PLATE 1
Massey-Ferguson MF 65 Tractor with Davis Backhoe attached to rear and Massey-Ferguson Loader attached to front.

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# Excavation With A Backhoe

ABSTRACT

It is suggested that in certain situations, and under careful control, the use of a backhoe as an archaeological tool may be a useful means of saving use of labour.

In 1961, the Canadian Government started the reconstruction of the Fortress of Louisbourg, Cape Breton Island, Nova Scotia. Since the time allowed was limited, research and excavation had to be telescoped to fit in with engineering and manpower dictates, and in an attempt to produce enough research information, various techniques were introduced: one of these was the use of a backhoe for archaeological excavation under certain carefully controlled circumstances.

The King's Bastion, part of the defensive works of the Fortress, was heavily damaged during the siege of 1745, and in the face of another impending attack, a revetted glacis, or slope, of boulders topped with earth was thrown up in *1757* as a temporary expedient to protect the exposed right flank of the Bastion.

The machine used for excavating the major portion of two ten-foot wide trenches, both at right angles across this glacis, was a Davis Backhoe, attached to the rear of a Massey-Ferguson MF *65* Tractor. The tractor (P1. 1), is available with either a petrol or a diesel engine, has a *7* ft. wheelbase, an overall length of 10 ft. *6* in. and an approximate weight of *4,000* lbs. The backhoe attachment, which weighs approximately *2,300* lbs., has a bucket which gives a maximum digging distance from the line of the rear axle of the tractor of 18 ft. *5* in. and a maximum vertical digging depth of 13 ft. *6* in.; this bucket can be obtained in 18 *or* 24 in. widths, but other buckets, giving a slightly lesser digging reach and depth, can be obtained in widths from 12 to *36* in.

This backhoe can be attached either to the centre of the frame containing the vertical stabilizers which links it to the tractor (as here) or to either side: when attached to the centre it can swing through 185°, when attached to either side, *200°*. It can extend to a height of 10 ft. 2 in. above ground level; the maximum height that can be reached with the bucket in such a position as to hold material is *8* ft. *6* in. The particular machine used came equipped with a Massey-Ferguson Loader on the front, but this was not used during this operation; however, it would be of considerable use for moving dumps.

Locally, a backhoe and operator could be hired for about *$60* a day. At Louisbourg, it was possible to obtain the services of a Project backhoe for as long or as short a period as needed ; but with a commercially-hired

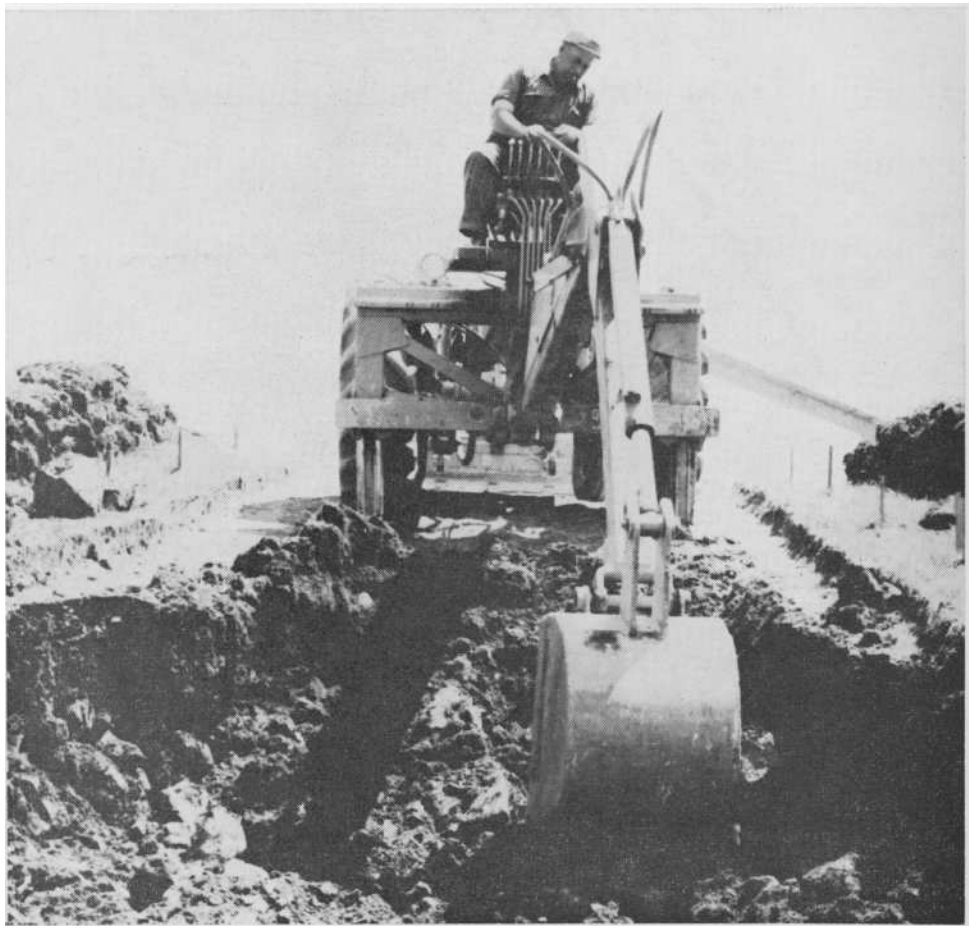

PLATE 2
Backhoe excavating in first trench. Material is dumped on either side.

backhoe this would not have been possible, so that it would be necessary to plan the work in advance for a concentrated period and to have alter-native places for work for the machine in case it turned up anything unexpected.

It is easy to see advantages in mechanically excavating a relatively simple construction such as the one here, with virtually no pottery or other material to be watched for, no complex stratigraphy, and a boulder core that would otherwise be extremely arduous to clear by hand ; however, there are certain practical difficulties and limitations.

A great deal depends on not only the operator's skill but also on his ability to grasp the meaning of the work from an archaeological stand-point.

Trenches for archaeological purposes that are less than 10 ft. wide are not practical for excavation by the backhoe in question: a trench,

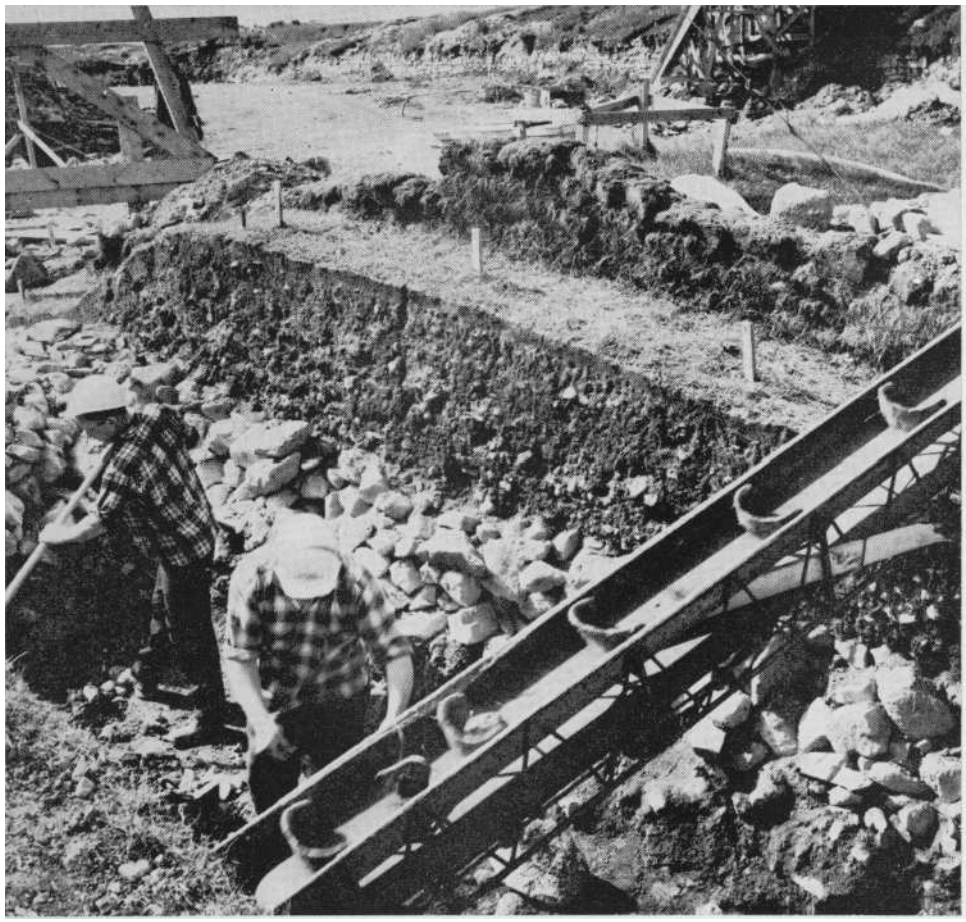

PLATE 3

Use of hand labour and a conveyor belt to clear lowest part of second trench, thus protecting trench sides.

a bucket's width across can be useful for locating walls and ditches, but for photography and section-drawing the trench has to be at least 5 ft. wide ; however, the backhoe cannot straddle and dig a trench that wide, and in any case would knock down reference stakes. The machine must work *in* the trench ( Pl. 2), which thus has to be at least 10 ft. wide, a width that was in good proportion to the greatest depth and made photography much easier.

The procedure employed was as follows: First the grass over the area to be excavated was cut by a power mower. Then the trenches were deturfed manually in rectangular pieces, and the pieces used to build retaining walls for the dumps on either side of the trench. Manual excavation at the rear of the construction then exposed the stone revetment.

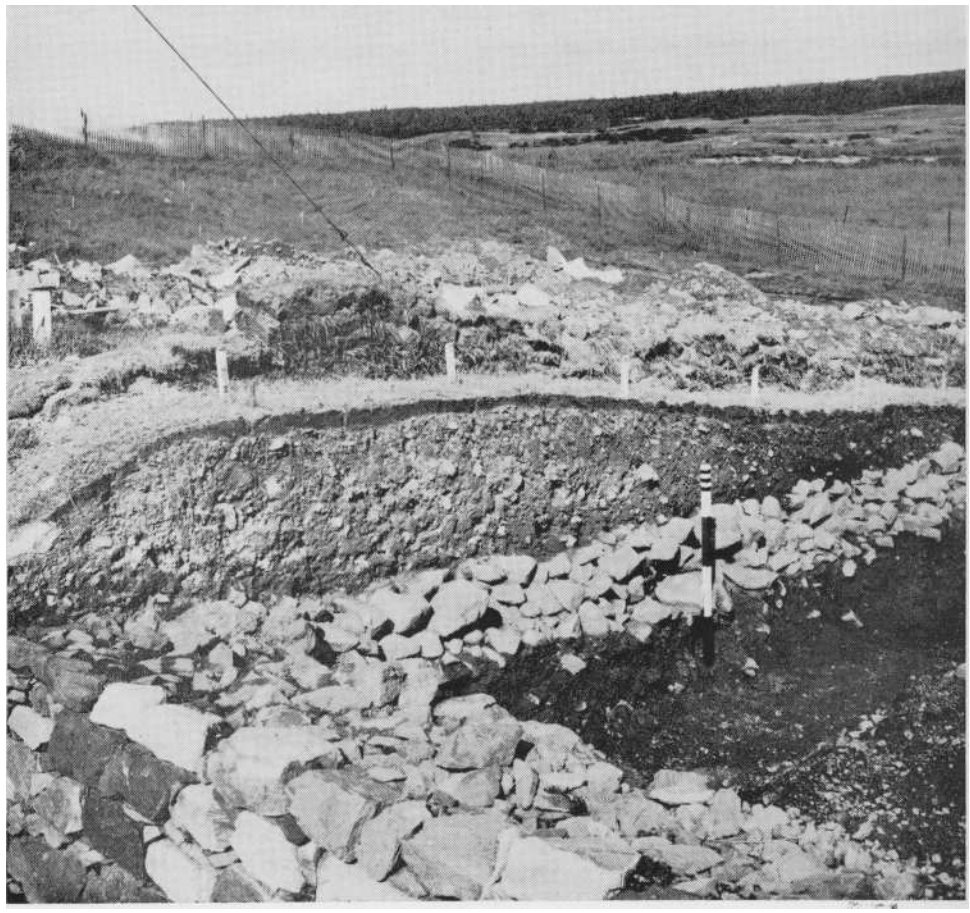

PLATE 4

Completed section in second trench through revetted glacis, showing stone core topped with earth. Rear revetment of the work is visible in left foreground.

Men working in a trench whose sides contain unstable boulders can excavate so that these sides can remain stable ; a backhoe, because it tends to dislodge anything unstable with which it comes in contact, has to be kept about two feet away from the trench sides. In order to prevent the sides from collapsing during rain, polyethylene sheets were placed over them in rainy weather and each night.

It was found that the backhoe was unable to lift material from the deepest parts of the trench sufficiently high to clear the turf retaining wall of the dump and to reach across the three foot margin between trench side and dump. As a result, these margins became covered with rubble which had to be cleared and reference stakes became dislodged and had to be reset. When the second trench was dug by machine, therefore, a conveyor

belt, filled by hand, was used to clear the deepest part (Pl. 3) after the backhoe had loosened the material. This belt, 20 ft. long, was powered by a gasoline motor.

At the end of each day, the edges and sides of the trenches were tidied as necessary, and final excavation was done by hand (P1. 4).

The opening of a drain which ran through the construction had been located while the revetment was being exposed by hand; had manual excavation of the revetment not preceded machine excavation of the glacis it is likely that this drain would have been at least partially destroyed before its presence had been recognized.

Three Spanish silver coins, each in excellent condition, were discovered together in the trench side, in a position where the backhoe, had it been six inches nearer, would have removed them, giving the uncomfortable feeling that others might have been lost by excavating in this manner. However, it was still felt that the carefully supervised use of this machine for this type of work was a success. Obviously, to use a backhoe to clear sites with occupation material and/or complex stratigraphy would constitute the rape of a site, but presumably no qualified archaeologist would do this. For rapid test trenching and for making ditch and rampart sections, especially if a hand-dug section has been excavated previously for general guidance, a backhoe seems worth using as an archaeological tool.

## ACKNOWLEDGEMENTS

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