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# Smart Planning for Stormwater Management

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 UTC Mentors: Dr. Jejal Reddy Bathi & Carmen Harvey



## Summary

A project-based lesson (PBL) is designed to provide high school students hands-on experience with real-world connections. The project aims at smart planning of urban development that would have a minimum environmental impact (traditional gray infrastructure minimized with the green infrastructure approach). In this effort, teachers with diverse teaching backgrounds in secondary education participated in urban designs and green infrastructure (GI) research and PBL design training at the University of TN-Chattanooga.

## Motivation

We are motivated to create a smart plan to replace grey infrastructure with green infrastructure. Doing so will provide an opportunity for more social, economic, and environmental benefits. Our plan will help eliminate pollution to the TN River, help reduce crime rates, and contribute to a better economy.

## Questions

- How can we manage stormwater runoff environmentally, economically, and socially beneficial for our community (our neighborhoods, schools, and surrounding areas)?
- As stakeholders of Hamilton County Department of Education (Tyner Academy and Soddy Daisy), how can we help engineers of smart cities as they seek to improve our water quality and water management systems?
- How can our school and our community stakeholders help eliminate the hazards, risks, and exposure to dangers when dealing with water management?

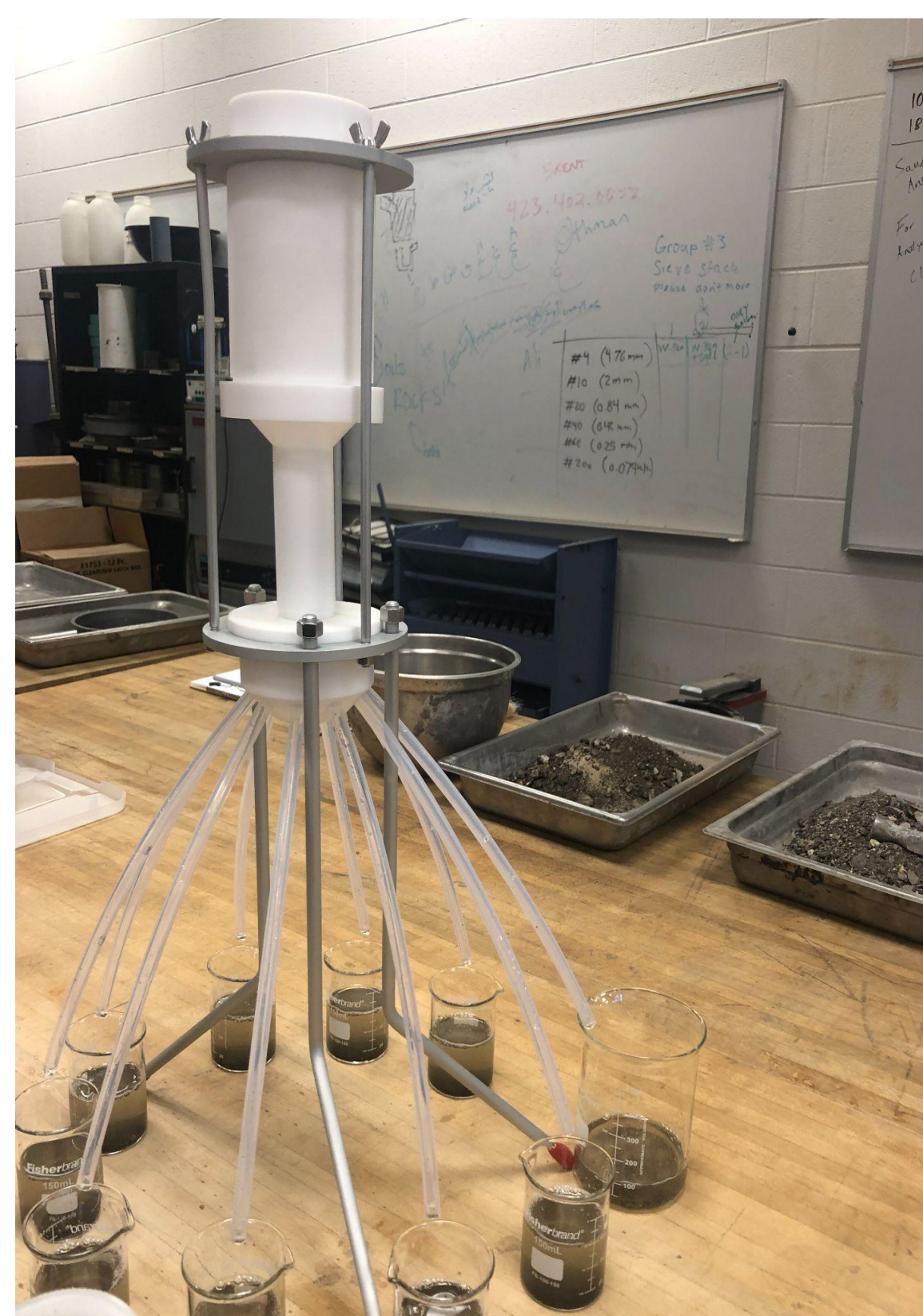
## Hypothesis

After collecting stormwater samples from various locations (both at UT-Chattanooga/EMCS Building and Chattanooga-Zoo) and analyzing sample data, it is possible to discover the pros and cons of permeable (porous surfaces such as soil, sand, trees, flowers ... etc) and impermeable surfaces (roads, sidewalks, driveways, and parking lots). With the samples collected, it is possible to identify which and how surfaces catch precipitation surface runoff, allow infiltration into the soil, improve social benefits, and most importantly, help reduce the amount of pollutants and runoff volume.

## Project Description

Teachers collected, analyzed and compared the composition of stormwater samples from Chattanooga areas and developed smart planning to change grey infrastructure into green infrastructure. They translated their research training into (soon to be widely disseminated) lesson plans in order to help students become more STEM-savvy, better communicators (written and spoken), and responsible citizens who take care of their communities and are successful in STEM-related careers and degrees.

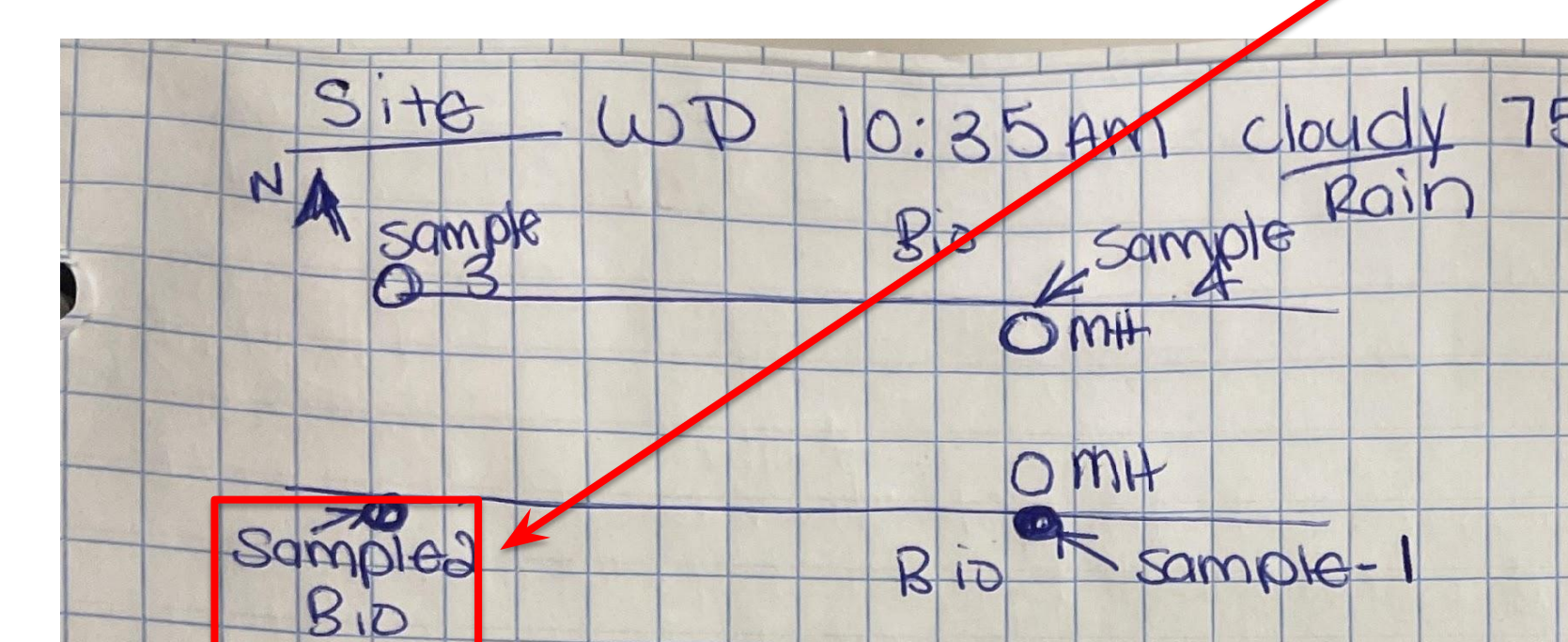
## Infrastructure photo



## Results



Sample	Dry Filter Mass (g)	Pan Mass (g)	Turbidity (NTU)	Conductivity (µS/cm)	pH	Bowl Mass (g)	Sediment Mass (g)
1	0.0697	2.5847	129	127.5	7.47	112.3832	0.2194
2	0.0691	2.6294	919	133.6	7.47	113.1675	1.3715
3	0.0689	2.6527	74.1	122.7	7.54	161.3088	0.1184
4	0.0716	2.5796	50.5	160	7.65	102.1300	0.0297
5	-	-	7.42	99.5	7.87	-	-



## On-site Project Materials & Photos

- Containers to collect stormwater
- Sharpie Marker
- Duct tape
- Cell phone/camera (photos & video)
- Plastic Cups (1 per individual)
- Rain boots (or shoes to walk in dirt/water)

## Research Materials used

- Google Pro Earth app (desktop/phone)
- EPA Stormwater Calculator
- Laptop
- Cell phone
- all materials listed under "On-Site Project Materials"
- PH testing strips/PH probe
- Doppler
- tweezers
- oven (brand used: "Hemboldt")
- chemical divider/separator scale
- weighing dish

## Conclusion

In conclusion, our research into stormwater runoff problems and possible green infrastructure solutions further proves the importance of water managers and planners constantly finding ways to improve water management and augment water supplies.

## References

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