2. EXECUTIVE SUMMARY

The James Lee Sorenson Language and Communication Center (SLCC) is designed to be a one-of-a-kind facility catering to the deaf and hearing impaired community of Gallaudet University and Washington, DC. The facility is home to several departments at the university and allows collaboration and research across these disciplines. The facility is also designed with sustainability in mind as the project is pursuing a LEED Certified Rating.

This thesis analyzes the current design of the SLCC and aims to improve its energy efficiency and acoustic conditions. The proposed redesign of the facility includes replacing the current variable-air volume (VAV) mechanical system with a dedicated outdoor air system (DOAS) with passive chilled beams and installing an extensive green roof in order to achieve these goals.

The following report summarizes the analysis of the original building design and the proposed design. These analyses include an acoustic conditions report, a structural evaluation, an energy use analysis, stormwater management calculations, LEED Rating re-evaluation, and cost analysis.

The findings suggest that an extensive green roof design may be applied to the majority of the roof area of the SLCC. The roof dramatically improves acoustic insulation during peak traffic times and also reduces stormwater runoff significantly. While the green roof does not improve energy efficiency significantly compared to the original "cool roof" design, the green roof reduces building cooling loads on the top floor spaces enough to significantly reduce the number of chilled beams necessary in these spaces. The additional dead load of the saturated soil and plant material would not require any increase in structural support.

The replacement of the original variable-air volume mechanical system with a dedicated outdoor air system saves up to $25,000/yr in energy costs. This figure is increased to about $31,000/yr with the addition of the green roof. This proposed supplies 30% more outdoor air than is required by ASHRAE Standard 62.1 but does not use the air as a primary thermal transport medium. Instead, chilled water is supplied through the building to passive chilled beams which cool plenum air and carry space sensible loads. As a result, air handlers, fans, and ducts are significantly downsized and pumps and chilled water piping are significantly increased in size and number.

The final recommendation is that both the DOAS system and green roof be installed for several reasons. While there is an increased first cost of about $1.83M with an expected payback period of about 34 years, this additional first cost may be justified by the intangible benefits of the proposed design. Also, the proposed design does meet the intended thesis goals for improved energy efficiency and acoustics. Finally, the proposed design could improve the LEED Rating from "Certified" to "Silver."