Comments from Metal Finishers Association of Southern California in letter dated November 20, 1998
[01/18/99]

Comment 1: The comment is pleased with the selection of the Circla et al. 1985 study as the basis of the REL and supports the use of the 3-fold uncertainty factor for LOAEL to NOAEL extrapolation. The commentator noted that the REL was presented as 11 m g/m^3 except in one place where it was stated to be 3.3 m g/m^3.

Response: Comment noted and appreciated. We note also that at the December 2, 1998 meeting of the SRP, the SRP suggested strongly that the LOAEL to NOAEL uncertainty factor be set to 6 rather than 3, as 6 represented the 95th percentile in an analysis of LOAEL to NOAEL ratios conducted for mild adverse effects. Thus, the document was revised to reflect this and the new nickel REL is 6 m g/m^3.

Comment 2: Sodium hydroxide. The OEHHA review of the acute toxicity of sodium hydroxide reflects the inadequacy of the database for the derivation of a health-based exposure limit. Missing from the database is a no-effect level (NOAEL). NIOSH in its 1974 criteria document for sodium hydroxide cites a study by Trent Lewis in which he found one individual who did not experience irritation at 0.28 mg/m^3 while a second did at 0.8 mg/m^3. The 10-fold uncertainty factor applied to 0.5 mg/m^3 is probably warranted. It would be a good idea for OEHHA to encourage development of data upon which a better risk assessment could be based. Such studies could probably reduce both the LOAEL and the intraspecies uncertainty factors which together account for a 100-fold reduction for a substance that has a rather simple effect, irritation. We trust you will also consider the October 1, 1998 comments to Dr. James F. Collins on NAOH in water solutions used at metal finishing shops.

Response: We agree that more information would be useful to us in our endeavor to derive reference exposure levels. We encourage the submission of data, as it becomes available.

We have recently revised the sodium hydroxide REL from 5 m g/m^3 to 8 m g/m^3 based on the SRP's suggestion to use a value of 6 as the LOAEL to NOAEL uncertainty factor for all mild adverse effects. Our initial proposal was to use an uncertainty factor of 10 for sodium hydroxide. Thus, the total uncertainty factor is now 60 rather than 100.

Comment 3: (From letter referred to above dated October 1, 1998 from Mr. Dean High, Pacific Environmental Services to Dr. James Collins on behalf of the MFASC).

It is clear from the document that NaOH dust particles were the prime source of data for the OEHHA draft documents. However, because the sodium and hydroxide are dissociated when dissolved in water, the comment questions whether the impact of such solutions when evaporated or misted into ambient air represents a similar health risk. Sodium, in and of itself, does not represent a health risk. We do understand that all caustic solutions can have severe acute impacts on the eye and to a lesser extent on the skin. Our metal plating shop workers wear face masks, gloves and aprons to protect themselves from such accidental exposures to their eyes and skin.

There is no published data that shows that such water solutions will have the same kind of chronic impact on the respiratory system as the NaOH particles. There are several reasons for this. First of all the Na and OH radicals are dissociated and water has diluted the NaOH such that the particles are no longer seeking moisture. Secondly, the particles of water generated by spraying or splashing are large and settle out rapidly or evaporate and react with organics and carbon dioxide in air.

Another consideration is that there is no way to measure NaOH in water particles or ambient air. There is not one official government test method to the best of our knowledge. One can only measure sodium and then attempt to estimate the NaOH that might have existed in a caustic solution which often includes other sodium or caustic chemicals. OEHHA's REL specify NaOH, so determining exposure and enforcement of the REL is a major problem. MFASC requests that OEHHA limit the NaOH acute and chronic RELs to NaOH dust particles, at least until a test method is adopted and until some studies show the respirable effects of the sodium hydroxide solutions.

Response: OEHHA's proposed acute REL is based on Ott et al. (1977) which evaluates occupational exposure to caustic dusts. OEHHA staff believe that sodium hydroxide is caustic whether it is a dry powder or particle or is an aerosolized wet mist. Grant and Schuman's Toxicology of the Eye (4th ed., 1993) states on p. 1302 "Sodium hydroxide, as a solid or solution, is severely injurious to all tissues". Ingestion of small amounts leads to esophageal necrosis and constriction in humans and animals. Heating a solution of NaOH to 180 C, as is done in metal plating, would result in vapors that likely contain NaOH. In warm ambient air, such as occurs in the Los Angeles basin, the mist could evaporate leaving dry NaOH particles. A high pH material or one capable of forming a high pH liquid upon contact with fluids would impact the mucous membranes of the eyes and respiratory tract. The fact that the NA+ and OH- ions dissociate in water does not lessen the irritant effects of a mist of NaOH relative to a dust of NaOH.

The issues of how much NaOH ends up emitted into the ambient air from a plating facility and how one measures NaOH in the ambient air are not directly relevant to derivation of a health-based REL. The engineering issues surrounding the emissions estimates and atmospheric reactions of any emitted NaOH would be considered during the air modeling done in a risk assessment. The resultant modeled concentrations in ambient air used to compare to the acute REL should reflect these concerns.