Stormwater Management using Green Infrastructure Technologies for the Future Development of Former Martin Tower Site

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Introduction

What once stood 21 stories high in the heart of the city of Bethlehem, the Martin Tower was a symbol of power for Bethlehem Steel. In the few years since its demolition on May 19, 2019, plans to use the 53-acre lot for a mixed-use development have been proposed to the city planning board. In contrast to the stand-alone tower, the new development plans maximize public and corporate use by including medical offices, a grocery store, a 130-room hotel, restaurants, retail, 300 apartments, a gas station, and a convenience store (Tatu 2021). A major concern is the long-term sustainability of the current design considering future increases in severe weather conditions due to climate change, carbonate geology, extensive impervious surface coverage, stormwater drainage pathways, and potential contamination and overfilling of the nearby Monocacy Creek and Burnside Plantation. Developer construction plans include minimal to no stormwater management plans. In our research, we hope to identify the best possible methods to mitigate risks of stormwater by using Best Management Practices (BMPs) for the Martin Towers (MT) site.

Figure 1: MT demolition and the cleared site 11 months after

Research Objectives

1) Identify general surface flow patterns, points of accumulation, and outflow locations in the Martin Towers lot.

2) Identify potential damage to surrounding systems (Monocacy creek, nearby properties) from runoff if not mitigated.

3) Identify Green Infrastructure solutions that could mitigate potentially harmful stormwater accumulation and runoff.

Methodology

- Observe the MT site characteristics in person, in photos, and on Google Earth Pro and developer's construction plans
- Assess surface flow paths and areas of accumulation of surface runoff
- Identify common runoff contaminants from commercial activity
- Analyze common contaminant impact to local environment
- Compare and contrast BMPs for implementation on MT site

Findings and Analysis

Site Geological Conditions

Figure 2: Carbonate Geology under MT Site

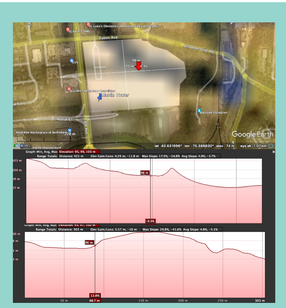


Figure 3: Surface elevation change from E – W, N - S

Developer Plans and Risks

Gas station (Petroleum)

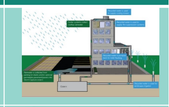
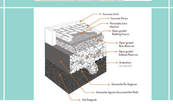
Hospitals (Biological Waste)

Residential Areas, Restaurants, Retail (Varied Waste)

Parking Lots (Impervious, runoff)

Figure 4: Current Plans for MT Site Development

Table 1: Potential BMP Additions to MT Site

BMP For Non Infiltration	Image	Stormwater Mitigation	General Cost
Capture/ Reuse Cisterns		Stormwater Storage for future use (irrigation)	$21,000 for 5,500-gal w/ UV sterile
Dry/Extended /Naturalized Detention basin		Basin to retard stormwater. Temporary storage and controlled release rate.	$25,000 - $50,000 / acre-ft
Vegetated Roofs		Waterproof & drainage layer, root barrier, growth media. Prevent stormwater overflow	$10.30 - $19.70 / ft^2 + $0.25 /year
Reduction of Impervious Cover		Alter surface material to increase stormwater seepage into subsurface	$3,000 to $9,000 / 300ft^2

Conclusion

After considering MT site geological conditions, current developer plans, and current BMPs that would be applicable to the site, our solutions to identified risks include:

- Implementation of viable green infrastructure methods that are cost effective and legally permissible
- Although costly, stormwater is critical to manage to avoid risks
- In the face of climate change, standardizing green infrastructure for proactive stormwater damage mitigation and overall sustainable design is critical

Future Outlook

With our conclusion that it is imperative to address stormwater management properly to avoid irreversible damages, we would like to extend our findings to be a blueprint for other future construction projects to consider. Martin Towers was one of many sites that failed to adequately address stormwater, and we would like to see projects begin to implement Best Management Practices like the ones we outlined for MT.

Citations and Credits

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