Executive Summary

This report compiled in accordance with senior thesis requirements discusses the design and construction of *Louis at the 14th* in a series of four primary analyses. These analysis topics collectively offer insight into providing the most effective, efficient, and safest foundation system for the building.

Analysis #1: Prevention Through Design for Foundations & Excavations

While prevention through design is more commonly practiced in designing the finishing details of buildings, this research highlights less common ways of applying prevention through design techniques to the foundation of a building and the excavation it requires. Its intention is to point out ways of changing design documents, specifications, and means and methods of excavation as well as the most hazardous elements of such work in order to provide the safest work environment.

Analysis #2: Foundation System Study

The schematic design of the foundation system was heavily challenged by soil conditions and the budget of the project. Had the schematic design taken a different direction, this analysis investigates that alternative option by utilizing a single mat slab design instead of a combination micropile and spread footing design. A structural study is also performed to aid in revealing the advantages and disadvantages of the mat slab system in comparison to that used on the actual project.

Analysis #3: Site Specific Safety Plan

By applying the findings of Analysis #1 to the foundation redesign of Analysis #2, a site specific safety plan is developed for the excavation phase. This plan focuses on identifying the risks and hazardous environments introduced by the mat slab design and provides analysis on the safest means and methods of protection and safety in accordance with the prevention through design research.

Analysis #4: Geothermal Loop System

In an effort to further exploit the building foundation area, this analysis looks into the installation of a closed-loop geothermal system with a well field installed in accordance with the actual micropile system used for the northern foundation. A mechanical study is completed to appropriately size the wells to serve the heating and cooling demands of the ground floor retail space of the building. The impact to the project budget and schedule are investigated as well as the overall constructability of the geothermal well field.