V. CONCLUSION AND RECOMMENDATION

In attempt to determine the quantity of the hazardous heavy metals in Mae Moh Basin; cadmium, copper, lead, manganese, nickel and zinc are of interest due to their toxicities and their existences in trace amounts in lignite, laterite soil and airborne particulates. Since atomic absorption spectrophotometry offered the required sensitivity, availability, simplicity and capability of multielement analyses, the technique was selected for analyses of these heavy metals.

Lignite sampling were performed in August, October and December, 1983 at the conveyor belt line of the Mae Moh Power Plant Units 1-3. The lignite samples were digested by using concentrated acid[2]. The slightly low contents of cadmium, copper, lead, manganese, nickel and zinc were detected in lignite as 0.25 µg/g, 5.56 µg/g, 1.59 µg/g, 29.63 µg/g, 34.75 µg/g and 7.34 µg/g, respectively. Such results might cause air pollution problem due to the concentration of heavy metals in the emitted fly ash.

Laterite soil samplings were conducted in December, 1983. A total of 48 samples were obtained from 16-sampling stations. The soil samples were prepared by acid digestion method[3]. The average contents of cadmium, copper, lead, manganese, nickel and zinc in the laterite soil varied from station to station and the ranges were 0.7 to 1.0 µg/g, 18.5 to 40.9 µg/g, 10.7-29.9 µg/g, 187.6 to 4737.0 µg/g, 21.0 to 134.8 µg/g and 27.8 to 69.5 µg/g, respectively. From the result understudied, it was seen that manganese content in the laterite soil was higher than those of nickel, zinc, copper, lead and cadmium, since manganese is the major element in the lithosphere, the others are traces[9]. The increased heavy metal contents in the soil were caused by ash disposal, natural weathering and deposition of sedimentary rock since the higher heavy metal contents were found in the areas where the ash dump trucks passed by, or were nearby the sedimentary rock, Doi Pha Hom.

Low volume airborne particulates were collected on the Millipore membrane by means of a Bendix Personnel Air Sampler in August and December, 1983. The sampling areas were located in the radius of 0.5 km around the plant. A total of 64 samples were obtained from 8-sampling stations and the samples were prepared by acid digestion method[1]. At all stations studied, the average contents of total particulate matters in August and December ranged from 1.19 to 9.21 mg/m^3 and from 2.45 to 20.54 mg/m^3, respectively; and the average contents of cadmium, cooper, lead, manganese, nickel and zinc associated with total particulate matters in both sampling months were non-detectable, non-detectable - 0.34 ug/m^3, non-detectable - 0.19 ug/m^3, non-detectable - 2.92 ug/m^3, non-detectable and non-detectable, respectively. Such contents of both total particulate matters and heavy metals were mainly came from the laterite road, the lignite stockpiles the crushing unit and the dump ash, since the high contents were found in the vicinity areas of these emission sources. The particulate and heavy metal contents in ambient air were markedly different from each sampling month and each station because they depended upon several factors such as meteorological factors (wind direction, wind speed, rainfall, ambient air temperature, humidity etc.), sampling site location and topography. Additionally, the heavy metal contents tended to increase with the particulate contents. Nevertheless, such results would not cause any deterioration to human healths, the heavy metal contents in these areas were much lower than the industrial regulations Occupational Safety and Health Administration (OSHA) and of the Labor Department of the Ministry of Interior Notification.

High volume airborne particulates or total suspended particulates were collected daily, a 24-hour period, on a piece of glass fiber filter via High Volume Air Sampler in August, October and December, 1983. The sampling stations were located in the radius of 2 km around the plant as the following: (1) in the forest, in the north of the plant, (2) Mae Moh Meteorological Substation No. 1, (3) Blast Hole Drill Office, (4) Mae Moh Meteorological Mainstation, (5) Mae Moh EGAT School, (6) main entrance gate to the project, (7) Ban Na Pom where was near by Huai

Luang Reservoir and (8) Ban Huai Rak Mai, the resettlement area, about 9 km from the southwest of the plant. The particulate samples were prepared by uisng acid extraction method[39-43, 48]. The average contents of total suspended particulate in ambient air in August, October and December ranged from 5.47 to 101.11 $\mu g/m^3$, from 5.31 to 150.98 $\mu g/m^3$ and from 32.50 to 1,114.71 $\mu g/m^3$, respectively. The average contents of cadmium, copper, lead, manganese, nickel and zinc associated with the total suspended particulates during three-month period were non-detectable - 3.1 ng/m, 2.2-235.5 ng/m^3, 12.6-226.6 ng/m^3, 2.6-871.1 ng/m^3, 2.2-81.0 ng/m^3 and 1.0-78.5 ng/m^3, respectively. From the results understudied, the total suspended particulate and heavy metal contents in the rainy season were usually lower than those in the dry season because of no mining activities and high rainfall in the rainy season. Both total suspended particulate and heavy metal contents were found to correspond to the meteorological conditions and traffic load which was mainly depended on construction, mining and dumping activities. The heavy metal contents tended to increase with the total suspended particulate content. The exact proportionality was not obtained since their dispersion between the emission sources and receptors were a process which was depended upon many variable meteorological conditions. The high heavy metal contents were detected in the areas where were downwind from the plant; and/or were nearly the ash dump road.

Comparison of the total suspended particulate content to NEB 24-hour ambient air quality standard of 330 $\mu g/m^3$, the airborne particulates in most stations were lower than the NEB's standard except the sampling stations where were located in the vicinity areas of mine pit, dumping area and laterite road. There are no current ambient air quality guidelines or standards available for the heavy metals to which this study can be compared, except lead which were 10 $\mu g/m^3$ as of NEB 24-hour guideline and 1.5 $\mu g/m^3$ as of U.S. EPA quarterly standard, thus the data obtained only served as the indicator for the potential presence of the heavy metals in the project area. By comparison to the lead guidelines, the lead content in Mae Moh ambient air was much lower than both

allowable limits. In addition, the other heavy metals in ambient air were generally low as the nanogram levels. Thus it can be concluded that in case of the heavy metals, Mae Moh air quality were in good conditions.

In this study, the areas where were in the radius of 2 km around the plant, were only investigated. Yet, small fly ashes which are highly enriched with heavy metals can be dispersed to a considerable distance in the atmosphere before removing from the air. Moreover, the results of this study seemed to indicate that there was an uncertain understanding for the distribution of the heavy metals. It is suggested for the future research that the air quality impact assessment of the heavy metals shall be conducted in the areas where are in the position that is directly affected by the prevailing wind in order to substantiate their significance. Additionally, it is hoped that this study will serve as a basis for further improvement of the distribution of the heavy metals in ambient air in area of the lignite fired power plant.