[d] The LOAEL is from the critical study used as the for the ATSDR intermediate MRL.

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Lead Compounds [(a)]

Hazard Summary

Lead is used in the manufacture of batteries, metal products, paints, and ceramic glazes. Exposure to lead can occur from breathing contaminated workplace air or house dust or eating lead-based paint chips or contaminated dirt. Lead is a very toxic element, causing a variety of effects at low dose levels. Brain damage, kidney damage, and gastrointestinal distress are seen from acute (short-term) exposure to high levels of lead in humans. Chronic (long-term) exposure to lead in humans results in effects on the blood, central nervous system (CNS), blood pressure, kidneys, and Vitamin D metabolism. Children are particularly sensitive to the chronic effects of lead, with slowed cognitive development, reduced growth and other effects reported. Reproductive effects, such as decreased sperm count in men and spontaneous abortions in women, have been associated with high lead exposure. The developing fetus is at particular risk from maternal lead exposure, with low birth weight and slowed postnatal neurobehavioral development noted. Human studies are inconclusive regarding lead exposure and cancer.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS), which contains information on the carcinogenic effects of lead, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) *Toxicological Profile for Lead*.

Uses

- The primary use of lead is in the manufacture of batteries. (1)
- Lead is also used in the production of metal products, such as sheet lead, solder (but no longer in food cans), and pipes, and in ceramic glazes, paint, ammunition, cable covering, and other products. (1)
- Tetraethyl lead was used in gasoline to increase the octane rating until lead additives were phased out and eventually banned from use in gasoline in the U.S. by the EPA by 1996. (1)

Sources and Potential Exposure

- The largest source of lead in the atmosphere has been from leaded gasoline combustion, but with the phasedown of lead in gasoline, air lead levels have decreased considerably. Other airborne sources include combustion of solid waste, coal, and oils, emissions from iron and steel production and lead smelters, and tobacco smoke. (1,2)
- Exposure to lead can also occur from food and soil. Children are at particular risk to lead exposure since they commonly put hands, toys, and other items in their mouths, which may come in contact with lead-containing dust and dirt. (1,2)
- Lead-based paints were commonly used until 1978 and flaking paint, paint chips, and weathered paint powder may be a major source of lead exposure, particularly for children. (1,2)
- Lead in drinking water is due primarily to the presence of lead in certain pipes, solder, and fixtures. (1,2)
- Exposure to lead may also occur in the workplace, such as lead smelting and refining industries, steel and iron factories, gasoline stations, and battery manufacturing plants. (1,2)
- Lead has been listed as a pollutant of concern to EPA's Great Waters Program due to its persistence in the environment, potential to bioaccumulate, and toxicity to humans and the environment. (3)

Assessing Personal Exposure

- The amount of lead in the blood can be measured to determine if exposure to lead has occurred. (1,2)
- The level of lead in the blood is measured in micrograms per deciliter (µg/dL).
- Exposure to lead can also be evaluated by measuring erythrocyte protoporphyrin (EP), a component of red blood cells known to increase when the amount of lead in the blood is high. This method was commonly used to screen children for potential lead poisoning. (1,2)
- Methods to measure lead in teeth or bones by X-ray fluorescence techniques are not widely available. (1)

Health Hazard Information

Acute Effects:

- Death from lead poisoning may occur in children who have blood lead levels greater than 125 µg/dL and brain and kidney damage have been reported at blood lead levels of approximately 100 µg/dL in adults and 80 µg/dL in children. (1,2)
- Gastrointestinal symptoms, such as colic, have also been noted in acute exposures at blood lead levels of approximately 60 µg/dL in adults and children. (1,2)
- Short-term (acute) animal tests in rats have shown lead to have moderate to high acute toxicity. (4)

Chronic Effects (Noncancer):

- Chronic exposure to lead in humans can affect the blood. Anemia has been reported in adults at blood lead levels of 50 to 80 µg/dL, and in children at blood lead levels of 40 to 70 µg/dL. (1,2)
- Lead also affects the nervous system. Neurological symptoms have been reported in workers with blood lead levels of 40 to 60 µg/dL, and slowed nerve conduction in peripheral nerves in adults occurs at blood lead levels of 30 to 40 µg/dL. (1,2)
- Children are particularly sensitive to the neurotoxic effects of lead. There is evidence that blood lead levels of 10 to 30 µg/dL, or lower, may affect the hearing threshold and growth in children. (1,2)
- Other effects from chronic lead exposure in humans include effects on blood pressure and kidney function, and interference with vitamin D metabolism. (1,2,5)
- Animal studies have reported effects similar to those found in humans, with effects on the blood, kidneys, and nervous, immune, and cardiovascular systems noted. (1,2,5)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for elemental lead or inorganic lead compounds. (6)
- EPA has established a Reference Dose (RfD) for tetraethyl lead (an organometallic form of lead) of 1 x 10^{-7} milligrams per kilogram body weight per day (mg/kg/d) based on effects in the liver and thymus of rats. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk, but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (7)
- EPA has medium to low confidence in the RfD due to (1) medium to low confidence in the study on which the RfD for tetraethyl lead was based because, although only a few animals per sex per dose level were tested, a good histopathologic exam was conducted and a dose-severity was observed; and (2) medium to low confidence in the data base because some supporting information was available. (7)

Reproductive/Developmental Effects:

- Studies on male lead workers have reported severe depression of sperm count and decreased function of the prostate and/or seminal vesicles at blood lead levels of 40 to 50 µg/dL. These effects may be seen from acute as well as chronic exposures. (1,5)
- Occupational exposure to high levels of lead has been associated with a high likelihood of spontaneous abortion in pregnant women. However, the lowest blood lead levels at which this occurs has not been established. These effects may be seen from acute as well as chronic exposures. (1,5)
- Exposure to lead during pregnancy produces toxic effects on the human fetus, including increased risk of preterm delivery, low birthweight, and impaired mental development. These effects have been noted at maternal blood lead levels of 10 to 15 µg/dL, and possibly lower. Decreased IQ scores have been noted in children at blood lead levels of approximately 10 to 50 µg/dL. (1,2)
- Human studies are inconclusive regarding the association between lead exposure and other birth defects, while animal studies have shown a relationship between high lead exposure and birth defects. (1,5)

Cancer Risk:

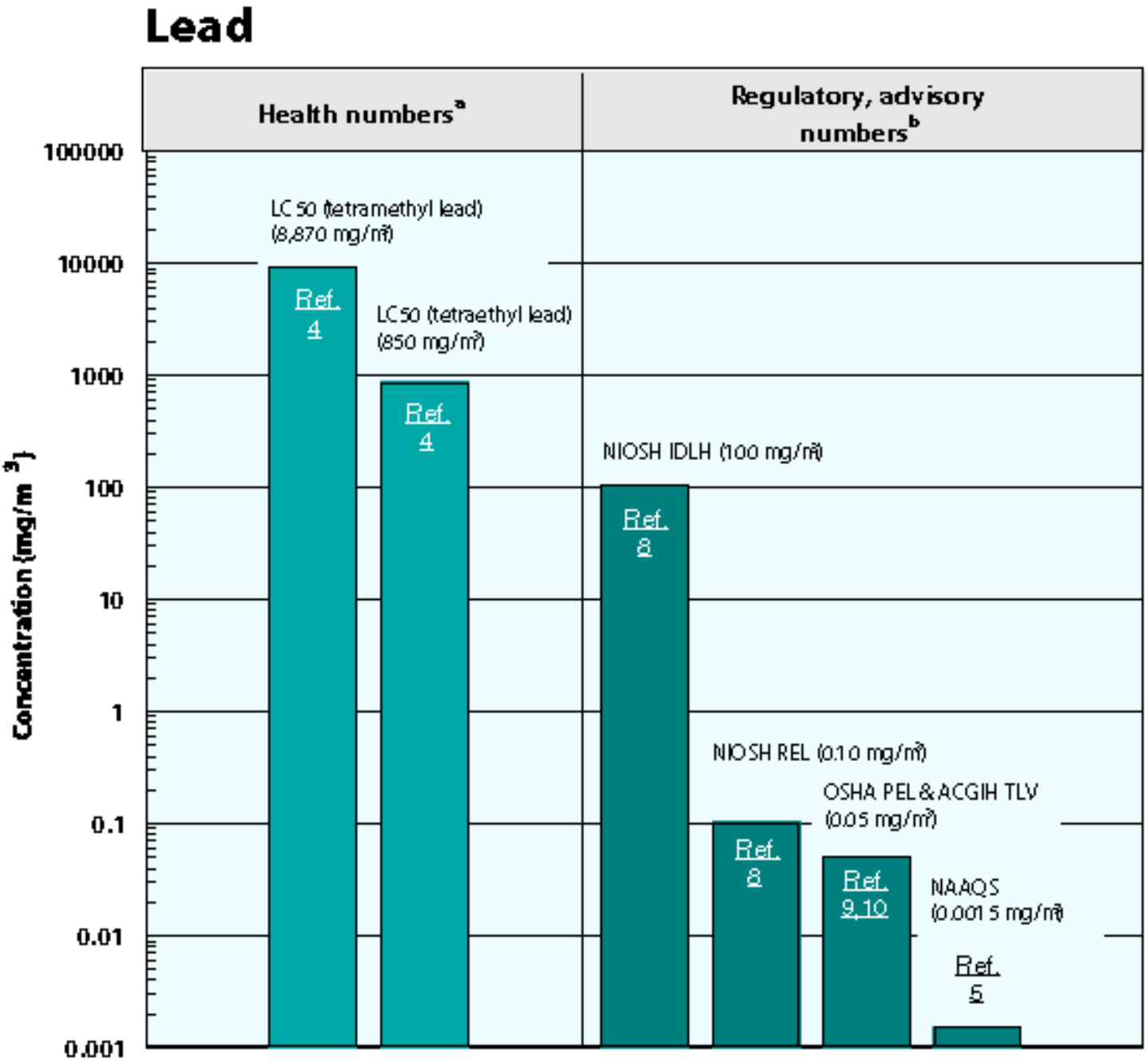
- Human studies are inconclusive regarding lead exposure and an increased cancer risk. Four major human studies of workers exposed to lead have been carried out; two studies did not find an association between lead exposure and cancer, one study found an increased incidence of respiratory tract and kidney cancers, and the fourth study found excesses for lung and stomach cancers. However, all of these studies are limited in usefulness because the route(s) of exposure and levels of lead to which the workers were exposed were not reported. In addition, exposure to other chemicals probably occurred. (1,2,6)
- Animal studies have reported kidney tumors in rats and mice exposed to lead via the oral route. (1,2,5,6)
- EPA considers lead to be a Group B2, probable human carcinogen. (6)

Physical Properties

- Lead is a naturally occurring, bluish-gray metal that is found in small quantities in the earth's crust. (1,2)
- Lead is present in a variety of compounds such as lead acetate, lead chloride, lead chromate, lead nitrate, and lead oxide. (1,2)
- Pure lead is insoluble in water; however, the lead compounds vary in solubility from insoluble to water soluble. (1,2)
- The chemical symbol for lead is Pb and the atomic weight is 207.2 g/mol. (1)
- The vapor pressure for lead is 1.0 mm Hg at 980 °C. (1)

Conversion Factors:
To convert concentrations in air (at 25°C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For lead: 1 ppm = 8.5 mg/m^3.

Health Data from Inhalation Exposure



ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.
NIOSH IDLH -- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.
NAAQS--National Ambient Air Quality Standard. NAAQS set by EPA for pollutants that are considered

to be harmful to public health and the environment; the NAAQS for lead is 1.5 µg/m^3, maximum arithmetic mean averaged over a calendar quarter.
OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.
[a]Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.
[b]Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA and NAAQS numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

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[a] Human exposure to lead occurs through a combination of inhalation and oral exposure, with inhalation generally contributing a greater proportion of the dose for occupationally exposed groups, and the oral route generally contributing a greater proportion of the dose for the general population. The effects of lead are the same regardless of the route of exposure (inhalation or oral) and are correlated with internal exposure, as blood lead levels. For this reason, this fact sheet will not discuss the exposure in terms of route but will present it in terms of blood lead levels.

Methyl Ethyl Ketone (2-Butanone)

78-93-3

Hazard Summary

Methyl ethyl ketone is used as a solvent. Acute (short-term) inhalation exposure to methyl ethyl ketone in humans results in irritation to the eyes, nose, and throat. Limited information is available on the chronic (long-term) effects of methyl ethyl ketone in humans. Chronic inhalation studies in animals have reported slight neurological, liver, kidney, and respiratory effects. No information is available on the developmental, reproductive, or carcinogenic effects of methyl ethyl ketone in humans. Developmental effects, including decreased fetal weight and fetal malformations, have been reported in mice and rats exposed to methyl ethyl ketone via inhalation and ingestion. EPA has classified methyl ethyl ketone as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's *Health Effects Assessment for Methyl Ethyl Ketone* and EPA's Integrated Risk Information System (IRIS), which contains information on inhalation chronic toxicity of methyl ethyl ketone and the RfC and oral chronic toxicity and the RfD.

Uses

- The primary use of methyl ethyl ketone is as a solvent in processes involving gums, resins, cellulose acetate, and cellulose nitrate. (1)
- Methyl ethyl ketone is also used in the synthetic rubber industry, in the production of paraffin wax, and in household products such as lacquer and varnishes, paint remover, and glues. (1)

Sources and Potential Exposure

- Methyl ethyl ketone has been detected in both indoor and outdoor air. Methyl ethyl ketone can

be produced in outdoor air by the photooxidation of certain air pollutants, such as butane and other hydrocarbons. (1)
- Methyl ethyl ketone has been found in drinking water and surface water at a number of sites. (2)
- Exposure to methyl ethyl ketone could also occur at the workplace and through exposure to household products containing the chemical. (1)

Assessing Personal Exposure

- Levels of methyl ethyl ketone in the urine can be measured to determine exposure to the chemical. (1)

Health Hazard Information

Acute Effects:

- Acute exposure of humans to high concentrations of methyl ethyl ketone produces irritation to the eyes, nose, and throat. (1,4)
- Other effects reported from acute inhalation exposure in humans include central nervous system depression, headache, and nausea. (1,4)
- Dermatitis has been reported in humans following dermal exposure to methyl ethyl ketone. (1)
- Tests involving acute exposure of rabbits has shown methyl ethyl ketone to have high acute toxicity from dermal exposure, while acute oral exposure of rats and mice has shown the chemical to have moderate toxicity from ingestion. (5)
- Acute inhalation tests in rats indicate low toxicity from methyl ethyl ketone exposure via inhalation. (5)

Chronic Effects (Noncancer):

- Limited information is available on the chronic effects of methyl ethyl ketone in humans from inhalation exposure. One study reported nerve damage in individuals who sniffed a glue thinner containing methyl ethyl ketone and other chemicals. (1)
- Slight neurological, liver, kidney, and respiratory effects have been reported in chronic inhalation studies of methyl ethyl ketone in animals. (1)
- The Reference Concentration (RfC) for methyl ethyl ketone is 1 milligram per cubic meter (mg/m^3) based on decreased fetal birth weight in mice. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (6)
- EPA has medium confidence in the principal study on which the RfC is based because it is well designed and tested several exposure concentrations and several endpoints of toxicity although there are insufficient data presented for possible respiratory effects; low confidence in the

database because there are no multigenerational studies and only one subchronic study and portal-of-entry effects are not adequately addressed; and, consequently, confidence in the RfC is low. (6)

- The Reference Dose (RfD) for methyl ethyl ketone is 0.6 milligrams per kilogram body weight per day (mg/kg/d) based on decreased fetal birth weight in rats. (6)
- EPA has low confidence in the study on which the RfD is based because lowering the high-dose group from 3.0 to 2.0% confounded determination of the critical effect; low confidence in the database because of the lack of oral data for MEK itself, the absence of data in a second species, and the lack of long-term metabolism data; and, consequently, low confidence in the RfD. (6)

Reproductive/Developmental Effects:

- No information on the reproductive or developmental effects of methyl ethyl ketone in humans was located.
- An inhalation study in mice exposed to methyl ethyl ketone reported decreased fetal weight and fetal malformations. Developmental effects have also been reported in rats following oral and inhalation exposures. (4,7)

Cancer Risk:

- No information on the carcinogenicity of methyl ethyl ketone in humans was located.
- No studies were available on the carcinogenicity of methyl ethyl ketone by the oral or inhalation routes. In a dermal carcinogenicity study, skin tumors were not reported from methyl ethyl ketone exposure. (1,6)
- EPA has classified methyl ethyl ketone as a Group D, not classifiable as to human carcinogenicity, based on a lack of data concerning carcinogenicity in humans and animals. (6)

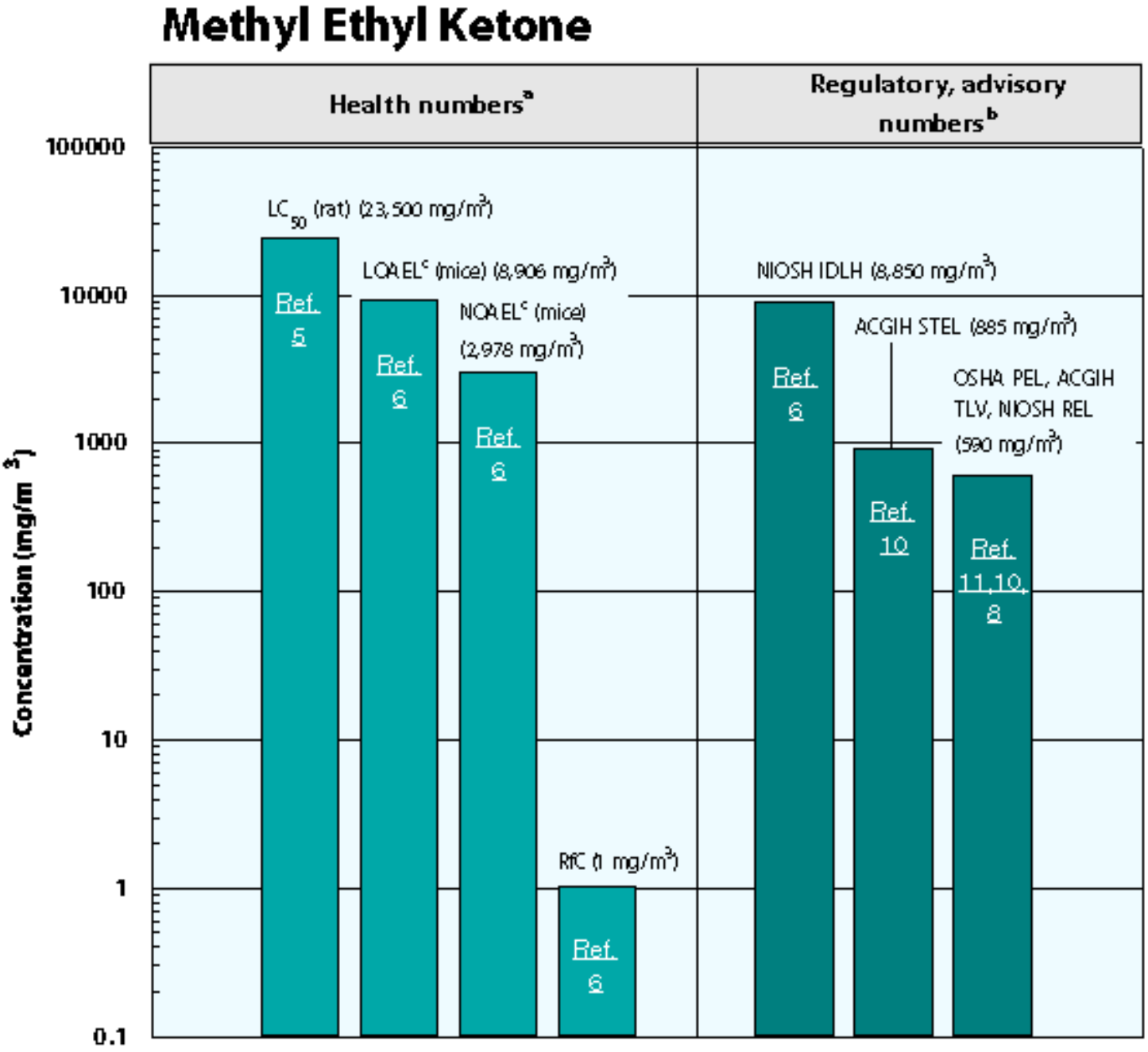
Physical Properties

- Methyl ethyl ketone is a colorless volatile liquid that is soluble in water. (2)
- The odor threshold for methyl ethyl ketone is 5.4 parts per million (ppm), with an acetone-like odor reported. (3)
- The chemical formula for methyl ethyl ketone is C_4H_8O and the molecular weight is 72.10 g/mol. (7,9)
- The vapor pressure for methyl ethyl ketone is 95.1 mm Hg at 25 °C, and it has a log octanol/water partition coefficient (log K_{ow}) of 0.261. (9)
- Methyl ethyl ketone is also referred to as 2-butanone. (6)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For methy ethyl ketone: 1 ppm = 2.95 mg/m^3.

Health Data from Inhalation Exposure



ACGIH STEL--American Conference of Governmental and Industrial Hygienists' short-term exposure limit: 15-min time-weighted-average exposure that should not be exceeded at any time during a workday even if the 8-h time-weighted-average is within the threshold limit value.
ACGIH TLV--ACGIH's threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.
LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.
LOAEL--Lowest-observed-adverse-effect level.
NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit;

NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.
NIOSH IDLH-- NIOSH's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.
NOAEL--No-observed-adverse-effect level.
OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

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[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.
[c] The LOAEL and NOAEL are from the critical study used as the basis for the EPA RfC.

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Toluene

108-88-3

Hazard Summary

Toluene is added to gasoline, used to produce benzene, and used as a solvent. Exposed to toluene may occur from breathing ambient or indoor air. The central nervous system (CNS) is the primary target organ for toluene toxicity in both humans and animals for acute (short-term) and chronic (long-term) exposures. CNS dysfunction and narcosis have been frequently observed in humans acutely exposed to toluene by inhalation; symptoms include fatigue, sleepiness, headaches, and nausea. CNS depression has been reported to occur in chronic abusers exposed to high levels of toluene. Chronic inhalation exposure of humans to toluene also causes irritation of the upper respiratory tract and eyes, sore throat, dizziness, and headache. Human studies have reported developmental effects, such as CNS dysfunction, attention deficits, and minor craniofacial and limb anomalies, in the children of pregnant women exposed to toluene or mixed solvents by inhalation. Reproductive effects, including an association between exposure to toluene and an increased incidence of spontaneous abortions, have also been noted. However, these studies are not conclusive due to many confounding variables. EPA has classified toluene as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS), which contains information on inhalation chronic toxicity of toluene and the RfC, oral chronic toxicity and the RfD, and the carcinogenic effects of toluene, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) *Toxicological Profile for Toluene*.

Uses

- The major use of toluene is as a mixture added to gasoline to improve octane ratings. Toluene is also used to produce benzene and as a solvent in paints, coatings, adhesives, inks, and cleaning agents. (1)
- Toluene is also used in the production of polymers used to make nylon, plastic soda bottles, and polyurethanes and for pharmaceuticals, dyes, cosmetic nail products, and the synthesis of organic chemicals. (1)

Sources and Potential Exposure

- The highest concentrations of toluene usually occur in indoor air from the use of common household products (paints, paint thinners, adhesives, and nail polish) and cigarette smoke. The deliberate inhalation of paint or glue may result in high levels of exposure to toluene, as well as to other chemicals, in solvent abusers. (1)
- Toluene exposure may also occur in the workplace, especially in occupations such as printing or painting, where toluene is frequently used as a solvent. (1)
- Automobile emissions are the principal source of toluene to the ambient air. Toluene may also be released to the ambient air during the production, use, and disposal of industrial and consumer products that contain toluene. (1)
- Levels of toluene measured in rural, urban, and indoor air averaged 1.3, 10.8, and 31.5 micrograms per cubic meter ($\mu g/m^3$), respectively. (1)

Assessing Personal Exposure

- Toluene and its breakdown products can be detected in the blood or urine to determine whether or not exposure has occurred. Metabolites measured in the urine are not specific to toluene, and testing must occur within 12 hours of exposure. (1)

Health Hazard Information

Acute Effects:

- The CNS is the primary target organ for toluene toxicity in both humans and animals for acute and chronic exposures. CNS dysfunction (which is often reversible) and narcosis have been frequently observed in humans acutely exposed to low or moderate levels of toluene by inhalation; symptoms include fatigue, sleepiness, headaches, and nausea. CNS depression and death have occurred at higher levels of exposure. (1)
- Cardiac arrhythmia has also been reported in humans acutely exposed to toluene. (1)
- Following the ingestion of toluene a person died from a severe depression of the CNS. Constriction and necrosis of myocardial fibers, swollen liver, congestion and hemorrhage of the lungs, and tubular kidney necrosis were also reported. (1)
- Acute exposure of animals to toluene has been reported to affect the CNS as well as to decrease resistance to respiratory infection. (1)
- Acute animal tests in rats and mice have demonstrated toluene to have low acute toxicity by inhalation or oral exposure. (1)

Chronic Effects (Noncancer):

- CNS depression has been reported to occur in chronic abusers exposed to high levels of toluene. Symptoms include drowsiness, ataxia, tremors, cerebral atrophy, nystagmus (involuntary eye movements), and impaired speech, hearing, and vision. Neurobehavioral effects have been observed in occupationally exposed workers. (1,2)
- Effects on the CNS have also been observed in studies of animals chronically exposed by inhalation. (1,2)

- Chronic inhalation exposure of humans to toluene causes irritation of the upper respiratory tract and eyes, sore throat, dizziness, headache, and difficulty with sleep. (1,2)
- Inflammation and degeneration of the nasal and respiratory epithelium and pulmonary lesions have been observed in rats and mice chronically exposed to high levels of toluene by inhalation. (1)
- Mild effects on the kidneys and liver have been reported in solvent abusers chronically exposed to toluene vapor. However, these studies are confounded by probable exposure to multiple solvents. (1,2)
- Slight adverse effects on the liver, kidneys, and lung and high-frequency hearing loss have been reported in some chronic inhalation studies of rodents. (1)
- The Reference Concentration (RfC) for toluene is 0.4 milligrams per cubic meter (mg/m^3) based on neurological effects in humans and degeneration of the nasal epithelium in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (2)
- EPA has medium confidence in the studies on which the RfC was based because the neurological study indicates adverse neurological effects of toluene in a small worker population that are consistent with effects occurring at abusive concentrations and the respiratory irritation study was well conducted, examined an adequate number of animals, and performed histopathology on all major organs; medium confidence in the database because even though many chronic laboratory animal studies are available, long-term data in humans are not available for either the neurotoxicity or irritation endpoint; and, consequently, medium confidence in the RfC. (2)
- The Reference Dose (RfD) for toluene is 0.2 milligrams per kilogram body weight per day (mg/kg/d) based on changes in liver and kidney weights in rats. (2)
- EPA has high confidence in the study on which the RfD was based because a sufficient number of animals/sex were tested in each of six dose groups and many parameters were studied; medium confidence in the database because it is supported by a 6-month oral study, but there is no oral reproductive study available; and, consequently, medium confidence in the RfD. (2)

Reproductive/Developmental Effects:

- CNS dysfunction, attention deficits, minor craniofacial and limb anomalies, and developmental delay were observed in the children of pregnant women exposed to toluene or to mixed solvents during solvent abuse. Growth retardation and dysmorphism were reported in infants of another study. However, these studies were confounded by exposure to multiple chemicals. (1,2)
- Children born to toluene abusers have exhibited temporary renal tubular acidosis. (1)
- Paternal exposure (in which the mothers had no occupational exposure to toluene but the fathers did) increased the odds ratio for spontaneous abortions; however, these observations cannot be clearly ascribed to toluene because of the small number of cases evaluated and the large number of confounding variables. An increased incidence of spontaneous abortions was also reported among occupationally exposed women. (1)
- Several inhalation studies have shown toluene to be a developmental toxicant, but not a reproductive toxicant, in rodents. (1)

Cancer Risk:

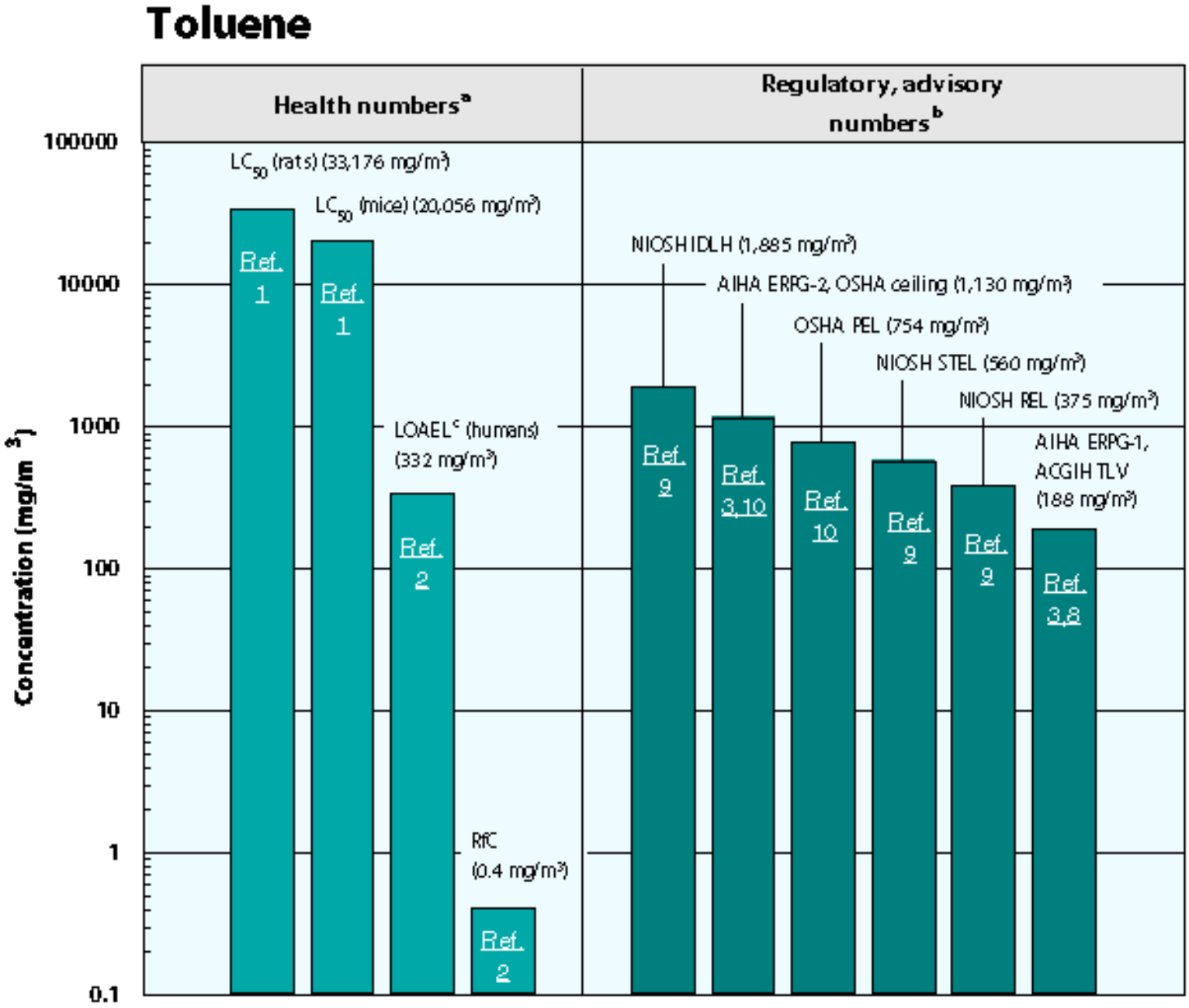
- Two epidemiological studies did not detect a statistically significant increased risk of cancer due to inhalation exposure to toluene. However, these studies were limited due to the size of the study population and lack of historical monitoring data. (1)
- Chronic inhalation exposure of rats did not produce an increased incidence of treatment-related neoplastic lesions. (1,2)
- EPA has classified toluene as a Group D, not classifiable as to human carcinogenicity. (2)

Physical Properties

- The chemical formula for toluene is $C_6H_5CH_3$, and its molecular weight is 92.15 g/mol. (1,4)
- Toluene occurs as a colorless, flammable, refractive liquid, that is slightly soluble in water. (1,5)
- Toluene has a sweet, pungent odor, with an odor threshold of 2.9 parts per million (ppm). (1,6)
- The vapor pressure for toluene is 28.4 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is 2.69. (1)

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For toluene: 1 ppm = 3.77 mg/m^3.

Health Data from Inhalation Exposure



AIHA ERPG--American Industrial Hygiene Association's emergency response planning guidelines. ERPG 1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor; ERPG 2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing or developing irreversible or other serious health effects that could impair their abilities to take protective action.

ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC_{50} (Lethal Concentration$_{50}$)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL--Lowest-observed-adverse-effect level.

NIOSH IDLH -- National Institute of Occupational Safety and Health's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure

condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.
NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.
NIOSH STEL--NIOSH's recommended short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.
OSHA ceiling--Occupational Safety and Health Administration's permissible exposure limit ceiling value; the concentration of a substance that should not be exceeded at any time.
OSHA PEL--OSHA's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.
[a] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.
[b] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH, ACGIH, and AIHA numbers are advisory.
[c] This LOAEL is from the critical study used as the basis for the EPA RfC.

References

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APPENDIX D

Summary of HEM-Screen Input Data and HEM-Screen Output Files

Table D-1
Summary of HEM Inputs

Facility	Emission Release Point	Vert/Non	Non-cancer Emissions	Cancer Emissions	Stack Height (m)	Area (m2)	Stack Diameter (m)	Gas Exit Velocity (m/s)	Temperature (K)
Quantegy Inc.	Stack1	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack2	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack3	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack4	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack5	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack6	Vert	2.09E+00	0.00E+00	5.1816	0	0.82296	1.312537541	310.9277778
	Stack7	Vert	1.81E-01	0.00E+00	7.62	0	0.4572	0.119788515	322.0388889
	Stack8	Vert	2.27E+01	0.00E+00	15.91056	0	0.88392	0.202117335	375.65
	Fug1-1	Non-vert	3.03E+00	0.00E+00	2.286	26.70652723	0	0	292.9833333
	Fug1-2	Non-vert	3.03E+00	0.00E+00	2.286	209.03184	0	0	292.9833333
	Fug1-3	Non-vert	1.06E+01	0.00E+00	2.286	1059.775945	0	0	292.9833333
	Fug2-1	Non-vert	3.03E+00	0.00E+00	2.286	5.437924608	0	0	292.9833333
	Fug2-2	Non-vert	3.03E+00	0.00E+00	2.286	8.91869184	0	0	292.9833333
	Fug2-3	Non-vert	3.03E+00	0.00E+00	2.286	1027.105043	0	0	292.9833333
	Fug2-4	Non-vert	1.06E+01	0.00E+00	2.286	2573.649562	0	0	292.9833333
	Fug3-1	Non-vert	3.03E+00	0.00E+00	2.286	3.833798784	0	0	292.9833333
	Fug3-2	Non-vert	3.03E+00	0.00E+00	2.286	15.3290016	0	0	292.9833333
	Fug3-3	Non-vert	3.03E+00	0.00E+00	2.286	91.9740096	0	0	292.9833333
	Fug3-4	Non-vert	3.03E+00	0.00E+00	2.286	46.2966816	0	0	292.9833333
	Fug3-5	Non-vert	1.06E+01	0.00E+00	2.286	328.4741818	0	0	292.9833333
JVC Magnetics America Co.	Fug1	Non-vert	6.98E+01	0.00E+00	2.286	1796.94918	0	0	292.9833333
	Fug2	Non-vert	6.01E+01	0.00E+00	2.286	1757.285776	0	0	292.9833333
	Fug3	Non-vert	6.98E+00	0.00E+00	2.286	1571.671695	0	0	292.9833333
	Fug4	Non-vert	2.79E+00	0.00E+00	2.286	334.9464269	0	0	292.9833333
3M Magnetic Tape Manufacturing Division	Fug1	Non-vert	1.46E+01	0.00E+00	3.048	100.0008323	0	9.144E-05	295.3722222
	Stack1	Vert	8.20E+01	0.00E+00	13.53312047	0	0.853439985	9.479280116	375.9277778
	Stack2	Vert	2.18E+00	0.00E+00	15.75816023	0	0.670560015	7.101839767	439.4833299
Eastman Kodak Co. - Kodak Park	Stack1	Vert	7.10E+00	0.00E+00	30.48	0	3.6576	7.622295699	310.9277778
	Stack2	Vert	1.59E+00	0.00E+00	22.2504	0	0.1524	0.776167482	292.9833333
	Stack3	Vert	9.07E-03	0.00E+00	22.5552	0	0.381	15.31637165	292.9833333
Imation Enterprises Corp.	Stack1	Vert	1.82E+00	2.47E-04	9.144	0	1.0668	15.8401527	477.5944444
	Stack2	Vert	9.36E-01	0.00E+00	9.144	0	1.0668	15.8401527	477.5944444
	Stack3	Vert	9.36E-01	0.00E+00	9.144	0	1.0668	15.8401527	477.5944444
	Fug1	Non-vert	7.26E-04	0.00E+00	2.286	100.0008323	0	0	292.9833333
Sony Magnetics Products Inc. of America	Fug1	Non-vert	2.63E+03	0.00E+00	2.286	464.5152	0	0	292.9833333
	Fug2-1	Vert	2.73E+01	0.00E+00	15.24	0	1.724209175	41.275	292.9833333
	Fug2-2	Vert	2.06E+01	0.00E+00	15.24	0	1.724209175	41.275	292.9833333
	Fug2-3	Vert	2.40E+01	0.00E+00	15.24	0	1.724209175	41.275	292.9833333
	Fug2-4	Vert	1.03E+01	0.00E+00	15.24	0	1.724209175	41.275	292.9833333
	Fug3-1	Vert	2.73E+01	0.00E+00	15.24	0	1.724209175	47.625	292.9833333
	Fug3-2	Vert	2.06E+01	0.00E+00	15.24	0	1.724209175	47.625	292.9833333
	Fug3-3	Vert	2.40E+01	0.00E+00	15.24	0	1.724209175	47.625	292.9833333
	Fug3-4	Vert	1.03E+01	0.00E+00	15.24	0	1.724209175	47.625	292.9833333
	Stack1	Vert	4.33E+00	0.00E+00	15.24	0	1.724209175	41.275	292.9833333
	Stack2	Vert	4.33E+00	0.00E+00	15.24	0	1.724209175	47.625	292.9833333

TABLE D-2
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 4/20/2004 Time: 08:50
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
3M Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\3m.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50 km
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	1.37E-02	79	1.08E+00
MIN:	1.76E-06	144,000	1.04E+01

Level	Concentrat	Population	Exposure
1	1.37E-02	79	1.08E+00
2	1.00E-02	79	1.08E+00
3	5.00E-03	79	1.08E+00
4	2.50E-03	519	2.45E+00
5	1.00E-03	2,140	4.91E+00
6	5.00E-04	5,570	7.15E+00
7	2.50E-04	9,930	8.70E+00
8	1.00E-04	13,900	9.45E+00
9	5.00E-05	15,200	9.54E+00
10	2.50E-05	17,300	9.61E+00
11	1.00E-05	37,700	9.87E+00
12	5.00E-06	70,400	1.01E+01
13	2.50E-06	133,000	1.03E+01
14	1.74E-06	144,000	1.04E+01

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	1.37E-02	79	1.08E+00
MIN:	1.76E-06	144,000	1.04E+01

Level	Risk Level	Population	Exposure * Unit Risk
1	1.37E-02	79	1.08E+00
2	1.00E-02	79	1.08E+00
3	5.00E-03	79	1.08E+00
4	2.50E-03	519	2.45E+00
5	1.00E-03	2,140	4.91E+00
6	5.00E-04	5,570	7.15E+00
7	2.50E-04	9,930	8.70E+00
8	1.00E-04	13,900	9.45E+00
9	5.00E-05	15,200	9.54E+00
10	2.50E-05	17,300	9.61E+00
11	1.00E-05	37,700	9.87E+00
12	5.00E-06	70,400	1.01E+01
13	2.50E-06	133,000	1.03E+01
14	1.74E-06	144,000	1.04E+01

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposi	Annual Inc	Repeat Interrval
3 3M Man	1.37E-02	79	1.08E+00	1.08E+00	1.37E-02	1.76E-06	144,000	1.04E+01	0.15	6.8

*** END OF REPORT ***

TABLE D-3
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 4/20/2004 Time: 14:17
Chemical Name: tape Unit Risk: 6.67E-01

REPORT DESCRIPTION
3M Lead Only to Determine Annual Average Air Concentration

MODELING OPTIONS
Input File Name: c:\hem\input\3mpb2.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50 km
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentration	Population	Exposure
MAX:	3.18E-04	79	2.51E-02
MIN:	5.53E-08	144,000	2.95E-01

Level	Concentration	Population	Exposure
1	3.18E-04	79	2.51E-02
2	2.50E-04	79	2.51E-02
3	1.00E-04	79	2.51E-02
4	5.00E-05	1,010	9.02E-02
5	2.50E-05	2,370	1.38E-01
6	1.00E-05	8,000	2.27E-01
7	5.00E-06	13,000	2.64E-01
8	2.50E-06	14,100	2.68E-01
9	1.00E-06	16,200	2.71E-01
10	5.00E-07	20,400	2.74E-01
11	2.50E-07	46,800	2.83E-01
12	1.00E-07	108,000	2.92E-01
13	5.47E-08	144,000	2.95E-01

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	2.12E-04	79	1.68E-02
MIN:	3.69E-08	144,000	1.97E-01

Level	Risk Level	Population	Exposure * Unit Risk
1	2.12E-04	79	1.68E-02
2	1.00E-04	79	1.68E-02
3	5.00E-05	494	4.01E-02
4	2.50E-05	1,450	7.32E-02
5	1.00E-05	5,460	1.31E-01
6	5.00E-06	9,930	1.63E-01
7	2.50E-06	13,400	1.77E-01
8	1.00E-06	15,200	1.80E-01
9	5.00E-07	17,400	1.81E-01
10	2.50E-07	25,800	1.84E-01
11	1.00E-07	72,100	1.92E-01
12	5.00E-08	136,000	1.96E-01
13	3.65E-08	144,000	1.97E-01

HEM COMPLETE RESULTS

Source	Max Concentr	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
32 3M Mai	3.18E-04	79	2.51E-02	1.68E-02	2.12E-04	5.53E-08	144,000	2.95E-01	0.0028	360

*** END OF REPORT ***

TABLE D-4
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 5/18/2004 Time: 11:44
Chemical Name: tape-cancer Unit Risk: 1.00E+00

REPORT DESCRIPTION
Imation Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\imationc.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	1.20E-08	6	7.20E-08
MIN:	3.07E-12	56,300	8.52E-06

Level	Concentrat	Population	Exposure
1	1.20E-08	6	7.20E-08
2	1.00E-08	6	7.20E-08
3	5.00E-09	39	3.70E-07
4	2.50E-09	679	2.32E-06
5	1.00E-09	2,160	4.58E-06
6	5.00E-10	3,950	5.93E-06
7	2.50E-10	8,080	7.31E-06
8	1.00E-10	11,400	7.93E-06
9	5.00E-11	13,600	8.07E-06
10	2.50E-11	16,500	8.16E-06
11	1.00E-11	33,400	8.37E-06
12	5.00E-12	52,000	8.50E-06
13	3.07E-12	56,300	8.52E-06

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	1.20E-08	6	7.20E-08
MIN:	3.07E-12	56,300	8.52E-06

Level	Risk Level	Population	Exposure * Unit Risk
1	1.20E-08	6	7.20E-08
2	1.00E-08	6	7.20E-08
3	5.00E-09	39	3.70E-07
4	2.50E-09	679	2.32E-06
5	1.00E-09	2,160	4.58E-06
6	5.00E-10	3,950	5.93E-06
7	2.50E-10	8,080	7.31E-06
8	1.00E-10	11,400	7.93E-06
9	5.00E-11	13,600	8.07E-06
10	2.50E-11	16,500	8.16E-06
11	1.00E-11	33,400	8.37E-06
12	5.00E-12	52,000	8.50E-06
13	3.07E-12	56,300	8.52E-06

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
52 Imation	1.20E-08	6	7.20E-08	7.20E-08	1.20E-08	3.07E-12	56,300	8.52E-06	<0.0001	**********

*** END OF REPORT ***

TABLE D-5
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 5/18/2004 Time: 11:43
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
Imation Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\imation.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	1.79E-04	6	1.08E-03
MIN:	4.59E-08	56,300	1.27E-01

Level	Concentrat	Population	Exposure
1	1.79E-04	6	1.08E-03
2	1.00E-04	39	5.54E-03
3	5.00E-05	78	7.78E-03
4	2.50E-05	951	4.38E-02
5	1.00E-05	3,440	8.43E-02
6	5.00E-06	5,640	9.90E-02
7	2.50E-06	10,200	1.16E-01
8	1.00E-06	12,000	1.19E-01
9	5.00E-07	14,400	1.21E-01
10	2.50E-07	17,700	1.22E-01
11	1.00E-07	42,600	1.26E-01
12	5.00E-08	56,000	1.27E-01
13	4.59E-08	56,300	1.27E-01

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	1.79E-04	6	1.08E-03
MIN:	4.59E-08	56,300	1.27E-01

Level	Risk Level	Population	Exposure * Unit Risk
1	1.79E-04	6	1.08E-03
2	1.00E-04	39	5.54E-03
3	5.00E-05	78	7.78E-03
4	2.50E-05	951	4.38E-02
5	1.00E-05	3,440	8.43E-02
6	5.00E-06	5,640	9.90E-02
7	2.50E-06	10,200	1.16E-01
8	1.00E-06	12,000	1.19E-01
9	5.00E-07	14,400	1.21E-01
10	2.50E-07	17,700	1.22E-01
11	1.00E-07	42,600	1.26E-01
12	5.00E-08	56,000	1.27E-01
13	4.59E-08	56,300	1.27E-01

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
51 Imation	1.79E-04	6	1.08E-03	1.08E-03	1.79E-04	4.59E-08	56,300	1.27E-01	0.0018	550

*** END OF REPORT ***

TABLE D-6
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 4/20/2004 Time: 09:01
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
JVC Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\jvc.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50 km
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	1.93E-02	105	2.02E+00
MIN:	3.82E-06	227,000	2.03E+01

Level	Concentrat	Population	Exposure
1	3.19E-02		0.00E+00
3	1.00E-02	105	2.02E+00
4	5.00E-03	116	2.10E+00
5	2.50E-03	682	3.87E+00
6	1.00E-03	2,250	6.17E+00
7	5.00E-04	6,660	9.10E+00
8	2.50E-04	13,100	1.14E+01
9	1.00E-04	34,200	1.46E+01
10	5.00E-05	69,100	1.71E+01
11	2.50E-05	126,000	1.91E+01
12	1.00E-05	175,000	1.99E+01
13	5.00E-06	224,000	2.03E+01
14	3.80E-06	227,000	2.03E+01

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	1.93E-02	105	2.02E+00
MIN:	3.82E-06	227,000	2.03E+01

Level	Risk Level	Population	Exposure * Unit Risk
1	3.19E-02		0.00E+00
3	1.00E-02	105	2.02E+00
4	5.00E-03	116	2.10E+00
5	2.50E-03	682	3.87E+00
6	1.00E-03	2,250	6.17E+00
7	5.00E-04	6,660	9.10E+00
8	2.50E-04	13,100	1.14E+01
9	1.00E-04	34,200	1.46E+01
10	5.00E-05	69,100	1.71E+01
11	2.50E-05	126,000	1.91E+01
12	1.00E-05	175,000	1.99E+01
13	5.00E-06	224,000	2.03E+01
14	3.80E-06	227,000	2.03E+01

HEM COMPLETE RESULTS

Source	Max Conce	Max People	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Expos	Annual Inci	Repeat Interrval
2 JVC	1.93E-02	105	2.02E+00	2.02E+00	1.93E-02	3.82E-06	227,000	2.03E+01	0.29	3.5

*** END OF REPORT ***

TABLE D-7
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 4/21/2004 Time: 14:47
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
Kodak Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\kodak.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	2.14E-04	11	2.35E-03
MIN:	8.94E-08	958,000	2.87E+00

Level	Concentrat	Population	Exposure
1	2.14E-04	11	2.35E-03
2	1.00E-04	860	1.22E-01
3	5.00E-05	4,520	3.69E-01
4	2.50E-05	16,000	7.55E-01
5	1.00E-05	66,300	1.52E+00
6	5.00E-06	125,000	1.93E+00
7	2.50E-06	229,000	2.29E+00
8	1.00E-06	443,000	2.63E+00
9	5.00E-07	655,000	2.78E+00
10	2.50E-07	820,000	2.84E+00
11	1.00E-07	957,000	2.87E+00
12	8.94E-08	958,000	2.87E+00

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	2.14E-04	11	2.35E-03
MIN:	8.94E-08	958,000	2.87E+00

Level	Risk Level	Population	Exposure * Unit Risk
1	2.14E-04	11	2.35E-03
2	1.00E-04	860	1.22E-01
3	5.00E-05	4,520	3.69E-01
4	2.50E-05	16,000	7.55E-01
5	1.00E-05	66,300	1.52E+00
6	5.00E-06	125,000	1.93E+00
7	2.50E-06	229,000	2.29E+00
8	1.00E-06	443,000	2.63E+00
9	5.00E-07	655,000	2.78E+00
10	2.50E-07	820,000	2.84E+00
11	1.00E-07	957,000	2.87E+00
12	8.94E-08	958,000	2.87E+00

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
4 Kodak	2.14E-04	11	2.35E-03	2.35E-03	2.14E-04	8.94E-08	958,000	2.87E+00	0.041	24

*** END OF REPORT ***

TABLE D-8
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 5/18/2004 Time: 11:45
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
Quantegy Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\quantegy.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	8.10E-03	24	1.94E-01
MIN:	1.62E-06	446,000	1.58E+01

Level	Concentrat	Population	Exposure
1	2.78E-02		0.00E+00
4	5.00E-03	146	9.05E-01
5	2.50E-03	644	3.13E+00
6	1.00E-03	1,940	4.67E+00
7	5.00E-04	3,640	5.76E+00
8	2.50E-04	7,570	7.11E+00
9	1.00E-04	26,600	9.70E+00
10	5.00E-05	69,300	1.29E+01
11	2.50E-05	81,300	1.33E+01
12	1.00E-05	129,000	1.40E+01
13	5.00E-06	363,000	1.54E+01
14	2.50E-06	446,000	1.58E+01
15	1.62E-06	446,000	1.58E+01

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	8.10E-03	24	1.94E-01
MIN:	1.62E-06	446,000	1.58E+01

Level	Risk Level	Population	Exposure * Unit Risk
1	2.78E-02		0.00E+00
4	5.00E-03	146	9.05E-01
5	2.50E-03	644	3.13E+00
6	1.00E-03	1,940	4.67E+00
7	5.00E-04	3,640	5.76E+00
8	2.50E-04	7,570	7.11E+00
9	1.00E-04	26,600	9.70E+00
10	5.00E-05	69,300	1.29E+01
11	2.50E-05	81,300	1.33E+01
12	1.00E-05	129,000	1.40E+01
13	5.00E-06	363,000	1.54E+01
14	2.50E-06	446,000	1.58E+01
15	1.62E-06	446,000	1.58E+01

HEM COMPLETE RESULTS

Source	Max Conce	Max People	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
1 Quanteg	8.10E-03	24	1.94E-01	1.94E-01	8.10E-03	1.62E-06	446,000	1.58E+01	0.23	4.4

*** END OF REPORT ***

TABLE D-9
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 5/18/2004 Time: 11:46
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
Sony Non-Cancer Risks

MODELING OPTIONS
Input File Name: c:\hem\input\sony.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	2.13E-01	264	5.62E+01
MIN:	7.77E-05	227,000	6.53E+02

Level	Concentrat	Population	Exposure
1	2.50E-01		0.00E+00
2	1.00E-01	712	1.33E+02
3	5.00E-02	2,560	2.77E+02
4	2.50E-02	4,010	3.29E+02
5	1.00E-02	9,790	4.13E+02
6	5.00E-03	20,100	4.83E+02
7	2.50E-03	39,900	5.51E+02
8	1.00E-03	69,900	6.00E+02
9	5.00E-04	98,300	6.20E+02
10	2.50E-04	161,000	6.41E+02
11	1.00E-04	225,000	6.53E+02
12	7.77E-05	227,000	6.53E+02

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	2.13E-01	264	5.62E+01
MIN:	7.77E-05	227,000	6.53E+02

Level	Risk Level	Population	Exposure * Unit Risk
1	2.50E-01		0.00E+00
2	1.00E-01	712	1.33E+02
3	5.00E-02	2,560	2.77E+02
4	2.50E-02	4,010	3.29E+02
5	1.00E-02	9,790	4.13E+02
6	5.00E-03	20,100	4.83E+02
7	2.50E-03	39,900	5.51E+02
8	1.00E-03	69,900	6.00E+02
9	5.00E-04	98,300	6.20E+02
10	2.50E-04	161,000	6.41E+02
11	1.00E-04	225,000	6.53E+02
12	7.77E-05	227,000	6.53E+02

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
6 Sony	2.13E-01	264	5.62E+01	5.62E+01	2.13E-01	7.77E-05	227,000	6.53E+02	9.3	0.11

*** END OF REPORT ***

TABLE D-10
HUMAN EXPOSURE MODEL
STANDARD SUMMARY REPORT

Date: 5/18/2004 Time: 11:47
Chemical Name: tape Unit Risk: 1.00E+00

REPORT DESCRIPTION
Sony Cobalt Only to Determine Percent of Total Risk Attributed to Cobalt

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MODELING OPTIONS
Input File Name: c:\hem\input\sonyco.hem
Radii Set: 0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50
Census Data: 2000
Atmospheric Decay: No

HEM EXPOSURE RESULTS

	Concentrat	Population	Exposure
MAX:	2.09E-01	264	5.53E+01
MIN:	7.43E-05	227,000	6.33E+02

Level	Concentrat	Population	Exposure
1	2.47E-01		0.00E+00
2	1.00E-01	712	1.31E+02
3	5.00E-02	2,510	2.69E+02
4	2.50E-02	3,880	3.19E+02
5	1.00E-02	9,490	4.00E+02
6	5.00E-03	19,400	4.67E+02
7	2.50E-03	38,000	5.31E+02
8	1.00E-03	68,500	5.81E+02
9	5.00E-04	94,700	5.99E+02
10	2.50E-04	155,000	6.20E+02
11	1.00E-04	224,000	6.33E+02
12	7.43E-05	227,000	6.33E+02

HEM RISK RESULTS

	Risk Level	Population	Exposure * Risk
MAX:	2.09E-01	264	5.53E+01
MIN:	7.43E-05	227,000	6.33E+02

Level	Risk Level	Population	Exposure * Unit Risk
1	2.47E-01		0.00E+00
2	1.00E-01	712	1.31E+02
3	5.00E-02	2,510	2.69E+02
4	2.50E-02	3,880	3.19E+02
5	1.00E-02	9,490	4.00E+02
6	5.00E-03	19,400	4.67E+02
7	2.50E-03	38,000	5.31E+02
8	1.00E-03	68,500	5.81E+02
9	5.00E-04	94,700	5.99E+02
10	2.50E-04	155,000	6.20E+02
11	1.00E-04	224,000	6.33E+02
12	7.43E-05	227,000	6.33E+02

HEM COMPLETE RESULTS

Source	Max Conce	Max Peopl	Max Expos	Lifetime In	Max Risk	Min Conce	Min People	Min Exposu	Annual Inci	Repeat Interrval
62 Sony C	2.09E-01	264	5.53E+01	5.53E+01	2.09E-01	7.43E-05	227,000	6.33E+02	9	0.11

*** END OF REPORT ***

APPENDIX E

SCREEN3 Modeling Summary Tables

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Emission type	Pollutant	Emissions, tpy	Stack height, ft	Stack diameter, ft	Building Area, ft^2	Stack flowrate, ft^3/min
62	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Antimony	3.15E-03	44.4	2.80		
54	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Ethyl benzene	4.50E-02	44.4	2.80		
55	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Ethylene glycol	6.75E-03	44.4	2.80		
63	3M Magnetic Tape Manufacturing Division	Stack2	Stack	Lead compounds	3.60E-03	51.7	2.20		
51	3M Magnetic Tape Manufacturing Division	Fug1	Fugitive	MEK	1.47E+01	10.0	0.00	1,076	
58	3M Magnetic Tape Manufacturing Division	Stack1	Stack	MEK	2.40E+01	44.4	2.80		
57	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Methanol	1.17E+01	44.4	2.80		
59	3M Magnetic Tape Manufacturing Division	Stack1	Stack	MIBK	1.50E-01	44.4	2.80		
50	3M Magnetic Tape Manufacturing Division	Fug1	Fugitive	n-Hexane	4.50E-02	10.0	0.00	1,076	
56	3M Magnetic Tape Manufacturing Division	Stack1	Stack	n-Hexane	2.55E+00	44.4	2.80		
52	3M Magnetic Tape Manufacturing Division	Fug1	Fugitive	Toluene	5.10E+00	10.0	0.00	1,076	
60	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Toluene	2.10E+01	44.4	2.80		
53	3M Magnetic Tape Manufacturing Division	Fug1	Fugitive	Xylenes	1.95E-02	10.0	0.00	1,076	
61	3M Magnetic Tape Manufacturing Division	Stack1	Stack	Xylenes	1.50E-01	44.4	2.80		
67	Eastman Kodak Co. - Kodak Park	Stack2	Stack	Cobalt	5.00E-07	73.0	0.50		30
68	Eastman Kodak Co. - Kodak Park	Stack3	Stack	Cobalt	1.00E-06	74.0	1.25		3,700
66	Eastman Kodak Co. - Kodak Park	Stack2	Stack	Hydrogen chloride	3.50E-02	73.0	0.50		30
64	Eastman Kodak Co. - Kodak Park	Stack1	Stack	Methyl ethyl ketone	1.22E+00	100.0	12.00		169,697
65	Eastman Kodak Co. - Kodak Park	Stack1	Stack	Toluene	3.03E+00	100.0	12.00		169,697
70	Imation Enterprises Corp.	Stack1	Stack	Acrylonitrile	4.00E-03	30.0	3.50		30,000
72	Imation Enterprises Corp.	Stack2	Stack	Methanol	1.00E-02	30.0	3.50		30,000
75	Imation Enterprises Corp.	Stack3	Stack	Methanol	1.00E-02	30.0	3.50		30,000
69	Imation Enterprises Corp.	Stack1	Stack	Methyl ethyl ketone	5.00E-03	30.0	3.50		30,000
73	Imation Enterprises Corp.	Stack2	Stack	Methyl ethyl ketone	2.71E+00	30.0	3.50		30,000
76	Imation Enterprises Corp.	Stack3	Stack	Methyl ethyl ketone	2.71E+00	30.0	3.50		30,000
77	Imation Enterprises Corp.	Fug1	Fugitive	Methyl ethyl ketone	4.00E-03	7.5		1,076	
71	Imation Enterprises Corp.	Stack2	Stack	Toluene	1.95E-01	30.0	3.50		30,000
74	Imation Enterprises Corp.	Stack3	Stack	Toluene	1.95E-01	30.0	3.50		30,000
43	JVC Magnetics America Co.	Fug1	Fugitive	Methyl ethyl ketone	4.19E+01	7.5		19,342	
45	JVC Magnetics America Co.	Fug2	Fugitive	Methyl ethyl ketone	3.60E+01	7.5		18,915	
47	JVC Magnetics America Co.	Fug3	Fugitive	Methyl ethyl ketone	4.19E+00	7.5		16,917	
49	JVC Magnetics America Co.	Fug4	Fugitive	Methyl ethyl ketone	1.67E+00	7.5		3,605	
42	JVC Magnetics America Co.	Fug1	Fugitive	Toluene	2.74E+01	7.5		19,342	
44	JVC Magnetics America Co.	Fug2	Fugitive	Toluene	2.36E+01	7.5		18,915	
46	JVC Magnetics America Co.	Fug3	Fugitive	Toluene	2.74E+00	7.5		16,917	
48	JVC Magnetics America Co.	Fug4	Fugitive	Toluene	1.10E+00	7.5		3,605	

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Stack velocity, ft/s	Stack temperature, deg F	Emissions, lb/yr	Operating hr/yr	Concentration, ug/m^3	Distance, m
62	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	6.30	8,760	6.31E-03	101
54	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	90.00	8,760	9.01E-02	101
55	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	13.50	8,760	1.35E-02	101
63	3M Magnetic Tape Manufacturing Division	Stack2	23.30	331.3999939	7.20	8,760	8.08E-03	102
51	3M Magnetic Tape Manufacturing Division	Fug1	0.00	72	29,400.00	8,760	1.49E+03	100
58	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	48,000.00	8,760	4.80E+01	101
57	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	23,400.00	8,760	2.34E+01	101
59	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	300.00	8,760	3.00E-01	101
50	3M Magnetic Tape Manufacturing Division	Fug1	0.00	72	90.00	8,760	4.56E+00	100
56	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	5,100.00	8,760	5.10E+00	101
52	3M Magnetic Tape Manufacturing Division	Fug1	0.00	72	10,200.00	8,760	5.16E+02	100
60	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	42,000.00	8,760	4.20E+01	101
53	3M Magnetic Tape Manufacturing Division	Fug1	0.00	72	39.00	8,760	1.97E+00	100
61	3M Magnetic Tape Manufacturing Division	Stack1	31.10	217	300.00	8,760	3.00E-01	101
67	Eastman Kodak Co. - Kodak Park	Stack2	2.55	67.7	0.00	630	6.75E-05	100
68	Eastman Kodak Co. - Kodak Park	Stack3	50.25	67.7	0.00	630	5.31E-05	131
66	Eastman Kodak Co. - Kodak Park	Stack2	2.55	67.7	70.00	630	4.73E+00	100
64	Eastman Kodak Co. - Kodak Park	Stack1	25.01	100	2,434.23	3,000	1.32E+00	1079
65	Eastman Kodak Co. - Kodak Park	Stack1	25.01	100	6,065.77	3,000	3.30E+00	1079
70	Imation Enterprises Corp.	Stack1	51.97	400	8.00	6,257	5.72E-03	100
72	Imation Enterprises Corp.	Stack2	51.97	400	20.00	6,257	1.43E-02	100
75	Imation Enterprises Corp.	Stack3	51.97	400	20.00	6,257	1.43E-02	100
69	Imation Enterprises Corp.	Stack1	51.97	400	10.00	6,257	7.15E-03	100
73	Imation Enterprises Corp.	Stack2	51.97	400	5,420.00	6,257	3.87E+00	100
76	Imation Enterprises Corp.	Stack3	51.97	400	5,420.00	6,257	3.87E+00	100
77	Imation Enterprises Corp.	Fug1		67.7	8.00	6,257	5.88E-01	100
71	Imation Enterprises Corp.	Stack2	51.97	400	390.00	6,257	2.79E-01	100
74	Imation Enterprises Corp.	Stack3	51.97	400	390.00	6,257	2.79E-01	100
43	JVC Magnetics America Co.	Fug1		67.7	83,729.00	8,760	3.02E+03	100
45	JVC Magnetics America Co.	Fug2		67.7	72,006.94	8,760	2.61E+03	100
47	JVC Magnetics America Co.	Fug3		67.7	8,372.90	8,760	3.13E+02	100
49	JVC Magnetics America Co.	Fug4		67.7	3,349.16	8,760	1.64E+02	100
42	JVC Magnetics America Co.	Fug1		67.7	54,879.50	8,760	1.98E+03	100
44	JVC Magnetics America Co.	Fug2		67.7	47,196.37	8,760	1.71E+03	100
46	JVC Magnetics America Co.	Fug3		67.7	5,487.95	8,760	2.05E+02	100
48	JVC Magnetics America Co.	Fug4		67.7	2,195.18	8,760	1.07E+02	100

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Emission type	Pollutant	Emissions, tpy	Stack height, ft	Stack diameter, ft	Building Area, ft^2	Stack flowrate, ft^3/min
14	Quantegy Inc.	Stack8	Stack	Cobalt	2.50E-03	52.2	2.90		263
21	Quantegy Inc.	Fug1-3	Fugitive	Cobalt	8.33E-04	7.5		11,407	
30	Quantegy Inc.	Fug2-4	Fugitive	Cobalt	8.33E-04	7.5		27,703	
41	Quantegy Inc.	Fug3-5	Fugitive	Cobalt	8.33E-04	7.5		3,536	
2	Quantegy Inc.	Stack1	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
4	Quantegy Inc.	Stack2	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
6	Quantegy Inc.	Stack3	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
8	Quantegy Inc.	Stack4	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
10	Quantegy Inc.	Stack5	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
12	Quantegy Inc.	Stack6	Stack	Methyl ethyl ketone	1.23E+00	17.0	2.70		1,479
13	Quantegy Inc.	Stack7	Stack	Methyl ethyl ketone	1.00E+00	25.0	1.50		42
16	Quantegy Inc.	Fug1-1	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		287	
18	Quantegy Inc.	Fug1-2	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		2,250	
20	Quantegy Inc.	Fug1-3	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		11,407	
23	Quantegy Inc.	Fug2-1	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		59	
25	Quantegy Inc.	Fug2-2	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		96	
27	Quantegy Inc.	Fug2-3	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		11,056	
29	Quantegy Inc.	Fug2-4	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		27,703	
32	Quantegy Inc.	Fug3-1	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		41	
34	Quantegy Inc.	Fug3-2	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		165	
36	Quantegy Inc.	Fug3-3	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		990	
38	Quantegy Inc.	Fug3-4	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		498	
40	Quantegy Inc.	Fug3-5	Fugitive	Methyl ethyl ketone	1.78E+00	7.5		3,536	
1	Quantegy Inc.	Stack1	Stack	Toluene	8.23E-01	17.0	2.70		1,479
3	Quantegy Inc.	Stack2	Stack	Toluene	8.23E-01	17.0	2.70		1,479
5	Quantegy Inc.	Stack3	Stack	Toluene	8.23E-01	17.0	2.70		1,479
7	Quantegy Inc.	Stack4	Stack	Toluene	8.23E-01	17.0	2.70		1,479
9	Quantegy Inc.	Stack5	Stack	Toluene	8.23E-01	17.0	2.70		1,479
11	Quantegy Inc.	Stack6	Stack	Toluene	8.23E-01	17.0	2.70		1,479
15	Quantegy Inc.	Fug1-1	Fugitive	Toluene	1.19E+00	7.5		287	
17	Quantegy Inc.	Fug1-2	Fugitive	Toluene	1.19E+00	7.5		2,250	
19	Quantegy Inc.	Fug1-3	Fugitive	Toluene	1.19E+00	7.5		11,407	
22	Quantegy Inc.	Fug2-1	Fugitive	Toluene	1.19E+00	7.5		59	
24	Quantegy Inc.	Fug2-2	Fugitive	Toluene	1.19E+00	7.5		96	
26	Quantegy Inc.	Fug2-3	Fugitive	Toluene	1.19E+00	7.5		11,056	
28	Quantegy Inc.	Fug2-4	Fugitive	Toluene	1.19E+00	7.5		27,703	

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Stack velocity, ft/s	Stack temperature, deg F	Emissions, lb/yr	Operating hr/yr	Concentration, ug/m^3	Distance, m
14	Quantegy Inc.	Stack8	0.66	216.5	5.00	6,257	6.40E-02	100
21	Quantegy Inc.	Fug1-3		67.7	1.67	8,760	6.84E-02	100
30	Quantegy Inc.	Fug2-4		67.7	1.67	8,760	5.42E-02	100
41	Quantegy Inc.	Fug3-5		67.7	1.67	8,760	8.17E-02	100
2	Quantegy Inc.	Stack1	4.31	100	2,461.00	6,257	5.75E+01	100
4	Quantegy Inc.	Stack2	4.31	100	2,461.00	6,257	5.75E+01	100
6	Quantegy Inc.	Stack3	4.31	100	2,461.00	6,257	5.75E+01	100
8	Quantegy Inc.	Stack4	4.31	100	2,461.00	6,257	5.75E+01	100
10	Quantegy Inc.	Stack5	4.31	100	2,461.00	6,257	5.75E+01	100
12	Quantegy Inc.	Stack6	4.31	100	2,461.00	6,257	5.75E+01	100
13	Quantegy Inc.	Stack7	0.39	120	2,000.00	6,257	5.71E+01	100
16	Quantegy Inc.	Fug1-1		67.7	3,559.17	6,257	2.68E+02	100
18	Quantegy Inc.	Fug1-2		67.7	3,559.17	6,257	2.53E+02	100
20	Quantegy Inc.	Fug1-3		67.7	3,559.17	8,760	1.46E+02	100
23	Quantegy Inc.	Fug2-1		67.7	3,559.17	6,257	2.70E+02	100
25	Quantegy Inc.	Fug2-2		67.7	3,559.17	6,257	2.69E+02	100
27	Quantegy Inc.	Fug2-3		67.7	3,559.17	6,257	2.06E+02	100
29	Quantegy Inc.	Fug2-4		67.7	3,559.17	8,760	1.16E+02	100
32	Quantegy Inc.	Fug3-1		67.7	3,559.17	6,257	2.70E+02	100
34	Quantegy Inc.	Fug3-2		67.7	3,559.17	6,257	2.69E+02	100
36	Quantegy Inc.	Fug3-3		67.7	3,559.17	6,257	2.62E+02	100
38	Quantegy Inc.	Fug3-4		67.7	3,559.17	6,257	2.66E+02	100
40	Quantegy Inc.	Fug3-5		67.7	3,559.17	8,760	1.74E+02	100
1	Quantegy Inc.	Stack1	4.31	100	1,646.67	6,257	3.85E+01	100
3	Quantegy Inc.	Stack2	4.31	100	1,646.67	6,257	3.85E+01	100
5	Quantegy Inc.	Stack3	4.31	100	1,646.67	6,257	3.85E+01	100
7	Quantegy Inc.	Stack4	4.31	100	1,646.67	6,257	3.85E+01	100
9	Quantegy Inc.	Stack5	4.31	100	1,646.67	6,257	3.85E+01	100
11	Quantegy Inc.	Stack6	4.31	100	1,646.67	6,257	3.85E+01	100
15	Quantegy Inc.	Fug1-1		67.7	2,383.75	6,257	1.79E+02	100
17	Quantegy Inc.	Fug1-2		67.7	2,383.75	6,257	1.69E+02	100
19	Quantegy Inc.	Fug1-3		67.7	2,383.75	8,760	9.79E+01	100
22	Quantegy Inc.	Fug2-1		67.7	2,383.75	6,257	1.81E+02	100
24	Quantegy Inc.	Fug2-2		67.7	2,383.75	6,257	1.80E+02	100
26	Quantegy Inc.	Fug2-3		67.7	2,383.75	6,257	1.38E+02	100
28	Quantegy Inc.	Fug2-4		67.7	2,383.75	8,760	7.75E+01	100

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Emission type	Pollutant	Emissions, tpy	Stack height, ft	Stack diameter, ft	Building Area, ft^2	Stack flowrate, ft^3/min
31	Quantegy Inc.	Fug3-1	Fugitive	Toluene	1.19E+00	7.5		41	
33	Quantegy Inc.	Fug3-2	Fugitive	Toluene	1.19E+00	7.5		165	
35	Quantegy Inc.	Fug3-3	Fugitive	Toluene	1.19E+00	7.5		990	
37	Quantegy Inc.	Fug3-4	Fugitive	Toluene	1.19E+00	7.5		498	
39	Quantegy Inc.	Fug3-5	Fugitive	Toluene	1.19E+00	7.5		3,536	
78	Sony Magnetics Products Inc. of America	Fug1	Fugitive	Cobalt	7.25E-02	7.5		5,000	
79	Sony Magnetics Products Inc. of America	Fug1	Fugitive	Cobalt	2.18E-01	7.5		5,000	
80	Sony Magnetics Products Inc. of America	Fug2-1	Fugitive	Cobalt compounds	1.50E-03	7.5		40,000	2,167
89	Sony Magnetics Products Inc. of America	Fug2-4	Fugitive	Cobalt compounds	3.75E-04	7.5		40,000	2,167
92	Sony Magnetics Products Inc. of America	Fug3-1	Fugitive	Cobalt compounds	1.50E-03	7.5		40,000	2,500
101	Sony Magnetics Products Inc. of America	Fug3-4	Fugitive	Cobalt compounds	3.75E-04	7.5		40,000	2,500
81	Sony Magnetics Products Inc. of America	Fug2-1	Fugitive	Methyl ethyl ketone	1.88E+01	7.5		40,000	2,167
83	Sony Magnetics Products Inc. of America	Fug2-2	Fugitive	Methyl ethyl ketone	2.81E+01	7.5		40,000	2,167
85	Sony Magnetics Products Inc. of America	Fug2-3	Fugitive	Methyl ethyl ketone	3.28E+01	7.5		40,000	2,167
87	Sony Magnetics Products Inc. of America	Stack1	Stack/fugitive	Methyl ethyl ketone	5.91E+00	50.0	5.66		2,167
90	Sony Magnetics Products Inc. of America	Fug2-4	Fugitive	Methyl ethyl ketone	9.38E+00	7.5		40,000	2,167
93	Sony Magnetics Products Inc. of America	Fug3-1	Fugitive	Methyl ethyl ketone	1.88E+01	7.5		40,000	2,500
95	Sony Magnetics Products Inc. of America	Fug3-2	Fugitive	Methyl ethyl ketone	2.81E+01	7.5		40,000	2,500
97	Sony Magnetics Products Inc. of America	Fug3-3	Fugitive	Methyl ethyl ketone	3.28E+01	7.5		40,000	2,500
99	Sony Magnetics Products Inc. of America	Stack2	Stack/fugitive	Methyl ethyl ketone	5.91E+00	50.0	5.66		2,500
102	Sony Magnetics Products Inc. of America	Fug3-4	Fugitive	Methyl ethyl ketone	9.38E+00	7.5		40,000	2,500
82	Sony Magnetics Products Inc. of America	Fug2-1	Fugitive	Toluene	4.55E+00	7.5		40,000	2,167
84	Sony Magnetics Products Inc. of America	Fug2-2	Fugitive	Toluene	6.82E+00	7.5		40,000	2,167
86	Sony Magnetics Products Inc. of America	Fug2-3	Fugitive	Toluene	7.95E+00	7.5		40,000	2,167
88	Sony Magnetics Products Inc. of America	Stack1	Stack/fugitive	Toluene	1.44E+00	50.0	5.66		2,167
91	Sony Magnetics Products Inc. of America	Fug2-4	Fugitive	Toluene	2.27E+00	7.5		40,000	2,167
94	Sony Magnetics Products Inc. of America	Fug3-1	Fugitive	Toluene	4.55E+00	7.5		40,000	2,500
96	Sony Magnetics Products Inc. of America	Fug3-2	Fugitive	Toluene	6.82E+00	7.5		40,000	2,500
98	Sony Magnetics Products Inc. of America	Fug3-3	Fugitive	Toluene	7.95E+00	7.5		40,000	2,500
100	Sony Magnetics Products Inc. of America	Stack2	Stack/fugitive	Toluene	1.44E+00	50.0	5.66		2,500
103	Sony Magnetics Products Inc. of America	Fug3-4	Fugitive	Toluene	2.27E+00	7.5		40,000	2,500

Table E-1
Magnetic Tape Manufacturers Screen3 Modeling Summary

ID	Facility name	Emission Release Point ID	Stack velocity, ft/s	Stack temperature, deg F	Emissions, lb/yr	Operating hr/yr	Concentration, ug/m^3	Distance, m
31	Quantegy Inc.	Fug3-1		67.7	2,383.75	6,257	1.81E+02	100
33	Quantegy Inc.	Fug3-2		67.7	2,383.75	6,257	1.80E+02	100
35	Quantegy Inc.	Fug3-3		67.7	2,383.75	6,257	1.76E+02	100
37	Quantegy Inc.	Fug3-4		67.7	2,383.75	6,257	1.78E+02	100
39	Quantegy Inc.	Fug3-5		67.7	2,383.75	8,760	1.17E+02	100
78	Sony Magnetics Products Inc. of America	Fug1		67.7	145.00	8,760	6.84E+00	100
79	Sony Magnetics Products Inc. of America	Fug1		67.7	435.00	8,760	2.05E+01	100
80	Sony Magnetics Products Inc. of America	Fug2-1	135.42	67.7	3.00	8,760	8.71E-02	100
89	Sony Magnetics Products Inc. of America	Fug2-4	135.42	67.7	0.75	8,760	2.18E-02	100
92	Sony Magnetics Products Inc. of America	Fug3-1	156.25	67.7	3.00	8,760	8.71E-02	100
101	Sony Magnetics Products Inc. of America	Fug3-4	156.25	67.7	0.75	8,760	2.18E-02	100
81	Sony Magnetics Products Inc. of America	Fug2-1	135.42	67.7	37,530.00	8,760	1.09E+03	100
83	Sony Magnetics Products Inc. of America	Fug2-2	135.42	67.7	56,295.00	8,760	1.63E+03	100
85	Sony Magnetics Products Inc. of America	Fug2-3	135.42	67.7	65,677.50	8,760	1.91E+03	100
87	Sony Magnetics Products Inc. of America	Stack1	135.42	67.7	11,822.50	8,760	4.62E+02	707
90	Sony Magnetics Products Inc. of America	Fug2-4	135.42	67.7	18,765.00	8,760	5.45E+02	100
93	Sony Magnetics Products Inc. of America	Fug3-1	156.25	67.7	37,530.00	8,760	1.09E+03	100
95	Sony Magnetics Products Inc. of America	Fug3-2	156.25	67.7	56,295.00	8,760	1.63E+03	100
97	Sony Magnetics Products Inc. of America	Fug3-3	156.25	67.7	65,677.50	8,760	1.91E+03	100
99	Sony Magnetics Products Inc. of America	Stack2	156.25	67.7	11,822.50	8,760	4.62E+02	774
102	Sony Magnetics Products Inc. of America	Fug3-4	156.25	67.7	18,765.00	8,760	5.45E+02	100
82	Sony Magnetics Products Inc. of America	Fug2-1	135.42	67.7	9,090.00	8,760	2.64E+02	100
84	Sony Magnetics Products Inc. of America	Fug2-2	135.42	67.7	13,635.00	8,760	3.96E+02	100
86	Sony Magnetics Products Inc. of America	Fug2-3	135.42	67.7	15,907.50	8,760	4.62E+02	100
88	Sony Magnetics Products Inc. of America	Stack1	135.42	67.7	2,872.50	8,760	4.62E+02	707
91	Sony Magnetics Products Inc. of America	Fug2-4	135.42	67.7	4,545.00	8,760	1.32E+02	100
94	Sony Magnetics Products Inc. of America	Fug3-1	156.25	67.7	9,090.00	8,760	2.64E+02	100
96	Sony Magnetics Products Inc. of America	Fug3-2	156.25	67.7	13,635.00	8,760	3.96E+02	100
98	Sony Magnetics Products Inc. of America	Fug3-3	156.25	67.7	15,907.50	8,760	4.62E+02	100
100	Sony Magnetics Products Inc. of America	Stack2	156.25	67.7	2,872.50	8,760	4.62E+02	774
103	Sony Magnetics Products Inc. of America	Fug3-4	156.25	67.7	4,545.00	8,760	1.32E+02	100

Table E-2
Magnetic Tape Manufacturers 1-Hour Maximum Concentrations and Facility Totals

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
3M Magnetic Tape Manufacturing Division	Antimony	6.30	6.306E-03
3M Magnetic Tape Manufacturing Division	Ethyl benzene	90.00	9.008E-02
3M Magnetic Tape Manufacturing Division	Ethylene glycol	13.50	1.351E-02
3M Magnetic Tape Manufacturing Division	Lead compounds	7.20	8.078E-03
3M Magnetic Tape Manufacturing Division	MEK	77,400.00	1.536E+03
3M Magnetic Tape Manufacturing Division	Methanol	23,400.00	2.342E+01
3M Magnetic Tape Manufacturing Division	MIBK	300.00	3.003E-01
3M Magnetic Tape Manufacturing Division	n-Hexane	5,190.00	9.660E+00
3M Magnetic Tape Manufacturing Division	Toluene	52,200.00	5.583E+02
3M Magnetic Tape Manufacturing Division	Xylenes	339.00	2.274E+00
3M Total		**158,946.00**	**2.130E+03**

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
Eastman Kodak Co. - Kodak Park	Cobalt	0.003	1.206E-04
Eastman Kodak Co. - Kodak Park	Hydrogen chloride	70.00	4.728E+00
Eastman Kodak Co. - Kodak Park	Methyl ethyl ketone	2,434.23	1.324E+00
Eastman Kodak Co. - Kodak Park	Toluene	6,065.77	3.299E+00
Kodak Total		**8,570.00**	**9.351E+00**

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
Imation Enterprises Corp.	Acrylonitrile	8.00	5.717E-03
Imation Enterprises Corp.	Methanol	40.00	2.859E-02
Imation Enterprises Corp.	Methyl ethyl ketone	10,858.00	8.342E+00
Imation Enterprises Corp.	Toluene	780.00	5.574E-01
Imation Total		**11,686.00**	**8.934E+00**

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
JVC Magnetics America Co.	Methyl ethyl ketone	167,458.00	6.111E+03
JVC Magnetics America Co.	Toluene	109,759.00	4.005E+03
JVC Total		**277,217.00**	**1.012E+04**

Table E-2
Magnetic Tape Manufacturers 1-Hour Maximum Concentrations and Facility Totals

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
Quantegy Inc.	Cobalt	10.00	2.683E-01
Quantegy Inc.	Methyl ethyl ketone	59,476.00	3.172E+03
Quantegy Inc.	Toluene	38,485.00	2.086E+03
Quantegy Total		**97,971.00**	**5.258E+03**

Facility Name	Pollutant Name	Total Emissions (lb/yr)	Total of Maximum 1-Hour Concentrations (ug/m3)
Sony Magnetics Products Inc. of America	Cobalt	580.00	2.737E+01
Sony Magnetics Products Inc. of America	Cobalt compounds	7.50	2.176E-01
Sony Magnetics Products Inc. of America	Methyl ethyl ketone	380,180.00	1.127E+04
Sony Magnetics Products Inc. of America	Toluene	92,100.00	3.429E+03
Sony Total		**472,867.50**	**1.473E+04**

APPENDIX F

Lead Deposition and Soil Concentration Modeling at the 3M Facility

Appendix F
Lead Deposition and Soil Concentration Modeling at the 3M Facility

Lead emissions are reported for one magnetic tape facility, 3M Magnetic Tape. In order to determine if the lead emissions reported by 3M may be associated with potential human health multipathway or ecological risks, we modeled lead deposition with ISCST3, and calculated soil concentrations resulting from the facility's reported emissions depositing into soil over a specified time period. The maximum calculated lead soil concentration was used in the Integrated Exposure Uptake Biokinetic (IEUBK) model to determine the extent of its potential effect on the blood lead levels in children, who may be exposed via ingestion to lead in soil at and around 3M. Calculated lead soil concentrations were also evaluated considering the Region IV recommended ecological screening value for lead.

The details and results of this evaluation are presented below.

ISCST3 Input Data

Lead emissions were reported for one stack at the 3M facility. This stack was modeled as a single point source located at the facility coordinates. The exact location of the stack could not be determined, so it was not possible to model building downwash at the facility. The parameters used to model the source in ISCST3 are provided in Table F-1. These are identical to the parameters presented in Table B-1 of Appendix B for the 3M facility.

Table F-1
Input Values for Lead Emissions from the 3M Facility

ISCST3 Input Parameter	Stack2
Source type	Point
Location (utmx, utmy, zone 15)	392675.82, 4970549.31
Annual Average Emission Rate (g/s)	1.04E-04
Release Height (m)	15.8
Exit Gas Temp (K)	439.5
Exit Gas Velocity (m/s)	7.10
Inside Stack Diameter (m)	0.67

ISCST3 requires particle size information to model wet and dry deposition. There were no readily available data on the particle size of the lead emissions from the facility. Additionally, 3M was the only magnetic tape facility that reported emissions of lead; therefore, particle size information was not available from any other facility. Due to a lack of facility or source

category-specific data, information reported in the Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Facilities (EPA, 1998) was used to make conservative assumptions about particle properties. A large particle size was selected (in the absence of site-specific data) to ensure that the deposition rate would not be underestimated. The particle properties used in the ISCST3 modeling for 100% of the particles are presented in Table F-2.

Table F-2
Particle Properties for ISCST3 Modeling

Particle Property	Value	Source
Particle Diameter (microns)	15	Selected as the largest mean particle diameter presented in a generalized particle size distribution in HHRAP (EPA, 1998)
Density of Particles (g/cm^3)	1.0	Suggested default particle density in HHRAP (EPA, 1998)
Wet Scavenging Coefficient (h/(mm-s))	6.6E-04	Figure 1-11 in ISC3 User's Guide Volume II (EPA, 1995a)

Three years of meteorological data (1990, 1991, and 1993) for Minneapolis, MN (surface data) and St. Cloud, MN (upper air data) were used for these simulations. These sets of meteorological data were selected as the closest available complete meteorological data.

ISCST3 Model Options

For this analysis, we used the EPA regulatory modeling default options provided in the ISC3 User's Guide (EPA, 1995b). These regulatory defaults include: (1) the stack-tip downwash option and buoyancy-induced dispersion; (2) not using gradual plume rise, except in the case of building downwash; (3) upper-bound concentration estimates for sources influenced by building downwash from super-squat buildings; (4) the "calms" processing routines, default wind profile exponents, and default vertical potential temperature gradients; and (5) assuming flat terrain. It was also assumed that urban dispersion coefficients were appropriate and that the pollutant does not undergo any chemical reactions (i.e., no transformation). However, plume depletion via deposition was modeled.

Receptor Information and Model Runs

Annual average wet and dry deposition rates were estimated at each receptor location. The receptor network for the facility was created based on U.S. Census Bureau 2000 data, and consisted of all census block centroids within a 1.5 km radius of the facility.

Three ISCST3 model runs were performed for each year of meteorological data. For each model

run, annual average wet and dry deposition rates at each receptor location were calculated and summed to generate total deposition rates. These results were analyzed to determine the populated census block receptor locations with the highest total deposition rate of lead each year.

Soil Concentration Calculations

Soil lead concentrations associated with lead emissions at the 3M facility were calculated from total deposition rate at census block centroid receptor locations, using the following formula from HHRAP (EPA, 1998):

$$C = 100 * Dep_{Tot} * T / (Z * BD)$$

where

C	=	Average soil concentration at the end of exposure period (ug Pb/g soil)
Dep_{Tot}	=	Annual average deposition rate (g/m^2-yr)
T	=	Years that soil is exposed to lead deposition (yrs)
Z	=	Soil mixing zone depth (cm)
BD	=	Soil dry bulk density (g soil/cm^3 soil)
100	=	Units conversion (ug-m^2/g-cm^2)

It was assumed that lead deposition has occurred for 30 years (*T*) at the average deposition rate. The soil mixing depth, *Z*, was estimated as 1 cm (the value suggested in HHRAP [EPA, 1998] for untilled soil). The soil dry bulk density (*BD*) was assumed to be 1.5 g/cm^3 (EPA, 1998). This method to estimate lead concentration in the soil did not take into account losses such as leaching, runoff, or erosion. Therefore, the estimates of long-term lead soil levels are conservative.

IEUBK modeling

IEUBKwin version 1.0 was used to model child blood lead levels associated with the calculated soil lead concentrations near the 3M facility. IEUBK uses four interrelated modules (exposure, uptake, biokinetic, and probability distribution) to estimate blood lead levels in children exposed to lead-contaminated media. See the IEUBK user's guide (EPA, 2002) for more details about the model.

IEUBK was set up using the suggested default parameters in the user's guide (Table 2-1 in EPA, 2002), with one modification. The default lead concentration in soil is 200 μg/g. To model the increase in blood lead level due to the lead emissions from the facility, the maximum modeled soil lead concentration associated with 3M was added to the default value of 200 μg/g. Blood lead levels were generated for children 7 years old and younger for both the default scenario and the scenario considering 3M lead emissions.

Results

The annual average deposition rates for the three years modeled were averaged to obtain an average deposition rate at each census block centroid. The centroid with the highest deposition rate is southeast of the facility, and is reported to have zero population per the 2000 U.S. census. The receptor with the next highest deposition rate is north of the facility and has a population of 79. Results are presented for both receptor locations in Table F-3.

Table F-3
Deposition and Soil Concentration Results at Two Highest Receptor Locations

	Receptor 1	Receptor 2
2000 Census Population	0	79
Location (utmx, utmy, zone 15)	392850.43, 4970436.83	392575.83, 4970777.33
Annual average modeled deposition rate (g/m^2-yr)[a]	0.0023	0.0011
Estimated lead concentration in soil after 30 years of deposition (μg/g)[b]	4.6	2.2

[a] Average of 3 years of annual deposition rates modeled with ISCST3.
[b] Does not include background lead levels.

The maximum soil concentration of lead due to deposition over 30 years at a census block centroid is estimated as 4.6 μg/g. However, because there is zero population at this block, the second highest deposition value (2.2 μg/g) was also considered. Neither of these concentrations is very high relative to environmental measurements of lead soil concentrations reported by ATSDR for lead (1999). The ATSDR reports that natural lead content of soil ranges from <10 to 30 μg/g soil. Soil effected by anthropogenic sources of lead typically has much higher concentrations. The ATSDR presents a soil concentration of 60,000 μg/g of lead outside a smelter facility and concentrations >10,000 μg/g outside houses with exterior lead-based paints.

Results of the IEUBK modeling are presented in Table F-4. The blood lead levels were calculated using an assumed soil lead concentration of 204.6 μg/g, which represents the IEUBK default of 200 μg/g plus the maximum calculated soil concentration of lead associated with 3M of 4.6 μg/g. The results show that blood lead levels increased by 0.1 μg/dL for children ages 4-5 and 5-6 years old. There was no increase for children in other age groups. All of the blood lead levels are well below 10.0 μg/dL, the value which represents a level of concern for children as specified by EPA and the Centers for Disease Control and Prevention.

Table F-4
Blood Lead Levels Modeled with IEUBK

Age	Default Blood Lead Level (μg/dL)	Blood Lead Level in Children Exposed to Soil at Maximum Receptor (μg/dL)
0.5 - 1	3.8	3.8
1 - 2	4.2	4.2
2 - 3	3.9	3.9
3 - 4	3.7	3.7
4 - 5	3.1	3.2
5 - 6	2.7	2.8
6 - 7	2.5	2.5

EPA Region IV publishes Ecological Risk Assessment Bulletins that provide soil, sediment, and surface water screening values for risk assessment purposes. Region IV recommends an ecological screening value for lead in soil of 50 μg/g (EPA, 2001). Predicted soil lead concentrations associated with the 3M facility are low compared to this screening value (with a maximum of 4.6 μg/g) and would not be expected to cause unacceptable risks to ecological receptors.

Based on the results of this evaluation, emissions of lead associated with 3M Magnetic Tape are not expected to be associated with significant human health multipathway or ecological risks.

References

ATSDR. 1999. Toxicological profile for lead. U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Atlanta, GA.

EPA. 1995a. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models: Volume II - Description of Model Algorithms. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EPA-454/B-95-003b.

EPA. 1995b. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models: Volume I - User Instructions. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EPA-454/B-95-003a.

EPA. 1998. Human Health Risk Assessment Protocol for Hazardous Waste Combustion

Facilies: Volume I, Chapter 3 – Air Dispersion and Deposition Modeling. U.S. Environmental Protection Agency, Office of Solid Waste. EPA530-D-98-001A.

EPA. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Originally published November 1995. Website version last updated November 30, 2001: http://www.epa.gov/region4/waste/ots/ecolbul.htm.

EPA. 2002. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows Version – 32 Bit Version. U.S. Environmental Protection Agency, Office of Soil Waste. EPA 540-K-01-005.

APPENDIX G

Results of the Acute Risk Assessment

Exhibit G.1 - Acrylonitrile Acute Exposure Reference Levels and Exposure Concentrations

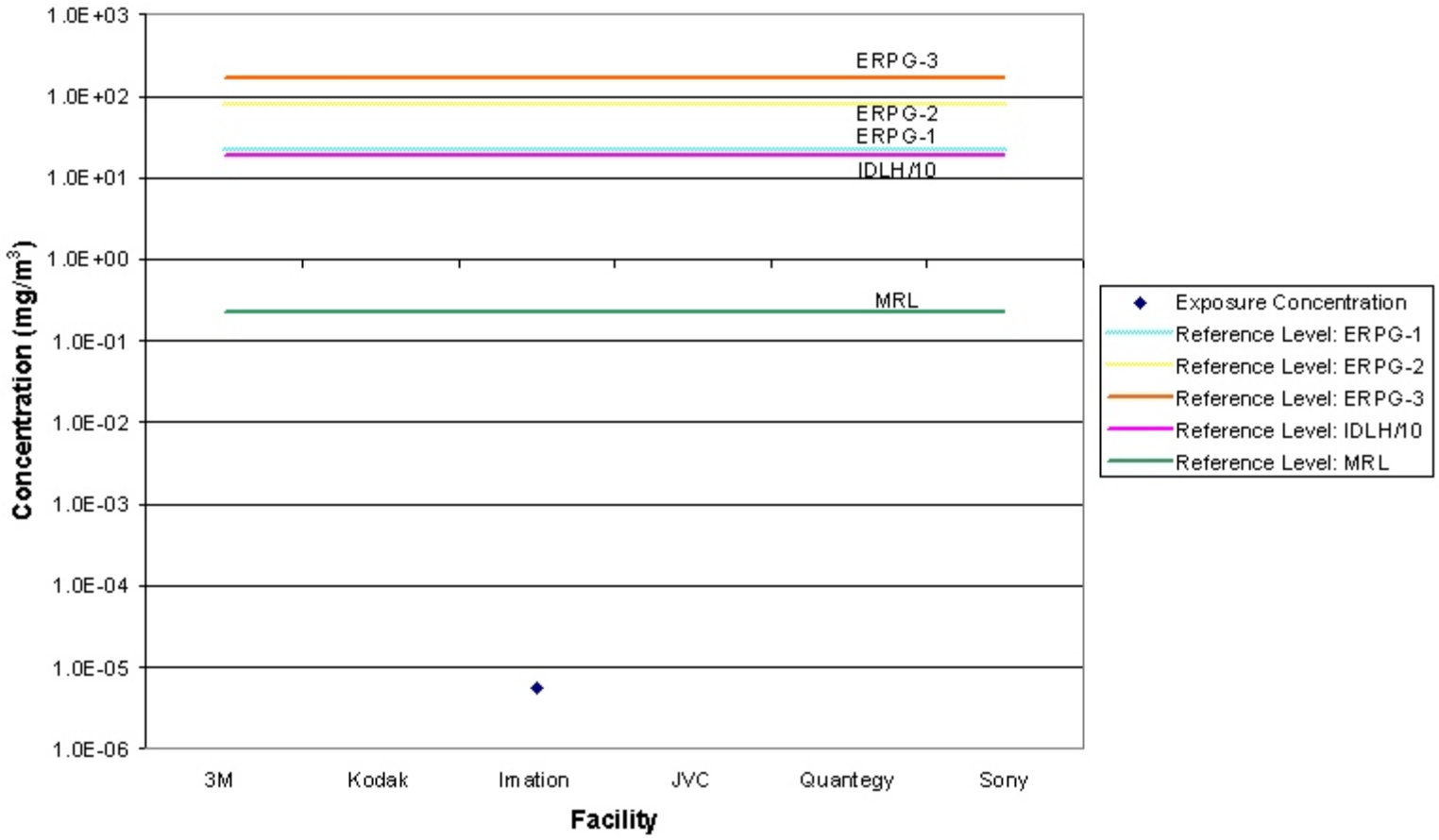


Exhibit G.2 - Antimony Acute Exposure Reference Levels and Exposure Concentrations

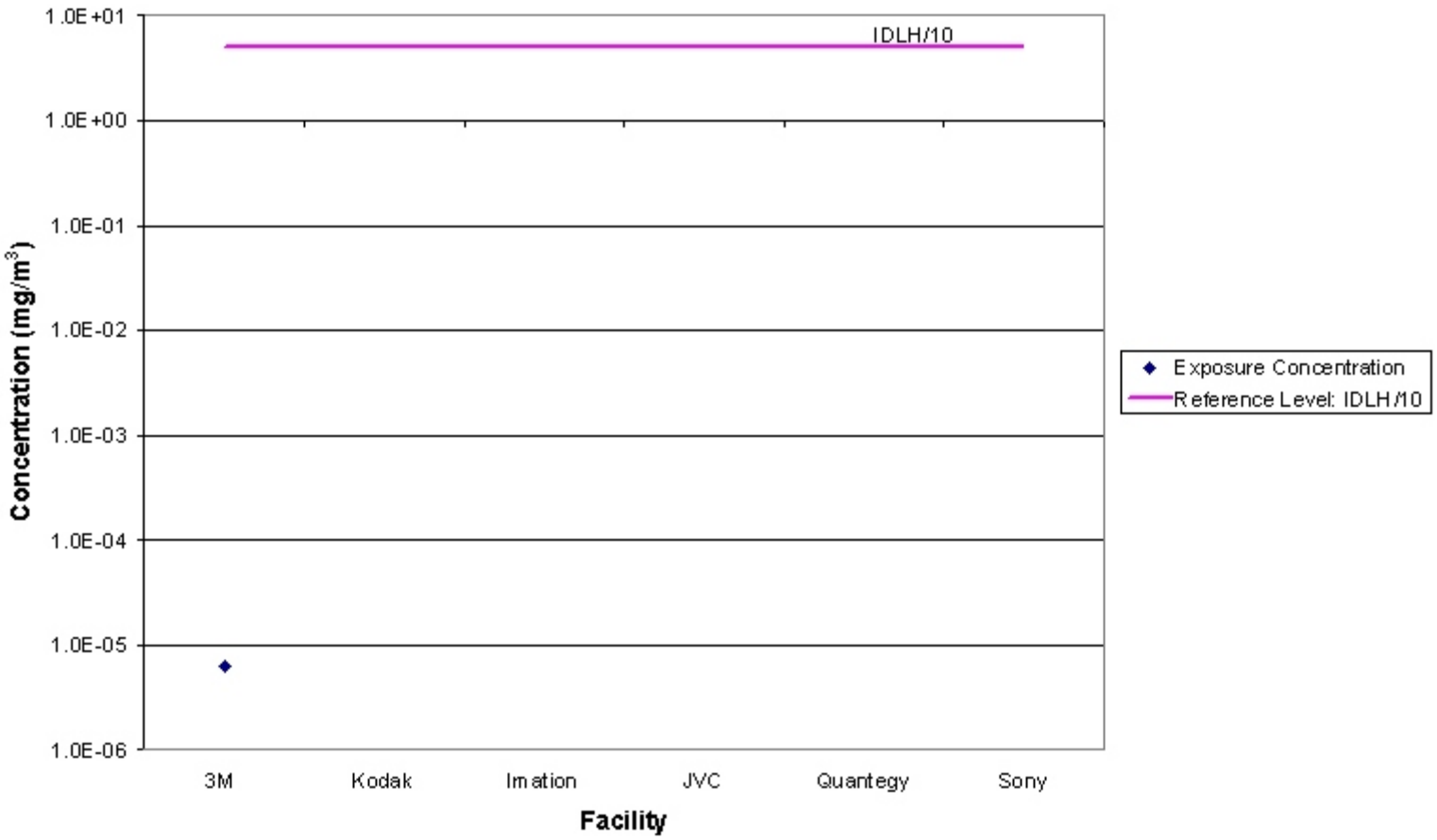


Exhibit G.3 - Cobalt Acute Exposure Reference Levels and Exposure Concentrations

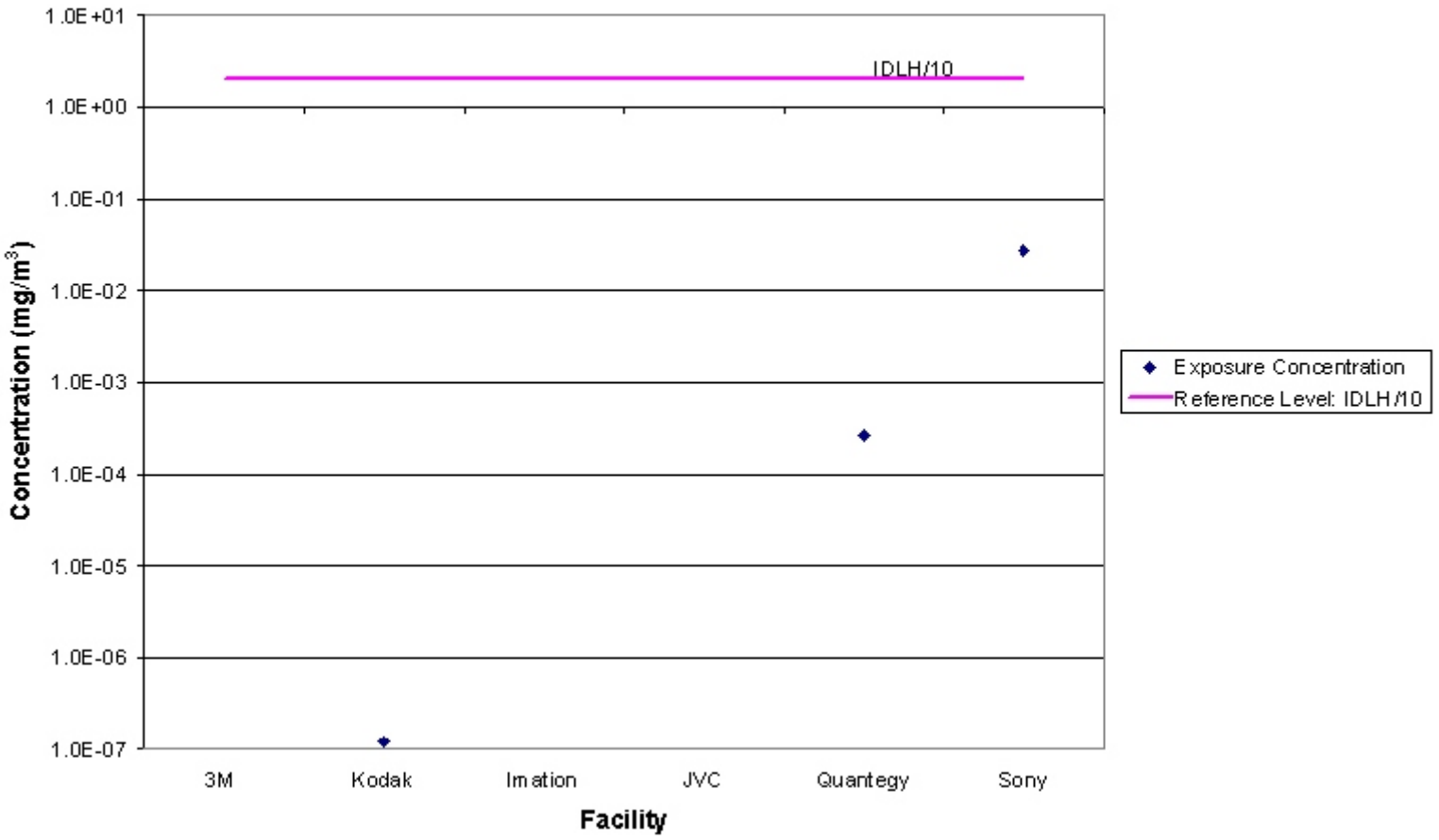


Exhibit G.4 - Ethyl Benzene Acute Exposure Reference Levels and Exposure Concentrations

Exhibit G.5 - Ethylene Glycol Acute Exposure Reference Levels and Exposure Concentrations

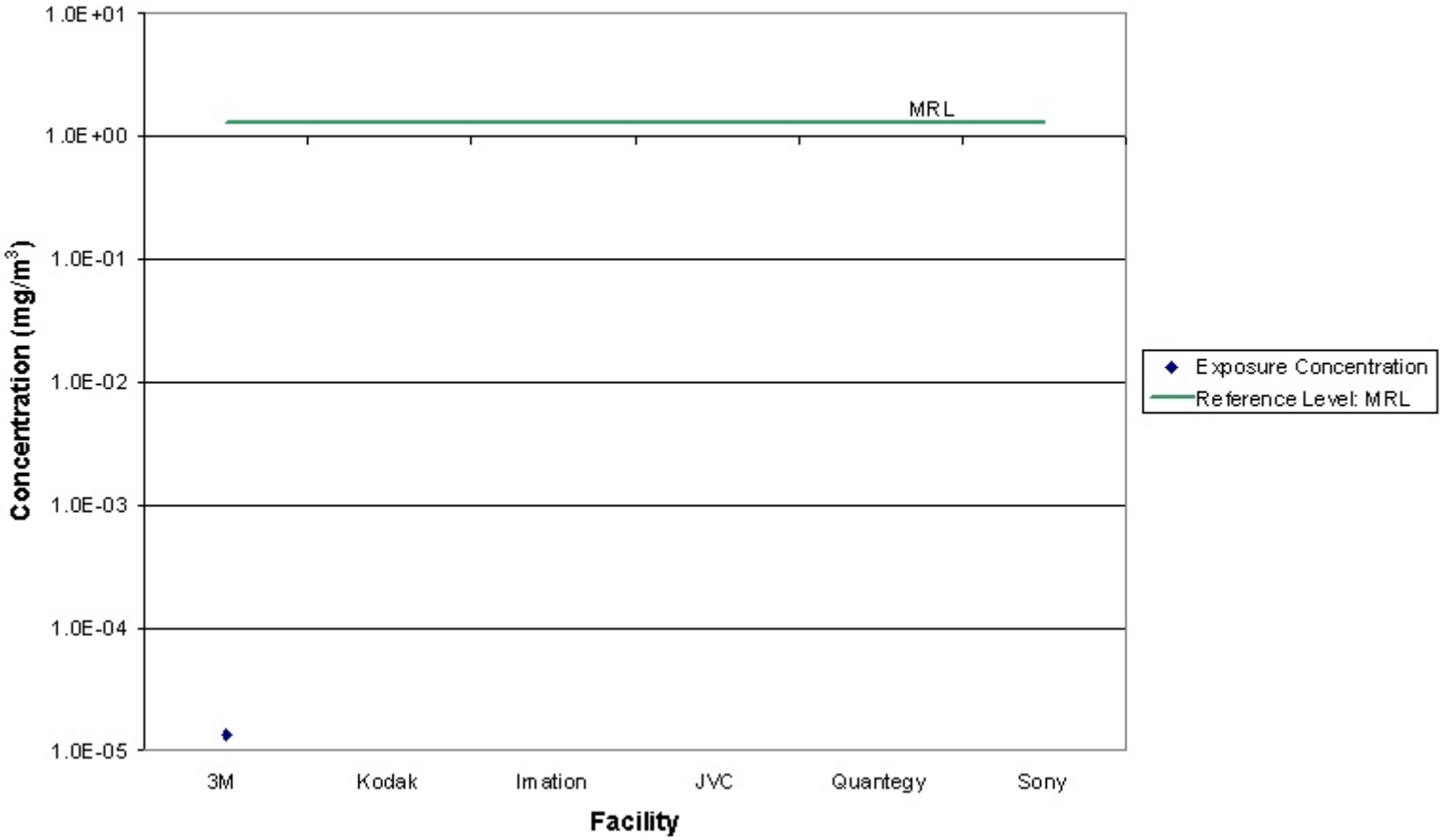


Exhibit G.6 - Hydrogen Chloride Acute Exposure Reference Levels and Exposure Concentrations

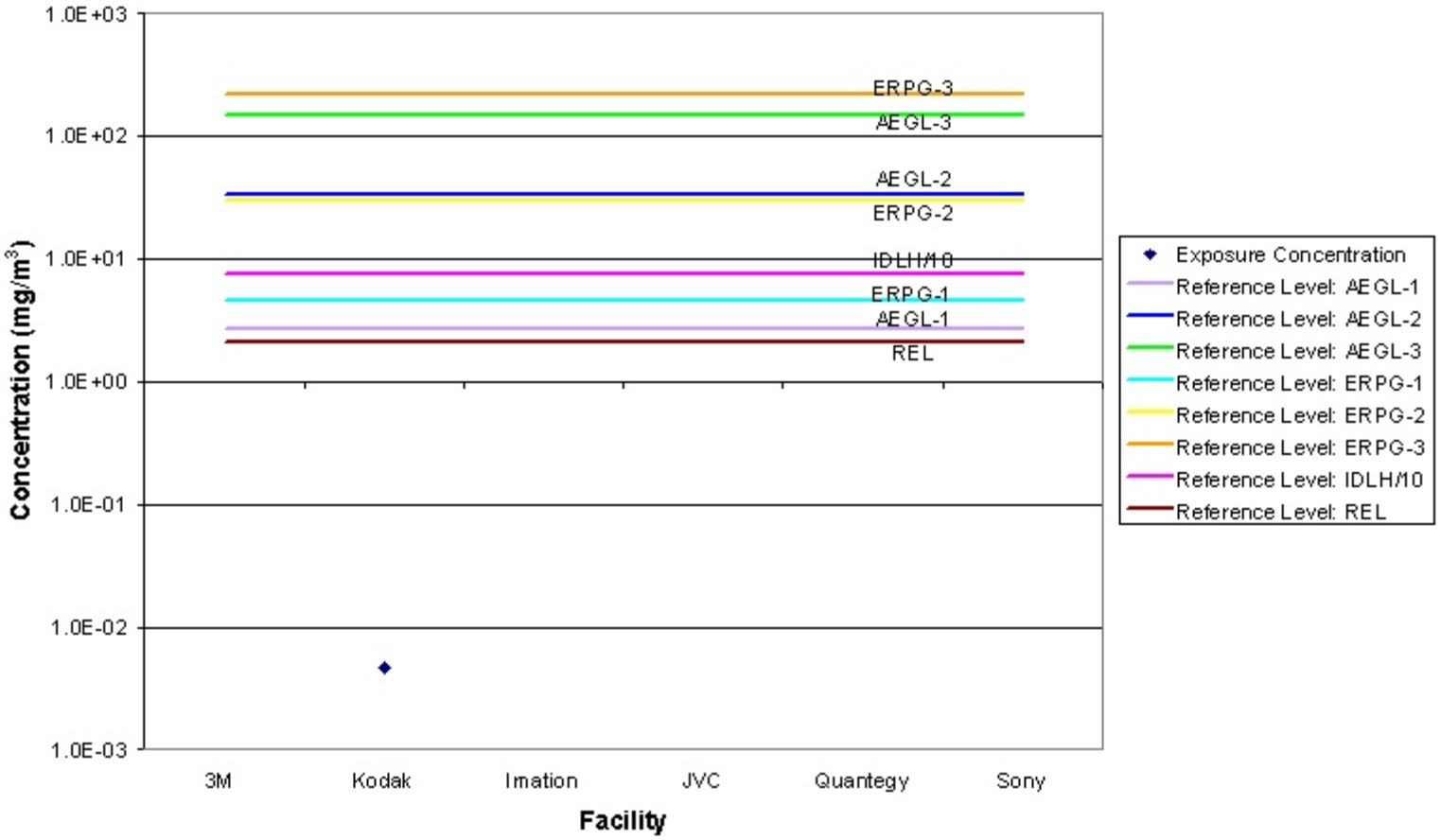


Exhibit G.7 - n-Hexane Acute Exposure Reference Levels and Exposure Concentrations

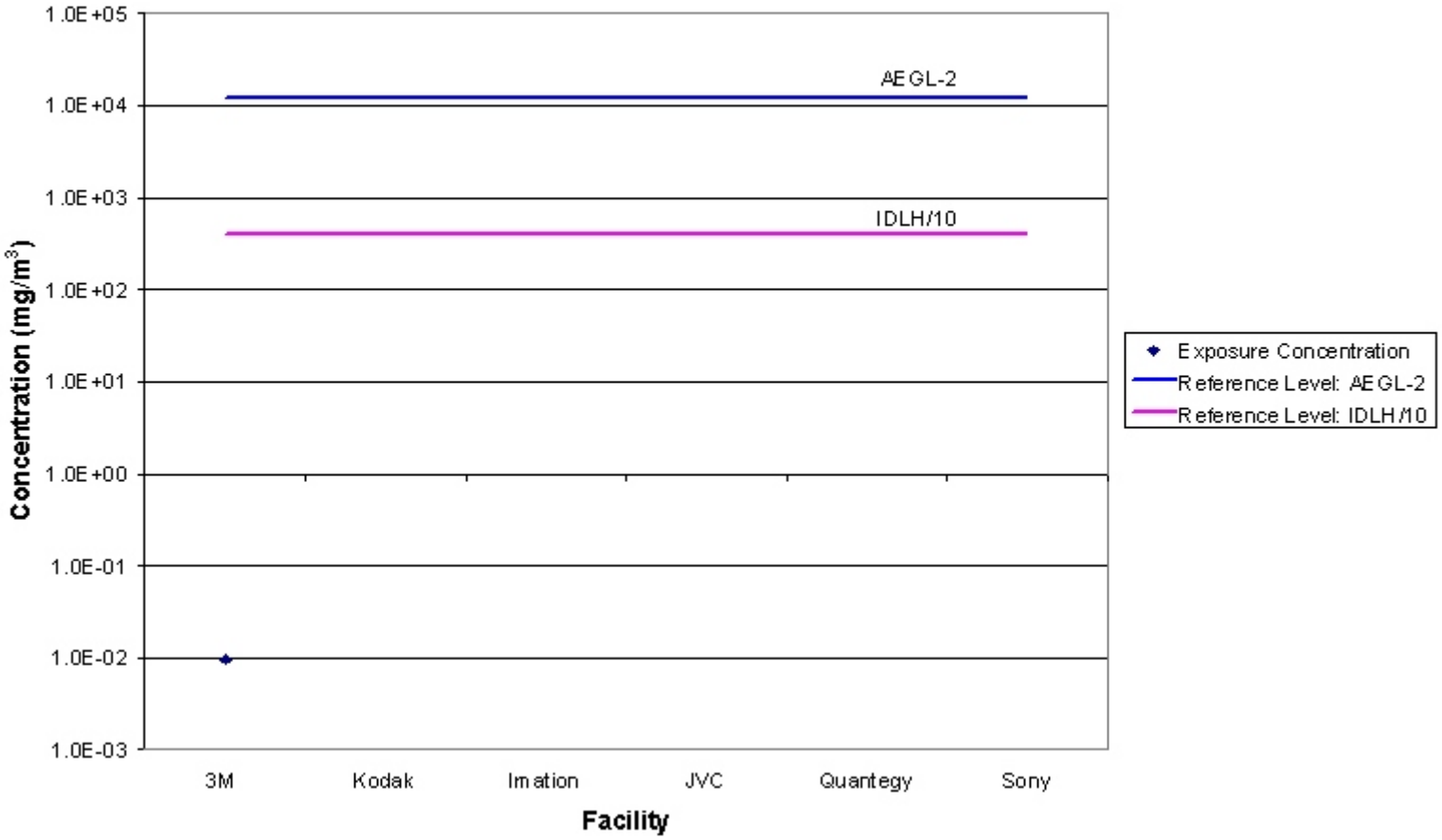


Exhibit G.8 - Lead Acute Exposure Reference Levels and Exposure Concentrations

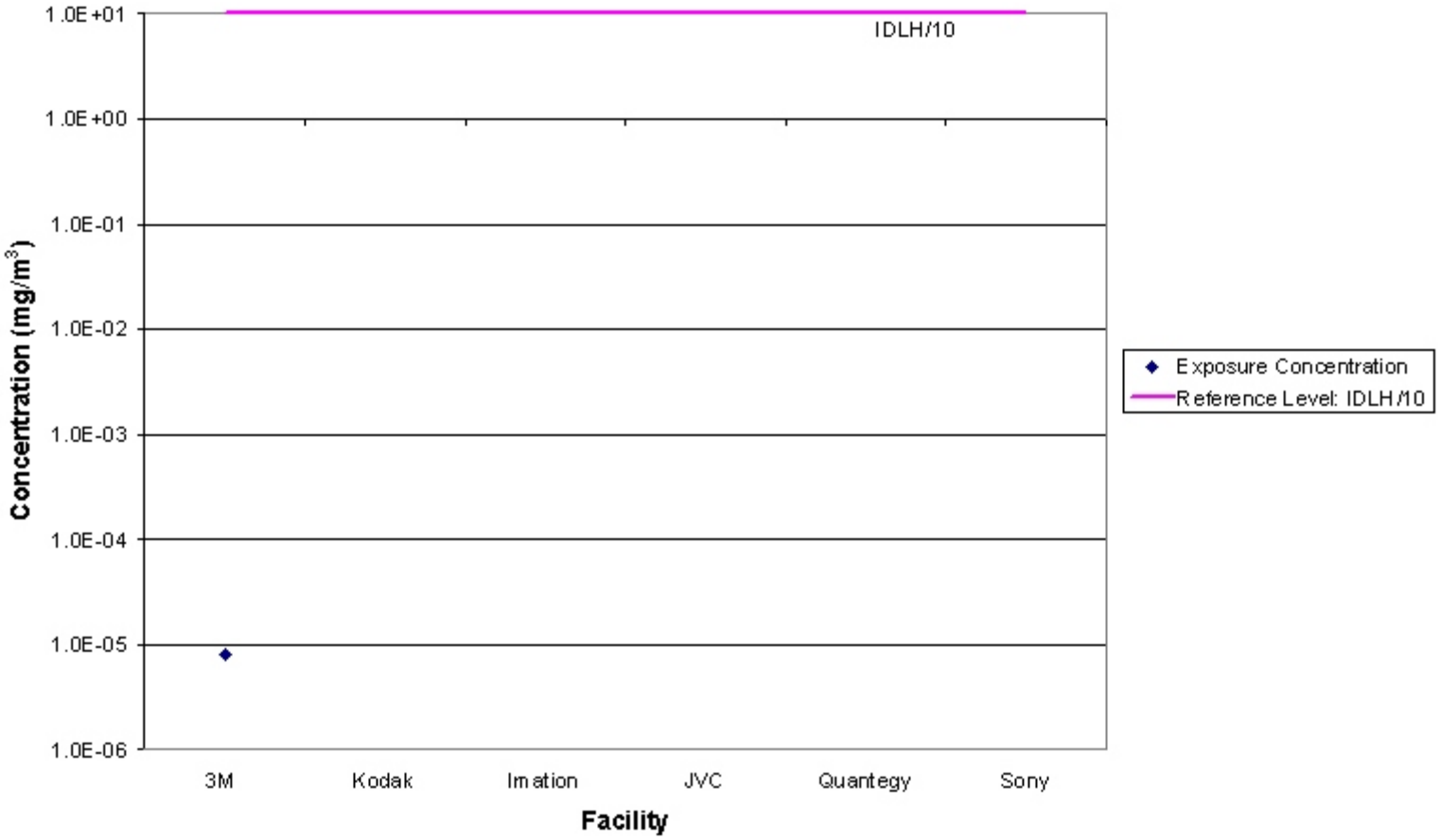


Exhibit G.9 - Methanol Acute Exposure Reference Levels and Exposure Concentrations

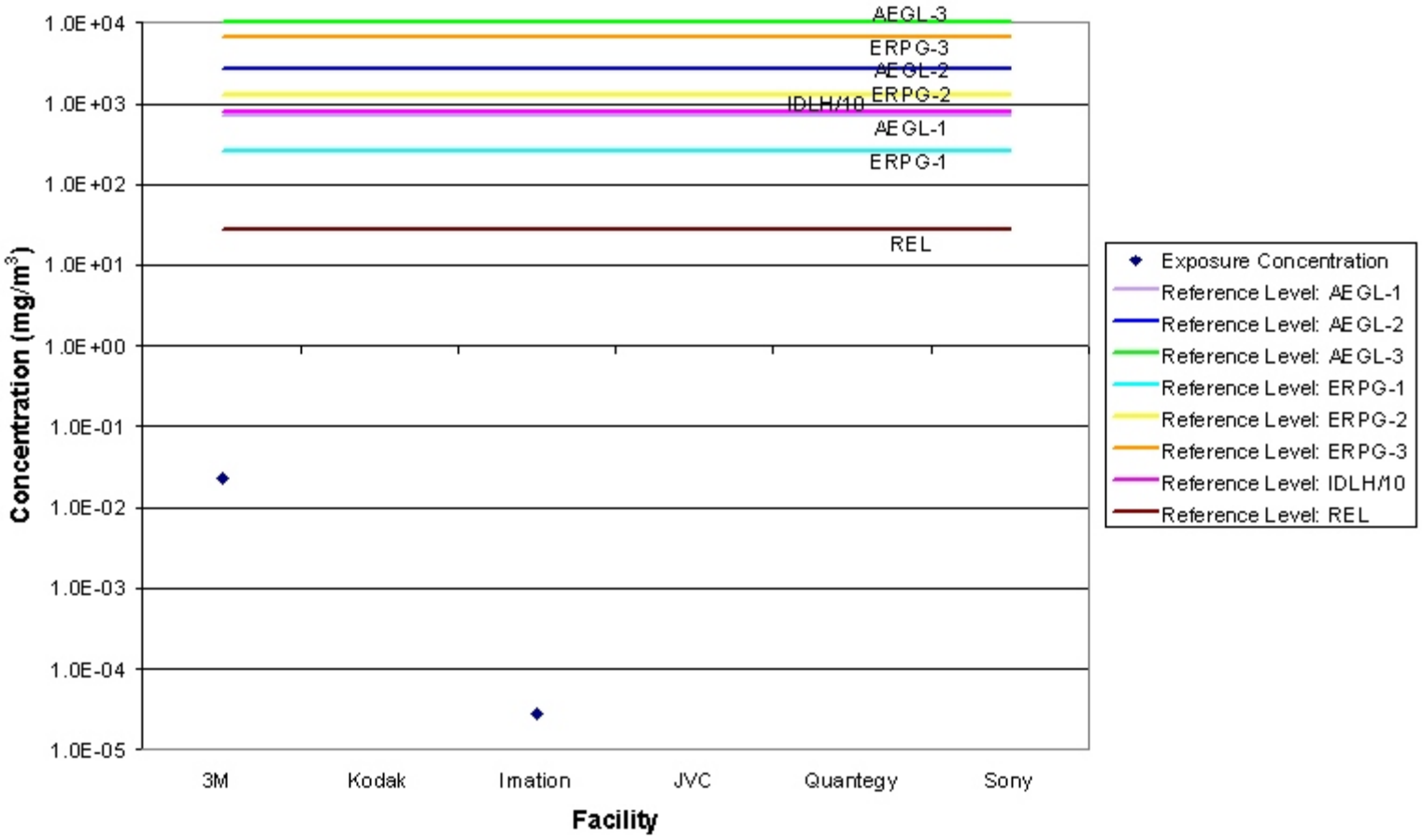


Exhibit G.10 - MEK Acute Exposure Reference Levels and Exposure Concentrations

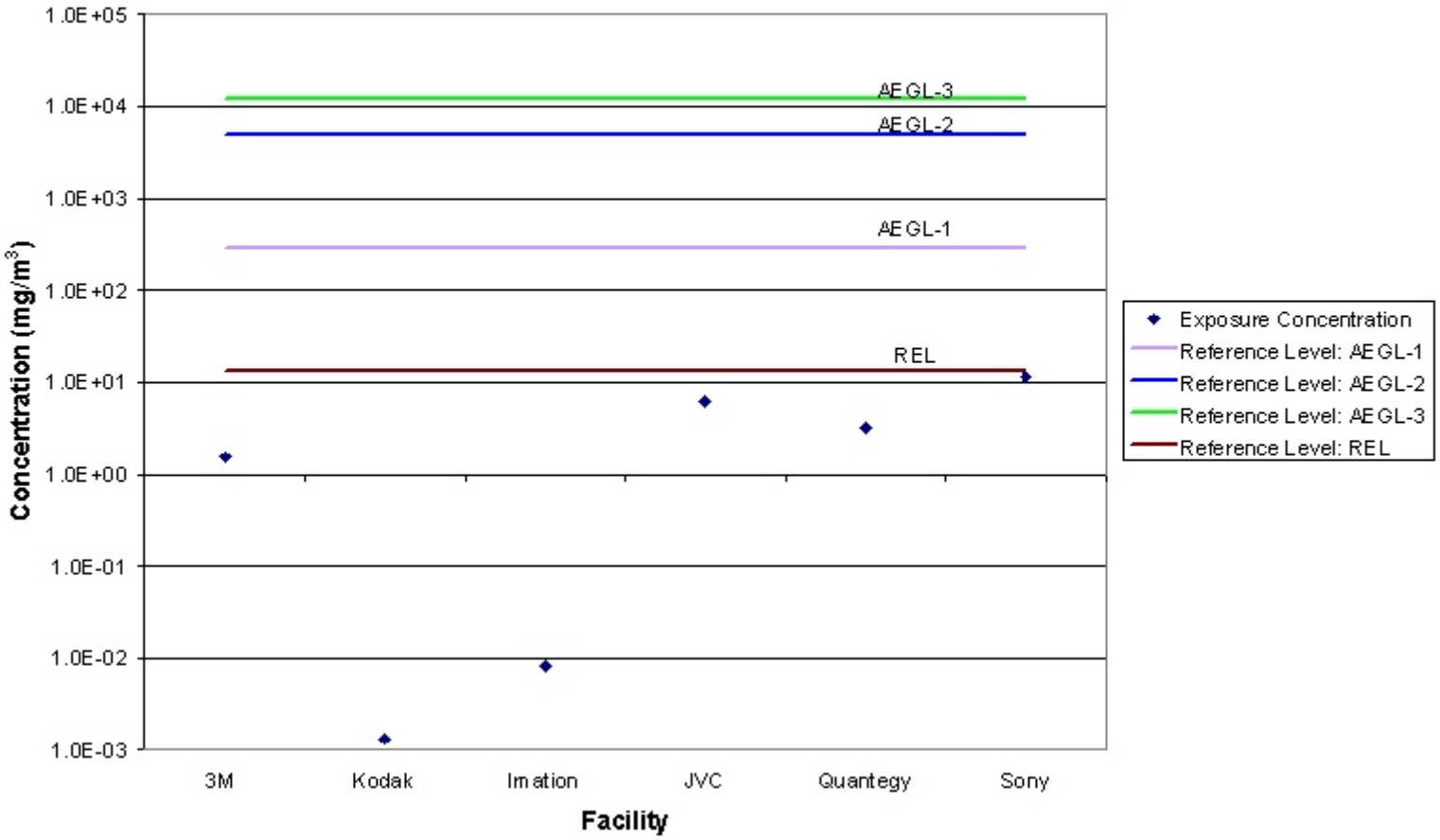


Exhibit G.11 - Toluene Acute Exposure Reference Levels and Exposure Concentrations

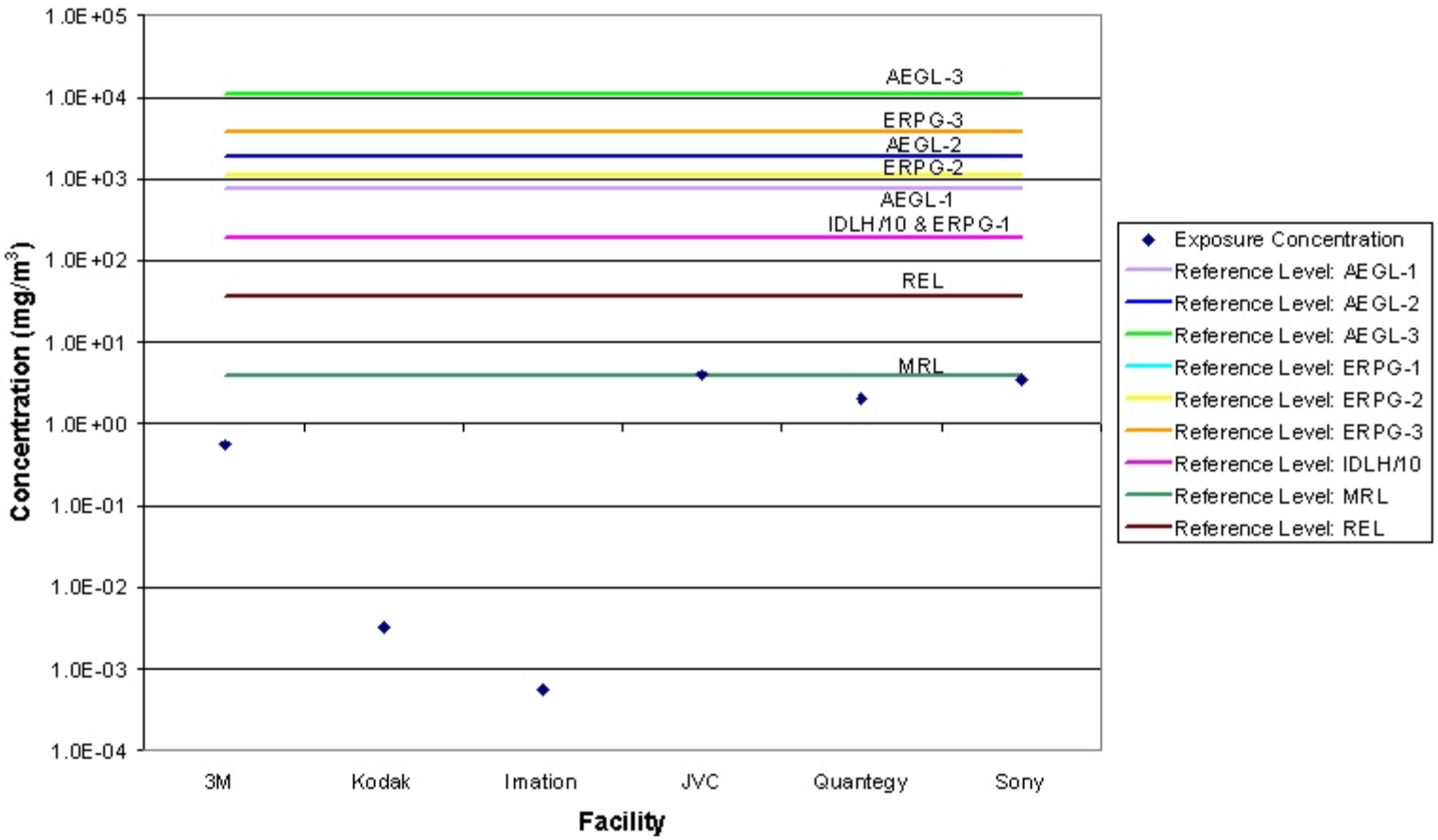
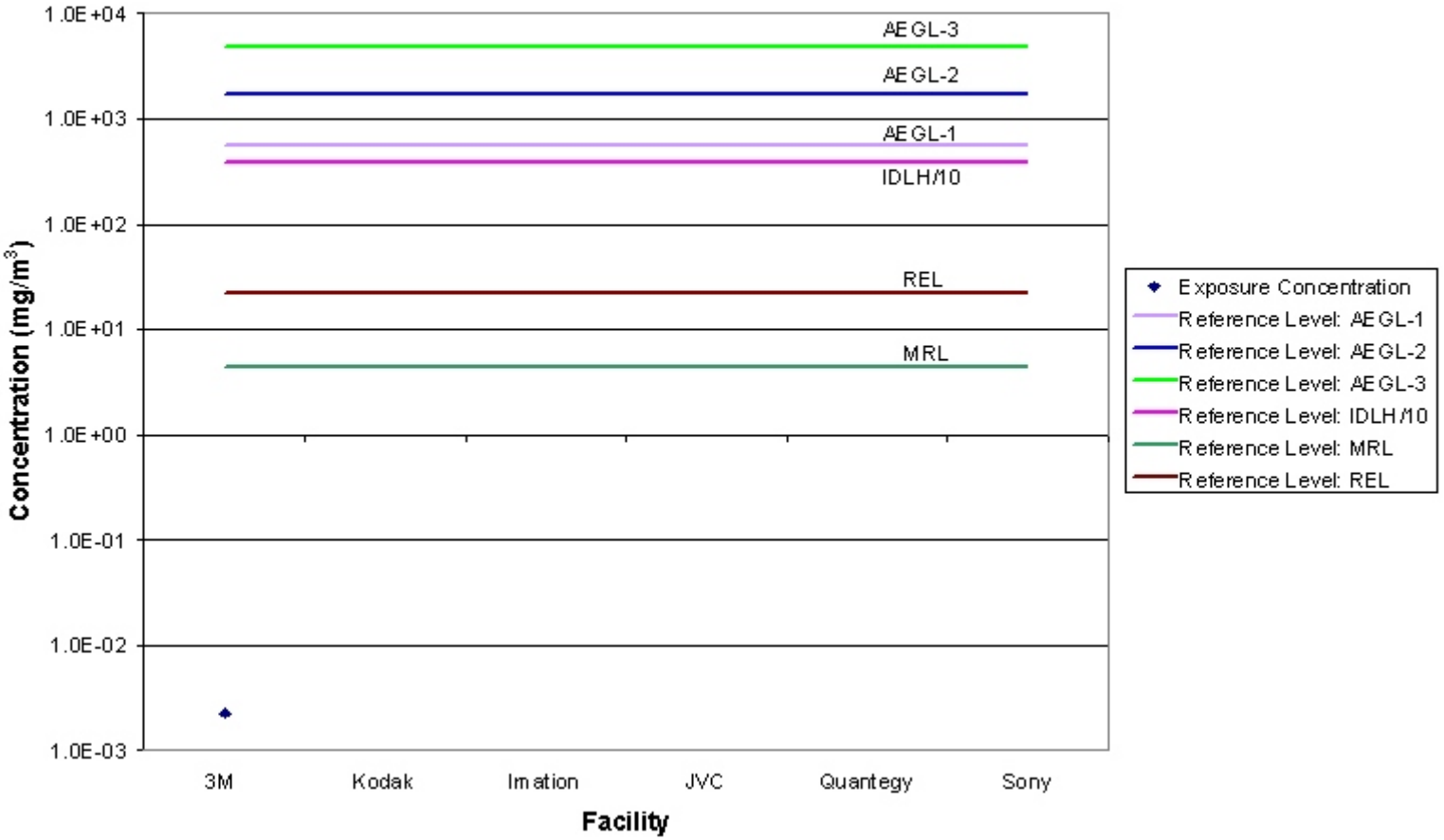


Exhibit G.12 - Xylenes Acute Exposure Reference Levels and Exposure Concentrations



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
EMISSION STANDARDS DIVISION
RESEARCH TRIANGLE PARK, NC 27711

July 20, 2005

SUBJECT: Residual Risk Assessment for the Magnetic Tape Manufacturing Source Category (Addendum)

FROM: Maria Pimentel
Risk and Exposure Assessment Group, OAQPS (C404-01)

TO: David E. Guinnup, Group Leader
Risk and Exposure Assessment Group, OAQPS (C404-01)

Section 112(f)(2) of the Act directs EPA to assess the risk remaining (residual risk) after the application of MACT standards under section 112(d). To evaluate the residual risk from the magnetic tape manufacturing source category after implementation of the Magnetic Tape Manufacturing NESHAP, it was necessary to identify those facilities that are subject to the control requirements of the standard and also to accurately describe their site locations, operations, and emissions. The primary HAP emitted from magnetic tape manufacturing are MEK and toluene. These organic compounds comprise 97 percent of the HAP emitted from magnetic tape surface coating. Three facilities reported metallic cobalt emissions ranging from less than 0.001 to 0.3 Mg/yr (0.001 to 0.3 ton/yr). One facility reported cobalt compound emissions of 0.1 Mg/yr (0.1 ton/yr), with cobalt comprising 3 weight-percent of the mix. Some metals, such as iron and chromium compounds, are also found in trace amounts in many magnetic tape coatings.

Acrylic acid emission estimates for one facility were discovered after the initial residual risk assessment was completed. This led us to conduct an additional evaluation using the data for acrylic acid. The results of this initial evaluation increased the maximum chronic inhalation hazard index (HI) for one facility from 0.2 to 0.3. Since this adjusted HI is still below 1, this result should have no impact on the residual risk decision.

Facility name	Address	City	State	Zip	County	Latitude	Longitude	SIC code	NAICS code
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
3M Magnetic Tape Manufacturing Division	905 - 915 Adam Street S	Hutchinson	MN	55350	McLeod	44-52-49	94-21-32	3695; 2672	334613; 3222
Total 3M									

Facility name	Mag tape products	Equipment	Emission type	Control devices	Pollutant	Emissions, tpy	Emissions, lb/yr	Stack diameter, ft	Stack flowrate, ft3/s
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Acrylic acid	2.1	4,200		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Fugitive		Acrylic acid	0.1	240		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Ethyl benzene	0.05	90		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Ethylene glycol	0.007	14		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		n-Hexane	2.6	5,100		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Fugitive		n-Hexane	0.05	90		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Methanol	12	23,400		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		MEK	24	48,000		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Fugitive		MEK	15	29,400		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		MIBK	0.2	300		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Toluene	21	42,000		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Fugitive		Toluene	5.1	10,200		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Xylenes	0.2	300		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Fugitive		Xylenes	0.02	39		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Antimony	0.003	6.3		
3M Magnetic Tape Manufacturing Division	Audio and videotape		Stack		Lead compounds	0.004	7.2		
Total 3M						82	163,386		

Facility name	Stack height, ft	Stack velocity, ft/s	Stack temperature, deg F	Building volume, ft3	Operating hr/yr
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
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3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
3M Magnetic Tape Manufacturing Division					8,760
Total 3M					

Facility name	Notes
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
3M Magnetic Tape Manufacturing Division	Estimated emissions by applying 30% factor to 2000 TRI emissions; assume 24 hr/d,
Total 3M	

EMISSION DATA NORMALIZATION

Facility name	Latitude	Longitude	Emission type	Pollutant	Emissions, tpy	Emissions	RfC	RfC X 1000	1/RfC	ER x 1/RfC	Fugitives	Stack 1	Stack 2	
3M Magnet	445249	942132	Stack	Acrylic acid	2.1	1.91E+03	0.001	1	1	1.91E+03		1.91E+03		
3M Magnet	445249	942132	Fugitive	Acrylic acid	0.12	1.09E+02	0.001	1	1	1.09E+02	1.09E+02			
3M Magnet	445249	942132	Stack	Ethyl benze	0.045	4.08E+01	1	1000	0.001	4.08E-02		4.08E-02		
3M Magnet	445249	942132	Stack	Ethylene gl	0.00675	6.12E+00	0.4	400	0.0025	1.53E-02		1.53E-02		
3M Magnet	445249	942132	Stack	n-Hexane	2.55	2.31E+03	0.2	200	0.005	1.16E+01		1.16E+01		
3M Magnet	445249	942132	Fugitive	n-Hexane	0.045	4.08E+01	0.2	200	0.005	2.04E-01	2.04E-01			
3M Magnet	445249	942132	Stack	Methanol	11.7	1.06E+04	4	4000	0.00025	2.65E+00		2.65E+00		
3M Magnet	445249	942132	Stack	MEK	24	2.18E+04	5	5000	0.0002	4.35E+00		4.35E+00		
3M Magnet	445249	942132	Fugitive	MEK	14.7	1.33E+04	5	5000	0.0002	2.67E+00	2.67E+00			
3M Magnet	445249	942132	Stack	MIBK	0.15	1.36E+02	3	3000	0.000333	4.54E-02		4.54E-02		
3M Magnet	445249	942132	Stack	Toluene	21	1.91E+04	0.4	400	0.0025	4.76E+01		4.76E+01		
3M Magnet	445249	942132	Fugitive	Toluene	5.1	4.63E+03	0.4	400	0.0025	1.16E+01	1.16E+01			
3M Magnet	445249	942132	Stack	Xylenes	0.15	1.36E+02	0.1	100	0.01	1.36E+00		1.36E+00		
3M Magnet	445249	942132	Fugitive	Xylenes	0.0195	1.77E+01	0.1	100	0.01	1.77E-01	1.77E-01			
3M Magnet	445249	942132	Stack	Antimony	0.00315	2.86E+00	0.0002	0.2	5	1.43E+01		1.43E+01		
3M Magnet	445249	942132	Stack	Lead comp	0.0036	3.27E+00	0.0015	1.5	0.666667	2.18E+00		2.18E+00		
3M	**Total Emission Nornalization**									2.11E+03	**1.23E+02**	**1.99E+03**	**48.53**	

HEM INPUTS													
						Location			Vent Type				
	Unit					Urban or			Process Vent (P)				
	Risk	Facility				Rural?	Number	Emissic	Storage Vent (S)		Stack	Area	Vent Type
	Factor	ID		Latitude	Longitude	0 - Urba	of Emiss	Point	Fugitive Emissions	Emission R	Height	(square	0 - vertical
Chemical Name	(ug/m3)-1	Number	Facility Name	(deg,min,sec)	(deg,min,sec)	1 - Rura	Points	ID Num	Stack (H)	(kg/year)	(meters)	meters)	1 - nonvert
ACRYLIC ACID	1	1	3M	445249	942132	0	3	1	Fugitive Emissions	1.23E+02	3.048	1000	1
ACRYLIC ACID	1	1	3M	445249	942132	0	3	2	H	1.99E+03	13.53312	100	0
ACRYLIC ACID	1	1	3M	445249	942132	0	3	3	H	48.53	15.75816	100	0

				Model Output			Choosing your own Meteorology Site					
Stack	Gas Exit	Gas Exit		Maps?	Each Ring?							
Diameter	Velocity	Temperature		Y - Yes	Y - Yes		STAR Site	Ambient (K	Lapse Rate	Lapse Rate	Lapse Rate	
(meters)	(m/sec)	(K)		N - No	N - No				Stab D	Stab E	Stab F	
	9.14E-05	295.3722		N - No	N - No							
0.85344	9.47928	375.9278		N - No	N - No							
0.67056	7.10184	439.4833		N - No	N - No							

Thursday 7-Apr I 2005 - 13: Report Uses 2000 Population

Summary f or ACRYL IC ACID N(N
Maximum I adius = 50.0 Km

Conc	People	Max Risk	Plant
2.59E-01	79	2.59E-01	1 3M

Peer Review Comments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
EMISSION STANDARDS DIVISION
RESEARCH TRIANGLE PARK, NC 27711

July 20, 2005

SUBJECT: Residual Risk Assessment for the Magnetic Tape Manufacturing Source Category (EPA Internal Peer Review)

FROM: Maria Pimentel
Risk and Exposure Assessment Group, OAQPS (C404-01)

TO: David E. Guinnup, Group Leader
Risk and Exposure Assessment Group, OAQPS (C404-01)

In accordance with the Residual Risk rule making process, we requested EPA scientists to comment on the residual risk assessment for the magnetic tape manufacturing source category**.** Our reviewers, Dr. Alvaro Alvarado, Toxicologist from EPA Region 3 ; Dr. Harlarl Choudhury from the National Center for Environmental Assessment, Office of Research and Development and Dr. Robert Elias from National Center for Environmental Assessment, Office of Research and Development.

Each submitted comments and suggestion regarding the assessment. In this case, we found that the comments added clarity and clarity to the document. Therefore, we incorporated the comments in the attached Residual Risk Assessment for the Magnetic Tape Manufacturing Source Category

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

SUBJECT: Residual Risk Analysis Internal Peer Review Magnetic Tape Manufacturing Source Category **DATE:** September 16, 2004

FROM: Álvaro Alvarado, Ph.D.

TO: Maria Pimentel, Ph.D.

I have reviewed the Residual Risk Analysis for Magnetic Tape Manufacturing Source Category and charge questions for peer reviewers. Below are my comments on the risk assessment and responses to charge questions. I hope you find them helpful. Thank you for the opportunity to review the residual risk assessment.

All of the charge questions were answered satisfactorily. The scientific nature of the assessment does not warrant external peer review. The residual risk document is acceptable as is. I have two comments for you to consider. The assessment could be strengthened by a more complete characterization of the risks from exposure to lead and toluene.

Lead

Page 10, Summary of Human Health Multipathway and Ecological Assessment Results: The section states that lead is not expected to pose a significant human health or ecological risk. I agree that the modeled concentrations are very low compared to the NAAQS standard. They are 4 orders of magnitude lower, and likely pose no significant human health or ecological risk. Considering the assumption that lead emissions will end up in the soil, and bioaccumulate, a deposition model would be appropriate. Then, comparing modeled soil concentrations to ecological and human health standards to confirm that the risk is low.

Toluene

Page 10, second paragraph: This section characterizes the acute risk from exposure to toluene. The one-hour maximum concentration modeled with Screen3 is 4.0 mg/m3. This is greater than the ATSDR MRL of 3.8 mg/m3. The ATSDR MRL assumes a 1-14 day exposure. While this may not be the ideal acute reference level, it shows that toluene could be a concern. Clarification would be helpful on what the one-hour max could mean in terms of an average 1-day concentration in order to compare 'apples to apples'. Perhaps a scaling factor could be used to make the conversion from one-hour to one-day.

Peer Review #2

I have had the opportunity to review the residual risk analysis for Magnetic Tape Manufacturing Sources category for CAA112.

The document has included toxicity information on source chemicals as found in the IRIS, Cal EPA and ATSDR documents as well as listed by the NIOSH/OSHA and ACGIH.

Where data are unavailable, appropriate model estimates have been used to calculate exposure estimates. Due to inherent model uncertainties in some of the input parameters, the model estimates may be over predictive, however, in the absence of actual data, these estimates would be protective in assessing the impact on human health effects. I agree with the impact of the metal emmisisons, particularly lead (no risk) and chromium (possible risk at Sony Facility) provided in the document.
I agree with the estimates of risk presented in the document and I do not believe further external evaluation would further impact on this assessment.

Harlal Choudhury, Ph.D., DABT
U.S. EPA/ORD
National Center for Environmental Assessment (MS-117)
Cincinnati, Ohio 45268.
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Residual Risk Analysis Internal Peer Review Form

Internal Peer Review of the Scientific Basis for CAA 112
Residual Risk Analyses For Magnetic Tape Manufacturing Source Category

Document to be reviewed:

Residual Risk Test for the Magnetic Tape Manufacturing Source Category

Review period:

3 weeks from date of receipt, August 30, 2204

Contacts:

Workgroup Lead:

Lynn Dail
Office of Air Quality Planning and Standards
Emission Standards Division
Coatings and Consumer Products Group
(919) 541-2363
dail.lynn@epa.gov

Questions on the documents:

Maria Pimentel
Office of Air Quality Planning and Standards
Emission Standards Division
Risk and Exposure Assessment Group
(919) 541-5280
pimentel.maria@epa.gov

Review completion date:

Please review document and return comments to the Workgroup Lead by **September 20, 2004**.

Summary of planned use of document(s):

The residual risk analysis performed for the magnetic tape manufacturing source category determined the potential human health risks from major sources. The results of this analysis will be used in the final Agency decision-making with respect to the non-development of a residual risk standard for this source category. The Agency has considered all health information and has determined that an "ample margin of safety"

exists with the current standards in place and will propose no further action on this source category.

Charge:

You are asked to review and comment on the named document(s). Feel free to make notations on the documents as well as in the comments sections below, particularly regarding your recommendations and thoughts on the questions posed. If you are unable to review the documents by the above date for completed review, please contact Rhea Jones (Workgroup Lead) within one week of receipt.

Questions for Internal Peer Review:

Questions	Summary Rating (Check appropriate column and explain in comments section any unsatisfactory ratings)	
	Satisfactory	Unsatisfactory
1. Are the emission estimates appropriate for the purposes of the assessment? And is the basis clearly described?	X	
2. Were the exposure and risk assessment models and methods suitable to the assessment used? And were they and their implementation clearly described? Does the analysis sufficiently describe the scientific basis to support the regulatory decision with respect to: • direct inhalation of pollutants (chronic and acute exposures); • multi pathway exposure to pollutants (e.g., ingestion, dermal) • adverse environmental effects? Note that, depending on the specific pollutants in question and the nature of the regulatory decisions, these analyses need not be extensive, but must be appropriate for the setting		X
3. Was the assessment performed and its results presented in a manner consistent with Agency guidance and policy on risk characterization? (See http://epa.gov/osp/spc/rchandbk.pdf)	X	
4. Is the scientific nature of the assessment novel or controversial enough that EPA should undertake an external peer review of risk analysis document? If yes, explain what is to novel or controversial (different unique science approach, ...) in comment section below?	Yes	No X

_____Robert W. Elias_____ Reviewer Name _____ Reviewer Signature and Date	Recommendations: ☐ Acceptable as is ◙ Acceptable after minor revision ☐ Acceptable after major revision ☐ Not acceptable If you have checked either of the last two boxes, specifically state the reasons in the comments space below.

Comments: (Explain all unsatisfactory ratings. Use extra sheets if needed)

The current NAAQS for lead, 1.5 μg/m^3, is not considered to be protective of human health. It was set in the mid 1970s, when blood lead concentrations below 35 g/dL in children were considered safe. When the standard was reviewed in the mid 1980s, substantial scientific evidence was provided for a lower standard, but no revision was deemed necessary in light of the decision to prohibit lead additives in gasoline by 1990. Whereas this lead additive policy was effective in drastically reducing air concentrations of lead, and the consequent human exposure thereof, it is clear that any risk assessment based on an assumed exposure to 1.5 μg/m^3 can result in excess exposure to lead (i.e. elevated blood lead concentrations). Furthermore, the level of protection for blood lead in children has been reset to 10 μg/dL, and serious health effects have been identified as low as 2 μg/dL.

This report should be corrected to reflect the fact that worst case the margin of error (i.e. the one reported value of 3.2 x 10^{-4}), which appears to be four orders of magnitude based on a "protective" air quality standard of 1.5 μg/dL, is actually less than two orders of magnitude.