Esso's artificial island at Issungnak.

prohibitively expensive, however, when the site is in deep water.

One island, Tarsiut, was built in the summer and fall of 1981 in seventy-two feet of water northwest of Richards Island, between shore ice and ice pack, using a novel technique.

First the berm was laid much smaller than normal, with a crest twenty feet below the waterline. It had a much steeper slope than older examples—a rise of one foot in five rather than one in fifteen—and less than half as much material was needed in its construction.

Four floatable, high-strength, oblong concrete boxes—each 36 feet wide, 49 feet deep and 262 feet long—were then arranged in a square above the crest of the berm. They were hollow with ribbed walls forming many compartments and were joined together by steel doors and anchored to the ocean floor.

Filled with water, they sank to form a wall around the flat top of the berm though their tops were still above the water line. The pool above the berm was pumped dry and the water in the caissons replaced by sand.

Sand and gravel were then added to the berm until the top surface of the island was 25.5 feet above the waterline.

Tarsiut was equipped with over a million dollars worth of monitoring equipment. Diaphragms separating the caisson compartments transfer ice pressures from front to back walls, and gauges measure the strain. Hollow steel plates filled with oil, called Flat Jacks, measure ice pressures on the east wall, and circular plates with shear bars measure loads on the north. The data are recorded on magnetic tape and correlated with ice conditions.

Tarsiut is owned by Gulf Canada Resources, Dome Petroleum Ltd., Mobil Corp's Canadian unit, Canterra Energy Ltd. and Norcen Energy Resources Ltd. Tests of the well designated Tarsiut N 44 this spring showed it capable of an estimated sustained production of 3,500 barrels of oil a day. The oil contains a high percentage of gasoline and diesel. Gulf Canada Resources, the operator, said it will drill two more wells to give a more exact delineation of the reservoir. If the additional wells find sufficient reserves, production could begin as early as 1986.

Tarsiut could be converted from a drilling to a production island by putting more and bigger caissons around it.

The Caissons Came Rolling Along

The four caissons at Tarsiut were built in Vancouver, British Columbia, and cost $27 million.

They were transported to the Beaufort Sea on submersible barges in July, 1981.

The barges were loaded with water ballast until all but their control towers were below the surface. The caissons were then floated over the barges and the water was pumped out, raising the barges and placing the caissons on deck. They were unloaded by reversing the process in Pauline Cove at Herschel Island.

The Men on Hans Island

Hans Island is rather like a mesa in the sea.

It rises in the Kennedy Channel between Greenland and Ellesmere Island with sheer sides and a flat top, some 3,200 feet in diameter, 650 feet above the water.

Its towering sides are battered by ice in the summer and locked in it in the winter. It is, in this respect, under the same kind of pressures that affect the man-made islands used to drill oil.

In August, 1980, five scientists spent three weeks on Hans monitoring its ice. They used aerial and surface time-lapse photography, accelerometers, theodolites, a distant meter, a bore hole jack and airborne impulse radar to measure the force of multi-year ice crashing into the island. Some floes were several miles in diameter.

Much of what they learned has been put to use in designing oil islands. The project was initiated by Dome Petroleum and funded by Dome Petroleum and several other oil companies.

Super Ships

In 1972 Canada adopted the Canadian Arctic Oil Pollution Prevention Regulations. They were designed to prevent oil spills, and they set design and strength standards for ships sailing in sixteen different arctic zones.

The zones reflect ice conditions. Zone 1 has the most, year round. Ships are classified in terms of their strength in Roman numerals, from I to X.

The higher class vessels have not yet been built. A class X ship may prove too expensive to build. It would be able to break through multi-year ice ten feet thick and could operate in Zone 1 or anywhere else in the Arctic year round. A Class VII ship could reach the southeast tip of Melville