

Seattle Green Roof Evaluation Project

Convinced that quantifying the storm water benefits of green roofs is pivotal to their wider use, Magnusson Klemencic Associates conceived of and executed an unprecedented private-sector research project to confirm their benefits and accelerate green roof acceptance. That undertaking was known as the "Seattle Green Roof Evaluation Project" (or SGREP). This "first ever" endeavor remains the only project in the country to monitor multiple green roof systems in multiple plots actually ON multiple building roofs, and the validation and data produced will be invaluable in the implementation of green roofs.

Green roofs, encouraged in many cities across the nation and mandated in others, are proven to reduce pollution, lower urban temperatures, provide green space for wildlife, create oxygen, absorb carbon dioxide, double or triple building roof life, and provide insulation. Yet their most compelling benefit is their ability to manage storm water: they mitigate rainfall where it lands rather than letting it reach the ground to burden city infrastructure. For individual buildings, green roofs can reduce the need for conventional storm water management systems, remove airborne pollutants, and lower runoff temperatures. Implemented en masse in urban areas, green roofs can significantly roll back the negative effects of urbanization, re-create lost natural ecological processes, and combat urban flooding related to climate change.

MKA conceived of SGREP after observing how frequently green roofs were considered by owners and architects, yet ultimately rejected due to cost, lack of understanding regarding implementation, or lack of recognition of the conventional storm water management systems that the green roof could replace. Even though their storm water management potential was always their most-touted attribute, virtually no information was available to quantify these project benefits. Additionally, while the City of Seattle accepts green roofs as a storm water management practice, the burden is on the project engineer to demonstrate that a site's storm water release rate complies with City storm water regulations: the "applicant must model the storage capacity and discharge rate of the green roof." Out of that requirement, and the need for justification data, evolved MKA's SGREP.

SGREP, funded two thirds by MKA with the rest coming from project sponsors and donations, was completed in two stages. First, MKA spent a year developing an innovative computerized site analysis and design tool to model runoff from sites with green roofs. This work validated that green roofs could function as significant storm water attenuators in Seattle's climate. Next, MKA collaborated with three local developers and a building contractor to install five green roof test plots at four commercial building sites around downtown Seattle. Each plot was outfitted with custom-designed monitoring systems which measured site-specific climate parameters and test plot runoff for 18 months. By monitoring the effectiveness of green roofs to manage storm water based on actual rainfall and weather conditions, the research project creates a valuable new body of verification data that can be applied to Seattle and nationwide.

The complex modeling tool developed by MKA accounts for 10 different environmental processes and physical characteristics. Most importantly, it proves what to date had just been theorized: (1) building-specific detention benefits can be substantial (with the potential for over 50% of a project's detention requirement to be met by a green roof) and (2) storm water infrastructure system benefits can be substantial (with as much as 50% of average annual building rainfall never becoming runoff). These facts, and their validation, are incredibly significant in the promotion, implementation, and acceptance of green roofs as storm water management tools.

It is hoped that further understanding and quantification of green roof benefits will hasten their implementation, provide City regulators with data to justify and permit their use as a storm water management tool, and enable policymakers to consider appropriate incentives. The study proved that green roofs are effective at attenuating runoff, offsetting the need for conventional detention and dramatically reducing cumulative runoff over the course of the rainy season.

MKA's SGREP provides the profession with the missing link that will enable civil engineers to consider the storm water management elimination value of green roofs in their storm water management designs in their respective localities. MKA's modeling tool is the first methodology of its type to model actual storm water flow through a LID technique and allow its combination with flow from other site surfaces, critical to larger-range acceptance and implementation. This methodology is already being applied beyond green roofs into other LID practices, such as permeable pavements, rain gardens, and subdrain systems.

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