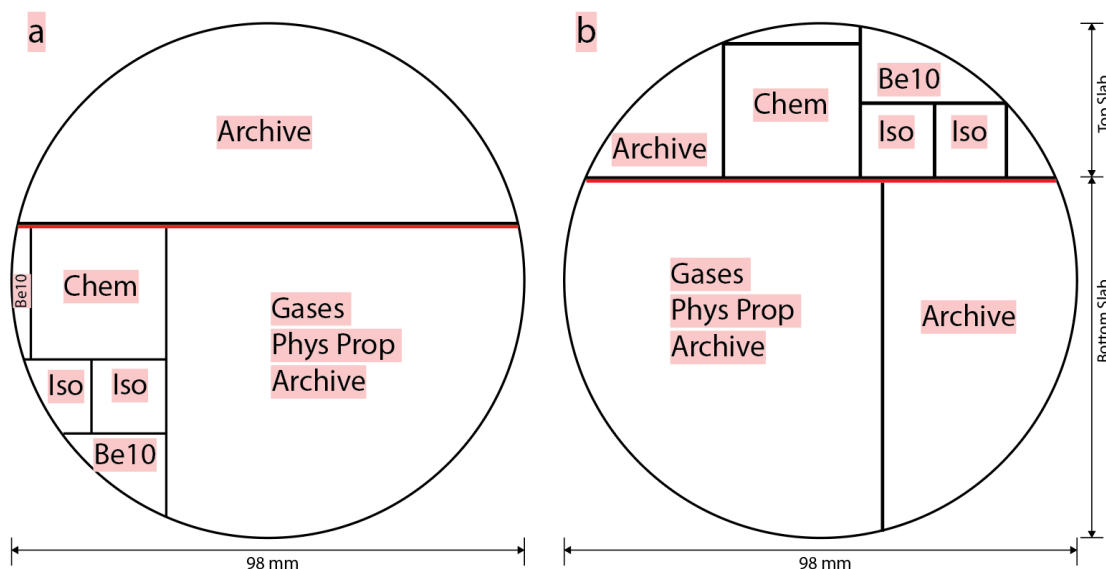


Field Project Challenge Information Sheet

Ice Core Cut Plan:

Here are examples of how scientists might cut an ice core to conduct various studies. The cut plan may be altered depending on what the primary objectives are for a particular ice coring project, such as studying chemistry (Chem) or isotopes (Iso) using a Continuous Flow Analysis (CFA), gas such as CO₂, or physical properties (Phys Prop). Often multiple groups will collaborate on one project, so scientists develop these cut plans before a project starts to determine what size of ice core is needed and how much ice will be allotted to each area of study.



Drilling Fluid:

Drilling fluid may be used for multiple reasons. A primary reason is it improves core quality, i.e. less cracks or breaks, which can have a large impact on the quality of science that can be done on the ice. High quality ice cores can usually be drilled without fluid (dry drilling) to a depth of about 250 meters. It is possible to dry drill deeper, but the core quality gradually decreases with depth. Maintaining a column of drilling fluid in the borehole keeps pressure on the ice being cut, acts as lubricant, and aids with the transport of ice cuttings within the drill. Another reason is to minimize borehole closure in deeper holes due to plastic flow. Filling a borehole with a fluid that has a density close to that of the ice will keep the hole from slowly closing on multi-year projects and keep the borehole open for years to come.

The two main fluids currently being used on U.S. projects are Isopar K (naphtha) and Estisol 140 (a synthetic ester). The downsides to using drilling fluids includes impacts to the science data, environmental impact, and, in the context of this challenge, the logistics impact. Drilling fluid is heavy to transport and requires additional equipment to work with it and extract it from the ice cuttings, roughly doubling the weight to deploy a drill system.

Transportation:

Payload capacities for a particular aircraft or tractor for overland traverse can vary widely depending on the travel distance, weather, and snow conditions for aircraft skiways or tractors pulling sleds. For this exercise, here are average capacities for the typical aircraft and traverse tractors used for polar expeditions.



Bell 212 Helicopter 1,000 lbs.	DHC-6 Twin Otter 2,000 lbs.	BT-67 Basler 5,000 lbs.	LC-130 Hercules 20,000 lbs.	PistenBully 300 30,000 lbs.
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