

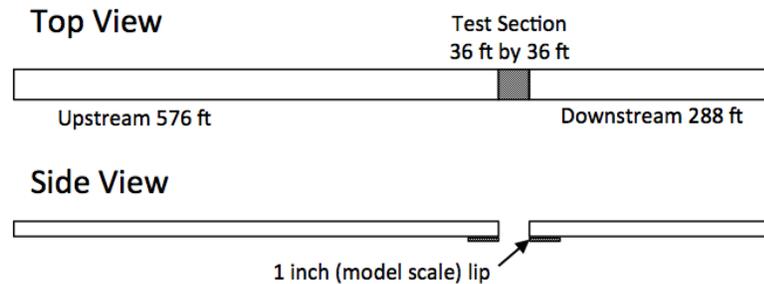


Introduction

Stormwater runoff occurs when precipitation flows over the ground. On its way to drainage channels, stormwater picks up debris, pollutants, and sediments. Most stormwater flows untreated into lakes, streams, rivers, wetlands, or coastal waters. Therefore, the removal of debris, among other contaminants, is fundamental to preserving water bodies that we use for drinking water supply, recreation, agriculture and industrial needs. This pre-design competition will challenge students to design a hydraulic structure capable of removing debris from a concrete-lined stormwater channel.

Project design description

The challenge is to build a 1:36 (model:prototype) scaled model of a hydraulic structure that is intended to remove debris from a stormwater system. The prototype rectangular channel has the characteristics described in the following table and accompanying figure.



	Prototype Channel
Upstream length (ft)	576
Downstream length (ft)	288
Width (ft)	36
Depth (ft)	18
Q_{low} (cfs)	4200
Q_{high} (cfs)	8600
Slope (ft/ft)	0.001

The design teams should build an apparatus that can be placed within the specified space with the goal of removing the largest amount of debris possible, while still passing all of the flow downstream. A 1-inch lip will be placed at the edge of the channel (made of coroplast) in order to accommodate the model structures. The debris used in the model will include a combination of coarse coffee grounds (pre-soaked) and paper confetti created with a paper punch. Approximately 1 cup of each type of debris (known weight) will be introduced for each model run. During the competition, we will evaluate the hydraulic structure at two different flows as specified in the table. Of course, it is expected that the model channel will not overflow laterally because of the impact of the structure on the flow.



Evaluation

Collected debris will be immediately centrifuged for 30 seconds to remove any excess water and will be weighted to calculate the debris retained by the structure. The winning team will be the one with the greatest mass of debris retained in the structure over the two model runs (high and low flows). As a reminder, this competition grants a maximum of 100 points for the general competition (i.e., canoe 350, bridge 250, technical paper 125, non-technical paper 125, predesign 100, mystery design 50, Total = 1000).