CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study was conducted to evaluate the potential of waste foundry sand as media in permeable reactive barrier (PRB) to the removal of zinc from groundwater as media. Serial batch kinetic tests and batch sorption tests were conducted to determine zinc removal characteristics and removal capacities. Tests were also conducted on iron filing, bentonites, and coal dust for comparison. Synthetic foundry sand was synthesized to compare the removal efficiency of zinc onto waste foundry sand and synthetic foundry sand including enhanced the removal efficiency of synthetic foundry sand by using a multivariate regression analysis to optimize the proportion of significant index parameters for the best removal efficiency. Laboratory experiments and analytical modeling were conducted in this work.

- Leaching characteristics of the waste foundry sands were evaluated. The results showed that heavy metals contained in leachates from waste foundry sands were less than the values from the Ministry of Industry's standard.

- Results of serial batch kinetic tests showed that waste foundry sands are effective for the removal of zinc via sorption and precipitation processes. Particularly, amount of zinc removed increased as solution pH increased.

- The zinc removal efficiency by foundry sands using initial zinc concentration 50 mg/l ranged from 12.95 – 51.02 % at initial solution pH of 3.72 and ranged from 58.74 – 84.77 % and 68.75 – 92.39 % for initial solution pH 6.59 and 8.01 respectively.

- Clay, TOC, and total iron contain in waste sands are responsible for the sorption of zinc, and the presence of clay and total iron resulted in elevated solution pH, which caused the formation of zinc hydroxide and provided more sorption sites for zinc. Empirical equations were developed using multivariate regression indicated that zinc removal is a function of iron content, clay content and total organic content. However, there are other factors in foundry sand that contributing the removal of zinc especially when solution pH increased.

- Comparison between waste foundry sand and synthetic sand showed that zinc removed by synthetic sand was comparable with waste sand. This confirmed the hypothesis that TOC, clay and total iron content are significant index parameters for the zinc removal.

However, inexpensive or no cost waste sands will compensate their reactivity by using as media in permeable reactive barrier. Therefore, utilization of waste foundry sands as a reactive medium is attractive in terms of sustainable development, and also save valuable landfill spaces increasing in a variety of areas including the transportation, construction.

5.2 Recommendations

This is preliminary study on the utilization of foundry sand waste as heavy metal sorbent. Further study should cover some others aspects that relate to column

study and investigate the feasibility of using waste foundry sand to remove other heavy metals. The recommendations for future studies are listed below.

- Collect more samples from other manufactories in order to achieve the real data.

- Using actual groundwater in batch kinetic and batch sorption isotherms to determine the effect of actual groundwater on sorptive capacity.

- Conduct on column experiment for better stimulating the real natural conditions.

- Study on the possibility of using foundry sand to remove other heavy metals.