

# *KRAKEN*

Michigan Technological University  
Enhanced Focus Area Report 2022

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## Introduction

Environmental deterioration was a pivotal issue of 2021 and will likely continue to be a concern as 2022 plays out. Keeping this in mind, the 2022 Michigan Tech Concrete Canoe team applied this idea of environmental awareness to their canoe-building process. The Tech Team chose an enhanced focus area(EFA) that explored the concept of sustainability and what it would mean for future Michigan Tech teams. The main goal of this being to instill a sense of environmental consciousness to future members. This included not only looking at where principle materials were coming from, but finding a way to conserve a resource like water. This meant implementing a new set of guidelines to follow surrounding concrete recycling and even water use. Houghton, Michigan is one of the snowiest cities in the country, allowing the team to look into different water options.

## Selection Process

Selecting an EFA began with the idea that the team focus on sustainability. However, this very broad subject brought up ideas surrounding supply chains, manufacturer ethics, business models, team time management, climate change, and resource usage. The team already had details on all manufacturers, which made research a viable option. Furthermore, the Keweenaw Peninsula is a prime location for snowfall, making snow melt a good option for saving water.

The Team wanted this year's EFA to address unknowns for future teams. This led the team to look into where their materials were coming from, if they were at risk of running out, and what the overall impact they had on the planet. However, there are many different categories of material that go into a canoe, from aggregate to reinforcement. The Team decided the best approach was to focus on two main sections of the mix: mined resources and recycled ones. On a smaller scale, the team wanted to implement this idea of sustainability within their canoe-building process. Gathering and making mix ingredients wasn't an option, but the integral part of concrete, water, was an option. This is in part due to the large amount of snow in the Keweenaw around build time.

## Environmental Analysis

The 2022 Michigan Tech canoe is primarily made of aggregate and cement, along with recycled materials. To focus on the sustainability of the canoe, the team first decided to take a deeper look at material allocation. Of the eleven different mix ingredients used in the 2022 canoe, 47.05% came from Alpena, MI, 12.24% came from Innisfil, Ontario, 11.57% was recycled concrete, and 29.14% was untraceable/had many locations. The high percentage of materials coming from areas surrounding Tech corresponds with lower impacts of transportation of these materials. Continuing on, an analysis of the ingredients themselves was to be conducted. From this, the team wanted to create an accurate estimate of recycled materials. Of all the mix ingredients, 11.57% comes from recycled concrete while 12.24% comes from recycled concrete. In total, 23.81%, almost a quarter of the canoe, comes from recycled materials.

## Applying Environmental Analysis

A fundamental of any environmentally conscious organization, especially one using as many resources as a canoe team, has to be sustainability. After the core resources had been analyzed, the team decided to move on to the implementation of a sustainable water-saving practice. On average, Houghton, Michigan receives 200 inches per year. This made snow-melt a viable option. Moving forward, a protocol had to be designed in order to have enough water come mix day. The team had an ample amount of five-gallon buckets, originally used to store concrete ingredients. It was decided that these would be used to mix in. Contaminants would have to be removed from these buckets to prevent any structural issues occurring in the final canoe.

Moving forward, snow and liquid water have a rough 10 to 1 estimate. The 2022 canoe build took place over 12 hour increments, and there needed to be water for the duration of this process. It was devised that two days in advance, the team would meet to go and collect snow. It wasn't hard to find. There was plenty of snow right outside the lab entrance. On average, each batch of concrete requires 0.700 liters of water. Each bucket has 5 gallons or about 19 liters of volume. This equated to about 2 liters of total water from each bucket of snow. With 37 batches of concrete used to make the final canoe, 13 buckets were required.

A concern was raised surrounding the possibility that unwanted contaminants could make their way into the final mix by way of snowmelt. This meant the team had to further design a process to filter the snow. Mesh was placed over the buckets in order to filter any contaminants from the snow.

## Conclusion

With sustainability as a core focus, this year's EFA needed to address this. This enhanced focus area served two main purposes: to provide insight into the canoe's sustainability, and to promote sustainability with the implementation of a water-saving practice. The EFA needed to provide useful knowledge for future canoe teams. However, there also needed to be an application of knowledge to this year's canoe. The analysis fulfilled the first requirement, while the snow-melt method fulfilled the latter. There are new environmental dilemmas facing the civil engineering industry everyday. This year's EFA certainly helped the Michigan Tech Concrete Canoe team gain insight into a topic certain to rise to importance in coming years.

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