

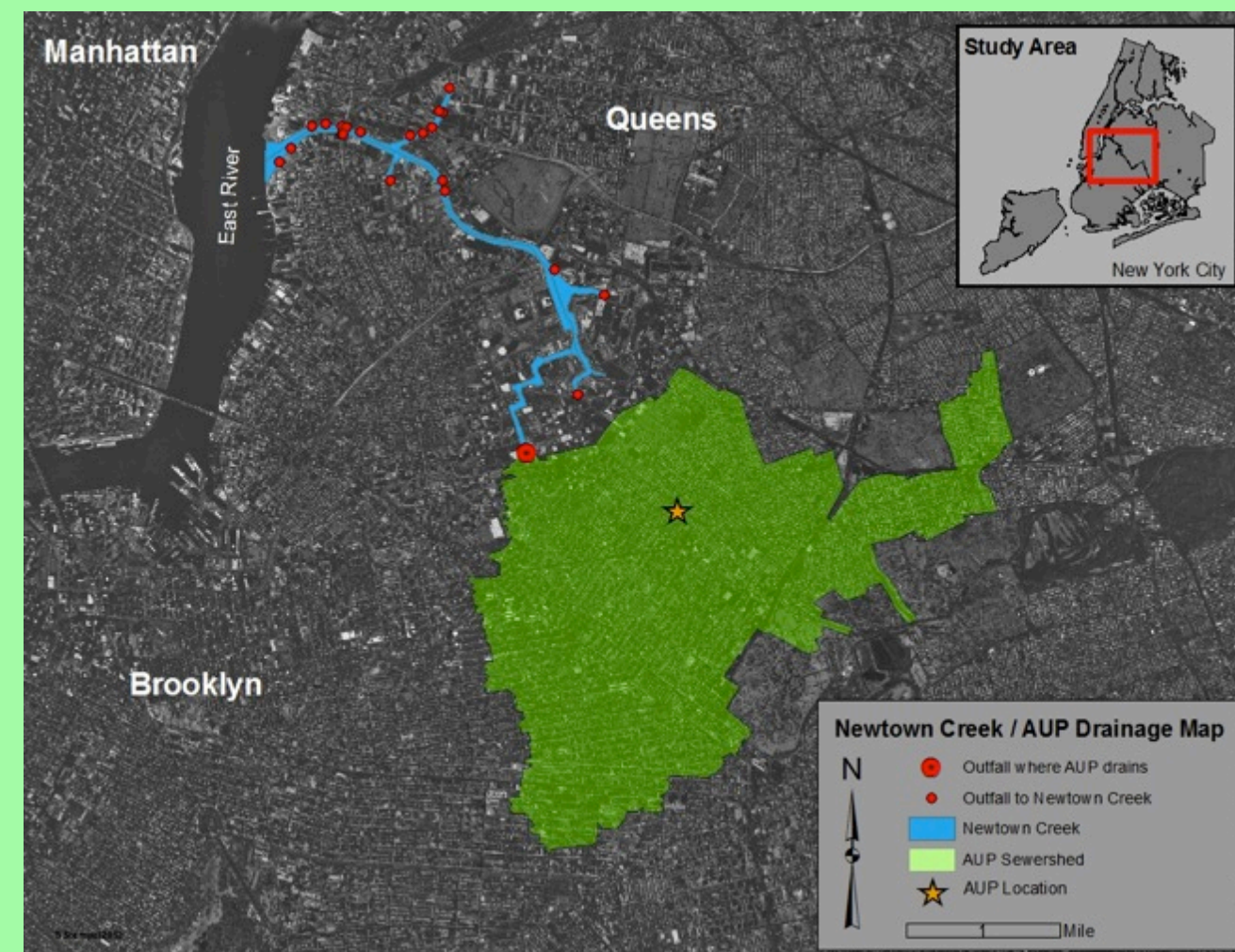
FACTORS AFFECTING THE QUANTITY AND QUALITY OF STORMWATER RUNOFF AROUND THE ACADEMY OF URBAN PLANNING CAMPUS, BUSHWICK, NY

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ABSTRACT

In urban areas, run-off water from rainstorms can cause flooding, sewage overflows, and pollution of local waterbodies. This issue was investigated by conducting a stormwater survey of the Academy of Urban Planning (AUP) campus, which drains to Newtown Creek, a listed Superfund site. Mapping techniques, spatial calculations, and laboratory procedures were used to determine how the types of surfaces and pollutant sources around the school contributed to run-off water quality. Results showed that over 60% of the school campus was impervious, which would lead to nearly 200,000 gal. of run-off water during a typical storm (based on the NY state stormwater design manual). One of the main pollutants associated with stormwater around the campus was loose leaves and dirt, which were found to contribute nutrients to runoff water. After analyzing the data opportunities for best management practices such as rain gardens, rain barrels, and litter control were identified around the AUP campus.

BACKGROUND



The purpose of the stormwater study around AUP is to know how run-off water from rainstorms can cause flooding, sewage overflows and pollution of local waterbodies. There is a creek named Newtown Creek located between Brooklyn and Queens. This body of water is one of the most polluted in the whole city. We, Bushwick Campus add stormwater pollution to this creek. New York City has requirements for stormwater pollution. This study will look at the pollution from our school campus.

Research Questions: Does our school have an impact on Newtown Creek pollution? How much runoff water from AUP goes into Newtown Creek? How can we help fix stormwater runoff problems?

Hypothesis: The AUP campus is mostly impermeable and probably drains a lot of stormwater to Newtown Creek.

We Completed our Project in Three Sections:

1. Stormwater and Pollution Mapping
2. Stormwater Calculations
3. Yard waste Study

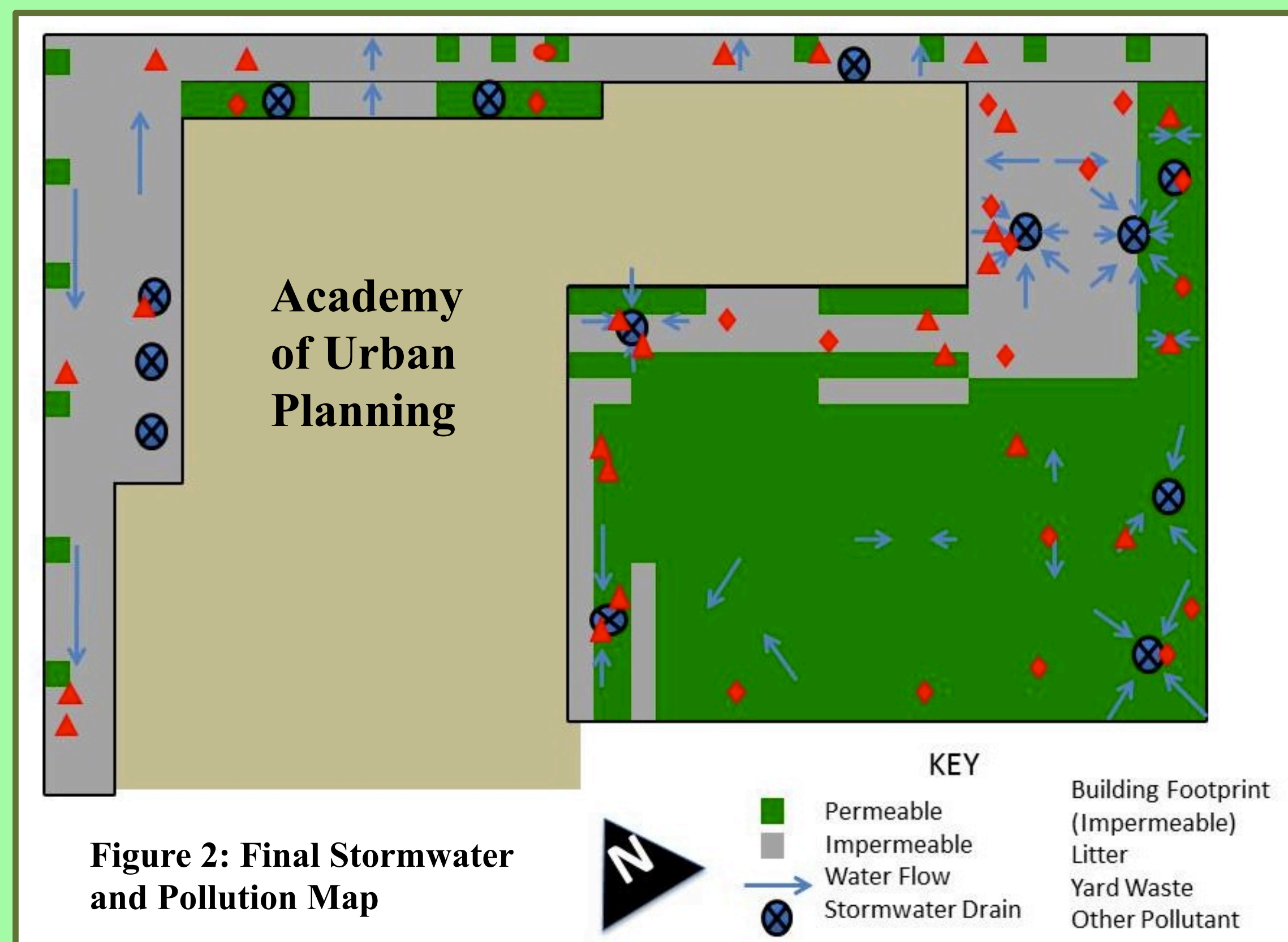
(1) Stormwater and Pollution Mapping

Methods:

- Divide campus into 11 sections
- Groups from each class mapped different sections looking for:
 1. Permeable vs. Impermeable Surfaces
 2. Direction of Water Flow
 3. Sources of Pollution
- Each hand drawn map was copied into PowerPoint to make the final map.



Results:



(2) Stormwater Event Calculations

Methods:

- The percent permeable and campus area were calculated using our mapping results with a ruler and map print out.
- This information was used to calculate runoff and infiltration volumes on AUP's campus for three model storm events.

These values were taken from the New York Stormwater Manual:
90% Storm = 0.033 meters of rain in 24 hours
1-Year Storm = 0.0711 meters of rain in 24 hours
10-Year Storm = 0.1270 meters of rain in 24 hours

Example Storm Event Calculation

During a 90% Storm 0.033 m of rain will fall in 24hrs

How Much Rain Falls Over the School during a rainfall that is 90% of our storms?
 $0.033 \text{ m rain} \times 29,846 \text{ m}^2 \text{ (campus area)} = 984.92 \text{ m}^3 \times 264 \text{ gal/m}^3 =$
260,018 Gal. of rain over the campus

How Much Water will Run off the Campus?

$984.92 \text{ m}^3 \text{ of rain over the campus} \times 72.9\% \text{ impermeable} / 100 = 718.00 \text{ m}^3 \times 264 \text{ gal/m}^3 =$
189,554 Gal. of runoff

How Much Water Will Infiltrate into the Ground?

$984.92 \text{ m}^3 \text{ of rain over the campus} - 718.00 \text{ m}^3 \text{ of runoff} = 266.92 \text{ m}^3 \times 264 \text{ gal/m}^3 =$
70,467 Gal. of infiltration

Results:

	Rain Fall over School	Run-off	Infiltration
90% Storm	260,018 Gal	189,554 Gal	70,467 Gal
1-Year Storm	560,221 Gal	403,590 Gal	150,031 Gal
10-Year Storm	1,000,677 Gal	729,493 Gal	271,183 Gal



(3) AUP Stormwater Quality

Methods:

- We collected yard waste (dirt, grass, and leaves) from our school campus
- We soaked yard waste in water for 1 week.
- We tested water for water clarity, Nitrate, Nitrite, Phosphate, pH using water quality test strips
- Our control group was clean tap water



Results:



Experimental Setup



Testing Water Quality!

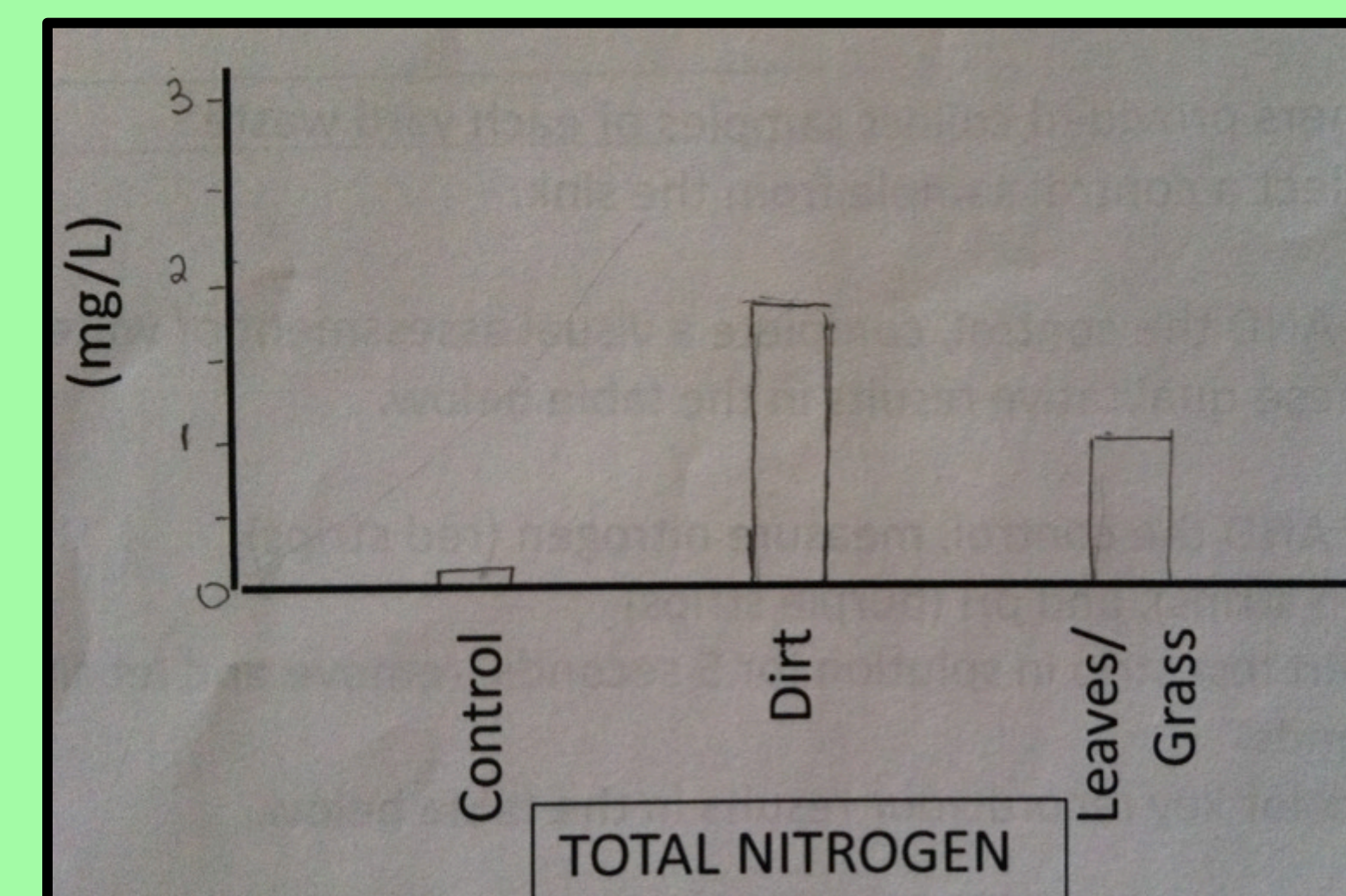


Figure 3: Graph of Total Nitrogen contents in Dirt and Leaves/Grass

FINAL RESULTS AND DISCUSSION

AUP has mostly impermeable surfaces, so most of the stormwater will run off into Newtown Creek. When we combine the Nitrogen results from the yard waste study with the volume from our stormwater calculations we find:

2,143 Kg of Nitrogen

flow from our campus into Newtown for the most typical storm (a 90% storm)

This is important because New York State is trying to lower the amount of Nitrogen in Newtown Creek and we do not want to add pollution to Newtown creek because it is already very polluted with oils and sewage.

The results from this study relate to each other and NYC as a whole because the impermeable surfaces of NYC and our school put the most pollution in the stormwater water because everything slides together into a large mass of sewage down into the City's water bodies



In the Fall, we took a trip to Newtown Creek to learn about the pollution

CONCLUSIONS

• Our School is contributing pollution to Newtown Creek

• We can do some Future Research to help solve this problem

1. Students can clean up litter
2. We can compost yard waste
3. We can collect runoff water in a rain barrel
4. We can create a green roof with plants to make more permeable area

After we implement the ideas, we can measure the pollution again to see if there is a change



We ♥ Trees because they help absorb stormwater!



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