6.0
DISCUSSION

6.1 PROBLEMS ENCOUNTERED IN THE SURVEY

In comparison with other emission inventory surveys conducted by the contractor's staff, the present survey had relatively few problems. The problems that were encountered, and their resolutions, were as follows.

6.1.1 Mailing Label Error

The commercial mailing house that assembled and distributed the survey package failed to include the survey ID numbers on the mailing labels that were affixed to the survey cover letter. For each returned questionnaire, it was necessary to search the survey tracking database by facility name to obtain the survey ID number.

6.1.2 Foreign Languages

A high percentage of the contacts in the industries surveyed spoke languages other than English. Most of the survey recipients who had problems with English were in Group 2, which consisted largely of very small welding shops. The language problem was resolved completely in the case of Spanish speakers. First, one of the contractor's engineers, whose native language is Spanish, translated all the technical terms on the questionnaire form. Second, for most of the telephone conversations with Spanish-speaking survey recipients, the contractor used personnel who were native Spanish speakers or were fluent in that language.

A few survey recipients spoke Japanese. The contractor used a native Japanese speaker in those cases. Unfortunately, many of the survey recipients who had problems with English spoke Korean and other languages that were unknown to survey staff. In almost all those cases, the companies did not fill out the questionnaires.

6.1.3 Inability to Contact

Over 900 facilities were called but failed to return messages or otherwise respond to the survey. Given the large number of facilities to contact, it was not possible to call these companies more than two or three times.

6.1.4 Resistance to the AQMD

About seven percent of the survey recipients explicitly refused to provide any data about their operations, even information demonstrating that they were ineligible for the inventory. Many of them gave as a reason the belief that the survey would ultimately lead to regulations that could hurt them financially. The contractor's staff responded by telling these facilities that it was in everyone's best interests that accurate emissions data be obtained. This argument convinced only a few people.

6.2 UNCERTAINTIES IN THE INVENTORY

6.2.1 Comparison With Existing Emission Inventories

The contractor was unable to locate any existing geographically organized estimates of toxic metal emissions from metal welding, cutting or spraying operations.

6.2.2 Confidence Limits

Tables 5-6 and 5-11 showed 95-percent confidence limits about the survey-based estimates of the numbers of facilities in the AQMD that perform each type of metal welding and cutting, respectively. To gain an appreciation for the uncertainty in the emission results, an analysis of nickel emissions from gas metal arc welding was performed. The half-width of a 95-percent confidence interval about the estimated total emissions was calculated as (McClave and Benson, 1982):

$$2\sigma_T = 2\,[\Sigma\, N_i(N_i - n_i)s_i^2/n_i]^{1/2} \qquad [6\text{-}1]$$

In this case, N_I is the estimated number of facilities in the ith group, and s_i and n_i are the standard deviation and number of samples in the group, respectively. Table 6-1 summarizes the calculation for the example. A 95-percent confidence interval about the basin-wide emissions of nickel from GMAW would be 11.1 ± 7.4 lb/yr or 3.7 to 18.5 lb/yr.

Table 6-1

EXAMPLE CALCULATION OF CONFIDENCE INTERVAL:
AQMD-WIDE EMISSIONS OF NICKEL FROM GAS METAL ARC WELDING

Stratum	N	n	s	$N_i(N_i - n_i)s_i^2/n_i$
1	49	28	0.03118	0.0357
2	90	28	0.05914	0.6971
3	77	11	0.16013	11.8464
4	57	4	0.02269	0.3888
5	24	2	0.04666	0.5748
6	8	2	0.11039	0.2925
			Total	13.8353
			$2\sigma_T$	7.4392