Determining the Quality of Rainwater Drainage from Various Rooftops.

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I. Introduction

Rainwater harvesting has a long history dating back to ancient Native Americans. Recent technologies and innovative methods have made it a viable solution in many situations. By understanding roof structures and their drainage systems, it is possible to use rainwater for human consumption and for landscapes, especially in Utah. This project determined the differences in rainwater run-off between various traditional roof structures and a green roof system. Rainwater samples are being collected and analyzed for contaminants and pollutants such as TSS, VSS, DOC, metals, phosphorous, and nitrogen.

Figure 1. Flat membrane roof on ENG Building, USU-Logan Campus

Figure 2: Assembled gutters to collect storm run-off from both solar panels and metal roof, USU Logan Campus.

Figure 3: Green roof system, USU-Logan Campus

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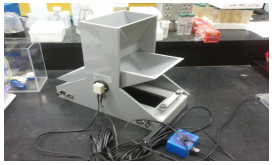

Figure 4: TB1L Bucket Flow Gauge installed in manhole.

Figure 5. Isco-Autosampler installed at drain vault.

II. Methods

Tipping Bucket Flow Gauges were placed in various locations on Utah State University campus to measure the quantity of run-off from various roof surfaces. Isco-Autosampler's were connected to the effluent of the Tipping Bucket Flow Gauges and pumped run-off into 500 mL sample bottles during rain events for laboratory analyses. These analyses were used to determine TSS, VSS, DOC, metals, nutrients, and organics in the run-off water as a function of the type of roof being sampled.

III. Results

The results of Total Suspended Solids and Volatile Solids from a drain vault on USU Logan campus are shown in Figure 7, metals in Figure 8, and DOC in Figure 9.

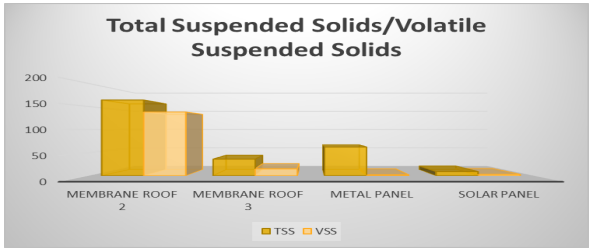

Figure 7. Results of TSS/VSS from a standard commercial membrane covered roof compared to metal and solar panel roof, USU Logan Campus.

III. Results cont.

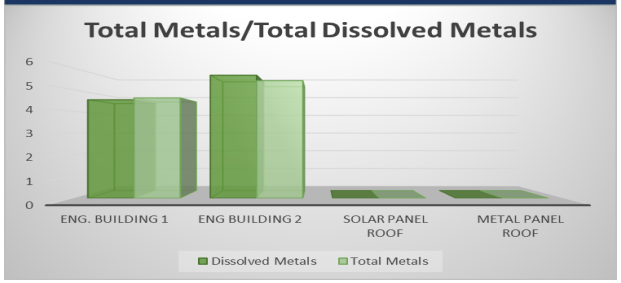

Figure 8: Results of Total Metals/Dissolved metals from various roof types.

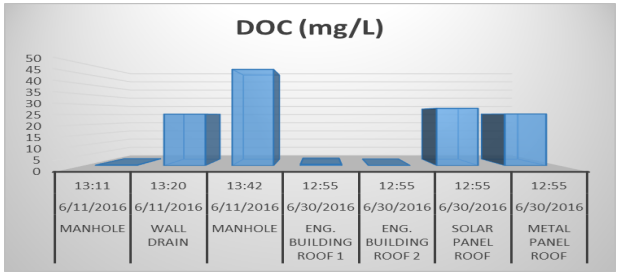

Figure 9: Results of Dissolved Organic Carbon from various roofs over time.

IV. Conclusions

Harvesting and proper management of rainwater/storm-water resources are urgently required to ensure a safe and adequate supply of water for future needs of the growing population in the Intermountain West. Collected data will help determine if roof drainage is of sufficient quantity and high quality to be safe to use as a substitute water resource for humans and for our environment to help manage the future water needs in our cities.