CHAPTER 7
SUMMARY AND CONCLUSIONS

7.1 SUMMARY

In this study, an attempt was made to optimize the usage of GCS as an aggregate in bituminous base. The studies include the literature review of bituminous mixes, their properties and specifications. The chemical and physical analyses have been carried out to find out the suitability of GCS in order to use the same in bituminous mixes. From chemical analysis, it has been observed that the toxic element concentrations are within the regulatory limits given by EPA. The physical properties conform to the ASTM and MORTH specification requirements for fine aggregates in bituminous works.

The mix properties and their design requirements are used as constraints for the optimization process. The test values of mix properties from the experimental mix design have been used for arriving at objective functions of mix properties. The MONLOP technique has been used to form a specification for CSDB as a FABB. The conclusions and limitations on the study are summarized.

7.2 CONCLUSIONS

From the analysis of GCS for its usage as an aggregate in FABB, the following conclusions are arrived at:

- Based on the TCLP test, the toxic element concentrations are within the regulatory limits given by EPA (2004).
• The physical properties conform to the ASTM and MORTH specification requirements for fine aggregates in bituminous works.

• GCS can be used as an alternative aggregate for bituminous works by considering the environmental and engineering properties.

• By optimizing GCS utilization in the mix without compromising the design requirements of specifications for FABB courses, CSDB yields desirable Marshall Properties and hence this can be used as a FABB course in the bituminous pavement construction.

• The designed grading of CSDB is capable of satisfying all the specifications from which the constraints are derived.

• Conventionally the design of bituminous mix is aimed at optimizing the Pba from the values of mixes obtained in a single aggregate grading selected from specification limits. Whereas by using MONLOP process, the optimization of three inputs like binder, aggregate and their mix properties is possible. In a nutshell, it can be concluded from this study that the MONLOP technique is an effective tool to design the grading of CSDB.

• By this method, the mixture composition may not be given as a single prescription. Instead, depending upon the availability of mixture constituents, the composition may be adjusted, without compromising any design requirements.
7.3 LIMITATIONS OF THE STUDY

- The chemical and leaching analyses have been carried out on GCS obtained from one source only. If the source of GCS changes, the chemical analysis and leaching procedure must be carried out to check environmental impacts.

- The physical characteristics of GCS and quarry dust considered for this study are also source specific and require separate studies for different sources.

7.4 FUTURE STUDY

- As GCS exhibits good physical properties, it may be tried for bituminous surface courses with thermal conductivity study.

- The methodology of MONLOP could be applied to dense graded bituminous mixes to achieve optimum gradation of aggregates.

- As GCS has been studied as aggregate replacement in FABB bases, the performance testing using modified binders may be carried out in order to satisfy the growing needs of traffic.

- The cost benefit analysis of GCS may be tried for economic consideration.