

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Frank Espino, Director
Tony Walker, Air Manager
TCEQ Region 4–Dallas/Fort Worth

Date: September 22, 2004

From: Nathan Pechacek, M.S.
Toxicology Section, Chief Engineer's Office

Subject: Health Effects Review of 2003 Data Collected from Ambient Air Network Monitoring Sites in Region 4, Dallas/Fort Worth

Conclusions

- All reported VOCs and metals annual average concentrations, except nickel at the Dallas-Morrell site and both formaldehyde and MEK/Methacrolein at the Dallas-Hinton and Fort Worth-Northwest sites, were below their long-term ESLs and were not a health concern.
- The reported annual levels of formaldehyde and MEK/Methacrolein exceeded their long-term ESLs but were not of a health concern.
- Annual nickel levels at the Dallas-Morrell site have historically exceeded the long-term nickel ESLs and did so again in 2003. Metallic nickel is likely the major form of nickel detected at the site due to emissions from Dal Chrome Co. Inc. However, the presence of other nickel species in the particulate matter samples and other nickel sources in the area can not be precluded. The calculated theoretical excess cancer risk from the 2003 annual nickel level is within the acceptable risk range. It is unclear at this time if chronic non-cancer health effects are a relevant concern for nickel levels at the Morrell site. Nickel levels should continue to be monitored and assessed for this site.

Background

This memorandum conveys the Toxicology Section's evaluation of ambient air sampling conducted at monitoring network sites in Region 4–Dallas/Fort Worth during 2003. We reviewed annual summary results for 24- and/or 1-hour Volatile Organic Compounds (VOCs) including carbonyls. In addition, we reviewed summary results for metals from 24-hour PM_{2.5}, PM₁₀, and TSP filter samples collected every third or sixth day. This memorandum evaluated air monitoring data on a chemical-by-chemical basis. Evaluation of the potential for cumulative effects will be presented in a later report.

It should be noted that 24-hour air samples are designed to provide representative long-term average concentrations. Therefore, annual averages from 24-hour samples were evaluated for potential chronic health concerns. Twenty-four-hour samples do not show short-term or peak concentrations, and therefore, have limited use in evaluating the potential for acute health effects or odors. One-hour air samples are designed to provide representative short-term concentrations and have utility in evaluating potential acute health and odor concerns.

The measured chemical concentrations were compared to TCEQ health-based Effects Screening Levels (ESLs). An ESL is a guideline concentration which is protective of the general public including sensitive members of the population, such as the elderly, children, and persons with pre-existing health conditions. Health-based ESLs are guideline comparison levels set well below levels at which adverse health effects have been reported in the scientific literature. If an air concentration of a pollutant is below the ESL, we do not expect adverse health effects to occur. If an air concentration of a pollutant is above the health-based ESL,

it is not indicative that adverse effects will necessarily occur, but rather, that further evaluation may be warranted.

Lead was monitored at one site in Region 4–Dallas/Fort Worth. It was not evaluated in this memorandum since it is a criteria pollutant with a corresponding National Ambient Air Quality Standard (NAAQS).

Evaluation

Except for formaldehyde and MEK/methacrolein at the Dallas-Hinton and Fort Worth-Northwest sites and nickel at the Dallas-Morrell site, all reported VOCs and metals annual average concentrations were below their long-term ESLs. In addition, 24-and 1-hour concentrations for all reported VOCs and 24-hour concentrations for all reported metals were below levels that would cause acute health effects or odors. However, because 24-hour composite samples do not provide information about shorter-term and peak concentrations, potential for acute health effects and odors could not be fully evaluated. It should also be noted that select VOCs at particular monitoring sites did not meet the TCEQ's goal for data completeness of 75% data return. Formaldehyde and MEK/methacrolein at the Dallas-Hinton and Fort Worth-Northwest sites and nickel at the Dallas-Morrell site are discussed further below.

Formaldehyde and MEK/Methacrolein

Dallas-Hinton

The annual average formaldehyde concentration (3.0 parts per billion by volume (ppbv)) exceeded the long-term ESL of 1.2 ppbv. This annual average is not expected to pose unacceptable long-term health risks. The reported MEK/methacrolein annual average concentration (0.14 ppbv) was slightly above the methacrolein long-term ESL of 0.13 ppbv and would not be expected to cause long-term health effects.

Forth Worth-Northwest

The annual average formaldehyde concentration (3.4 parts per billion by volume (ppbv)) exceeded the long-term ESL of 1.2 ppbv. This annual average is not expected to pose unacceptable long-term health risks. The reported MEK/methacrolein annual average concentration (0.16 ppbv) was slightly above the methacrolein long-term ESL of 0.13 ppbv and would not be expected to cause long-term health effects.

Nickel

Dallas Morrell

The 2003 annual average nickel concentration (0.19 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)) exceeded the long-term ESL of $0.015 \mu\text{g}/\text{m}^3$. The Toxicology Section is aware of elevated annual nickel levels being detected at the Morrell site since 1987. From 1987 to 1994, the annual nickel concentrations ranged from approximately 0.6 to $0.9 \mu\text{g}/\text{m}^3$, with typical values between 0.8 to $0.9 \mu\text{g}/\text{m}^3$. Beginning in 1995, the annual nickel levels decreased and since 1997 have stabilized in the range of 0.1 to $0.3 \mu\text{g}/\text{m}^3$. The reduction in annual nickel levels first observed in 1995 are attributed to actions taken by Dal Chrome Co. Inc. (Dal Chrome), a known source of nickel upwind from the Morrell site.

The 2003 annual nickel concentration for the Morrell site is reported as total nickel. The total nickel concentration is potentially comprised of a variety of different nickel species. Dal Chrome is likely the major contributor to the elevated nickel measurements. However, it should be noted that other potential sources may exist in the vicinity of the site and contribute to the observed measurements. Based on the process operations occurring at Dal Chrome, metallic nickel is likely to be the main nickel species emitted from the facility. However, emissions of other nickel species can not be precluded. Therefore, in assessing the nickel levels

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detected at the Morrell site, it is assumed that a mixture of species is potentially present, with metallic nickel being a predominant form.

The long-term ESLs for all nickel compounds are set to prevent carcinogenic effects. However, there is significant uncertainty regarding the carcinogenicity of various forms of nickel. Subsequently, assuming all nickel compounds to be carcinogenic is likely to be conservative in protecting the general public from a theoretical excess cancer risk from nickel exposure. Using cancer potency estimates for various nickel species, the theoretical excess cancer risk from the annual nickel level at the Morrell site ranges from 4.6 E-05 to 9.1E-05, which is within the acceptable risk range of 1E-06 to 1E-04 as defined by the USEPA. It should be noted that in addition to cancer, other health concerns from long-term exposure to nickel have been identified which include effects to the respiratory system and blood. It is unclear at this time if these effects are a relevant concern for the monitored annual nickel concentration. As additional information on the toxicity of nickel becomes available, reassessment and clarification of chronic non-cancer health effects can be made. It should be stressed that nickel levels will continue to be monitored and assessed at the Morrell site in the future.

If you have any questions about this evaluation, please call me at (512) 239-1336 or email me at npechace@tceq.state.tx.us.

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